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Siboga-Expeditie

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THE

DECAPODA OF THE SIBOGA EXPEDITION

PART III

Families ERYONIDAE, PALINURIDAE, SCYLLARIDAE AND NEPHROPSIDAE

BY

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With 4 plates

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TO THE MEMORY

OF HIS HIGHLY ESTEEMED AND BELOVED PARENTS

THIS WORK IS DEDICATED

BY

THE AUTHOR.

Family ERYONIDAE.

Of the Family Eryonidae seven species, one of which was new to science, have been collected by the Siboga Expedition: they belong to the genera *Stereomastis* Sp. Bate and *Polycheles* Heller.

In a paper, published February 1912 in the "Records of the Indian Museum, Vol. VII, Part I, N° 2", Messr. S. KEMP and R. B. S. SEWELL, who had been able to compare two specimens of *Pol. typhlops* Heller, captured by the "Talisman" off the Cape Verde Islands, with ALCOCK's types of *Pent. Hextii*, did not only resolve on the specific identity of these two species, but they came moreover to the important conclusion that the genera *Polycheles* Heller, *Pentacheles* Sp. Bate and *Stereomastis* Sp. Bate ought to be united in one genus *Polycheles* Heller. In his Report on the Stalk-eyed Crustacea, collected by the "Albatross", Mr. FAXON had remarked in 1895 that "an examination of a large number of species discloses a gradual transition in the development of the epipods, from large well developed organs through small, delicate and thin ones, to merest rudiments in the shape of small expansions at the base of the stem of the gill" and these words have evidently led Messr. KEMP and SEWELL to their conclusion, for in the Indian species such a gradual transition in the development of the epipods does not occur, so that Professor ALCOCK in his "Descriptive Catalogue of Indian Deep-Sea Crustacea" of 1901 has rightly recognized two distinct groups, to which he, however erroneously, assigned the names of *Polycheles* and *Pentacheles*.

In my opinion, however, the cited words of FAXON are, if well considered, not in contradiction with ALCOCK's observations concerning the epipods and the signification, attached to them by KEMP and SEWELL, seems to me to be erroneous. After a careful examination of the specimens collected by the Siboga expedition and after a careful study of the descriptions of all the species which are at present known, I have been led to the conclusion that ALCOCK's opinion is the only true one and that the two groups, distinguished by that author, must be recognized and accepted.

As has already been remarked, the epipods of *Polycheles typhlops* Heller = *Pentacheles Hextii* Alcock are developed like in ALCOCK's genus *Pentacheles*, while *Polycheles* Alcock is identical with *Stereomastis* Sp. Bate: it appears therefore necessary that the genus of which *P. typhlops* is the representative, should henceforth bear the name of *Polycheles* Heller and *Stereomastis* be the name of the other.

To this genus *Polycheles* Heller now, of which *Pol. typhlops* is the type species, 17 species must be assigned and it is my firm conviction that in all these forms the thoracic legs, except the last pair, are provided with normal epipods, which, however, may vary in length; the epipod of the external maxillipeds in most cases is also normally developed, sometimes it is of fair size, sometimes small and slender, while only in *Pol. Tanneri* Fax. it is reduced to a mere rudiment. In the following 9 species the external maxillipeds and the first four thoracic legs are provided with normal epipods: *baccatus* Sp. Bate, *Carpenteri* (Alcock), *enthrix* (Will.-Suhm), *gibbus* (Alcock), *gracilis* (Sp. Bate), *granulatus* Fax., *laevis* (Sp. Bate), *obscurus* (Sp. Bate) and *typhlops* Heller. In *Pol. Tanneri* Fax. the epipods of the thoracic legs are about half as long as their podobranchs, though very delicate in texture, while that of the external maxillipeds is a mere rudiment. *Pol. asper* Rathb., *crucifer* (Will.-Suhm) and *Snyderi* Rathb. bear an epipod on the external maxillipeds, but those of the thoracic legs have not been described. Unfortunately also nothing is known about the epipods of *Pol. debilis* (S. I. Smith), *debilis* (S. I. Smith) var. *armata* Bouv., *dubius* Bouv., *eryoniformis* Bouv. and *validus* (A. M.-Edw.). It would appear therefore doubtful whether the last mentioned species are indeed congeneric with the preceding ones, the epipods of which have been described, but the species of this genus show still other features that are common to all. The lateral borders of the carapace, namely, are constantly armed with more than 20 spines: the smallest number, 21 or 22, are observed in *Pol. Tanneri* Fax., 46 to 48 occur in *Pol. Snyderi* Rathb. and 51 to 54, which is the largest number known, even in *Pol. asper* Rathb., while one observes an intermediate number in the other species. The only exception is presented by *Pol. obscurus* (Sp. Bate), in which form the lateral margins are armed with 11 to 13 spines: the specimen, however, on which this species has been founded, was only 25 mm. long, probably still young and, as we read in the Challenger Report, was "in a very poor condition and had much the appearance of one that had recently cast its skin".

In the second place the median dorsal carina of the carapace is usually double, granulated, rarely nodulated and in most cases presents no definite small number of spines, being often traversed by bead-like tubercles or granulations or covered with crowded spinules. The 1st abdominal tergum, finally, is probably never armed with the two small spines at and near the outer ends of the anterior border, that generally occur in the species of *Stereomastis*.

The genus *Stereomastis* Sp. Bate now contains at present 10 species. In these species the epipod of the external maxillipeds has been described as rudimentary (*auriculata* (Sp. Bate), *Suhmi* (Sp. Bate)), very minute (*nana* (S. I. Smith)) or as represented at most by a papilla (*andamanensis* (Alcock), *cerata* (Alcock), *phosphorus* (Alcock), *sculpta* (S. I. Smith), *sculpta* (S. I. Smith) var. *pacifica* Fax. and *trispinosa* (de Man)). In these last mentioned five species and variety the epipods of the thoracic legs are membranous expansions of the base of the podobranchs; this is also the case with *Stereom. Suhmi* (Sp. Bate), according to the fig. 38, page 158, of the Challenger Report, while in *Stereom. auriculata* (Sp. Bate) the epipods are said to be absent from the thoracic legs. As regards *Stereom. Helleri* (Sp. Bate) I would remark that of the type specimen, which was a male and collected at Stat. 218 of the Challenger Expedition, North of New Guinea, the epipods have not been described, while the specimen

from Stat. 170, near the Kermadec Islands, which was considered by Spence Bate to be the female of *Helleri* and the thoracic legs of which were provided with normal epipods, certainly belongs to the other genus. Concerning the epipods of *Stereom. Grimaldii* (Bouv.) nothing is known, but this species is very closely allied to *Stereom. nana*, of which it is regarded by Mr. C. M. Selbie to be a variety.

Like the species of *Polycheles*, also those of the genus *Stereomastis* are distinguished by some other common features, which likewise demonstrate the validity of this genus. The lateral borders of the carapace, indeed, are constantly armed with less than 20 spines, the median dorsal ridge is smooth and invariably armed with a definite number of 4 to 7 spines and, except *Stereom. cerata* (Alcock), there are constantly two spines at and near the outer angles of the anterior border of the 1st abdominal somite. As regards *P. Grimaldii* (Bouv.), I would remark that this form is said to be closely related to *Stereom. andamanensis* (Alcock) and *Stereom. nana* (S. I. Smith), so that this species certainly also must be assigned to the genus *Stereomastis*.

The genus *Eryoneicus* Sp. Bate, distinguished by the inflate and globose carapace, which is longer than the abdomen, by the shape of the phymacerite, the shortness of the inner antennular flagellum and some other features, includes nowadays 12 species and 1 variety, that nearly all occur in the Atlantic. The Indopacific Region, indeed, is inhabited only by one single species, *Eryon. indicus* Alcock & Anderson, that occurs in the Arabian Sea and the Bay of Bengal, and by its variety *hawaiiensis* Rathb., which was taken in the vicinity of Kauai Island. The Eastern Atlantic, north of the Equator, is the habitat of the curious *Eryon. Alberti* Bouv., which, as Professor Bouvier remarks, differs from all known Eryonidae by the immoderate width of its carapace, furthermore of *Eryon. caecus* Sp. Bate, the first described species of this genus, discovered by the Challenger Expedition off the Canary Islands, of *Eryon. spinoculatus* Bouv., that has been obtained north of Terceira, Azores, and finally of 3 species, recently described by Mr. C. M. Selbie, which have been captured by the Irish Fishery cruiser Helga off the west coast of Ireland, viz. *Eryon. hibernicus*, *Eryon. Scharffi* and *Eryon. Kempi*. Two species are found in the Mediterranean, firstly *Eryon. Puritanii* Lo Bianco, taken near the island of Capri, but observed also off the Azores and in the Gulf of Gascony; the other species, *Eryon. Faxoni* Bouv., has been gathered by the "Princesse-Alice" south west of the Balearic Islands, but was previously already captured by the "Talisman" off Cape Cantin, Morocco. *Eryon. atlanticus* Lenz, a species discovered by the German Southpolar Expedition 1901—1903 and a detailed description of which was given by K. Strunck, of Lübeck, formerly assistant of the lamented Prof. H. Lenz, has been captured in the Equatorial Atlantic. *Eryon. spinulosus* Fax. occurs near the Galapagos Islands and the last species, finally, taken also by the "Albatross" Expedition in the Gulf of Panama, is in Faxon's Report of 1895, that contains beautiful figures of this *Eryoneicus*, referred with some hesitation to *Eryon. caecus* of the "Challenger" Expedition, but Bouvier has pointed out in 1905 that both species are certainly different.

The genus *Willemoesia* Grote, finally, that differs from the three other genera by the

situation of the immovable eye-stalks beneath and parallel with the anterior border of the carapace, is represented by 4 species. *Will. leptodactyla* (Will.-Suhm), the first discovered species, does not only occur in the Atlantic, north and south of the Equator, but has also been observed off the west coast of South America. The Gulf of Panama is inhabited by *Will. inornata* Fax., which may easily be recognized by the few spines on the margin and dorsal ridges of the carapace, while *Will. forceps* A. M.-Edw., the carapace of which is more inflated, has been obtained by the "Blake" Expedition in the Gulf of Mexico. The fourth species, finally, is *Will. indica* Alcock from the Bay of Bengal.

The recent Eryonidae are represented by about 45 species and 3 varieties, that are enumerated in the following List, which indicates also the localities where the species have been observed and the depths at which they have been obtained. The greatest depth at which a species of this family was taken, was 2225 fathoms off the coast of South America, whence from *Will. leptodactyla* has been recorded.

LIST OF ALL THE SPECIES OF RECENT ERYONIDAE, KNOWN AT PRESENT, NOVEMBER 1915 [1]).

I. Genus **Stereomastis** Sp. Bate 1888.

SPECIES	HABITAT	DEPTH IN FATHOMS
**andamanensis* (Alcock) 1894	Travancore coast	1043
	Bali Sea	380
	Flores Sea	1093
	Strait of Makassar	395
	Channel between Makjan and Halmaheira	258
auriculata (Sp. Bate) 1878	Fiji Islands	610
cerata (Alcock) 1894	Andaman Sea	922
Grimaldii (Bouv.) 1905	Coast of Senegal	
	Off south-west coast of Ireland	982
Helleri (Sp. Bate) 1878.	Off the Kermadec Islands [2])	520
	North of New Guinea	1070
nana (S. I. Smith) 1884.	East coast of the United States	843—1917
	Gulf of Panama	899—1322
**phosphorus* (Alcock) 1894.	Andaman Sea	200—740
	Bay of Bengal	
	Arabian Sea	
	Gulf of Manár	
	East of Rotti	284
	Hawaiian Islands	55—809
**sculpta* (S. I. Smith) 1880	East coast of the United States	250—843
	West-Indies	611—1568
	Eastern Atlantic	
	West coast of Ireland	610—982

1) The species collected by the "Siboga" are marked with an asterisk and the new species are printed in a more heavy type.
2) The female, collected by the Challenger Expedition at this Station, belongs probably to another species.

SPECIES	HABITAT	DEPTH IN FATHOMS
	Gulf of Gascony	350—660
	Coast of Sardinia	1170—1550
	Cape Natal	440
	Arabian Sea	738—836
	Bali Sea	556
	Gulf of Boni	633
sculpta (S. I. Smith) var. *pacifica* Fax. 1893	Gulf of Panama	511—1270
	West coast of Mexico	660—772
Suhmi (Sp. Bate) 1878	South-western coast of South America	160
	Near Magellan Strait	245
*trispinosa (de Man) 1905.	Bali Sea Flores Sea	294—500

II. Genus **Polycheles** Heller 1862.

asper Rathb. 1906.	Hawaiian Islands	735—865
**baccatus* Sp. Bate 1878	Fiji Islands	310—315
	Bali Sea	400—500
**Carpenteri* (Alcock) 1894.	Bay of Bengal	1370—1540
	Off the Sangir Islands	1122
crucifer (Will.-Suhm) 1875	Off Sombrero Island	450
debilis (S. I. Smith) 1884.	East coast of the United States	1290—1309
debilis (S. I. Smith) var. *armata* Bouv. 1905	Coast of Morocco	
	Azores	1060
[1]) *dubius* Bouv. 1905	Azores	
	Off the Cape Verde Islands	
	Off the coast of Spain	
eryoniformis Bouv. 1905	South of Madeira	
euthrix (Will.-Suhm) 1875	Off the Kermadec Islands	520—630
	Off the Fiji Islands	315
gibbus (Alcock) 1894	Andaman Sea	922
	Arabian Sea	912—931
gracilis (Sp. Bate) 1888.	Fiji Islands	610
[2]) *granulatus* Fax. 1893	Gulf of Panama	899
	Hawaiian Islands	385—809
	Off Colombo	675
	Cape of Good Hope	480—600
	Off the south-west coast of Ireland	670—770
laevis (Sp. Bate) 1878.	Between Samboangan and New Guinea	500
	West of Valparaiso	1375
obscurus (Sp. Bate) 1878	North of New Guinea	1070

1) This species is regarded by C. M. SELBIE (The Decapoda Reptantia of the Coasts of Ireland, London 1914, p. 23) as a synonym of *Polycheles granulatus* Fax.

2) With this species *Polycheles Beaumontii* (Alcock) 1894 from off Colombo is no doubt identical. It is the opinion of Miss RATHBUN (The Brachyura and Macrura of the Hawaiian Islands, Wash. 1906, p. 899), of Mr. C. M. SELBIE (l. c. 1914, p. 23) and of the Rev. STEBBING (South African Crustacea, Part VII, 1914, p. 11), while Mr. FAXON is "inclined to regard *P. beaumontii* as, at most, but a geographical race of *P. granulatus*".

A species, however, from the Cape of Good Hope, of which a male and a female were referred by the Rev. STEBBING in 1908 with some doubt to *P. Beaumontii* (South African Crustacea, Part IV, p. 25), is regarded by SELBIE (l. c.) as a different form; I am of the same opinion which is corroborated by the fact that the Rev. STEBBING in: South African Crustacea, Part VII, 1914, p. 11, does not quote here his description of 1908.

SPECIES	HABITAT	DEPTH IN FATHOMS
Snyderi Rathb. 1906	Hawaiian Islands	313—800
Tanneri Fax. 1893	Galapagos Islands	
	Gulf of Panama	
**typhlops* Heller 1862	Adriatic, Mediterranean	340—1100
	Off the south-west coast of Ireland	208—728
	Between Iceland and the Hebrides	725
	Eastern Atlantic	
	West-Indies	118—1058
	Andaman Sea	188—220
	Arabian Sea	224—284 and 719
	Coast of Malabar	237
	Bali Sea	158 and 285
validus (A. M.-Edw.) 1880	West-Indies	955—1591

III. Genus **Eryoneicus** Sp. Bate 1882.

Alberti Bouv. 1905	Sargasso Sea, Atlantic	Between the surface and 1100
atlanticus Lenz 1914	Equatorial Atlantic	1640
caecus Sp. Bate 1882	Off the Canary Islands	1620
caecus Fax. 1893	Gulf of Panama	764—1832, surface to 400
Faxoni Bouv. 1905	Off Cape Cantin	1200
	South-west of the Balearic Islands	Between the surface and 1300
	South-west of Ireland	
hibernicus Selbie 1914	West coast of Ireland	
indicus Alcock & Anderson 1899	Arabian Sea	480, 487 and 824
	Bay of Bengal	690—920
indicus hawaiiensis Rathb. 1906	Hawaiian Islands	480—577
Kempi Selbie 1914	West coast of Ireland	
Puritanii Lo Bianco 1903	Near Capri	330—1040
	Azores	Surface
	Gulf of Gascony	820
Scharffi Selbie 1914	West coast of Ireland	
spinoculatus Bouv. 1905	Azores	1570
spinulosus Fax. 1893	Galapagos Islands	384
sp. Selbie 1914	Off the South-west coast of Ireland	

IV. Genus **Willemoesia** Grote 1873.

forceps A. M.-Edw. 1880	Gulf of Mexico	1920
indica Alcock 1901	Bay of Bengal	1310—1803
inornata Fax. 1893	Gulf of Panama	1322—1823
leptodactyla (Will.-Suhm) 1873	North and South Atlantic	1900
	West coast of South America	1375, 2225

Stereomastis Sp. Bate.

Stereomastis C. Spence Bate, Report on the Challenger Macrura, 1888, p. 154.
Polycheles A. Alcock, A descriptive Catalogue of the Indian Deep-Sea Crustacea, Calcutta 1901, p. 166.

In this genus the lateral margins of the carapace are constantly armed with less than 20 spines, the median dorsal ridge is smooth and carries a definite number of 4 to 7 spines and there are invariably two spines at the outer angles of the anterior border of 1st abdominal somite, except only in *Stereom. cerata* (Alcock). The epipod of the external maxillipeds is rudimentary, while those of the thoracic legs are membranous expansions of the base of the podobranchs.

The genus *Stereomastis* contains at present 10 species and 1 variety: just as is the case with the genus *Polycheles*, most species inhabit the Indopacific. Like *Polycheles typhlops* Heller in the genus *Polycheles*, it is in this genus *Stereom. sculpta* (S. I. Smith) that presents a very extended geographical distribution: this species, indeed, occurs from Nova Scotia along the east coast of the United States to the West-Indies; it has been observed in the eastern Atlantic, in the Gulf of Gascony and in the western half of the Mediterranean, furthermore at Cape Natal and in the Arabian Sea, while it has been secured by the "Siboga" even in the Bali Sea and at the entrance of the Gulf of Boni. A variety *pacifica* Fax. is found in the Gulf of Panama and off the west coast of Mexico. Still another species of *Stereomastis* occurs along the east coast of the United States and specimens from the Gulf of Panama hardly differ from the type form: this species is *Stereom. nana* (S. I. Smith), which has wrongly been regarded as a dwarf deep-water variety of *Stereom. sculpta*. Near Magellan Strait and off the south western coast of South America *Stereom. Suhmi* was discovered by the "Challenger", while *Stereom. Grimaldii* (Bouv.) occurs on the coast of Senegal: the latter species, however, has quite recently been captured off the south-west coast of Ireland and is regarded by Selbie as a variety of *Stereom. nana* (S. I. Smith). The 6 other species are all distributed throughout the Indopacific. The Indian Ocean, north of the Equator, is inhabited by *Stereom. andamanensis* (Alcock), *cerata* (Alcock) and *phosphorus* (Alcock); the first and the third of these species as also *Stereom. trispinosa* (de Man), a new form discovered by the Siboga expedition, are found in the Indian Archipelago, while *Stereom. phosphorus* has moreover also been observed off the Hawaiian Islands. *Stereom. auriculata* (Sp. Bate) is known from near the Fiji Islands, the last species, finally, *Stereom. Helleri* (Sp. Bate), was taken north of New Guinea.

The greatest depth at which a species of this genus has been observed, was 1917 fathoms, at which depth *Stereom. nana* has been secured off the east coast of the United States.

Key to the species obtained by this expedition.

a. Median ridge of the gastric region carrying behind the two rostral teeth three spines, the penultimate of which is double; median carinae of the 1st until and inclusive the 5th terga culminating anteriorly in a spine. . . . . *sculpta* (S. I. Smith)

aa. Median ridge of the gastric region carrying behind the two rostral teeth four spines, the penultimate of which is double.

b. The first three terga culminate in a spine . . . . . *trispinosa* (de Man)

bb. The first four terga culminate in a spine. Terga smooth . . *phosphorus* (Alcock)

bbb. The first five terga culminate in a spine. Terga not smooth . *andamanensis* (Alcock).

Like as of the genus *Polycheles*, so also of *Stereomastis* no species were known to inhabit the Indian Archipelago before the discoveries of the "Siboga"; probably still one or two other forms will afterwards prove to occur also in these seas, so e. g. *Stereom. cerata* (Alcock) or *Stereom. Helleri* (Sp. Bate).

One of the specimens of *Stereom. andamanensis* (Alcock) was taken at a depth of 1093 fathoms, nearly at the same depth (1043 fathoms), at which the type of this species was obtained; the other specimens were gathered in less deep water.

1. *Stereomastis sculpta* (S. I. Smith).

Polycheles sculptus S. I. Smith, in: Proc. U. S. Nat. Museum, Wash., Vol. II, for 1879, March 1880, p. 346, Pl. VII.

Pentacheles sculptus S. I. Smith, in: Bull. Mus. Compar. Zoology Harvard College, Cambridge, Vol. X, N° 1, 1882, p. 23, Pls. III and IV and in: Report of the Commissioner of Fish and Fisheries for 1882, Wash. 1884, p. 358.

Polycheles sculptus M. Caullery, in: Annales de l'Université de Lyon, Paris, 1896, p. 385.

Pentacheles sculptus A. Alcock and A. R. S. Anderson, in: Annals Mag. Nat. Hist. Ser. 7, Vol. III, 1899, p. 289.

Polycheles sculptus A. Alcock, A descriptive Catalogue of the Indian Deep-Sea Crustacea Decapoda, Macrura and Anomala in the Indian Museum, Calcutta, 1901, p. 170.

Polycheles sculptus Th. R. R. Stebbing, South African Crustacea, Pt. II, Cape Town, 1902, p. 36.

Polycheles sculptus A. Senna, in: Bull. Soc. Entom. Ital. XXXIV, 1903, p. 338.

Polycheles sculptus C. M. Selbie, in: Fisheries, Ireland, Sci. Invest. 1914, I. [1914], p. 18, Pl. II, figs. 1—9.

Pentacheles spinosus A. Milne Edwards, in: Bull. Mus. Compar. Zoology Harvard College, Cambridge, Vol. VIII, 1880, p. 66.

Stat. 18. March 18. 7° 28′.2 S., 115° 24′.6 E. 1018 m. Bottom fine grey mud. 1 male.

Stat. 211. September 25. 5° 40′7 S., 120° 45′.5 E. 1158 m. Bottom coarse grey mud, superficial layer more liquid and brown. 1 young male.

The male from Stat. 18, which is almost adult, closely agrees with SMITH's minutely-detailed description of 1882. The external maxillipeds reach as far forward as the antennular peduncles: it is no doubt a mistake, when SMITH (l. c. p. 27) writes, that they "reach, when extended, nearly to the bases of the peduncles of the antennulae", for in his figure, Plate IV, fig. 1, they appear just as long as in the present specimen. The 1st legs are wanting. The merus of the legs of the 2nd pair reaches to the upper carina on the ventral region of the carapace, that does not extend to its postero-lateral angle; according to SMITH the merus of these legs should reach to the edge i. e. to the lateral margin of the carapace, but his specimens were older and larger. This specimen does not show, except the spine of the eye-stalk, the peculiarities of FAXON's variety *pacifica*, but completely agrees with the individuals observed in the Arabian Sea. The spines in the mid-line of the carapace are (the two rostral spines included):

2, 1, 2, 1, fossa, 2, 2, 2; the marginal spines on each side: 6—3—7. The sublateral carina on the branchial region carries on either side 5 spines; just as in SMITH's figure (l. c. 1882, Pl. III) the distances between these spines somewhat increase from before backwards and the posterior one is just twice as far distant from the fourth as the first from the second. This sublateral carina, though nearly parallel with the lateral margin of the carapace, appears, indeed, very slightly curved, so that its distance from the lateral margin is somewhat larger in the middle than at its extremities.

The tooth or spine in the middle of the anterior border of the ophthalmic lobe is small, sharp, directed outward and as distinctly developed as in the variety *pacifica*; according to ALCOCK, this spine should be wanting in the specimens from the Arabian Sea. The 5th legs are subcheliform; the immobile finger is obtusely pointed, the dactylus, twice as long, tapers to a sharp extremity and is slightly incurved.

The other example agrees with that which has been described.

Measurements in millimeters:

	♂	♂
Length from front of carapace to tip of telson:	94	47
Length of carapace along median line:	41	21
Width of carapace between the tips of the spines at the antero-lateral angles:	$20^1/_4$	9
Greatest width, in front of cervical suture:	$31^1/_2$	$14^1/_2$
Length of 1st pair of legs:		52
„ „ merus of these legs:		$15^1/_2$
„ „ carpus „ „ „		8
„ „ chela „ „ „		$16^1/_2$
„ „ dactylus of „ „		$9^1/_2$
Greatest breadth of abdomen at the second somite:	25	$11^1/_2$
„ „ „ „ „ „ sixth somite:	$13^1/_2$	6
Length of telson:	$16^1/_2$	8
Width of telson:	$8^1/_2$	4

Stereomastis auriculata (Sp. Bate) from Kandavu Island is, no doubt, different. The median line of the carapace, between the two rostral teeth and the cervical suture, carries two single teeth more, the sublateral carinae on the branchial region are more strongly waved and armed with a larger number of teeth, the inner and the outer margin of the orbital notch are nearly parallel with one another and with the median line of the carapace and the 5th abdominal tergum carries "no tooth, but a small, carina-like ridge".

A closely allied form is also *Polycheles Tanneri* Fax., which, besides by its more or less developed epipods on the thoracic legs, may easily be distinguished by the different armature of the lateral margins and of the upper surface of the carapace. *Pol. Tanneri* forms, however, just in virtue of the spinulation of its carapace and of the feeble development of its epipods, a remarkable transition from the genus *Polycheles* to the genus *Stereomastis* (vide p. 22).

Geographical distribution: Southeast of Sable Island, off the coast of Nova Scotia, 250 fathoms, also at other localities off the East coast of the United States, e. g. off the mouth of Chesapeake Bay, at depths varying between 300 and 843 fathoms (S. I. SMITH);

Caribbean Sea, Guadeloupe, Dominica, between 611 and 1568 fathoms (A. Milne-Edwards); West coast of Ireland, 610—982 fathoms (Selbie); Gulf of Gascony at depths of 355—655 fathoms (Caullery); Mediterranean (Senna); Eastern Atlantic (Bouvier); Cape Natal N. by E. (approx.) 24 miles, 440 fathoms (Stebbing); Arabian Sea, 738, 824, 836 fathoms (Alcock).

2. *Stereomastis trispinosa* (de Man). (Pl. I, Fig. 1—1*b*).

Pentacheles trispinosus J. G. de Man, in: Tijdschr. Ned. Dierk. Vereen. (2) Dl. IX, 1905, p. 587.

Stat. 38. April 1. 7° 35'.4 S., 117° 28'.6 E. 732—915 m. Bottom coral. 1 male of medium size, 1 younger male and 4 younger females.

Stat. 45. April 6. 7° 24' S., 118° 15'.2 E. 794 m. Bottom fine grey mud, with some radiolariae and diatomes. 1 young male.

Stat. 314. Febr. 17, 1900. 7° 36' S., 117° 30'.8 E. 694 m. Bottom fine sandy mud. 1 female without eggs of medium size and 7 young specimens, 5 males and 2 females.

Stat. 316. Febr. 19, 1900. 7° 19'.4 S., 116° 49'.5 E. 538 m. 1 adult female with eggs and 3 males, one of medium size and two young.

Though closely related to *Stereom. phosphorus* (Alcock), *Stereom. andamanensis* (Alcock) and other forms, I did not hesitate to describe this species as a new one, for it is distinguished, besides by other characters, at first sight by the fact that the carinae of only the three first abdominal terga are culminating in an antrorse spine, — from which character the specific name is derived.

The carapace of the adult female from Stat. 316 shows its greatest width in front of the deep cervical groove: it is little more than two-thirds the length, the rostral spines included. The carapace is a little less broad, in proportion to its length, than that of *Stereom. phosphorus* and the antero-lateral angles are slightly farther distant from one another. Posterior to the cervical groove, the lateral borders converge but very slightly backwards, like in *Stereom. phosphorus*. Beneath the hairy tomentum, with which it is covered, the upper surface appears, here and there, minutely granular, so especially on the branchial regions, less distinctly also outside the orbital notches and on the gastric region. The frontal border is concave, like in *Stereom. phosphorus*, the orbital notches have the same form, the same size and the same direction with regard to the mid-dorsal line. In this specimen the acute tooth on the frontal border of the eye-stalks is situated near the outer margin, for it is 3-times as far distant from the inner border as from the outer border of the orbital notch; the tooth is directed upward and outward. The frontal border, slightly concave between the orbital sinuses, makes almost right angles with the oblique inner margins of the latter and carries at either angle a short spine, which is directed upward, forward and slightly outward. The outer and the inner border of the orbital notches run nearly parallel, their outer angle is rounded and unarmed; the oval, semitranslucent, not calcareous area at the posterior end of the eye-stalk is quite distinct, situated as usual in a depression of the carapace. The upper surface of the carapace slopes obliquely down from the median carina, which is its most elevated part, towards the lateral borders, but the hepatic region, situated between the orbital sinus and the lateral border and extending, gradually narrowing, from the frontal border until the cervical groove, is flattened

and horizontal; it appears therefore rather incorrect to describe the carapace of this and other allied species as "depressed", as we read in the "Catalogue of the Indian Deep-Sea Crustacea". As regards the armature of the mid-dorsal carina, this species fully agrees with *Stereom. phosphorus*. Between the two rostral teeth and the cervical groove the carina carries four spines, the penultimate of which is double; the two rostral teeth, which are directed upward and somewhat forward, are in this specimen coalesced for three fourth parts of their length. The three pairs of juxtaposed spines, posterior to the cervical groove, agree, as regards their position and size, with those of *Stereom. phosphorus*, the two spines of the posterior pair being farther distant from one another than the rest.

The lateral borders of the carapace present exactly the same armature in all the 18 specimens of this collection, so that we may conclude that the number of spines on their three divisions is characteristic. The anterior division is invariably armed with 5 spines, including the spine at the antero-lateral angle, which is slightly curved inward and a little longer than the four others. The middle division of the lateral border carries 3 spines and the posterior, that is somewhat longer than the two other ones taken together, constantly with 9: except the first, which is somewhat larger, the eight other spines, with which the lateral border of the branchial region is armed, are of the same size and equidistant, though we must remark that the last spine is twice as far distant from the posterior extremity of the border as from the 8th or penultimate. The notch that separates the anterior and the middle division of the lateral border from one another, is a little larger and deeper than that of the cervical groove. There is also a longitudinal row of spines on the branchial region extending from the posterior margin till near the cervical groove; it is twice as far distant from the mid-dorsal carina as from the lateral border and is slightly undulate, so that it appears, just behind the middle, somewhat farther distant from the lateral border than at its extremities. This row is armed with 13 spines, which are somewhat smaller than those of the lateral border and equidistant, except the two last ones that are farther distant from one another. In *Stereom. phosphorus*, however, this sublateral ridge carries only 7 spines and it runs quite straight in the quoted figure 2 of the "Illustrations"; the lateral borders are armed, in this species, "with 6 (rarely 7) + 3 (rarely 4) spines in front of the cervical groove, and 6 or 7 behind it". Like in *Stereom. phosphorus*, one observes five or six small spines on the anterior half of the branchial regions, just outside the oblique furrow defining the cardiac region and one or two more are visible somewhat farther backward near the sublateral ridge. *Stereom. trispinosa* carries likewise the 6 spines on the anterior portion of the carapace, that are found in *Stereom. phosphorus*, on each side of the median carina, viz. three in an oblique row running from the orbital notch backward and inward, one at the bifurcation of the cervical groove and two between it and the former. In the adult female the posterior border of the carapace carries a few minute sharp granules, though it cannot be said to be spinulose. The ventral sidewalls are minutely granular and somewhat hairy; the two oblique ridges are spinulose, the lower armed with about 50 spinules, that somewhat diminish in size near both extremities.

The carapace, measured in the middle line, appears two-thirds of a telson-length shorter than the abdomen.

The abdomen differs from that of *Stereom. phosphorus* by the median carina of the 4th tergum that does not culminate in an acute antrorse spine, but the distal end of which is obtuse and rounded. For the rest, however, the abdomen apparently fully agrees with the quoted figure of *Stereom. phosphorus* in the "Illustrations" and with the description. The carinae of the three first terga culminate each in an acute, overhanging, antrorse spine; those of the 1st and of the 2nd tergum are small, of the same size, that of the 3rd is considerably larger. The carina of the 5th terminates not at all in a tooth, but ends abruptly and presents, in a lateral view, the same form as the carina on the 4th tergum of *Polycheles gracilis* (Challenger Macrura, Pl. XVI, Fig. 2). The carina of the 6th tergum is double, both edges are denticulate and unite posteriorly. The carina at the base of the telson carries posteriorly two small teeth behind one another, the anterior tooth a little larger than the other. Like in *Stereom. phosphorus*, the anterior border of the smooth first somite carries at either end two small spines of equal size. The terga of the 4 following somites are obliquely and very deeply cleft at either side of the median carina, like in *Stereom. phosphorus*; these terga are, however, not smooth, but somewhat uneven and tubercular, especially on the edges of the oblique grooves. The tergum of the 6th somite appears a little shorter in proportion to its breadth than in the figure of *Stereom. phosphorus*: in the adult female from Stat. 316 this tergum is 7.5 mm. long in the middle line, its width at the antero-lateral angles is 15.5 mm. At either side of the double carina this tergum appears somewhat granular, like also near the antero-lateral angles.

The pleura are strengthened each by a salient, curved, minutely granular midrib, shaped as in *Stereom. auriculata* (Challenger Macrura, Pl. XVI, fig. 4), and one observes some sharp granules between this rib and their denticulate posterior margin; the much larger pleura of the 2nd somite are also somewhat granular or tubercular on their anterior half and they carry a small spine at their anterior end. The caudal fan resembles that of *Stereom. phosphorus*.

Immediately in front of the two rostral teeth arises from the frontal wall of the carapace ("metope" of Spence Bate) a slender, conical tooth directed upwards and slightly forwards; this tooth reaches barely, however, to the level of the upper surface of the carapace.

The antennules and the antennae fully agree with those of *Stereom. phosphorus*, except that there are two spinules at the outer angle of the basal joint of the antennular peduncle; the larger anterior spine is placed just near the arcuate acoustic sulcus on the upper surface, the second is only half as long and placed immediately behind it. There is a compressed tooth at the distal end of the inner border of the antepenultimate joint of the antennal peduncle and a smaller spinule occurs at the distal end of the inner border of the penultimate and of the last joint. The antennal scale reaches by its spiniform extremity as far forward as the antennal peduncle, the antennular scale is a little longer and its spiniform extremity is turned upwards.

The external maxillipeds reach as far forward as the penultimate joint of the antennular peduncle.

In the adult female the 1st pair of thoracic legs are just as long as the body, they resemble those of *Stereom. phosphorus*. The upper margin of the merus carries 2 or 3 spines in the middle of its upper margin, the lower margin is finely spinulose along its whole length

and carries, on the right leg, a spine in the middle; a claw-like spine, directed inward, occurs at the distal end of the merus. A straight, slender spine, directed forward, is observed near the far end of the upper border of the carpus and another much smaller one exists at the distal end of the lower. The chela is a little longer than the merus and, except in the youngest specimens, twice as long as the carpus. The upper border of the palm bears six or seven spines along its whole length, while one observes in *Stereom. phosphorus* only one claw-like spine at the far end; the lower border of the palm is finely spinulose along its distal half. The fingers of the adult female are one-fourth longer than the palm, in the other younger specimens one and a half times as long.

The following legs resemble also those of *Stereom. phosphorus*. The 2nd legs measure, in the adult female, a little more than one-third the length of the 1st pair, the following diminish gradually in length. The coxae of the 2nd and 3th pair are armed with a strong spine near the outer angle of their anterior border that articulates with the ischium. The merus of the 2nd legs presents a small spine at the far end of its upper border and a slender, straight spine at the far end of the carpus. The following legs are unarmed, except the spine on the coxa of the 3rd pair. The 5th legs are, in this adult female, cheliform.

Eggs ochre-yellow, very numerous, globular, small, their diameter measuring 0.8 mm. Genital apertures conspicuous.

The largest male, collected at Stat. 316, is 93 mm. long. The two rostral spines are coalesced for three fourth parts of their length. The armature of the lateral margins of the carapace is for the left side $\overset{5}{\underset{9.12}{3}}$, for the right $\overset{6}{\underset{12.9}{3}}$; the anterior division on the right side is armed abnormally with 6 or, properly speaking, with 7 spines, because the fifth is double. The sublateral ridge on the branchial regions consists of 12 spinules, which are smaller than those of the lateral margin, but I must remark that a 13th spinule occurs, on the inner side of the ridge, between the antepenultimate and the penultimate, both on the right and on the left branchial region. The acute tooth on the frontal border of the eye-stalk is directed outward and situated a little farther distant from the inner than from the outer angle. The large median spine of the 3rd abdominal tergum is 8 mm. long, measured from the posterior margin of the somite, and almost twice as long as the 2nd that measures 4.5 mm.

The merus of the left leg of the 1st pair carries two spines near one another, just behind the middle of its upper border and one opposite them on the lower, besides the minute spinules with which the latter is armed; that of the right leg presents one spine above and two smaller ones below, and in both meri one observes the usual spine at the distal end of the upper border. The coxae of the 2nd legs are armed with two spines on their anterior border, a larger one in the middle and a smaller more inward.

The largest female from Stat. 314 is 81,5 mm. long, the carapace being 35,5 mm. long, the abdomen 46 mm. The rostral spines are separated for more than half their length. The armature of the lateral borders of the carapace is typical, on both sides, the anterior division presenting 5, the middle one 3, the posterior 9 spines; of the teeth of the sublateral ridges on the branchial regions the 6 or 7 anterior ones are rudimentary, which is, of course, an abnormality. The merus of the left leg of the 1st pair carries one tooth, that of the right two

near one another just behind the middle of the upper border, besides the usual distal spine; the spinules of the lower border are all small, except one that is a little larger, on the merus of the left leg. The upper margin of the palm carries on the left leg 6, on the right 7 spines except the small acute tooth at the distal end. The coxae of the 2nd and 3rd pair are armed, on their anterior margin, only with one tooth.

The largest of the other specimens is a male from Stat. 38, which measures 79 mm. (carapace 35 mm., abdomen 44 mm.). The two rostral spines are separated until to the middle, the sublateral carinae on the branchial regions carry 12 spines instead of 13. The acute, outwardly directed tooth on the frontal border of the eye-stalks is situated on the middle of this border. The overhanging curved spine into which terminates the carina of the 3rd abdominal somite, is more than twice as long as that of the 1st. The coxae of the 2nd legs carry, instead of one, two or three spines, of which the outer one is larger than the others. There is no spine at the far end of the merus of these legs. The 5th legs are subcheliform, the dactylus being one and a half as long as the immobile finger. For the rest this specimen agrees with the described female from Stat. 316.

In a young female, long 55 mm., from the same Station the two rostral teeth are coalesced until the middle and slightly directed outward. The acute tooth on the frontal border of the eye-stalks is placed, like in the male, just in the middle of the border. The sublateral ridge carries on the left branchial region 11 spines, on the right 12. The slender, curved spine on the 3rd tergum is almost 3-times as long as that of the 1st. The upper border of the merus of the 1st pair of legs carries but one spine, somewhat behind the middle, besides that at the distal end. The coxae of the 2nd legs are armed again only with one spine and the far end of their merus is unarmed. The legs of the 5th pair resemble those of the male, the dactylus being still distinctly longer than the immobile finger.

The other specimens, males and females, are all younger than the last described female and nearly 40 mm. long; they present the same characters. The sublateral carina on the branchial regions carries usually 12, rarely 13 or 11, in one case even only 10 spines. These differences are apparently all individual.

The epipod of the external maxillipeds is a small papilla, about $1^1/_2$ mm. long, while those of the four thoracic legs are membranous expansions of the base of their podobranchs.

Measurements in millimeters.

	1 ♂	2 ♂	3 ♂	4 ♀	5 ♀	6 ♀
Length of the body, measured in the middle line, rostral teeth included	93	79	41	134	56	40
Length of the carapace	41	35	18	58	25	$17^1/_2$
„ „ „ abdomen	52	44	23	76	31	$22^1/_2$
Distance between the tips of the spines at the antero-lateral angles	19	17	$8^1/_2$	$28^1/_2$	12	$7^3/_4$
Greatest width in front of the cervical groove	$28^1/_2$	25	$12^1/_4$	41	$17^1/_2$	$11^1/_2$
Length of the telson	18	$15^1/_2$	$8^1/_4$	$25^1/_2$	$11^1/_2$	8
Width of „ „	$8^3/_4$	$7^1/_2$	$3^2/_3$	$12^1/_2$	5	$3^1/_2$

	1 ♂	2 ♂	3 ♂	4 ♀	5 ♀	6 ♀
Length of the 1st pair of legs	96	81	39	134	57	37
" " " 2nd " " "	36	32	15	50	21	15
" " " 5th " " "	24	20	9	36	$12^1/_2$	9
" " " merus of the 1st pair of legs	27	23	11	38	16	10
" " " carpus of the 1st pair of legs	15	13	$5^1/_2$	$21^1/_2$	9	5
" " " chela of the 1st pair of legs	30	27	$13^1/_2$	44	19	13
" " " palm of the 1st pair of legs	14	11	$5^1/_2$	$19^1/_2$	$7^1/_2$	$5^1/_4$
" " " fingers of the 1st pair of legs	16	16	8	$24^1/_2$	$11^1/_2$	$7^3/_4$

N° 1, 3 and 4 Station 316; N° 2, 5 and 6 Station 38.

3. *Stereomastis phosphorus* (Alcock).

Pentacheles phosphorus A. Alcock, in: Annals Mag. Natural History, Ser. 6, Vol. XIII, 1894, p. 240.

Polycheles phosphorus A. Alcock, A descriptive Catalogue of Indian Deep-Sea Crustacea, Calcutta, 1901, p. 168.

Polycheles phosphorus M. J. Rathbun, The Brachyura and Macrura of the Hawaiian Islands, Wash. 1906, p. 898.

Polycheles phosphorus S. Kemp and R. B. Seymour Sewell, in: Records Indian Museum. Vol. VII, Part I, N° 2, 1912, p. 24. — Illustrations Zool. Invest. Crust. 1894, Pl. VIII, Fig. 2.

Stat. 297. January 27, 1900. 10° 39′ S., 123° 40′ E. 520 m. Bottom soft, grey mud, with brown upper layer. 1 young female.

This specimen, though presenting two slight differences from the quoted description, is, however, referred to *Stereom. phosphorus* (Alcock). The anterior division of the lateral border of the carapace carries 6 spines, the middle one 3, the posterior, however, 9, instead of 6 or 7, as usual; these 9 spines are equidistant, except the two last ones, that are a little farther distant from one another. Specimens from the Hawaiian Islands presented even 10 spines behind the groove (Rathbun, l.c.). The other difference is shown by the basal joint of the antennular peduncle, which is armed with two spinules, instead of one; this fact, however, is probably of little moment, because also one of the specimens of another species, viz. *Stereom. andamanensis* (Alcock), presents a similar difference from its type (page 19).

For the rest the female from the east coast of the Island of Rotti apparently fully agrees with the type. The sublateral carinae of the branchial regions carry 7 spines, just as in the figure of the "Illustrations". The posterior border of the carapace is finely granular anteriorly, apparently a juvenile feature. The carinae of the first four terga culminate each in an overhanging, antrorse spine; the spine of the 2nd tergum is little longer than the 1st, that of the 3rd is much longer and the 4th spine is as long as the 3rd. The carina of the 5th tergum ends abruptly and is emarginate. The two edges of the double carina on the 6th tergum are denticulate and unite posteriorly into a compressed, rather high, median crest. At either side of the double carina one observes on the 6th somite a few small granules. The margins of the pleura are denticulate posteriorly and inferiorly and there is a spine at the anterior end of the pleura of the 2nd somite; they have the same form as in *Stereom. trispinosa*, but they are not

granular, though the 2nd pleura are finely punctate before the median depression, which is bordered posteriorly by the salient midrib.

The inner border of the antepenultimate joint of the antennal peduncle is armed at its far end with a small acute spine, and a still smaller one exists also at that of the penultimate joint.

As regards the 1st pair of legs, it should be remarked that there is no spine on the lower border of the merus, opposite the 2nd spine of the upper border, and that not only the lower, but also the upper border of the palm is finely serrated. The coxae of the 2nd legs are armed each with two juxtaposed spines, a small spinule occurs also on those of the 3rd pair. The 5th legs are subcheliform, the dactylus being a little longer than the immobile finger.

Measurements in millimeters.

Length of the body in the middle line	63
„ „ „ carapace	28
Distance between the tips of the spines at the antero-lateral angles	$14^1/_2$
Greatest width in front of the cervical groove	21
Length of the abdomen	35
„ „ „ 6th tergum	$3^3/_4$
Distance between the antero-lateral angles of the 6th tergum	$7^1/_4$
Length of the legs of the 1st pair	70
„ „ „ „ „ „ 2nd „	24
„ „ „ „ „ „ 5th „	16
„ „ „ merus of the 1st pair	$20^1/_2$
„ „ „ carpus of the 1st pair	$12^1/_2$
„ „ „ chela of the 1st pair	$22^1/_2$
„ „ „ palm of the 1st pair	$9^1/_2$
„ „ „ fingers of the 1st pair	13

Geographical distribution: Andaman Sea, Bay of Bengal, Arabian Sea and Gulf of Manár, in depths varying from 200 to 740 fathoms (Alcock); Hawaiian Islands (Rathbun).

4. *Stereomastis andamanensis* (Alcock). (Pl. I, Fig. 2—2*b*).

Pentacheles andamanensis A. Alcock, in: Annals Mag. Nat. Hist., Ser. 6, Vol. XIII, March 1894, p. 239.

Polycheles andamanensis A. Alcock, A descriptive Catalogue of the Indian Deep-Sea Crustacea, Calcutta, 1901, p. 169. — Illustrations of the Zoology of the Investigator, Crustacea, Pl. X, Fig. 3.

Stat. 18. March 18. 7° 28′.2 S., 115° 24′.6 E. 1018 m. Bottom fine grey mud. 1 young, much mutilated specimen, belonging either to *Stereom. phosphorus* (Alcock) or to this species: not determinable because the 4th and following abdominal somites are wanting.

Stat. 48. April 13. 8° 4′.7 S., 118° 44′.3 E. 2000 m. Bottom fine, grey mud; partially green. 1 young female.

Stat. 85. June 17. 0° 36′.5 S., 119° 29′.5 E. 724 m. Bottom fine, grey mud. 2 adult males.

Stat. 137. August 3. 0° 23′.8 N., 127° 29′ E. Channel between Makjan and Halmaheira. 472 m. Bottom fine, dark muddy sand. 1 young male.

Stat. 314. February 17, 1900. 7° 36′ S., 117° 30′.8 E. 694 m. Bottom fine, sandy mud. 1 male and 1 female without eggs, both adult.

The two adult males from Stat. 85 are 103 resp. 102 mm. long, twice as large as the single female, long 50 mm., from the Travancore coast, on which this species was founded. It is a remarkable fact that some species of this genus resemble one another so closely, even in minute details. This is also the case with the present species, which bears such a close resemblance to *Stereom. phosphorus*, except of course in a few specific characters, that it suffices to refer to Plate VIII, Fig. 2 of the "Illustrations of the Zoology of the Investigator" and to the measurements, in order to give a good idea also of *Stereom. andamanensis*. The general shape of carapace, abdomen and appendages is indeed quite the same. In one male from Stat. 85 the anterior division of the left lateral border of the carapace is armed with 6 spines, including the spine at the antero-lateral angle, the middle division with 3, the posterior with 8 and the sublateral ridge that runs parallel with the latter division, also with 8 spines; this armature may be indicated by the formula $\frac{6}{3}_{8.8}$. The formula for the right side is $\frac{7}{3}_{8.7}$, both sublateral ridges on the branchial regions carrying eight spines. The spines are disposed exactly like in the quoted figure of *Stereom. phosphorus*: of the posterior division the first 4 or 5 are placed much closer together than the following and the last spine of the sublateral ridge is situated likewise a little more laterally than the preceding. The formulae for the other male of this Station are $\frac{6}{4}_{8.7}$ for the left, and $\frac{6}{4}_{7.7}$ for the right side. As regards the other spines that occur on the carapace, both specimens agree with *Stereom. phosphorus*. A small acute tubercle is situated on the frontal border of the eye-stalk somewhat nearer to the outer than to the inner angle of the orbital notch. The two rostral spines are coalesced until the middle in one male, less far in the other. The spinule at the inner angle of the orbital notch is directed straight forward and obliquely upward. The two adult specimens from Stat. 314 agree with those just described. In the male, long 95 mm., the armature of the lateral margins is indicated for the left side by the formula $\frac{6}{4}_{8.6}$, for the right by the formula $\frac{6}{3}_{7.8}$; in the female, which is 86.5 mm. long, the formula is for each side $\frac{6}{3}_{7}$, while the sublateral ridge presents 7 spines also on each side. As regards the other spines on the upper surface of the carapace, these specimens agree with those from Stat. 85. The formulae of the lateral borders are in the young male from Stat. 137, which is 46 mm. long, on the left side $\frac{6}{3}_{7.7}$, on the right also $\frac{6}{3}_{7.7}$. The carapace of the young female from Stat. 48, finally, is mutilated on the left side, on the right the formula is $\frac{6}{3}_{5.6}$: this specimen measures 44 mm. These formulae indicate that the number of spines is slightly variable and that, as in Alcock's young female, the sublateral ridge on the branchial region presented also only 5 spines; this number seems to occur constantly in the young female.

Beneath the hairy tomentum with which the carapace is covered, it appears somewhat granular on the branchial regions between the sublateral ridge and the oblique groove that defines the cardiac region.

In the young female from Stat. 48 one observes, exactly as in the equally long type from the Travancore coast, 3 or 4 spinules between the anterior pair of spines on the cardiac region and the spine at the bifurcation of the cervical groove: these spines do no more occur in the adult. Like in the young type, the oblique grooves that border the cardiac region laterally, are also armed posteriorly with spines. On each side of the hindmost pair of spines

the posterior border of the carapace carries a few spinules, while it is only granular in the adult species. This young female therefore fully agrees with the type, except that the anterior division of the lateral border carries 6 spines instead of 4 or 5.

The carapace of the adult males is three quarters of a telson-length shorter than the abdomen.

The carinae of the first five abdominal terga culminate each in an acute antrorse spine. The spine of the 1st tergum is small; in the three adult males it is obliquely directed upward, in the other specimens more straightly forward, like in Fig. 3*a* of the "Illustrations". The spine of the 2nd tergum projects horizontally forward and is as long as that of the 1st; the 3rd spine and the 4th are more than twice as long as the 2nd, the 5th is almost as long as the 4th. The two edges of the double carina on the 6th tergum are denticulate, presenting 6 to 8 small teeth; they unite posteriorly to an obtuse tooth, which sometimes is a little larger than those of the edges. The carina on the anterior extremity of the telson is cut into two obtuse teeth, situated behind one another, the anterior a little larger than the other. The 1st somite that carries, like in other species, two equal spines at either end of the anterior border, appears, between these spines and the middorsal line, eroded or coarsely punctate. The four following terga are obliquely grooved on each side, like in *Stereom. phosphorus*. The grooves are narrow and deep, and widen somewhat at their inner end; on the 3rd, 4th and 5th somite their posterior border curves slightly backward at their inner end, while it appears straight in the figure of *Stereom. phosphorus*, and between this posterior border and that of the terga themselves the surface appears eroded and more or less distinctly furrowed transversely. The anterior margin of each oblique groove is indistinctly carved out in the middle, outside this notch one observes a small acute tooth. The anterior margin of the 2nd to 5th terga is also carved out, quite conspicuously, just outside the middle, and between this margin and the oblique groove the surface is slightly tubercular. One observes on the upper surface of the 2nd to 5th terga on each side a longitudinal crest, just near and parallel with their also carinate, lateral margin; between both carinae there is a groove, like in *Stereom. phosphorus* and *trispinosa*. The 6th tergum appears a little wider in proportion to its length than in *Stereom. phosphorus*. On either side of the double carina the tergum is covered with some acute granules and this granulated area is bounded laterally, like in *Stereom. phosphorus* and *trispinosa*, by a line that runs parallel with the midline of the body, while the triangular interspace between this line and the somewhat tubercular outer margin of the tergum is smooth. The granules of the granulated area are more prominent than in the two other species. The caudal fan resembles that of *Stereom. phosphorus*, the outer border of the exopodite being very slightly emarginate at the distal end; the submedian, longitudinal ridges on the telson are finely spinulose.

The pleura are characterized by the strongly curved, ear-shaped midrib, which is more or less distinctly interrupted in the middle, and by the lower part of this midrib being higher and more tuberculiform than in *Stereom. trispinosa*. On either side of the ear-shaped midrib the pleura are hairy; they are for the rest smooth, except a few sharp granules behind the tuberculiform lower end of the rib on the 3rd, 4th and 5th pleura. The lower edge

of the pleura of the 2nd somite is conspicuously armed with short spiniform teeth, while the tooth or spine at the anterior extremity is somewhat longer than the rest; the 3 following pleura are also denticulate inferiorly and on the lower half of their posterior edge.

The ventral sidewalls are hairy. The upper longitudinal ridge is spinulose; in front of the oblique groove that corresponds to the cervical sulcus, the spines are larger, though few in number, while behind the cervical groove they are much smaller and much more numerous. The lower ridge is armed with spines along its whole length, which on the anterior third are much smaller than posteriorly. Between the lower ridge and the thoracic legs the ventral sidewall is granular, except on its anterior third, and much finer granules occur between the anterior third of the upper ridge and the buccal frame.

According to Prof. Alcock's description the outer angle of the basal joint of the antennular peduncle should be armed with two spinelets: in all the specimens, however, lying before me, only one single spinelet occurs, except in the young female, long 44 mm., from Stat. 48. Of the two spinelets, existing in this female, the inner is almost twice as long as the outer. The number of spinelets, one or two, at the outer angle, seems therefore to depend upon the age of the specimens, because the type from the Travancore coast was also a young specimen, 50 mm. long. In the other examples the single spinelet is slightly directed outward and placed just near the acoustic sulcus.

In all the specimens the antepenultimate joint of the antennal peduncle is unarmed, except in the young female from Stat. 48 where it bears a small acute tooth, near the distal end of its inner border: the occurrence of this tooth seems to be again a juvenile feature. Both the penultimate and the terminal joint are armed, in all the specimens, with an acute spinule at the far end of their inner border. In the adult specimens the antennal scale reaches as far forward as the antennal peduncle, in the young female it is a little shorter; the antennular scale is barely longer and both terminate in a spiniform extremity.

Instead of the slender conical tooth existing in *Stereom. trispinosa*, the frontal wall of the carapace presents, beneath the two frontal teeth, a small, obtuse tubercle that is directed forward, though not upward, so that it is situated rather far below the upper surface of the carapace.

The external maxillipeds reach as far forward as the antennular peduncle.

The legs of the 1st pair, which in adult specimens are a little longer than the body, closely resemble those of *Stereom. phosphorus*. The merus, armed with a claw-like spine at the far end of its upper margin, carries 2 or 3 spines just behind the middle; opposite them the lower margin presents one or two smaller spines and between the latter and the distal end the lower margin is finely spinulose. The carpus has a slender spine at the far end of its upper border and a shorter one at that of the lower. At the inner distal extremity of the upper border of the palm a slender spine occurs; this upper border is soft to the touch, though one observes on it minute spinules by means of a magnifying glass. The lower border of the palm, on the contrary, is, in adult specimens, conspicuously spinulose, like in *Stereom. phosphorus*; in the young female from Stat. 48, however, it is still smooth.

The legs of the 2nd pair measure somewhat more than one-third of those of the 1st. The

coxae are armed on their anterior border with 2 or 3 spinules, there is a short spinule at the distal end of the upper border of the merus and there is a longer one at the distal end of the upper border of the carpus; a shorter spinule occurs near the far end of the outer border of this joint and this shorter spinule is preceded by a row of microscopical spinules that reaches to the middle of the carpus.

The following legs that gradually diminish in length, are unarmed, like also the coxae of the 3rd pair; these legs are, however, slightly granular on their lower side, except carpus and chela, while the upper margin of the palm of the 4th pair is finely spinulose. The coxae of the 5th pair are, in the adult male, distinctly granular on the outer half of their lower surface and the dactylus is almost twice as long as the immobile finger; in the adult female the coxae of these legs are smooth and they are perfectly chelate, both fingers being equally long. In the young female from Stat. 48 the dactylus is still distinctly longer than the immobile finger.

The epipod of the external maxillipeds is a small papilla, about $^1/_2$ mm. long, while those of the four thoracic legs are only membranous expansions of the base of the podobranchs.

Measurements of the four largest specimens.

	1 ♂	2 ♂	3 ♂	4 ♀
Length of the body, measured in the middle line, rostral teeth included	103	102	95	$86^1/_2$
Length of the carapace	45	44	42	$38^1/_2$
„ „ „ abdomen	58	58	53	48
Distance between the tips of the spines at the antero-lateral angles	$22^1/_2$	22	$21^1/_2$	$19^1/_2$
Greatest width in front of the cervical groove	$34^1/_2$	$32^1/_2$	31	$28^1/_2$
Length of the telson	$19^1/_2$	19	$17^1/_2$	$15^1/_2$
Width of the telson	$9^1/_2$	$9^1/_2$	9	8
Length of the 1st pair of legs	113	113	107	104
„ „ „ 2nd „ „ „	46	43	40	$36^1/_2$
„ „ „ 5th „ „ „	28	29	26	23
„ „ „ merus of the 1st pair of legs	33	33	31	30
„ „ „ carpus of the 1st pair of legs	$20^1/_2$	$20^1/_2$	$19^1/_2$	$18^1/_2$
„ „ „ chela of the 1st pair of legs	$34^1/_2$	34	32	30
„ „ „ palm of the 1st pair of legs	$14^1/_2$	$14^3/_4$	14	13
„ „ „ fingers of the 1st pair of legs	20	$19^1/_4$	18	17

N° 1 and 2, Station 85; N° 3 and 4, Station 314.

This species now bears such a close resemblance to *Stereom. nana* (S. I. Smith), that I wonder why Col. Alcock has made no mention of it, neither in his first description of 1894, nor in his work of 1901. This species which was described in 1884 (in: S. I. Smith, Report on the Decapod Crustacea of the Albatross Dredgings off the East coast of the United States in 1883, Wash. 1884, p. 359 (15)) and which was figured in the Report on the same Dredgings in 1884, Wash. 1886, pl. VII, Fig. 1 and 1*a*, occurs off the East coast of the United States, while a closely allied variety was dredged in 1891 by the "Albatross" in the Gulf of Panama (W. Faxon, in: Memoirs Mus. Compar. Zoology at Harvard College, Vol. XVIII, Cambridge,

1895, p. 121, Plate XXXIII, Fig. 1, 1*a*, 1*b*). Now I would first call attention to a clerical error in SMITH's description, l. c. p. 359 (15). This author writes "Including the very long and slender spine of the anterior angle, there are only five spines on the lateral margin in front of the cervical suture each side", in the figure 1, however, of 1886, the anterior division of the lateral margins appears to be armed with six spines on each side, including the spine at the anterior angle. The number of spines on the middle and on the posterior division was not described, but the figure shows 3 spines on the middle and 7 on the posterior division: as regards the armature of the lateral margin this species therefore fully agrees with *Stereom. andamanensis*. As regards the spinulation of the upper surface of the carapace, *Stereom. nana* seems to differ from *Stereom. andamanensis* 1° by the antero-internal angle of the orbital notch being unarmed, according to the figure, while in *Stereom. andamanensis* that angle bears a well developed spine, directed upward and slightly outward, 2° by the sublateral ridge on the branchial regions being armed only with five spines, while adult specimens of *Stereom. andamanensis* usually present 7 or 8 spines on that ridge. With regard to this character I would, however, remark that there are only 6 spines, in the adult male of Stat. 314, on the left and 7 on the right side and furthermore that the young female from Stat. 48 carries also five spines on the sublateral ridge. In *Stereom. nana* the outer angle of the basal joint of the antennular peduncle is armed with two spinelets, according to the figure, just as in ALCOCK's type. In *Stereom. nana* there seems to be no spine at the anterior angle of the pleura of the 2nd abdominal somite and near the anterior extremity of the telson the figure 1*a* presents but one single spiniform prominence, while one observes two tubercles behind one another in *Stereom. andamanensis*, but we read in SMITH's description that there is "occasionally a smaller secondary prominence just back of it".

The Pacific examples, described by FAXON, agree with the above described specimens of *Stereom. andamanensis* by the lower tubercle at the posterior end of the sulcated carina on the 6th abdominal somite and by the spine near the base of the telson being reduced to a blunt tubercle. Prof. SMITH's suggestion that *Stereom. nana* should be only a dwarf deep-water variety of *Stereom. sculpta*, is, however, quite erroneous.

General distribution: Off the Travancore coast, 1043 fathoms.

Polycheles Heller.

Polycheles C. Heller, in: Sitzungsber. Kais. Akad. Wiss. Wien, Bd. XLV, 1862, p. 389.
Pentacheles A. Alcock, A descriptive Catalogue of the Indian Deep-Sea Crustacea, Decapoda Macrura and Anomala in the Indian Museum, Calcutta 1901, p. 171.

In this genus the lateral borders of the carapace are almost invariably armed with more than 20 spines (as regards the only exception, *Pol. obscurus* (Sp. Bate), vide p. 468). Median dorsal carina of carapace usually with no definite, small number of spines, but mostly double, granulated, rarely nodulated, often traversed by bead-like tubercles or granulations or covered with crowded spinules. First abdominal tergum probably never armed with two small spines at the outer ends of the anterior border. Epipod of external maxillipeds normal, though it may

be of different size, while only in *Pol. Tanneri* Fax. it is reduced to a mere rudiment; those of the thoracic legs are normal epipods, ascending into the branchial chamber.

The genus *Polychelcs* Heller contains at present 17 species, the majority of which occur in the Indopacific. The first described species of all living Eryonidae, *Pol. typhlops* Heller, is also one of the most widely distributed of all: this species, indeed, does not only occur in the Mediterranean, from the south coast of Asia Minor to the west and south coast of Sardinia, in the Eastern Atlantic, off the south-west coast of Ireland, between Iceland and the Hebrides (*Pol. intermedius* Balss) and in the West-Indies (*Pol. Agassizii* (A. M.-Edw.)), but it has even been recorded, under the name of *Pentachelcs Hextii*, from the Arabian Sea and the Andaman Sea, while a fine adult female and a young specimen have been collected by the "Siboga" in the Bali Sea. *Pol. eryoniformis* Bouv., the carapace of which is much dilated, like that of the jurassic species of *Eryon*, was obtained by the "Princesse-Alice", south of Madeira, *Pol. dubius* Bouv., which is regarded by SELBIE to be a synonym of *Pol. granulatus* Fax., near the Azores, the Cape Verde Islands and off the coast of Spain, while a variety *armata* Bouv. of *Pol. debilis* (S. I. Smith) has been taken at the Azores and off the coast of Morocco. This *Pol. debilis* (S. I. Smith) occurs off the East coast of the United States, while *Pol. crucifer* (Will.-Suhm), a form collected by the "Challenger" expedition off Sombrero Island and the carapace of which is marked by a cruciform line, and *Pol. validus* (A. M.-Edw.) are found in the West-Indies. The Gulf of Panama and the coasts of the Galapagos Islands are inhabited by two species, viz. *Pol. Tanneri* Fax. and *Pol. granulatus* Fax., of which the former by the small number (21 or 22) of spines, with which the lateral margins of the carapace are armed, by the median dorsal ridge being smooth and presenting a definite number of spines and by the feeble development of the epipods, shows some relationship with the genus *Stercomastis*, while the latter is also known from the Hawaiian Islands, from off Colombo (*Pol. Beaumontii* Alcock), from the Cape of Good Hope and from off the southwest coast of Ireland. The 9 other species occur all in the Indopacific. Besides *Pol. typhlops* Heller and *Pol. granulatus* Fax., still two other species are found in the Indian Ocean north of the Equator, viz. *Pol. gibbus* (Alcock) and *Pol. Carpenteri* (Alcock): of the latter a fine adult male was taken by the "Siboga" off the Sangir Islands. *Pol. laevis* (Sp. Bate), a form remarkable by the smooth surface of carapace and abdomen, as also by the median dorsal ridge of the carapace presenting only two small spines, was taken by the "Challenger" between Samboangan and New Guinea, south-east of the Philippine Islands, but also west of Valparaiso, while north of New Guinea the immature and probably young type specimen of *Pol. obscurus* (Sp. Bate) was obtained. Three species, *Pol. baccatus* (Sp. Bate), *Pol. gracilis* (Sp. Bate) and *Pol. euthrix* (Will.-Suhm), were captured south of the Philippine Islands, the first form occurs, however, also in the Bali Sea, two fine specimens having been taken by the "Siboga". The two last species, finally, *Pol. asper* Rathb. and *Pol. Snyderi* Rathb., are found at the Hawaiian Islands.

The depth at which these species have been taken, varies rather much, I refer for it to the List of the species of Eryonidae at page 471, from which we learn that *Pol. validus* (A. M.-Edw.) has been captured at the greatest depth, namely 1591 fathoms.

Key to the species obtained by this expedition.

a. Posterior margin of carapace smooth. Carina of the abdominal terga deeply notched. Orbital notches not subdivided. . . . . *Carpenteri* (Alcock)

aa. Posterior margin of carapace spinulose. Carinae of the abdominal terga entire.

b. Orbital notches subdivided. One single rostral tooth. Median spine of 5th abdominal tergum not smaller than the 4th . *typhlops* Heller

bb. Orbital notches not subdivided. Two rostral teeth. Median spine of 5th abdominal tergum distinctly smaller than the 4th . *baccatus* Sp. Bate.

It is for the first time that species of this genus are recorded from the Indian Archipelago, for which fact we are indebted to the "Siboga" expedition: probably still a few other species will afterwards prove to occur in these seas, especially *Pol. granulatus* Fax., *gibbus* (Alcock), *laevis* (Sp. Bate) and *obscurus* (Sp. Bate).

Pol. Carpenteri (Alcock) was taken at the great depth of 1122 fathoms, almost as deep as the type from the Bay of Bengal; *Pol. typhlops* Heller was captured at depths of 158 and 285, *Pol. baccatus* Sp. Bate between 218 and 284 fathoms.

1. *Polycheles Carpenteri* (Alcock). (Pl. I, Fig. 3).

Pentacheles Carpenteri A. Alcock, Annals Mag. Nat. History, March 1894, p. 235 and in: A descriptive Catalogue of the Indian Deep-Sea Crustacea, Calcutta, 1901, p. 174; Illustrations of the Zoology of the Investigator, Crustacea, Pl. X, Fig. 1.

Stat. 126. July 20. 3° 27'.1 N., 125° 18'.7 E. 2053 m. Bottom hard (Traces of fine dark, hard sand). 1 adult male.

This male has just the same size as the only female on which this species was founded. The length of the carapace, measured in the middle line, is half a telson-length shorter than the abdomen and this length is in proportion to the greatest width as 4 : 3; the greatest width is one-third the length of the whole body. The acute spine that arises from the frontal wall of the carapace in the middle line, is small, does not reach to the level of the upper surface of the carapace and is curved backwards. The formula for the spinature of the left border is $\frac{7}{1\,3}$, for that of the right $\frac{5}{1\,9}$. The quite smooth and narrow, posterior margin of the carapace is more concave than in Figure 1 of the "Illustrations", its concavity is as large as in Fig. 2 of the same Plate X. The rounded outer angle of the right orbital notch is unarmed, that of the left carries a short sharp spine directed upward: the occurrence of this spine is evidently abnormal. The eye-peduncle carries a small sharp tooth or spine, directed a little outward, on the frontal border, considerably nearer to the outer than to the inner angle of the orbital notches; the shape of the eye-peduncle is characteristic. It is namely deeply grooved above posteriorly, so that the posterior end that carries the cornea, is distinctly separated from the rest as a prominent, nearly globular tubercle ("Illustrations", Fig. 1*b*).

The 2nd to 5th terga carry a few small granules on each side of the middle line, near

the posterior margin and laterally near the base of the pleura; the latter carry some small, sharp granules on their posterior half, the pleura of the 2nd somite moreover some ones on their anterior half. The antennular scale does not terminate in a sharp spine, but its distal extremity is obtuse, probably worn off. The joints of the antennal peduncle are unarmed and the peduncle is a little longer than its scale.

The legs of the 1st pair are just as long as the body; those of the 5th are subcheliform, the dactylus one and a half as long as the immobile finger.

The measurements of this specimen that closely agrees with the quoted description and figures, are the following:

Length of the body	90 mm.
„ „ „ carapace, in the middle line	40 „
„ „ „ abdomen „ „ „ „	50 „
Length of the telson	19 „
Width „ „ „	9 „
Distance between the antero-lateral angles of the carapace	18 „
Greatest width of the carapace	31 „
Length of the legs of the 1st pair	90 „

Geographical distribution: Bay of Bengal, on the slope of Carpenter's Ridge: 1370 to 1540 fathoms (Alcock).

2. *Polycheles typhlops* Heller.

Polycheles typhlops C. Heller, in: Sitzungsber. Kais. Akad. Wiss. Wien, Bd. XLV, 1862, p. 392, Taf. I, Fig. 1—6.
Polycheles typhlops C. Heller, Die Crustaceen des südlichen Europa, Wien 1863, p. 211, Taf. VII, Fig. 1, 2.
Polycheles typhlops J. V. Carus, Prodromus Faunae Medit. Pars II, Stuttgart 1885, p. 486.
Polycheles typhlops Th. Adensamer, in: Denkschr. Math.-Naturw. Classe Kais. Akad. Wiss. Bd. LXV, Wien 1898, p. 621.
Polycheles typhlops A. Senna, in: Bull. Soc. Entomol. Ital. XXXIV, Firenze 1903, p. 332, Tav. XVIII, fig. 1—11.
Polycheles typhlops E. L. Bouvier, in: Bull. Mus. Océanograph. Monaco, N° 28, 1905, p. 3.
Polycheles typhlops S. Kemp and R. B. Seymour Sewell, in: Records Indian Museum, Vol. VII, Part I, N° 2, Calcutta, 1912, p. 24.
Polycheles typhlops C. M. Selbie, in: Fisheries, Ireland, Sci. Invest., 1914. I [1914], p. 12, Pl. I, figs. 1—13.
Pentacheles Agassizii A. Milne-Edwards, in: Bull. Museum Compar. Zoology, Vol. VIII, N° 1, Cambridge 1880, p. 65 (teste E. L. Bouvier).
Polycheles Doderleini G. Riggio, in: Naturalista Sicil. IV, 1884—85, p. 99, tav. III, ♀.
Pentacheles Hextii A. Alcock, in: Annals Mag. Nat. Hist. Ser. 6, Vol. XIII, 1894, p. 237 (teste S. Kemp and R. B. S. Sewell).
Pentacheles Hextii A. Alcock, A descriptive Catalogue Indian Deep-Sea Crustacea in the Indian Museum, Calcutta 1901, p. 172 (teste S. Kemp and R. B. S. Sewell).
Polycheles intermedius H. Balss, in: Zoologischer Anzeiger, Bd. XLIV, N° 13, 1914, p. 599 [1]).
Illustrations of the Zoology of the Investigator, Crustacea, Pl. X, Fig. 2.

1) In a letter, dated 28 October 1915, Dr. Balss wrote me about the identity of this species with *Pol. typhlops*, specimens from Monaco of the latter having been compared by him with the type of *Pol. intermedius*.

Stat. 12. March 14. 7° 15′ S., 115° 15′.6 E. 289 m. Bottom mud and broken shells. 1 egg-laden, adult female.
Stat. 38. April 1. 7° 35′.4 S., 117° 28′.6 E. 521 m. Bottom coral. 1 young specimen.

It is on the authority of Messr. S. KEMP and R. B. SEYMOUR SEWELL (l. c.), that *Pent. Hextii* Alcock is identified with *Pol. typhlops* Heller, so that this species appears as widely distributed as *Stereom. sculpta* (S. I. Smith).

The adult female from the western Bali Sea is a little larger than ALCOCK's types of *Pentacheles Hextii* and closely agrees with the quoted description and figures. Measured in the middle line and the abdomen being stretched out, this specimen proves to be 113 mm. long from the tip of the single rostral spine to the extremity of the telson, the carapace being 49 mm. long, the abdomen 64 mm.; the difference in length (15 mm.) is but little smaller than the length of the telson (19 mm.). The carapace shows its greatest width of 34 mm. at the anterior extremity of the posterior division of the lateral borders, i. e. at the posterior groove, for it is here a little wider than two-thirds its length, measured in the middle line, but less than two-thirds its greatest length (56 mm.), when measured from the antero- to the postero-lateral angles. The distance between the acute spines at the antero-lateral angles that are turned upward and slightly curved inward, measures 23 mm., i. e. two-thirds the greatest width.

The obtuse conical tooth that arises from the frontal wall of the carapace, immediately beneath the single rostral spine, is directed obliquely forward and reaches almost to the level of the upper surface of the carapace. The lateral border is armed at the left side with 7 + 5 + 24 spines, at the right side with 8 + 5 + 28; those of the posterior part diminish gradually in size backwards and are mostly worn off. The sublateral ridges on the branchial regions are described by ALCOCK as "quite straight and parallel with the lateral margins": in the female from the Bali Sea both ridges first slightly converge backwards until their posterior third and then again curve towards the lateral margin, these ridges are formed each by 17 or 18 spines.

The spines at the frontal end of the ophthalmic peduncles are slender, acute.

The narrow antennal scale reaches barely to the end of the peduncle; the antepenultimate joint of the peduncle is armed with a sharp tooth at the far end of its inner border and a sharp spine occurs also at the distal end of the inner border of the penultimate and of the terminal joint.

The antennular scale, the upper border of which is serrate, reaches barely farther forward than that of the outer antennae; the basal joint carries a small spinule at the outer angle near the acoustic sulcus and a slightly longer one behind it. The legs of the 1st pair are about 120 mm. long, a little longer than the body. They agree with the original description: there are two spines, behind one another, at the far end of the upper border of the merus, like on the right leg of Fig. 2*a* of the "Illustrations". The merus is 35 mm. long, measured at its lower border, the chela 38,5 mm.

The numerous eggs are globular, diameter 0,56—0,6 mm.

The young individual is 39 mm. long, the carapace, measured in the middle line, 17 mm., the abdomen 22 mm., the difference, 5 mm., being two-thirds the length (7,5 mm.) of the telson. The formula of spines for the left border of the carapace is $\frac{7}{5}{}_{23}$, for the right $\frac{8}{5}{}_{23}$.

General distribution: Adriatic and Mediterranean [Sicily (Heller), Palermo (Riggio), West and South coast of Sardinia, 656 to 1553 m. (Giglioli, Senna), Adriatic, North coast of Africa, South coast of Asia Minor, South and North of Creta, in depths of 620 to 2055 m. (Adensamer)]; Eastern Atlantic (Bouvier); between Iceland and the Hebrides, 725 fathoms (Balss); off the south-west coast of Ireland, 208 to 728 fathoms (Selbie); off the Portuguese coast (Norman); West-Indies, 118 to 1058 fathoms (A. Milne-Edwards); Andaman Sea, 188 to 220 fathoms (Alcock); Arabian Sea, 224 to 284 and 719 fathoms (Alcock); Coast of Malabar, 237 fathoms (Kemp and Seymour Sewell).

3. *Polycheles baccatus* Sp. Bate. (Pl. I, Fig. 4, 4*a*).

Polycheles baccatus C. Sp. Bate, in: Annals Mag. Nat. History, 1878, Ser. 5, Vol. II, p. 278.
Polycheles baccata C. Sp. Bate, Report on the Challenger Macrura, 1888, p. 131, Pl. XIV, Fig. 1.

Stat. 38. April 1. 7° 35′.4 S., 117° 28′.6 E. 730—915 m. Bottom: coral. 1 male and 1 female without eggs.

Stat. 297. January 27, 1900. 10° 39′ S., 123° 40′ E. 520 m. Bottom soft, grey mud with brown upper layer. 1 very young specimen, 23 mm. long, without legs of the 1st pair, probably belonging to this species.

The two specimens from Stat. 38, which are of equal size, do not fully agree with Bate's description and show especially some differences from his figure, but this figure 1 of Plate XIV is certainly inaccurate. When being in London some time ago, I was enabled to examine the Challenger types: the dorsal ridge, which was described as being "without teeth or spines", proved, however, to be spinulose and granular, but the small spines were here and there worn off and less distinct than in the specimens from Stat. 38.

As is proved by comparing the measurements, this species closely resembles in its outer appearance *Pol. typhlops* Heller. The proportions between the length, the greatest width of the carapace and the distance between its antero-lateral angles are indeed quite the same. The carapace, not yet one and a half as long in the middle as measures its greatest width, appears very slightly convex transversely, except, like in other species, on the flattened hepatic regions. Beneath the hairy tomentum, the upper surface of the carapace is beset with small, sharp granules. The concave frontal border ends on each side into a strong and acute, flattened tooth, at the inner angle of the orbital notches, and between these teeth that are directed almost horizontally forward and the pair of juxtaposed rostral spines that are directed upward and slightly forward, the frontal border appears somewhat spinulose in the male and slightly granular in the female. The median, conical tooth that arises on the frontal wall of the carapace immediately below the rostral spines and that is directed upward and slightly forward, is very large and reaches considerably beyond the rostral spines; in the male it is rather acute, in the female obtusely pointed. The finely granular, median ridge on the gastric region carries two small acute teeth standing side by side immediately behind the middle; between this pair and the two rostral spines one observes in the male five, in the female four, single, acute teeth about of the same size, placed behind one another and between this pair and the cervical groove the ridge widens a little and is here beset with irregularly arranged, small, acute teeth

of unequal size, larger in the male than in the female. The ridge between the cervical groove and the posterior margin carries, like in the Challenger types, in the male a double row of acute teeth, curved forward, 14 or 15 on each side, of which the foremost and the last pair are a little larger than the rest; in the female the teeth of this ridge are smaller. The posterior margin which appears somewhat less concave than in the Figure 1 of the Report on the Challenger Macrura, is armed on its anterior edge with acute teeth, which gradually decrease in size laterally. The armature of the lateral margin of the carapace is in the male $^{10}_{5}{}_{27}$ on the left and $^{8}_{5}{}_{27}$ on the right side; in the female the formula is $^{8}_{4}{}_{24}$ at either side. In the Challenger types the anterior division is armed with 10 or 12 spines, the central with 4 or 5, the posterior with 25 or 26, so that they differ only by the number of spines on the anterior division. The three or four last spines of the posterior division are sometimes considerably smaller than the rest, so in the male on the left side, in the female on the right. The sublateral ridge on the branchial region carries as many teeth as the posterior division of the lateral margin, but these teeth are considerably smaller; anteriorly this ridge runs parallel with the lateral margin, soon, however, it curves inward so that, at one third of its length from the posterior extremity, it is more than one and a half as far distant from the lateral margin than anteriorly; from here it approaches again to the margin. The posterior edge of the cervical groove is also beset with small sharp teeth or granules. Somewhat nearer to the median ridge than to the lateral border the gastric region carries also a longitudinal row of acute teeth and granules; this row that appears slightly concave, with the concavity turned outward, carries anteriorly two spiniform teeth behind one another, which are as large as those of the median ridge, and these teeth are followed by two or three acute granules.

The orbital notches are triangular, narrow gradually backward and are not subdivided into two portions as in *Pol. typhlops* Heller. In the figure 1 C of Plate XIV of the Challenger Report the inner margin of the orbital notch is divided by a prominence into two equal parts; in the male from Stat. 38 this prominence is situated much more backward and the female shows no trace of it at all; this inner margin carries a few small acute granules. The rounded outer angle is armed in the male with 5 or 6 slender spines of nearly equal length, in the female 2 or 3 in the middle are longer than the others. The spine at the antero-lateral angle of the carapace has, in Figure 1 of the Challenger Report, a quite different form than in Fig. 1 C, the figure 1 is therefore probably inaccurate. In the "Siboga" specimens the spine at the antero-lateral angles is distinctly larger than the following and the acute point is curved inward; in both figures of the Challenger Report this spine is directed outward.

The eye-peduncle carries on its frontal margin an acute spiniform tooth, that stands twice as far distant from the outer than from the inner angle.

The abdomen, not yet one and a half as long as the carapace measured in the middle line, is a telson-length longer than the latter. In a lateral view our specimens agree very well with BATE's Figure 1 P, the granules of the double carina of the 6th segment are, however, more conspicuous and, just behind its anterior margin, the middle line of the telson carries 4 or 5 prominent granules, that are wanting in the figures of the Report on the Challenger Macrura. Like in the latter, the median carina of the 5th tergum culminates, in the male,

anteriorly in a small tooth, but in the female it ends abruptly, the carina being somewhat eroded. In Fig. 1 of BATE's work the abdomen has been figured quite inaccurately; so e. g. the posterior granulated part of the 1st tergum appears in this figure just as long as that of the 2nd, the posterior margin of the 3rd, 4th and 5th terga runs differently, being nearly straight at either side of the middle, while in the figure of the Challenger work each half appears S-like sinuate; the 6th tergum has also another form, for it reaches laterally not so much forward as in that figure, appearing therefore laterally shorter in proportion to its width. In Figure 1 the telson appears smooth above. As has already been remarked, the male from Stat. 38 carries on the anterior elevated part, somewhat behind the anterior margin, a median row of 4 acute granules of unequal size, in the female only 3, of which the posterior is obtuse and larger than the preceding. This elevated portion is bordered posteriorly by acute granules; the lateral margins of the telson are granular, the last third excepted. On the anterior half a ridge with sharp granules runs on each side near the lateral margin; two other sublateral ridges, converging backward to the pointed tip, run on the two posterior thirds of the telson, nearer to the middle line, and are also provided with sharp granules that are directed backward; between these ridges, like also anteriorly, the upper surface appears moreover granular and there is a narrow median groove that reaches from the elevated part of the telson as far backward as the inner sublateral ridges. In the female these granules are less conspicuous. Just behind the elevated part the telson is covered with hair.

The abdominal pleura are quite well figured in Fig. 1 P of the Challenger Report, their form is different from those of *Pol. typhlops* Heller, as is obvious when comparing Fig. 4*a* of Plate I of this work with Fig. 2*a* of Plate X of the "Illustrations". The principal differences are the following. The anterior margin of the 2nd pleura is straight and the anterior extremity rather sharp in *Pol. baccatus*, while in *Pol. typhlops* the latter is more obtuse and the anterior margin slightly convex; in *Pol. typhlops* the outer surface is a little concave and smooth, though hairy, in the middle and this concave portion is surrounded, especially posteriorly, by small granules; in *Pol. baccatus*, however, the outer surface is slightly convex transversely, the greater upper half is granular, but not hairy, and it carries in the middle a granular ridge, not far from and parallel with the posterior margin. In our male of *Pol. baccatus* the anterior margin of the 2nd pleura is a little granular near the tip and the lower edge is also finely serrate posteriorly. In *Pol. typhlops* the 3rd to 5th pleura are obtusely rounded inferiorly and their posterior margin is regularly convex; they carry nearly in the middle a prominent, granulated ridge that does not reach to the lower end, on either side of which the surface is hairy and the latter is covered with granules between this ridge and the posterior margin. In *Pol. baccatus*, however, both the anterior and the posterior margin are S-like waved and unite so that they form below a distinct angle with one another; the glabrous outer surface of these pleura is somewhat elevated on its posterior half and here granulated, but it is smooth anteriorly and inferiorly. In *Pol. typhlops* the pointed teeth into which the median carinae of the 2nd—5th terga culminate anteriorly, increase slightly in size in posterior succession, while in *Pol. baccatus* the tooth of the 5th tergum is almost rudimentary.

The 1st joint of the antennular peduncle appears concave at the dorsal side and carries

on its outer margin two small spinules, behind one another, one at the distal end near the acoustic groove, the other somewhat behind it; in Fig. 1 C of the Challenger Report this joint appears not at all concave and one observes on it, instead of two, five spinules. The 2nd joint is shorter than the 1st, unarmed and broadens somewhat distally; the 3rd joint is shorter than the 2nd and its inner margin terminates distally into a sharp tooth. In Fig. 1 C of the Challenger Report, however, which for the rest does not agree with Fig. 1, the 3rd joint appears longer than the 2nd and quite unarmed. The antennular scale, the spiniform tip of which is turned upward, reaches slightly beyond the distal end of the peduncle, as in Fig. 1 of the Challenger Report, while it appears much shorter in Fig. 1 C. The antennal peduncle reaches by its terminal joint beyond that of the inner antennae; the elongate triangular scaphocerite reaches in the male to the middle of the terminal joint, in the female a little farther. The 3rd joint, coalesced with the 2nd, is armed internally with a strong acute tooth; the penultimate joint which is distinctly longer and broader than the terminal one, carries a sharp strong tooth at the far end of its inner margin and a smaller one occurs at the inner distal end of the last joint that appears twice as long as broad. When Fig. 4 is compared with Fig. 1 C of the Challenger Report, the latter appears at once inaccurate.

In the male the legs of the 1st pair are just as long as the body, in the female a little longer. They are somewhat less slender than in Fig. 1 of the Challenger Report and in both specimens the fingers are distinctly longer than the palm. The wavy upper margin of the merus which is finely spinulose along its whole length, carries a curved spiniform tooth at the far end; the straight lower margin appears also very finely serrated, when examined under a magnifying glass. The carpus that thickens more regularly toward the distal end than in the figure of the Challenger Report, has its upper border grooved; both sides of this groove are denticulate and there is a stronger spine at the far end of the outer border. A small spinule occurs at the distal end of the lower border on the outer side and there is a blunt compressed tooth internally. The nearly straight, upper border of the palm is covered with numerous small teeth, the convex lower is grooved and both edges of this groove are spinulose; the fingers are distinctly longer than the palm and the upper border of the dactylus is finely serrated at its base.

As regards the other legs I must remark that the ischium and the merus are covered in the male on their lower surface with acute granules, disposed more or less distinctly in longitudinal rows, especially those of the 3rd and 4th pair; in the female these granules are much less conspicuous. The 5th pair of legs end in the male in a single dactylus, but in the female in a very small chela.

Measurements in millimeters.

	♂	♀
Length of the body in the middle line [1]	65	64
„ „ „ carapace „ „ „ [1]	26½	26½
„ „ „ abdomen „ „ „	38½	37½

1) The strong median tooth on the frontal wall of the carapace is not included.

	♂	♀
Distance between the antero-lateral angles of the carapace	13	12½
Greatest width of the carapace near the middle of the branchial region	19½	20
Greatest width of the abdomen at the pleura of the 2nd somite	18½	19
Length of the telson	12½	12
Width „ „ „	6½	6½
Length of the legs of the 1st pair	65	68
„ „ „ merus of the 1st pair	17½	18½
„ „ „ carpus of the 1st pair	7½	8½
„ „ „ chela of the 1st pair	22	23
„ „ „ palm of the 1st pair	10	10½
„ „ „ fingers of the 1st pair	12	12½

General distribution: Off Matuku (Fiji Islands), depth 310 to 315 fathoms, bottom: coral mud (Spence Bate).

Family PALINURIDAE.

The Palinuridae, collected by the "Siboga", belong to the genera *Puerulus* Ortm. and *Panulirus* White, the former represented by *Puerulus angulatus* (Sp. Bate), of which no less than 28 mostly adult specimens were captured, both males and females, from two Stations; the latter represented by two species, *Panul. ornatus* (Fabr.) and *Panul. versicolor* (Latr.). Of the last mentioned species 13 very young specimens were moreover obtained, that belong to the *puerulus*- or "Natant"-stage, from four Stations, and 2 of these 13 specimens were collected together with young individuals of *Panul. versicolor*. The descriptions of a few, most adult specimens of *Panul. penicillatus* (Oliv.), collected by Messr. KLEIWEG DE ZWAAN and E. JACOBSON, like also of a young female of *Panul. japonicus* (von Siebold), obtained by Mr. G. F. TYDEMAN, are added, and also critical remarks and observations on some other species and varieties of the genus *Panulirus* White.

LIST OF ALL THE SPECIES OF PALINURIDAE, KNOWN AT PRESENT, JUNE 1915.

I. Genus **Palinurellus** v. Mart.

SPECIES	HABITAT	REMARKS
Gundlachi v. Mart. 1878 . . .	Cuba, Barbados.	
Gundlachi v. Mart. var. *Wieneckii* de Man 1881	Off Benkulen. Mauritius.	Confer p. 34.

II. Genus **Jasus** Parker.

Lalandii (Lam.).	West coast of South Africa from Caledon District near False Bay, Cape of Good Hope, to Angra-Pequeña. Tristan da Cunha. Juan Fernandez.	Syn.: *Jasus frontalis* (H. M.-Edw.), 1837, according to ORTMANN and GRUVEL.

SPECIES	HABITAT	REMARKS
Lalandii (Lam.), var. *Edwardsii* Hutton 1875	New Zealand. Tasmania. St. Paul.	Confer: F. J. PARKER, 1887, according to whom there are constant differences between this variety and the typical species.
Parkeri Stebbing 1902	Buffalo River, South Africa.	
Verreauxi (H. M.-Edw.) 1851 .	New South Wales. Tasmania. New Zealand.	Syn.: *Palinurus Hügelii* Kollar and *Palin. tumidus* Kirk 1880.

III. Genus **Palinurus** Fabr. s. s.

Gilchristi Stebbing 1900 . . .	False Bay, Cape of Good Hope. St. Blaize, South-Africa.
longimanus H. M.-Edw. 1837 .	Antilles, Cuba. Martinique.
longimanus H. M.-Edw., var. *mauritianus* Miers 1882 . .	Mauritius.
Thomsoni Selbie 1914.	Off the south-west coast of Ireland.
vulgaris (Latr.)	Aegean Sea, Adriatic, Mediterranean, Madeira. It extends southwards as far as Cape Bojador, northwards, through the Bay of Biscay, to Great Britain, on the west coast as far as the outer Hebrides and the Orkneys, on the east coast nearly to Flamborough Head.
vulgaris Latr., var. *mauritanicus* Gruvel 1911	Coast of Mauritania from Cape Barbas to a little north of Saint-Louis, Senegambia.

IV. Genus **Palinustus** A. M.-Edw.

This genus is not identified with *Palinurus* Fabr., s. s., because nothing is known about the pleopods of the female and on account of the prismatic shape of the carapace.

truncatus A. M.-Edw. 1880. .	Cariacou (Grenadines).

V. Genus **Puerulus** Ortm.

This genus may perhaps once prove to be a synonym of *Palinustus* A. M.-Edw.

angulatus (Sp. Bate) 1888. . .	Eastern Pacific, north of New Guinea. Bali Sea. Between Rotti and Timor. Gulf of Manár. Arabian Sea off the Travancore coast.
carinatus Borr. 1910.	Off Saya de Malha bank.

SPECIES	HABITAT	REMARKS
	VI. Genus Linuparus White.	
trigonus (von Siebold) 1824. .	Bay of Tokyo, Yokohama, Kiushiu.	
	VII. Genus Panulirus White.	
argus (Latr.)	Bermuda Islands, Antilles. Coast of Brazil south to the Tropic of Capricorn.	Syn.: *Palinurus Ricordi* Guérin (teste Ortmann) and *Panul. americanus* (Lam.). According to ORTMANN and BOUVIER *Panul. americanus* (Lam.) should be identical with *Panul. guttatus* (Latr.).
bispinosus Borr. 1899	Loyalty Islands.	Perhaps founded, according to BORRADAILE, on a young specimen of *Panul. longipes* (A. M.-Edw.) = *femoristriga* (von Mart.).
Burgeri (de Haan) 1841 . . .	Japan?, Amboina, Borneo, Padang, Ceylon, Mascate, Fort Dauphin (Madagascar), Port Elisabeth, Algoa Bay.	
Burgeri (de Haan), var. *megasculptus* Pesta 1915	Kischin (South coast of Arabia).	
dasypus (Latr.)	Yokohama, Formosa, Swatow, Cebú, North-Celebes, New-Britain, Andai, Makassar, Sumatra, Moluccas, Madras, Silavaturai Par, Sokotra.	
echinatus S. J. Smith 1869 . .	Pernambuco. Fernando Noronha.	*Panul. echinatus* S. J. Smith and *Panul. guttatus* (Latr.) are considered by Miss RATHBUN 1900 to be different species.
guttatus (Latr.)	Antilles, Coast of Brazil. St. Paul's Rocks, Ascension.	
inflatus (Bouvier) 1895	Lower California. Gulf of Panama. Hawaiian Islands.	Syn.: *Panul. gracilis* Streets 1871 (Confer: A. E. ORTMANN, Carcinol. Studien 1897, p. 261 and G. NOBILI, in: Boll. Mus. Torino, XVI, N° 415, 1901, p. 11). Syn.: *Palin. Martensi* Nob. 1897 (teste G. NOBILI, l. c. 1901) and *Palin. Paessleri* Pfeffer 1897 (teste G. PFEFFER, in litt.).
interruptus (Randall) 1839 . .	Pacific coast of America, from the Southern United States to the Gulf of Tehuantepec.	
japonicus (von Siebold) 1824 .	Bay of Tokyo, Kochi, Nagasaki, Yokohama, North Formosa, Laysan, Hawaiian Islands.	
japonicus (von Siebold), var. *longipes* A. M.-Edw. 1868 .	Zanzibar, Madagascar, Mauritius. Indo-Malayan Seas. New Hebrides, Tahiti.	Syn.: *Palin. femoristriga* von Mart. 1872.

SPECIES	HABITAT	REMARKS
laevicauda (Latr.)	Tropical East coast of America, from Cuba to Rio de Janeiro.	Syn.: *Palinurus* sp., von Mart., 1872. (Confer p. 51).
ornatus (Fabr.) 1798	Indian Ocean, Zanzibar, Obock, Mauritius, Bengal, Ceylon, Singapore, Makassar, Amboina, Postillon Isl., Manilla, Cape Melville, Sangi, Samoa Islands.	Syn.: *Panul. homarus* (Herbst) 1796; *Panul. sulcatus* (Lam.); *Palin. brevipes* Pfeffer 1880, partim.
penicillatus (Oliv.)	Indopacific, from the Gulf of Akaba to Fusan (Korea), the Hawaiian and Gambier Islands and the New Hebrides.	Syn.: *Panul. Ehrenbergi* (Heller) 1860.
polyphagus (Herbst) 1796 . . .	Sonmiani (Balutschistan), Bombay, Minikoi, Mauritius, Singapore, Java, Upolu (Samoa Islands); Japan?	Syn.: *Palin. fasciatus* Fabr. 1798 and *Panul. orientalis* Doflein 1900.
regius de Brito Capello 1864 .	West coast of Africa, from Cape Barbas to the South of Angola. Observed in 1907 off Marseille by DARBOUX and STEPHAN.	Syn.: *Palin. longipes* Pfeffer 1881 and *Palin. phobernus* Rochebrune 1883.
spinosus (H. M.-Edw.) 1837 . .	Pulo Condore, Tahiti, Pacific Islands.	This species which was regarded by BOUVIER (1905) as valid and as an inhabitant of the Indopacific, is supposed by GRUVEL (1911) to be a synonym of the West-Indian *Panul. guttatus* (Latr.). The habitat appears therefore still to be uncertain.
versicolor (Latr.)	Tanga (near Zanzibar), Mascate, Seychelles bank, Mauritius, Christmas Island, Java Sea, Sumbawa, Banda Sea, Samangka Bay, Singora, Larantuka, North Celebes, Ternate, New Britain, Philippine Islands, Japan.	Syn.: *Palin. taeniatus* Lam.; *Palin. ornatus* Fabr., var. *decoratus* Heller (Confer p. 54); *Senex ornatus* Fabr., var. *laevis* Lanchester (Confer p. 55); *Panul. demani* Borr. 1899.

Palinurus marginatus Quoy and Gaimard 1824 from the Hawaiian Islands is still a doubtful species; according to Miss RATHBUN it should be related to *Panul. Burgeri* (de Haan) and *Panul. dasypus* (Latr.), while it is regarded by GRUVEL as being perhaps a synonym of *Panul. japonicus* (von Siebold).

Palinurellus von Mart.

1. *Palinurellus Wieneckii* (de Man)

Aracosternus wieneckii J. G. de Man, in: Notes from the Leyden Museum, III, 1881, p. 131.
Aracosternus wieneckei J. G. de Man, in: Tijdschrift voor Entomologie, XXV, 1882, p. 1—6, Pl. 1, 2.
Palinurellus wieneckii J. G. de Man, in: Notes from the Leyden Museum, IV, 1882, p. 161.
Palinurellus wieneckii A. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. VI, 1891, p. 16.
Palinurellus Gundlachi von Mart., var. *Wieneckii* A. Gruvel, in: Annales Instit. Océanogr., T. III, Fasc. IV, Paris 1911, p. 9.

It is a remarkable fact, indeed, that of this interesting Palinurid still only a few specimens

have been captured, for, as far as I am aware, only three have been obtained until at present. Firstly the type specimen, long 187 mm. (carapace 82 mm., abdomen 105 mm.), described by me in 1881 and figured in 1882, which was taken in the sea near Benkulen (Sumatra) and which is still preserved in the Leyden Museum, 2^0 a specimen, long 133 mm., from Mauritius, described by GRUVEL (l. c.) and preserved in the Museum of Paris, 3^0 a specimen also from Mauritius and preserved in the British Museum, London. The three specimens are all of the male sex, the female is still unknown. Unfortunately nothing is known about the depth, at which these specimens have been captured and I do not know whether the vertical distribution of the West-Indian representative of this genus, *Palinurellus Gundlachi* von Mart., with which, according to Dr. ORTMANN (l. c.), *Synaxes hybridica* Sp. Bate should be identical and which seems to be also a rare form, has been observed or not.

My descriptions of 1881 and 1882 do not indicate whether the abdominal terga are carinate in the middle line or not, but on Plate 1 of my dutch description the 2nd—6th terga like also the anterior part of the telson present a narrow band or stripe in the middle, that is smooth and devoid of the small tufts of very short hairs, which occur on either side of it: one cannot conclude, however, from this figure whether these narrow glabrous bands are carinate or not. I therefore applied to Dr. R. HORST of the Leyden Museum, who kindly reexamined for me the type specimen and wrote me the following. The 2nd, 3th and 4th terga are indeed furnished with a slightly convex, median carina, which, however, gradually disappears backward, so that the 5th and the 6th terga can hardly more be said to be carinate, for they only present in the middle a glabrous stripe. This glabrous stripe does not occur on the telson, so that my figure of the latter is inaccurate in this respect. These observations now fully agree with those made by GRUVEL (l. c.) of his specimen from Mauritius.

In my Note on the genus *Araeosternus* of 1882 I suggested that *Palinurellus Wieneckii* could be distinguished from the West-Indian form by its larger size and by the 5th pair of legs being not provided with a rudimentary hand: these differences, however, are of no importance, as has already been remarked by ORTMANN (l. c.), because the type of *P. Wieneckii* is a male and that of *P. Gundlachi* a female, but ORTMANN, led astray by my figure, supposed the abdomen to be not carinate and the species to be distinguished by this character from its West-Indian congener. GRUVEL's opinion that *P. Wieneckii* must be considered as a variety of *P. Gundlachi*, appears now still more probable and I like to follow him in it, though I wish finally to remark that the rostrum and the orbits of *Synaxes hybridica*, as figured by SPENCE BATE in the Report on the Challenger Macrura, p. 88, fig. 11, show a quite other form than in my figure of *Palinurellus Wieneckii*.

Puerulus Ortm.

? Syn.: *Palinustus* A. M.-Edw. 1880.

The genus *Puerulus* Ortm. is only represented by two species, which are both confined to the Indopacific. *Puerulus angulatus* (Sp. Bate), a very young specimen of which was discovered by the "Challenger" in the Eastern Pacific, North of New-Guinea, and numerous adult specimens of which were taken by the "Investigator" in the Gulf of Manár and the Arabian

Sea off the Travancore coast, has also been obtained by the "Siboga": a large number of well-preserved specimens of unequal size, adult, half-grown and young, were taken by this expedition both in the Bali Sea and between Rotti and Timor. The other species, *Pucrulus carinatus*, was described in 1910 by BORRADAILE after an adult male specimen, long 19 cm., that was dredged by the Percy Sladen Trust Expedition off Saya de Malha bank: this species is most closely related to the preceding, but the two teeth behind the large supra-orbital teeth reach farther backward, almost to the cervical groove, the telson is shorter and there are still a few other slight differences.

As has already been pointed out by Dr. CALMAN, in: The Annals and Mag. Nat. Hist. Vol. III, Ser. 8, 1909, p. 441, *Pucrulus* Ortm. is a valid genus, characterized, together with *Linuparus* White, by the pleopods of the 2nd abdominal somite of the female resembling those of the three following somites and by the prismatic form of the carapace, and distinguished by these characters from *Palinurus* Fabr. (s. s.), *Jasus* Parker and *Panulirus* White. In its outer appearance, however, the genus *Pucrulus* also much resembles *Palinurus* and in this connection I wish to call attention to the fact that in *Puer. angulatus* sometimes a rostrum, though very small, is observed, as is the case with several specimens collected by the "Siboga" and that, like in *Palinurus*, the epistome is longitudinally furrowed and the antennular flagella short. But I should not wonder that the genus *Pucrulus* once will prove to be identical with the genus *Palinustus* A. M.-Edw., about the single species of which, *Palinustus truncatus* A. M.-Edw., from the West-Indies, we are now quite well informed by the important monograph of A. GRUVEL, who, however, did refer this species to the genus *Palinurus* Fabr. s. s. The carapace of *Palinustus truncatus* bears one median and two lateral carinae, so that it appears rather more quadrangular than rounded ("qui lui donnent plutôt un aspect carré qu'arrondi", A. GRUVEL, l. c. p. 19). The antennular tergum is unarmed. The supra-orbital teeth are represented in *Palinustus truncatus* by a lamella, truncate and cut into teeth anteriorly, behind this lamella one observes a large tooth or spine, that is followed by two smaller ones: the lamelliform supra-orbital teeth may perhaps be regarded as homologous with the denticulate prominence which in *Puer. angulatus* is usually found at the inner side of the supra-orbital teeth. The epistome shows the same form and characters and differs only by there being three teeth in the middle of the anterior margin in *Palinustus truncatus*, instead of one single tooth in *Pucr. angulatus*. Unfortunately the characters of the pleopods were not described by GRUVEL, but he also considers this species already to be a primitive form of the genus *Palinurus*; when the pleopods of the 2nd abdominal somite of the female should indeed resemble those of the three following somites, then the genus *Pucrulus* should be regarded as identical with the genus *Palinustus*.

Both species of *Pucrulus* occur in deep water, *Pucr. angulatus* having been obtained at depths varying between 143 and 719 fathoms, while *Pucr. carinatus* was dredged in 125 fathoms.

1. *Pucrulus angulatus* (Sp. Bate). (Pl. II, Fig. 5—5*b*).

Panulirus angulatus C. Spence Bate, Report Challenger Macrura, 1888, p. 81, Pl. XI, figs. 2, 3, 4.
Pucr angulatus A. E. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. VI, 1891, p. 37.

Panulirus angulatus A. Alcock and A. R. Anderson, in: Journal Asiat. Soc. Bengal, Vol. LXIII, Pt. II, N° 3, 1894, p. 166.

Panulirus angulatus A. Alcock, A descriptive Catalogue Indian Deep-Sea Crustacea, Calcutta, 1901, p. 185.

Confer: W. T. CALMAN, in: Annals Mag. Nat. Hist. Ser. 8, Vol. III, 1909, p. 441—446.

A. GRUVEL, in: Annal. Instit. Océanogr. T. III. Fasc. IV. Paris 1911, p. 6, 7.

E. L. BOUVIER, in: The Transact. Second Entom. Congress, 1912, p. 78—89.

Stat. 38. April 1. 7° 35'.4 S., 117° 28'.6 E. Bali Sea. 521 m. Coral. 11 males and 12 females, 5 of which are egg-bearing.

Stat. 297. January 27th, 1900. 10° 39' S., 123° 40' E. Between Rotti and Timor. 520 m. Soft grey mud with brown upper layer. 3 males and 2 females.

The males are of a smaller size than the females, but this may be a fortuity and does not prove that the male is invariably smaller than the female. The largest male from the Bali Sea measures 134 mm. from the frontal margin to the end of the telson and the largest male from Stat. 297 is 145 mm. long; the largest female from Stat. 38 is 175 mm. long, while the two females from the other Station are 122 mm. and 110 mm. long. Of the largest specimen, observed by Col. ALCOCK, the carapace was described as being 70 mm. long, the abdomen 99 mm., so that the latter was not yet one and a half as long as the carapace; at the beginning of the description the carapace is said to be "half a telson-length shorter than the abdomen". Now it is clear that one of these two statements is wrong, if not both, for the telson should then have been 58 mm. long, only a little shorter than the carapace! This is, however, not the case in this species, for in BATE's figure the telson appears not yet half as long as the carapace and in all the specimens, collected by the "Siboga", it is little more than half as long as the latter (Confer the measurements at page 42). In BATE's figure the abdomen appears, however, also one and a half as long as the carapace. It is therefore remarkable that in all the specimens, taken by the Siboga Expedition, the abdomen appears almost twice as long as the carapace, remarkable because they agree for the rest very well with the cited descriptions and thus apparently belong to the same species. As was already remarked, the telson is little more than half as long as the carapace and it measures almost one-third the length of the abdomen. When we should read, however, in ALCOCK's description "carapace half a telson-length shorter than the abdomen, the telson excluded", the question is explained.

The youngest specimen, a female from Stat. 38, long 52 mm., is still one and a half as long as that which was collected by the "Challenger". The carapace is 18,5 mm. long, the abdomen 33,5 mm., the telson 11,5 mm.: the abdomen appears comparatively somewhat shorter than in the adult species, but the difference is slight. The anterior margin of the carapace bears in the middle line, between the large supra-orbital teeth, a very small, conical tooth, that is slightly directed upward. This fact is of great importance, for this tooth represents the rostrum, which constantly occurs in *Palinurus* s. s. and in *Jasus* Parker. On each side of this median tooth the anterior margin bears a few still smaller teeth, situated close together at the base of the supra-orbital teeth, on the right side 2, on the left 3. In the "Challenger" type no teeth did occur between the supra-orbital teeth on the frontal margin and Col. ALCOCK does also not describe them.

Behind the large supra-orbital teeth which are slightly directed outward, this specimen bears, like those from the Gulf of Manár, still two teeth that rapidly decrease in size: in the figure of the "Challenger" type there are on either side three teeth, instead of two, behind the supra-orbital spines. The infra-orbital spine is a little smaller than the large supra-orbital spine, below and anterior to it there is a conical tubercle and one observes a row of 4 or 5 small, sharp teeth between the infra-orbital spine and the cervical groove; between these teeth and the supra-orbital spines 3 other small teeth occur in front of the cervical groove and these spinules are continued to the posterior margin of the carapace as a longitudinal row of 18 or 20 small, sharp spinules on the well-defined, angular, lateral margins of the carapace. The gastric region carries in the middle two anteriorly-convergent, longitudinal rows of small, sharp spinules or teeth, 10 or 11 on either side, of which the 3 or 4 anterior ones are smaller than the others: in the younger "Challenger" type only the 3 posterior pairs were developed. The median carina, between the cervical groove and the posterior margin of the carapace, carries a row of 10 acute, subequal teeth, that are little larger than those of the gastric region; the foremost, immediately behind the cervical groove, and the fourth are double, there being here two teeth instead of one. In the "Challenger" type still only 5 teeth were developed and the 3rd was much larger than the rest. While in that very young specimen the carapace was still smooth between the armature, in front of the cervical groove, the young female from the Bali Sea carries here several small, acute teeth of unequal size. Behind the cervical groove the carapace is covered with numerous small, acute tubercles of unequal size, which on the sidewalls are smaller and arranged in close series radiating from the upper, anterior angle backward and downward.

Upper surface of carapace and abdomen covered with a short tomentum.

The abdomen is plentifully spinulose above. The 2nd—5th terga are transversely grooved, the groove is shallow and situated much nearer to the posterior than to the anterior margin. The terga are carinated in the middle line, the carina of the 6th is double and these carinae are armed with acute, somewhat compressed teeth or spinules of unequal size. The carina of the 1st somite bears an acute tooth, directed straight upward and behind it, on the posterior margin, a much smaller tooth which is directed backward. In front of the transverse groove the 2nd tergum carries 2 teeth and behind it also 2, of which the anterior stands straight upward, like the two preceding, while the posterior or 4th is much smaller, like on the 1st tergum, and directed obliquely backward. The 3rd and the 4th terga are also armed, in the middle line, each with 4 teeth, which, however, are all directed backward and this is also the case with the teeth of the following somites; there are, on the 3rd and on the 4th somite, 2 teeth before and 2 behind the transverse groove and on either of them the 2nd tooth is somewhat larger than the 3 others, nearly like in the "Challenger" type. The 5th somite bears only 3 teeth, the 1st or anterior is smaller than the 2 other ones, that have the same size as the largest tooth on the 4th tergum. Each of the two carinae on the 6th somite bears 4 or 5 teeth that are smaller than the 2 posterior teeth of the 5th; the posterior margin of the 6th somite is armed with 3, somewhat larger spines of equal size, one in the middle and one on the lateral angles, the latter turned slightly outward, and a few much smaller spinules are situated between

them. The telson, that measures $^1/_3$ the length of the abdomen, carries 2 sharp teeth on its lateral margins, one at the end of the anterior calcareous part and one a little before it; 2 small acute teeth are placed abreast in the middle just behind the anterior margin and posterior to them there is a row of 5 or 6 much smaller teeth on either side. The lateral margin of the calcareous part of the uropods ends also in a sharp spinule and a few smaller ones exist on the inner margin. On either side of the median carina the 2nd—5th terga bear a few acute teeth, which are smaller than those in the middle and which are arranged as an inner oblique row of 3 or 4 teeth and as an outer patch of some more, both groups separated by a shallow, oblique groove. A few still smaller spinules exist on the posterior part of these terga near the transverse groove and similar small teeth occur also on the 1st tergum near the transverse groove by which it is separated from the pleura. The pleura of the 1st somite carry a few small teeth just behind their rounded, anterior margin, one an their lateral margin and one at the posterior angle. The pleura of the 2nd—6th somites end in a pair of sharp spines, the anterior of which is a little larger than the posterior; there are 2 small, acute teeth on the anterior margin of the pleura of the 2nd somite, but the anterior margin of the four following is smooth and entire, while a very small, acute tooth exists on the posterior margin of the 2nd—5th pleura. There are on the outer surface of these pleura a few small teeth near the anterior margin and one or two in the middle, of which the lower is larger than the other.

The last 5 thoracic sterna bear an acute spine in the middle line, on the 5th this spine is slightly curved backward; the raised lateral margins of these sterna are armed with an acute spine posteriorly and in front of this spine one observes on the 2 posterior sterna still a much smaller tooth; for the rest the sterna are smooth.

The armature of the abdominal sterna fully agrees with Bate's description; the 6th has 2 spines in the middle of its anterior margin and 2 in the middle of the posterior, while one observes moreover on either side a transverse row of 2 or 3 smaller spinules.

The antennular peduncle is 15 mm. long, the longer flagellum 6 mm.; the 1st joint, 9 mm. long, is one and a half as long as the two following combined and the peduncle is little shorter than the carapace, while peduncle and flagella, taken together, are slightly longer than it. The peduncle reaches by half its terminal joint beyond that of the outer antennae. The flagella of the outer antennae are wanting; the joints of the peduncle are very spinose both on the outer and the inner margin like also on the upper and the lower surface. Still only the posterior half of the epistome is grooved in the middle line; there is an acute spine directed forward and downward in the middle of its anterior margin and a much smaller spine occurs near the lateral angles.

The external maxillipeds extend by half their terminal joint beyond the anterior margin of the epistome.

The thoracic legs increase in length from the 1st that are 18,5 mm. long, just as long as the carapace, to those of the slender 5th pair, which, measuring 41 mm., are a little more than twice as long as the carapace and as long as the body without the telson. All the thoracic legs are armed with a short spine at the distal end of the upper margin of their meropodites. The last pair, though slightly longer and slenderer than the 4th, resemble it as regards the

shape of the terminal joint: the dactyli, that measure one-third of the propodi, show still the same slender form as those of the 4th pair, so that these legs are not yet cheliform as is the case in the adult female.

The pleopods of the 2nd—5th abdominal somites are already shaped as in the adult female; they are biramous, the outer branch foliaceous, the inner slender, much shorter than the exopod and supporting an Appendix interna, that is also slender and a little shorter than the endopod.

Of this young female a detailed description was given, because it has nearly the same size as the "Challenger" type. As regards the other older and partly adult specimens I can therefore be shorter.

In two males, 134 mm. and 107 mm. long, and in two females measuring 174 mm. and 164 mm., the latter of which is egg-bearing, all from Stat. 38, then furthermore in two males, long 134 mm. (Pl. II, fig. 5) and 119 mm., and in a female, long 122 mm., from Stat. 297, the frontal margin bears in the middle the same small conical tooth, which has been described in the young female and which, no doubt, represents the rostrum, that occurs in the genera *Palinurus* s.s., *Palinustus* A. M.-Edw. and *Jasus* Parker. In all the other specimens, however, 20 in number, this tooth is completely wanting, the frontal margin being quite entire, as in the "Challenger" type. Like in the three cited genera, the large supra-orbital spines are turned outward and flattened above at their base; at their inner side the frontal margin projects more or less far forward and this prominence is usually cut into 2, 3 or 4 small, acute teeth, rarely, like in the male, long 142 mm., from Stat. 297 this prominence is rounded, unarmed. Behind the large supra-orbital spine there is another, which is much smaller, its posterior margin being little more than half as long as that of the large (proportion 8 : 14); this second tooth or spine is also directed outward and their tips are slightly farther distant from one another than those of the supra-orbital spines. The 2nd spine is followed posteriorly by a third, which is much smaller than the second, its posterior margin measuring only about $^1/_3$ of that of the second; these spines are slightly less distant from one another than those of the two anterior pairs. Alcock's description (l. c. 1901, p. 185) is not clear, as regards these spines, for they are not only regarded as defining the lateral margins of the carapace, but they are described as three large teeth, which is apparently not the case, the third being very small. In the original description of this species Spence Bate speaks of 3 or 4 teeth, but four are figured on either side. The large infra-orbital spine is little smaller than the supra-orbital one, but distinctly larger than the spine behind it; its outer margin is curved and it is directed more or less outward. Alcock says that there is a small spine below and anterior to it; in all the specimens, lying before me, one observes here a prominence about half as long as the infra-orbital spine and cut into 2, 3 or 4 acute teeth.

The spiniform teeth on the middle of carapace and abdomen, like also those on the lateral, angular margins of the carapace, described as occurring in the young female, become gradually lower and less prominent, the older the specimens are, so that those in the middle line of the abdomen appear at last as narrow, elongate and low tubercles, that are blunt and obtuse on the 2 or 3 anterior somites. The pleura of the 3rd—6th somites terminate, even in the largest individuals, in a pair of spines, which are larger in the female than in

the male, but those of the 2nd somite become gradually shorter, more dentiform. The spiniform teeth on the thoracic sternum are less sharp, more obtuse in these older specimens; in the male the acute teeth, with which the abdominal sterna are armed, remain spiniform and conspicuous, but in the older females they finally disappear, except on the 1st sternum.

The largest male, one from Stat. 297, is 145 mm. long; the abdomen, measuring 92 mm., is three-fourths longer than the carapace. The 1st pair of antennae, 86 mm. long, are almost as long as the abdomen and two-thirds longer than the carapace (53 mm.); the peduncle, the 1st joint of which, 28 mm. long, appears almost $^1/_3$ longer than the two following joints taken together, extends by the terminal joint and half the penultimate beyond the antennal peduncle. The longer inner flagellum (36 mm.) is about one-fourth longer than the 1st joint of the peduncle and the peduncle (50 mm.) is hardly shorter than the carapace.

The largest female, a female with eggs from Stat. 38, measures 175 mm., the abdomen (115 mm.) is almost twice as long as the carapace. The 1st pair of antennae, 71 mm. long, are much shorter than the abdomen, measuring not yet two-thirds its length and they are little longer than the carapace, only one-fifth. The peduncle, the 1st joint of which, 29 mm. long, appears $^1/_3$ longer than the two following taken together, extends only by its terminal joint beyond the peduncle of the outer antennae. The flagella are much shorter than in the male, the longer flagellum, indeed, is not longer than the 1st joint of the peduncle, but one-fourth shorter, the peduncle, finally, measures five-sixths the length of the carapace. We may infer from the preceding observations that in adult specimens the antennular flagella are longer in the male than in the female. In younger male specimens, however, they are comparatively shorter. Alcock's description of the inner antennae is therefore only apposite to the young male and to the female: the antennular peduncle being but little shorter than the carapace, his words "the antennular peduncle is more than half the length of the carapace" are not clear.

The outer antennae of the largest male from Stat. 38, which measures 134 mm., are 490 mm. long, i. e. more than $3^1/_2$-times the length of the body, according to Alcock they should be more than twice as long as it; the peduncle, measured on the lower side, appears to be 35 mm. long, nearly one-fourth the length of the body. The antennal peduncle is as plentifully spinose as in the first described young female. The outer margin of the penultimate joint is armed with 5, that of the terminal joint with 3 spines, that distally increase in length; there is a strong spine at the far end of the inner margin of the penultimate joint and 3 or 4 smaller ones on that of the last and these spines also gradually increase in size distally. Two rows of small spinules occur on the upper surface of the penultimate joint, one parallel with the outer, the other parallel with the inner margin and a few small spinules exist on the upper surface of the last joint. The lower surface of the antennal peduncle is likewise beset with small spinules, that are partly arranged in longitudinal rows. The outer antennae of the female agree with those of the male, as regards their length, armature and other characters.

Concerning the maxillipeds I will only remark that the exopod and flagellum of the 3rd or external pair have the same form and length as those of the 2nd; the exopod of the 1st maxillipeds (Pl. II, fig. 5*a*) is somewhat longer, more enlarged, narrowing distally and hairy

on its arcuate outer margin, while the tapering, multiarticulate flagellum is a little shorter than that of the other pairs (Pl. II, fig. 5*b*), but presents for the rest just the same form, so that it is not "short and stiff" as described by ALCOCK.

The epistome is distinctly grooved in the middle line up to the acute, median spine of the anterior margin; this spine is obliquely directed forward and downward, while on either side at some distance from the outer angle another smaller spine occurs.

In adult specimens, both of the male and of the female, the legs of the 1st pair are a little longer than the carapace, so in a male, long 145 mm., these legs measure 60 mm., while the carapace is 53 mm. long; in the female, long 175 mm., the legs of the 1st pair are 66 mm. long, the carapace 60 mm. In ALCOCK's specimens these legs measured about $^7/_8$ the length of the carapace. The following legs regularly increase in length and, though not so regularly, decrease in thickness. In the male, long 145 mm., the legs of the 5th pair measure 115 mm., being more than twice as long as the carapace, and these legs extend by the dactyli and somewhat more than one-third their propodi beyond the antennal peduncle; in the female, long 175 mm., the 5th legs, that measure 110 mm., are not yet twice as long as the carapace (60 mm.), they are even a little shorter than those of the 4th pair and, when stretched forward, reach only the middle of the dactyli of these legs. The legs of the 5th pair are namely cheliform in the female. The last joint is much shorter than the dactylus of the 4th pair, measuring $^1/_7$ the length of the propodus between both articulations; it carries below a curved tooth that is grooved on its lower surface and that forms with a process, just as long, of the propodus a perfect chela, beyond which the distal extremity of the modified dactylus extends dorsally.

The largest egg-laden female is 175 mm. long, the smallest specimen, provided with eggs, measures 134 mm. The very numerous, globular ova are of a small size, 0,85—0,9 mm. thick.

The measurements of the carapace, the abdomen and the telson, measured in the middle line, are the following:

Stat. 38. Males: 47, 87, 26; 46, 87, 25; 40, 76, 23; 40, 75, 23; 38, 72, 21; 37, 70, 22; 35, 67, 20; 33, 61, 19; 32, 60, 19; 31, 57, 18.

Females: 61, 113, 33; 60, 115, 33; 60, 112, 34; 56, 113, 32; 56, 108, 32; 56, 108, 32; 53, 102, 30; 46, 88, 27; 45, 85, 26; 44, 82, 25; 42, 78, 23; $18^1/_2$, $33^1/_2$, $11^1/_2$.

Stat. 297. Males: 53, 92, 27; 49, 85, 25; 43, 76, 23.

Females: 42, 80, 24; $38^1/_2$, 71, $21^1/_2$.

General distribution: Eastern Pacific, North of New Guinea (SPENCE BATE); Gulf of Manár and the Arabian Sea off the Travancore Coast (ALCOCK).

Panulirus White.

The genus *Panulirus*, established in 1847 by WHITE, contains those species of Palinuridae, of which the carapace presents no rostrum, in which the pleopods of the 2nd abdominal somite of the female differ greatly from the following pairs and the antennular flagella of which are very long. It is nowadays represented by 17 species, 3 of which, however, *Panul. bispinosus* Borr., *Panul. marginatus* (Quoy and Gaimard) and *Panul. spinosus* (H. M.-Edw.), are doubtful,

and by 2 varieties: this genus includes, therefore, a larger number of species than the six other genera of Palinuridae taken together. All the species are inhabitants of the tropical seas, but many occur moreover either a little north of the tropic of Cancer or a little south of the tropic of Capricorn. The majority are found in the Indopacific.

Panulirus Burgeri (de Haan), a nice species in which the margins of the uninterrupted furrows of the abdominal somites are conspicuously crenulate and the carapace very spinose, occurs in the Indian Ocean and the Indian Archipelago, from Port Elisabeth and Mascate to Borneo and Amboina, but its existence in the seas of Japan is still doubtful. A variety *megasculptus* has been recorded last year by Dr. PESTA from Kischin, on the south coast of Arabia. A closely related form, *Panul. dasypus* (Latr.), is distributed throughout the Indian Archipelago, the Philippine Islands and Japan, but has also been observed in the Indian Ocean, north of the Equator, near Ceylon and Sokotra. The typical *Panul. japonicus* (von Siebold) inhabits the seas of Japan, north Formosa and the Hawaiian Islands, while the variety *longipes* A. M.-Edw. is distributed throughout the Indian Ocean and the Indian Archipelago, from Zanzibar to Tahiti. *Panul. penicillatus* (Oliv.), with which *Panul. Ehrenbergi* (Heller) is apparently identical, occurs throughout the whole Indopacific from the Gulf of Akaba to Fusan (Korea), the Hawaiian and Gambier Islands and the New Hebrides. *Panul. bispinosus* Borr., still only recorded from the Loyalty Islands, has been founded on a very young specimen, long 25 mm., but, according to Mr. BORRADAILE himself, it may have been a young example of *Panul. femoristriga* (von Mart.), i. e. of the variety *longipes* of *Panul. japonicus* (von Siebold) and it is also my opinion that *Panul. bispinosus* will once prove to be the young stage of another known species. Of all the preceding Panuliridae the abdominal somites are transversely furrowed, the three species in which they are smooth, are the following. Firstly *Panul. versicolor* (Latr.), in young specimens of which the 2nd and 3rd abdominal terga are still furnished with rudimentary and interrupted, transverse grooves, that, however, gradually disappear in older individuals; this species, with which *Panul. taeniatus* of Lamarck is identical, is distributed throughout the whole Indopacific from Tanga near Zanzibar and Mascate to New Britain, the Philippine Islands and Japan. *Panul. ornatus* (Fabr.) is as widely distributed as *Panul. versicolor*, the last species, finally, is *Panul. polyphagus* of Herbst, described in 1796 and recorded from the coast of Balutschistan, Bombay, Minikoi, Mauritius, Singapore, Java and the Samoa Islands. Of two still problematical species one, *Panul. spinosus* (H. M.-Edw.), is supposed by Prof. GRUVEL to be identical with the west-indian *Panul. guttatus* (Latr.), but the validity of this species is maintained by Prof. BOUVIER, by whom an adult specimen from Pulo Condore has been referred to *Panul. spinosus*, while it has also been recorded from Tahiti and the Pacific Islands. *Panul. marginatus* (Quoy and Gaimard), finally, from the Sandwich Islands is also still a doubtful form: according to Miss RATHBUN it should be related to *Panul. Burgeri* (de Haan) and *Panul. dasypus* (Latr.), while it is regarded by GRUVEL as being perhaps a synonym of *Panul. japonicus* (von Siebold).

While this genus is not represented on the coasts of Europe, the west coast of Africa is only inhabited by one single species, *Panul. regius* de Brito Capello, the royal *Panulirus*, so named in commemoration of the fact that the type was discovered by the King of Portugal

at the Cape Verde Islands: this species has been recorded from Cape Barbas to the South of Angola.

Four species occur on the Atlantic coast of America. *Panul. argus* (Latr.) is distributed from the Bermuda Islands south to the tropic of Capricorn, *Panul. guttatus* (Latr.) occurs at the Antilles and on the coast of Brazil, while it has also been taken off the island of Ascencion; the third species, in which the abdominal somites are furrowed, is *Panul. echinatus* S. I. Smith from Pernambuco and Fernando Noronha, a species the validity of which is maintained by Miss Rathbun, while it is regarded by Ortmann and Gruvel as identical with *Panul. guttatus*. In the fourth species, *Panul. laevicauda* (Latr.), the abdominal somites are smooth; it is distributed from Cuba to Rio de Janeiro.

Two species, finally, occur on the Pacific Coast of America. *Panul. interruptus* (Rand.), in which the abdominal somites are provided with interrupted, transverse furrows, occurs from the southern United States to the Gulf of Tehuantepec. In the second the abdominal somites are smooth, not furrowed: this species, *Panul. inflatus* (Bouv.), is found along the coast of Lower California and Mexico to the Gulf of Panama, but occurs also at the Hawaiian Islands.

Little or no information at all is given in the descriptions of the species of *Panulirus* as regards their vertical distribution, but all seem to be inhabitants of shallow water and moderate depths. *Panul. penicillatus* (Oliv.), *ornatus* (Fabr.) and *versicolor* (Latr.) have been taken on the reef, *Panul. ornatus* also up to 32 m., while *Panul. versicolor* has been obtained also at depths of 13, 23 and 46 m., its *puerulus*- or "Natant"-stage *spiniger* (Ortm.) on the reef and at depths of 36 m., 46 m. and 70 m. A young specimen of *Panul. japonicus* (von Siebold) was captured at a depth of 69—78 fathoms on the north coast of Maui, Hawaiian Islands, and another young specimen, long 23 mm., of an undetermined species of *Panulirus* has been taken at 322 fathoms off Mariato Point on the Pacific Coast of Panama.

1. *Panulirus japonicus* (von Siebold).

Palinurus japonicus Ph. Fr. von Siebold, Spicilegia Faunae Japonicae, 1824, p. 15. — W. de Haan, Fauna Japonica, Crustacea, p. 158, pls. XLI and XLII, 1841.
Senex japonicus A. E. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. VI, 1891, p. 25.
Panulirus japonicus M. J. Rathbun, The Brachyura and Macrura of the Hawaiian Islands, Wash. 1906, p. 897, Pl. V.
Panulirus Japonicus A. Gruvel, in: Annales de l'Institut Océanogr., T. III, Fasc. IV, Paris 1911, p. 28, Pl. V, figs. 1 and 3.

Yokohama, 1 young female collected October 1909 by Mr. G. F. Tydeman.

This specimen measures 145 mm. from the frontal margin of the carapace to the end of the telson and fully resembles the excellent figures, published by Miss Rathbun and A. Gruvel, this species, however, attains a length of 360 mm. (Ortmann). There is a longitudinal row of 4 small spinules in the midline of the gastric region anteriorly, the foremost of which is placed between the large frontal spines; on the outer side of the latter one observes, on the anterior margin of the carapace, 4 or 5 small spines, one of which is placed just laterally, half as far distant from the pterygostomian angle as from the large frontal or supra-orbital spine and that is much larger than the others. All the transverse furrows on the abdomen are

uninterrupted. Anterior margin of the pleura of the 2nd somite slightly curved, that of the four following strongly arcuate, entire, unarmed; there is an acute tooth, posteriorly, at the base of the pleura of the 2nd—5th somites. Abdomen finely punctate. The peduncle of the inner antennae projects, like in Miss RATHBUN's figure, beyond that of the outer still only by its terminal joint.

The two principal spines on the antennular segment diverge slightly at the tips and are a little more than one and a half as long as the distance between their tips; they present a somewhat more slender shape than in DE HAAN's figure, namely the same form as in GRUVEL's Figure 1, being only half as thick at their base as long, owing perhaps to the young age of this specimen — I say, perhaps, because not only DE HAAN's specimen was much longer, viz. 13″ = 335 mm., but also the specimen, figured by GRUVEL, which was as large as that of DE HAAN. In front of the left spine are situated 2 or 3, in front of the right 1 or 2 small, acute tubercles, that are placed more laterally, and one observes a small acute granule just behind the left spine; for the rest the antennular segment appears unarmed and smooth.

The flagellum of the exopod of the outer maxillipeds reaches the middle of the 4th or merus-joint.

The 2nd legs are the longest and extend by their dactyli beyond the peduncle of the outer antennae.

Also as regards the colour, this specimen seems to agree with Miss RATHBUN's figure of a Hawaiian animal. *Panul. longipes* (A. M.-Edw.) from Zanzibar and Mauritius, with which *Panul. femoristriga* (von Mart.) from Amboina is said to be identical, must be regarded, at the utmost, as a local indian variety of DE HAAN's species. It appears indeed rather queer that in his description of *Panul. longipes* (in: Nouv. Archives du Muséum, Mémoires, T. IV, p. 89) A. MILNE-EDWARDS has made no mention at all, among the species with which it is compared, of *Panul. japonicus* which, as a matter of fact, is the most closely allied form, and furthermore that the transverse grooves on the abdominal terga of *Panul. Burgeri* are described as interrupted, while in DE HAAN's figure of this species the furrows appear distinctly continuous!

General distribution of the typical species: Japan (DE HAAN, GRUVEL); Bay of Tokyo (ORTMANN, DOFLEIN); Kochi (ORTMANN); Nagasaki (BALSS); Aburatsubo (BALSS); Simoda (STIMPSON); Tamsui, North Formosa (BALSS); Laysan (LENZ); Hawaiian Islands (PFEFFER, RATHBUN).

2. *Panulirus penicillatus* (Oliv.). (Pl. II, Fig. 6).

Palinurus penicillatus A. G. Olivier, Encycl. Méthod. T. VIII, p. 674, 1811.
Palinurus penicillatus H. Milne-Edwards, Hist. Nat. Crust. II, 1837, p. 299.
Palinurus (Panulirus) penicillatus E. J. Miers, in: Annals Mag. Nat. Hist. 1878, p. 410.
Palinurus penicillatus G. Pfeffer, Die Panzerkrebse und die Clypeastriden des Hamburger Museums, 1881, p. 34.
Senex penicillatus A. E. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. VI, 1891, p. 28.
Panulirus penicillatus G. Nobili, in: Annal. Scienc. Nat. 9e Série. Zool. IV, 1906, p. 88.
Panulirus penicillatus M. J. Rathbun, The Brachyura and Macrura of the Hawaiian Islands. Wash. 1906, p. 897.
Panulirus penicillatus G. Nobili, Ricerche sui Crostacei della Polinesia, Torino, 1907, p. 366 (16).
Panulirus penicillatus Th. R. R. Stebbing, South African Crustacea, Part IV, Cape Town, 1908, p. 33 and in: General Catalogue of South African Crustacea, London, 1910, p. 374.

Panulirus penicillatus A. Gruvel, in: Annales de l'Institut Océanogr., T. III, Fasc. IV, Paris 1911, p. 31, Pl. II, fig. 4.
Palinurus Ehrenbergi C. Heller, in: Sitzungsber. Kais. Akad. Wiss. Wien, Bd. XLIV, 1861, p. 260, Taf. II, Fig. 8.
Palinurus Ehrenbergi C. K. Hoffmann, Crustacés et Echinodermes de Madagascar, 1874, p. 30, Pl. VIII.

West-Nias. 3 males and 1 young female, collected in 1910 by Mr. KLEIWEG DE ZWAAN.
Lasikin (Simalur), Sumatra. 1 male, collected April 1913 by Mr. E. JACOBSON.
Labuan Badjau (Simalur), Sumatra. 1 male of medium size, collected June 1913 by Mr. E. JACOBSON.

The largest specimen, the male from Lasikin, measures 308 mm. from the frontal margin to the end of the telson, the carapace being 104 mm. long, nearly half as long as the abdomen; the other male of Mr. JACOBSON is 185 mm. long. The largest male from West-Nias is 225 mm. long, the carapace measuring 85 mm.; the two other males are nearly of equal size, their carapace being 75 mm., respectively 72 mm. long; the female measures 138 mm., the carapace 48 mm. This species, however, attains a length of 380 mm., the carapace being then 155 mm. long (NOBILI).

In the adult male from Lasikin and in the two largest males from West-Nias all the tubercles and spines of the carapace are naked, but in the male from Labuan Badjau and in the youngest male from West-Nias the stiff setae of a yellowish-brown colour are distinctly developed, while in the young female they are still also partly present. In the older specimens these setae are apparently worn off, the small impressed puncta, however, are still everywhere visible.

In all the specimens the transverse furrows on the abdominal somites are continuous, no one is interrupted. In the "Histoire Nat. des Crustacés" H. MILNE-EDWARDS says, however, concerning the abdomen, that it is "piqueté et conformé du reste comme celui de la L. mouchetée", i. e. *Panul. guttatus* (Latr.), in which the furrow of the 4th somite is sometimes interrupted (GRUVEL); in *Panul. Ehrenbergi* (Heller) the transverse furrows of the 4th and of the 5th somite are interrupted, but, like in *Panul. guttatus*, the specimen, on which *Panul. Ehrenbergi* was established by HELLER, may have presented a rare exception. In the medium-sized male [from Labuan Badjau and in the youngest male and in the female from West-Nias the furrows are setiferous, but in the 3 largest specimens the setae are here all worn off, though they exist still on the posterior margin of the segments.

The youngest male from West-Nias bears 2 or 3 teeth on the anterior margin of the pleura of the 2nd abdominal somite and one tooth on that of the 3rd, 4th and 5th, which teeth gradually decrease in size, but the pleura of the 6th and of the 1st are entire, unarmed. In the two largest examples from the same locality these teeth are partly worn off and the anterior margin of the pleura of the 5th somite appears entire, in one male even that of the 4th. In the female, finally, there are 2 teeth on the anterior margin of the 2nd pleura and one on the 3rd and 4th, while the 5th and the 6th, like the 1st, are unarmed.

In the adult male from Simalur there are 2 teeth on the anterior margin of the pleura of the 2nd somite, but the posterior is rudimentary, 2 well-developed teeth on that of the pleura of the 3rd somite, a rudimentary tooth on that of the 4th, while the anterior margin of the 5th and the 6th is quite unarmed; the male from Labuan Badjau bears 3 teeth, the posterior

of which is rudimentary, on the anterior margin of the 2nd pleura, but agrees for the rest with the male from Lasikin.

In all the specimens the two anterior spines of the antennular segment (Pl. II, fig. 6) are distinctly shorter than the two posterior, like in *Panul. Ehrenbergi*. In the specimens from Réunion, described by Hoffmann, the anterior pair were larger than the posterior. The spines are invariably directed outward, so that they distinctly diverge from one another; on either side of the middle line the anterior spine is coalesced at its base with the posterior, but in the female it is hardly the case and the left spine of the anterior pair is wanting and only represented by a minute rounded tubercle. The spines of the posterior pair are, however, not coalesced at their base, no more than those of the anterior, so that the two spines on the right side are separated by an intervening space from those of the left. In the figure of the specimen which was referred by Hoffmann to *Panul. Ehrenbergi*, the four spines stand much closer together than in our specimens, but the figure is probably inaccurate, because the posterior pair of spines appears larger than the anterior, in contrast with the description.

In the adult male from Simalur the antennular peduncle projects by the terminal joint beyond that of the outer antennae, in the younger male from Labuan Badjau only by half that joint. In the largest male from West-Nias the 1st joint of the right antennular peduncle is somewhat longer than that of the left, the 1st joint of the left peduncle reaches the apex of the penultimate article of the antennal peduncle and the left antennular peduncle projects by half the terminal joint beyond the tip of the peduncle of the outer antennae. In the second male the 1st joint of the right antennular peduncle appears also a little longer than that of the left, but the difference is not so great and the left peduncle extends by the whole terminal joint beyond that of the outer antennae. In the female the two antennular peduncles are nearly equal and project by one-third or one-fourth the terminal joint beyond the tip of the antennal peduncles. The distal margin of the outer side of the basal antennal article is armed with two spines, of which the upper is slightly larger than the lower: in the largest male from West-Nias these two spines are wanting on the left peduncle, which is, of course, an abnormality.

The specimen from Labuan Badjau shows a very dark, green colour, the tips of the spines are reddish with black points, while the pleopods are purple-coloured; the same colour is presented by the adult male from Simalur, but the abdominal terga and the branchial regions are red, like also the meropodites of the legs. The specimens from West-Nias are quite otherwise coloured, owing probably to the different action of the spirits. They are of a beautiful red, which on the sternum, the epistome and the lower side of the coxae of the thoracic legs is marbled with white, while the other joints of the legs are marked with narrow, white, longitudinal lines. The spines on the carapace, the antennular segment and the antennal peduncles are yellowish on their distal half with their points dark-brown.

The native name (Tapah) of the animals on the island of West-Nias is lahâ.

General distribution: Gulf of Akaba (Miers); Djeddah (de Man); Coseir (Heller, s. n. *Pal. Ehrenbergii*); Red Sea (Nobili); Indian Ocean (H. Milne-Edwards); Agulhas Bank? (Stebbing); Egmont Atoll (Chagos Archipelago) (Borradaile); Minikoi (Borradaile); Réunion (A. M.-Edwards, Hoffmann (s. n. *Pal. Ehrenbergi*)); Mauritius (Latreille, Richters); Ceylon

(Henderson); Sumatra (Gruvel); Padang (de Man); Christmas Island (Calman); New Guinea (Pfeffer); New-Caledonia (Gruvel); Pacific Ocean (Pfeffer, Ortmann); Loyalty Islands (Borradaile); Rotuma (Borradaile); New Hebrides (Miers); Tahiti (Stimpson, Spence Bate); Fiji Islands (Miers); Mahonga, Mariannes (Gruvel); Hao, Gambier Islands (Nobili, Gruvel); Formosa (Balss); Fusan, Korea (Pesta); Hawaiian Islands (Rathbun, Gruvel, Pesta); Samoa (Pesta).

3. *Panulirus dasypus* (Latr.).

Panulirus dasypus (Latreille), A. Gruvel, in: Annales de l'Institut Océanogr., T. III, Fasc. IV, Paris 1911, p. 34, Pl. II, fig. 5.
Palinurus Burgeri, J. G. de Man, in: Max Weber's Zoolog. Ergebn. einer Reise nach Niederl. Ost-Indien, II, 1892, p. 354.

The specimen from Makassar, a young female, about 90 mm. long from the frontal margin of the carapace to the end of the telson, which was referred by me (l. c.) in 1892 to *Panulirus Burgeri* (de Haan) and which is preserved in the Zoological Museum of the University of Amsterdam, is again lying before me. Having compared it with Gruvel's detailed description and excellent figures, it appears to me now quite certain that this specimen must be regarded as a young female of *Panul. dasypus* (Latr.). It is indeed only by the strong development of the spines on the cephalothorax, which are as plentiful and as well developed as in *Panul. Burgeri* (de Haan, Fauna Japon. Crustacea, Tab. XLIII and XLIV, fig. 1), that this specimen differs from the descriptions by H. Milne-Edwards and A. Gruvel of *Panul. dasypus*. There can, in my opinion, be no doubt, however, that this strong spinosity of the carapace be a juvenile feature, for it is also known to occur in other species.

Of the four outer spines on the antennular tergum the 2 posterior measure two-thirds the length of the 2 anterior and are a little less distant from one another; the four inner spinules are much smaller, measuring only $^1/_3$ the length of the anterior pair. The antennular peduncle extends almost by half the terminal joint beyond that of the outer antennae.

The legs, long 43 mm., of the 1st pair that project by half their dactyli beyond the penultimate article of the outer antennae, are half as long as the body. Though in both species the legs of the 3rd pair are the longest, in *Panul. Burgeri* their propodi hardly reach beyond those of the 2nd pair (de Haan, l. c.), but in *Panul. dasypus* the 3rd legs appear, with regard to those of the 2nd pair, much longer, so that in the young female from Makassar the propodi of the 3rd legs project by one-fifth their length beyond those of the 2nd pair and the 3rd legs reach as far forward as the antennular peduncle. The legs of the 5th pair extend to the middle of the propodi of the 1st; the lower margin of their propodi ends in a small acute tooth and the dactylus bears already a small prominence near the articulation on its outer surface, which, when joining the tooth, forms with it a very small chela, beyond which the long rest of the dactylus projects. In all the legs both the upper and the lower margin of the merus terminate distally in an acute tooth.

On its lower side body and appendages are cream-coloured, and this colour is also presented by the abdominal somites in front of the transverse groove, while posterior to it they are verdigris and marked with numerous, small, round spots. The upper surface of the carapace

and the antennular tergum is also verdigris, the supra-orbital spines are marbled with cream flecks and the spines of the upper surface are cream-coloured at their base, while those of the antennal peduncle are here blue coloured; the antennular peduncles and the legs, finally, are partly verdigris, partly cream-coloured above.

This specimen, however, certainly presents also a close resemblance to *Panul. spinosus* (H. M.-Edw.), in which species, according to Bouvier (in: Bull. Musée Océanogr. Monaco, 1905, p. 28) the exopodite of the 2nd maxilipeds should extend beyond the base of the carpus, while in *Panul. dasypus* it should hardly attain the extremity of the merus. In the specimen from Makassar the exopodite reaches indeed a little beyond the distal extremity of the merus, I do not venture, however, to refer it to *Panul. spinosus*, because two spines occur in the middle line of the gastric region, just in front of the cervical groove and placed behind one another, while, according to H. Milne Edwards 1837, the gastric region should bear no spine in the middle line. Gruvel, indeed, seems to have referred the specimen from Pulo Condore to *Panul. dasypus* (l. c. p. 34), while *Panul. spinosus* is regarded by him with some doubt as a synonym of the West-Indian *Panul. guttatus* (Latr.).

4. *Panulirus orientalis* Doflein.

Panulirus orientalis F. Doflein, Weitere Mitteilungen über decapode Crustaceen der k. bayerischen Staatssammlungen, in: Sitzungsber. k. Bayer. Akad. Wiss. München, 1900, Heft I, p. 130.

Though the identity of this species with *Panul. polyphagus* (Herbst) has already been acknowledged by H. Balss, in: Ostasiatische Decapoden II, 1914, p. 78, the following observations of the type of *Panul. orientalis* Doflein will still, I hope, be welcome; I am indebted for them to Dr. Balss, who kindly has enabled me to examine the type preserved in the Zoological Museum at Munich. The examination of this specimen, a young male, perhaps from Japan (Balss, l. c.), proved at once its identity with *Panul. polyphagus* (Herbst), of which I have published a detailed description in 1896 (in: Zoolog. Jahrb. Abth. f. Syst. IX, p. 502, Taf. 34, Fig. 59, 59*a*) after a full-grown female from Singapore. The type, long 110 mm. from the frontal margin of the carapace to the end of the telson, almost fully agrees with my cited description, not only as regards the morphological characters, but also as regards the characteristic coloration; it shows, however, some slight differences, owing to its younger age and these differences must be described, because they are still unknown.

The adult female from Singapore was 270 mm. long, the carapace 90 mm., and the supra-orbital spines, measured along their upper or posterior margin, proved to be 20 mm. long; in the type of *Panul. orientalis* these numbers are respectively 110 mm., 36 mm. and 11 mm., so that the supra-orbital spines are comparatively a little longer than in the adult specimen. The lateral parts of the gastric region presented in the adult specimen 3 small spines, situated behind one another and the posterior of which was rudimentary, while the gastric region did appear for the rest quite smooth; in Doflein's type, however, the posterior one of the 3 spines is well-developed, though it is very small, much smaller than the two anterior spines and one observes a 4th spine between the posterior one of the three and the second submedian spine behind the large supra-orbital one; this 4th spine is placed somewhat

nearer to the 2nd submedian spine than to the posterior one of the three and is slightly larger than the latter.

Three or four microscopical spinules exist moreover, between these spines, on the lateral parts of the gastric region. Behind the cervical groove the upper part of the branchial region is covered, between the larger spines, which occur also in the adult, with very small spinules, that are numerous and crowded on the posterior half, but that gradually disappear anteriorly, though well-developed spinules exist also on the posterior border of the lateral, descending parts of the cervical groove; a small number of these spinules occur also on the posterior half of the cardiac region. These small spinules are partly bordered anteriorly by microscopical setae. In the adult female from Singapore all these minute spinules on the posterior part of the carapace were worn off, like also their setae, and they did appear as minute tubercles or granules.

While in the adult *Panul. polyphagus* the abdominal terga are perfectly smooth, one observes on the tergum of the 2nd somite of this young specimen still a shallow, rudimentary, transverse furrow, which was not mentioned by Doflein; the breadth of this furrow, which is not interrupted in the middle line and situated slightly in front of the middle, measures only one-third the width of the 2nd somite. The following somites appear, however, already quite smooth, but I should not be surprised, when, in still younger individuals, also the 3rd or even also the 4th somite should present traces of a similar, rudimentary furrow.

In this species the external maxillipeds, viz. those of the 3rd pair, bear no exopod, but the exopod of the 2nd maxillipeds already fully resembles that of the adult: the stalk extends to the distal 5th part of the merus-joint of the endopod, while the flagellum, already 9-articulate and fully resembling the quoted figures 59 and 59*a*, slightly surpasses the carpus.

The 1st article of the antennular peduncle extends to the 2nd third part of the terminal joint of the antennal peduncle, the 2nd almost to the apex of this joint, so that the 3rd article surpasses the antennal peduncle almost by its whole length, in the adult female, however, only by half its length. As regards the spinulation of the antennal peduncle, the young specimen agrees with the adult, except the terminal joint that bears, just behind the distal spine, on the outer margin another spine which is much smaller and behind the latter still a rudimentary spinule. In this young male the legs of the 1st pair reach the apex of the penultimate article of the antennal peduncle, those of the 2nd pair project by their dactyli beyond the apex of this article and surpass the 1st article of the antennular peduncle by one-third of their dactyli; the legs of the 3rd pair are the longest of all and extend by their dactyli to the apex of the antennal peduncle; the legs of the 4th pair project by their dactyli beyond the penultimate antennal article, while those of the 5th attain the middle of it.

As regards the coloration I wish only to remark that the abdomen has a verdigris ground-colour, like the carapace, the antennal and antennular peduncles and the legs, but that between the posterior margin of each somite and the white band in front of it the colour is of a fine blue.

General distribution: *Panulirus polyphagus* (Herbst) is at present with certainty known from Sonmiani (Balutschistan) (Balss), Bombay (Nobili), Minikoi (Borradaile), Mauritius

(Ortmann), Java (Pesta), Singapore (Nobili, de Man, Balss) and from Upolu (Samoa Islands) (Ortmann), while it is still doubtful whether this species does also occur on the coasts of Japan.

5. *Palinurus* sp. (*ornatus* Oliv.?) von Mart.

Palinurus sp. (*ornatus* Oliv.?) E. von Martens, in: Archiv für Naturg. XXXVIII Jahrg., 1872, p. 128.
Confer: G. Nobili, in: Boll. Mus. Zool. Torino, Vol. XVI, N° 415, 1901, p. 11.

Upon my request Professor E. Vanhöffen of the Royal Zoological Museum of Berlin has been so kind to compare the small male specimen from Cuba, which, in 1872, was referred by von Martens with some doubt to *Panul. ornatus* (Fabr.), with the figures of *Panul. laevicauda* (Latr.), published in 1901 by Moreira and in 1911 by Gruvel. Prof. Vanhöffen wrote me thereupon that the Cuban specimen did well agree with these figures, that there was no exopod on the 3rd maxillipeds, that the exopod of the 2nd pair was furnished with an articulated flagellum and that it seemed therefore quite certain that this specimen must be referred to *Panul. laevicauda* (Latr.). I am of the same opinion and wish to add that this species was heretofore only known to occur from Rio de Janeiro to French Guyana.

6. *Panulirus ornatus* (Fabr.).

Palinurus ornatus J. C. Fabricius, Suppl. Entom. System. 1798, p. 400.
Palinurus ornatus H. Milne-Edwards, Hist. Nat. Crustacés, II, 1837, p. 296.
Palinurus brevipes G. Pfeffer, in: Verhandl. Naturw. Vereins, Hamburg 1880, p. 44 (partim).
Palinurus ornatus J. G. de Man, in: Zoolog. Jahrb. Abth. f. Syst. IX, 1896, p. 511.
Palinurus homarus G. Pfeffer, in: Mittheil. Naturh. Mus. Hamburg, XIV, 1897, p. 13.
Panulirus homarus G. Nobili, in: Annal. Scienc. Nat. 9e Série, Zool. T. IV, 1906, p. 90.
Panulirus ornatus A. Gruvel, in: Annales Instit. Océanograph., T. III, Fasc. IV, Paris 1911, p. 47 (partim), Pl. VI, fig. 2.
Panulirus ornatus H. Balss, Ostasiatische Decapoden II, München 1914, p. 78 (partim).
Cancer (Astacus) homarus J. F. W. Herbst, Versuch einer Naturg. Krabben u. Krebse, Bd. II, 1796, p. 84, Pl. XXXI, fig. 1.

Stat. 71. May 10—June 7. Makassar. Up to 32 m. 1 male of medium size.
Postillon-islands. 2 young specimens, presented by Mr. Jacquin of Makassar.
Ambon. Reef. 1 young female and 1 still younger individual.

Though Pfeffer after an examination of the types of Fabricius, preserved in the Museum of Kiel, has clearly demonstrated in 1897 the identity of *Panul. ornatus* of Fabricius with the *Cancer (Astacus) homarus* of Herbst, whose description has been published two years before that of Fabricius, I nevertheless prefer, in harmony with Messr. Gruvel and Balss, to use the name of Fabricius, because, already before Herbst, other species have been designated also by the name of *homarus*.

The male from Makassar is almost 23 cm. long from the anterior margin of the carapace to the end of the telson, the carapace being 82 mm. long, the abdomen 145 mm. The coloration of this specimen is typical and agrees with the figure of Herbst. The upper surface of carapace and abdomen has a verdigris ground-colour; quite anteriorly between the supra-orbital spines

like also between them and the lateral margins, the upper surface is finely marbled with cream-coloured lines on a dark-blue ground, though one observes, nearly midway between the supra-orbital spines and the lateral margins, a verdigris stripe bordered on its outer side by an elongate cream-coloured fleck. The supra-orbital spines are marked with large, dark-blue flecks, separated by narrow, pale, cream-coloured bands; the flecks do not reach the anterior margin of the spines except that near the tip. The other acute teeth on the upper surface are yellow with darker tip. The terga of the 2nd, 3th and 5th abdominal somites are adorned with a large, transverse, dark-blue band; on the 2nd and on the 3rd this band does not extend to the anterior nor to the posterior margin of the somite, but on the 5th it reaches until its posterior border, while on the 4th and on the 6th somite one observes but a trace of such a band. These bands are bounded on either side, anteriorly, by a narrow, oblique, cream-coloured stripe. A larger oval fleck of the same cream-colour runs obliquely and parallel with the other on the antero-lateral angle of the 1st—6th terga and these flecks, of which that on the 5th somite is a little smaller than the others, are also bordered by a dark-blue line. The verdigris pleura show cream-coloured extremities and their anterior margin presents the same colour, like also the denticulated lobe on their posterior margin; the acute tips are horny coloured. The calcareous anterior part of the telson bears on each side a small cream-coloured fleck and there is also one on the basal joint of the lateral swimmerets posteriorly.

The joints of the blue antennular peduncles are marked with cream-coloured flecks distally, the 1st joint also in the middle and their flagella are adorned with three rings of the same colour, the first of which is shorter than the following, like in the figure of HERBST. The antennal peduncle is finely marbled on a blue ground-colour, the yellow spines with which they are armed, are dark-blue at their base. The thoracic legs are cream-coloured between the dark-blue rings and flecks.

The upper surface of the carapace is covered with acute spines and teeth that partly are more or less distinctly arranged in longitudinal rows; behind the cervical groove a large number of smaller acute teeth are observed between them, especially on the branchial and intestinal regions; the teeth are fringed anteriorly with short bristles which, however, are often absent on the larger spines. The cardiac region bears, on either side of the median line, a row of 3 spines that slightly decrease in size posteriorly; the two rows converge distinctly backward, so that the tips of the two anterior spines are one and a half as far distant from one another as those of the posterior pair. There is a spine at the antero-lateral angle of the carapace; between it and the cervical groove are 2 smaller teeth, of which the anterior is larger than the other, there are, finally, 5 or 6 small, acute teeth on the anterior border of the carapace between the large spine at the antero-lateral angle and the antennular segment.

Abdominal somites densely punctate, for the rest smooth. Antennular segment anteriorly with 2 sharp spines and with 2 somewhat smaller ones behind them; the latter are a little farther distant from one another than those of the anterior pair. The right spine of the posterior pair is a little smaller than the left, but a fifth spine of the same size stands behind it, somewhat more laterally. Traces of two very small spines are moreover observed between the anterior and the posterior pair.

The inner antennae are 280 mm. long, the peduncle 80 mm., the longer flagellum 200 mm.; the shorter flagellum is one and a half as long as the peduncle. The antennular peduncle reaches by its terminal joint beyond the distal end of the peduncle of the outer antennae.

Lateral spines of the epistome half as long as the middle one. External antennae 610 mm. long, $2^2/_3$-times as long as the body; the peduncle is just as long as that of the inner antennae and just as long as the carapace, viz. 80 mm.

External maxillipeds (Pl. II, fig. 7*c*) without an exopodite; exopodite of the maxillipeds of the following or 2nd pair (Pl. II, fig. 7*b*) without a flagellum and reaching the terminal fourth part of the outer margin of the merus-joint. The oval, flattened flagellum of the 1st pair of maxillipeds is 10-jointed, its greatest width is a little more than $^1/_4$ its length.

The legs of the 1st pair reach by their dactyli beyond the 2nd joint of the antennal peduncle, those of the 2nd pair are as long as this peduncle, while the legs of the 3rd pair are the longest of all, extending by half their dactyli beyond the antennal peduncle; the legs of the 4th pair attain the middle of the 3rd, those of the 5th the middle of the 2nd joint of this peduncle.

The variability of *Panul. ornatus*, as regards its coloration, is proved by the young female from Ambon. This specimen is 91 mm. long, the carapace measuring 31 mm., the abdomen 60 mm. The gastric and the cardiac regions until to the transverse furrow near the posterior border are partly dark-green partly verdigris, like also the antennular segment and the inner half of the hepatic area; the outer half of the latter is dark-purple, marbled with some pale lines and there is a yellow fleck that separates the purple and the green portion of the hepatic region. The median regions of the carapace are marbled with pale lines and small spots. The branchial regions until the lateral border are yellow like also the posterior border of the carapace. The two supra-orbital spines are dark-purple, the proximal half of their anterior margin like also the anterior margin of the carapace between them are yellow. The sharp spines and teeth on the upper surface of the carapace agree, as regards their number and arrangement, with the large male from Makassar, all are yellow except 4 or 5 on the inner half of the hepatic region. The 1st abdominal somite is dark-green with small, pale spots, the pleura of the 1st somite also dark-green with cream-coloured extremity and a fleck of the same colour on their internal angle. The 2nd to 5th terga are honey-coloured; a dark-green, transverse fleck runs along the posterior margin of the 2nd somite, extending until the middle of this somite and a much smaller fleck of the same colour runs along the posterior margin of the 3rd, while the posterior margin of the two following somites is also dark. The posterior half of the 6th tergum, the calcareous parts of the caudal fan and the 2nd to 6th pleura show the same dark-green colour and the green parts are everywhere covered with small, pale spots. The two oblique, cream-coloured flecks near the antero-lateral angle of each somite are rather well visible, especially the larger outer one.

The 1st joint of the antennular peduncle is dark-green, the two following are honey-coloured, all with paler extremities; flagella honey-coloured with 3 pale rings on the shorter and 5 on the longer. Antennal peduncles dark-blue with fine pale markings; the flagella are proximally of the same colour, for the greater part they are honey-coloured.

Epistome, outer foot-jaws and sternum dark-green, the foot-jaws with cream-coloured flecks at their distal extremities. Thoracic legs honey-coloured, except the two first joints that are for the greater part dark-green; a dark-green ring on the meri and the propodi are paler coloured at both extremities. Antennular segment anteriorly with 2 sharp teeth and behind them 2 smaller ones, that are farther distant from one another than those of the anterior pair; in the quadrangle formed by these teeth one observes moreover traces of 3 or 4 minute teeth. The inner antennae are 143 mm. long, more than one and a half as long as the body; the peduncle measures 33 mm., nearly as long as the carapace, the shorter flagellum is 55 mm. long, the other 110 mm., just twice as long; the peduncle reaches almost by the whole terminal joint beyond the distal extremity of that of the outer antennae. The latter are 333 mm. long, $3^2/_3$-times as long as the body; the peduncle, 33 mm. long, appears just as long as that of the inner antennae, exactly like in the larger male. The exopod of the 2nd i. e. the penultimate pair of maxillipeds extends as far forward as in the larger male.

The legs of the 1st and of the 2nd pair are wanting, those of the 3rd extend by the distal third part of their dactyli beyond the antennal peduncle, while those of the 4th pair reach almost that tip; the 5th legs reach almost the distal extremity of the lower border of 1st antennal article.

The other specimen from Ambon is 40 mm. long, carapace $13^1/_2$ mm., abdomen $26^1/_2$. The genital apertures are not recognizable, but it seems to be a female, because the abdominal appendages of the 2nd to 5th somites consist of a large broadly-foliaceous exopod and an inner branch, that carries an Appendix interna. The general colour, that has apparently changed, is honey-brown, a longitudinal pale band runs in the middle of the anterior half of the abdomen and the joints of the thoracic legs are marked with brown rings on a paler ground. Besides the two larger spines on the antennular segment anteriorly there are behind them only traces of one or two other teeth. Inner antennae 44 mm. long, little longer than the body, their peduncle measures $13^1/_4$ mm.; the antennal peduncles are 14 mm. long, those of the inner antennae project by half their terminal joint beyond the former.

The legs of the 1st pair barely reach by their dactyli beyond the 2nd joint of the antennal peduncle, the 2nd pair extend almost to the distal end of the latter, the 3rd pair reach as far forward as that peduncle, the 4th are somewhat shorter and the legs of the 5th pair project by half their dactyli beyond the epistome.

The 2 young females from the Postillon-Islands show the same faded, pale-brown colour as the just described specimen and show nothing which is noticeable.

General distribution: Indian Ocean (Fabricius); Zanzibar (Pfeffer); Obock (Nobili); Mauritius (H. Milne-Edwards); Bengal (Pfeffer); Ceylon (Henderson); Singapore (Pfeffer); Amboina (Miers, de Man); Manilla (Pfeffer); Pipon Islands, Cape Melville (Miers); Tabukan, Sangi (Thallwitz); Samoa Islands (Haswell).

7. *Palinurus ornatus* var. *decoratus* Heller.

Palinurus ornatus var. *decoratus* C. Heller, Crustaceen der Novara-Reise, 1865, p. 99.

Though Heller's description is rather detailed, it deals exclusively with the coloration

of the single specimen from Java, upon which this variety was founded, and it contains nothing about the maxillipeds, while even the length has not been indicated. I therefore took the liberty to apply to Dr. O. PESTA of the K. K. Naturhistorisches Hofmuseum of Vienna, who kindly wrote me that a type specimen of this variety, collected by the Novara-Expedition, does not exist in the collections of the Museum. Dr. PESTA ran also over the old registers and catalogues of the Novara-Expedition, which in general seem to be very accurate, but he did not find this variety mentioned; he informed me that in HELLER's great work of 1865, not only Crustacea, collected by the "Novara", have been described, but also specimens of other origin, a fact already often observed by him, so that the type of *Pal. ornatus* var. *decoratus* will perhaps once prove to be in Innsbrück or elsewhere. He had just finished the determination of the Palinuridae preserved in the Museum of Vienna; among the 11 specimens of *Panul. ornatus* (Fabr.) three adult females, respectively from Batavia, Sumatra and the Red Sea, were referred by PESTA to the variety *decoratus*. In all these specimens now, thus also in the three of the variety, there is no exopod on the 3rd maxillipeds, while the exopod of those of the 2nd pair, hardly reaching the distal end of the merus, bears no flagellum, but only a tuft of hair at the distal extremity. This fact renders the question again doubtful, for both by GRUVEL and by me the variety *decoratus* of HELLER is regarded as identical with *Panul. taeniatus* (Lam.), while *Panul. taeniatus* (Lam.) is identical with *Panul. versicolor* (Latr.), in which the exopod of the 2nd maxillipeds bears a very small flagellum that is not articulate.

8. *Panulirus ornatus* (Fabr.), var. *laevis* Lanchester.

Senex ornatus Fabr., var. nov. *laevis* W. F. Lanchester, in: Proc. Zoolog. Soc. London, 1901, p. 557.

After having compared this description with the adult specimens of *Panul. versicolor* (Latr.) from Ternate and Simalur, I come to the conclusion that also this variety has been established upon a quite adult specimen of *Panul. versicolor* (Latr.). The three only species that can be taken into consideration, are *Panul. polyphagus* (Herbst), *Panul. ornatus* (Fabr.) and *Panul. versicolor* (Latr.). LANCHESTER now writes that the coloration of the abdomen and of the legs is that of *Panul. fasciatus* (de Haan), which is the same species as *Panul. versicolor* (Latr.); this coloration, however, is quite different from that which is presented by *Panul. ornatus* (Fabr.) and *Panul. polyphagus* (Herbst).

9. *Panulirus versicolor* (Latr.). (Pl. II, Fig. 7—7*c*).

Palinurus versicolor P. A. Latreille, Annales du Muséum, T. III, 1804, p. 394 and in: Nouv. Dict. d'hist. nat. T. XVII.
Palinurus versicolor G. Pfeffer, Zur Kenntnis der Gattung *Palinurus* Fabr., Hamburg 1897, p. 12.
Palinurus versicolor J. G. de Man, in: Abhandl. Senckenb. Naturf. Gesells., Bd. XXV, Heft III, 1902, p. 760.
Panulirus versicolor G. Nobili, in: Bull. Scientif. France-Belgique, T. XL, 1906, p. 59.
Palinurus taeniatus J. B. P. A. de Lamarck, Hist. nat. des animaux sans vertèbres, T. V.
Panulirus ornatus (Fabr.), var. *taeniatus* A. Gruvel, in: Annales Institut Océanogr., T. III, Fasc. IV, Paris 1911, p. 48, Pl. VI, fig. 3.

Palinurus fasciatus W. de Haan, Fauna Japon. Crustacea, 1850, p. 159, tab. 43/44, fig. 2.
Palinurus fasciatus J. Thallwitz, Decapoden-Studien, 1891, p. 28, 29.
Palinurus fasciatus J. G. de Man, in: Max Weber's Zoolog. Ergebn. einer Reise nach Niederl. Ost-Indien, II, 1892, p. 354 (after a new examination of the two specimens from the Bay of Bima).
Palinurus fasciatus J. G. de Man, in: Zoolog. Jahrb. Abt. f. Syst. IX, 1896, p. 508.
Palinurus ornatus, var. *decoratus* C. Heller, Crustaceen der Novara-Reise, 1865, p. 99.
Senex ornatus Fabr., var. nov. *laevis* W. F. Lanchester, in: Proc. Zool. Soc. London, 1901, p. 557.
Palinurus sp., J. G. de Man, l. c. 1896, p. 507.
Panulirus ornatus A. Gruvel, l. c. p. 47 (partim).
Panulirus ornatus H. Balss, Ostasiatische Decapoden. II. Die Natantia und Reptantia, München 1914, p. 78 (partim).
Palinurus polyphagus A. E. Ortmann, in: R. Semon, Zoolog. Forschungsreisen in Australien und dem Malayischen Archipel, Jena, 1894, Sep.-Abdr., p. 19.
Panulirus demani L. A. Borradaile, in: A. Willey's Zoological Results, Part IV, Sept. 1899, p. 418.

Stat. 58. April 25. Anchorage off Seba, Savu. Reef. 1 very young specimen.
Stat. 131. July 24/25. Anchorage off Beo, Karakelang-Islands. 13 m. Bottom mud and sand. 1 female of medium size.
Stat. 136. July 29—August 3. Ternate. 23 m. Bottom mud and stone. 1 adult specimen.
Stat. 193. Sept. 13/14. Sanana-Bay, East coast of Sula Besi. Reef. 1 very young specimen.
Stat. 209. Sept. 23. Anchorage off the south point of Kabaëna-Island. Reef. 1 very young specimen.
Stat. 225. Nov. 8. South point of South-Lucipara-Island. Reef. 1 very young specimen.
Stat. 231. Nov. 14/18. Ambon. Reef. 1 young and 2 very young specimens.
Stat. 234. Nov. 19/20. Nalahia-Bay, Nusa-Laut-Island. 46 m. Bottom stony. 1 young and 1 very young specimen.
Stat. 258. Dec. 12/16. Tual-Anchorage, Kei-Islands. 22 m. Bottom Lithothamnion, sand and coral. 4 very young specimens.
Stat. 282. January 15/17, 1900. 8° 25'.2 S., 127° 18'.4 E. Anchorage between Nusa Besi and the N. E. point of Timor. Reef. 1 young specimen.
Stat. 301. Jan. 30—Febr. 1, 1900. 10° 38' S., 123° 25'.2 E. Pepela-Bay, East coast of Rotti-Island. Reef. 2 young females.
Nias. 3 young specimens, captured in 1910 by Mr. Kleiweg de Zwaan, the largest one, the carapace of which is 11,5 mm. long, from Goenoeng Sitoli.
Sinabang-Bay (Simalur), Sumatra. 2 adult males, obtained Febr. 1913 by Mr. E. Jacobson.

It is a remarkable fact, indeed, that, in his important Monograph of the Palinuridae, *Panul. versicolor* (Latr.) is again regarded by A. Gruvel as a variety of *Panul. ornatus* (Fabr.), in spite of Pfeffer's researches, who in 1897 has fully elucidated the differential characters of both species in his paper: Zur Kenntnis der Gattung *Palinurus* Fabr., and that H. Balss has been of the same opinion (Ostasiatische Decapoden, II, 1914, p. 78). H. Milne-Edwards supposed in 1837 that *Panul. versicolor* should be the young of *Panul. penicillatus* and this fact may perhaps explain, why Latreille's species has been such a long time misunderstood. According to the author of the "Histoire Nat. des Crustacés", already in 1837 no specimens did exist in the Paris Museum, labelled *Palin. taeniatus* Lam.; Milne-Edwards, however, considered this species to be most closely related to *Palin. fasciatus* i. e. to *Panul. polyphagus* (Herbst). *Panulirus taeniatus* (Lam.) is now regarded by Gruvel as a variety of *Panul. ornatus* (Fabr.) and a beautiful figure of this variety is published by him as Fig. 3 of Plate VI. This figure now proves that *Panul. versicolor* (Latr.) is just the same species as that form which Gruvel

considers to be the *taeniatus* of LAMARCK, and the correctness of this identification is shown by the fact that by LAMARCK himself *Palin. versicolor* was regarded as a synonym of his *Palin. taeniatus* (Histoire nat. des animaux sans vertèbres, 2e Edition, T. V, p. 372).

Panul. versicolor (Latr.) and *Panul. ornatus* (Fabr.) are, no doubt, different species and may be distinguished by the following characters:

1° by the quite different and characteristic coloration.

2° by the exopodite of the maxillipeds of the 2nd or penultimate pair, which in *Panul. ornatus* bears no flagellum at all, while in *Panul. versicolor* it carries a distinct, though small, rudimentary and inarticulate flagellum.

3° by the terga of the abdominal somites, which in *Panul. ornatus* are constantly smooth, while in *Panul. versicolor* interrupted transverse furrows are observed on the 2nd to 4th segment in specimens of a certain age.

4° by the somewhat stouter shape of the external maxillipeds and of the legs in *Panul. ornatus*.

There are, however, probably still other differences. In both species one observes on the cardiac region, on either side of the middle line, a longitudinal row of 3 spines: in *Panul. ornatus* the two rows distinctly converge backward, while in *Panul. versicolor* they run parallel. There are, in both species, on either side of the supra-orbital spines, two spines, one at the lateral angle of the carapace, the other between this spine and the supra-orbital one. This second spine now appears in *Panul. ornatus* distinctly s m a l l e r than the lateral spine and than the spine which is situated immediately behind the supra-orbital one, in *Panul. versicolor*, however, the second spine is not smaller than the two others and directed o u t w a r d, in *Panul. ornatus*, on the contrary, straightly forward; this second spine is, moreover, in *Panul. ornatus* situated a l i t t l e f a r t h e r d i s t a n t from the anterior margin of the carapace than in the other species. The spine at the antero-lateral angle of the carapace has the tip slightly directed outward in *Panul. versicolor*, slightly inward in *Panul. ornatus*. The pleura of the abdominal somites, finally, are m o r e a c u m i n a t e in *Panul. versicolor* than in *Panul. ornatus*. The last mentioned differences were observed by me after having compared the adult male specimens of *Panul. versicolor*, obtained by Mr. JACOBSON, with the adult male of *Panul. ornatus* (Fabr.) from Stat. 71.

Of the largest male from Sinabang-Bay (Simalur) the carapace measures 91 mm., the telson 57 mm. [1]) and this specimen almost fully agrees with GRUVEL's figure 3 of his sixth Plate, also as regards the coloration, even in minute details, the only differences being shown by the antennular peduncles and by the legs which are slightly longer with regard to the peduncles of the external antennae. The 2nd joint of the antennular peduncle in this specimen just reaches beyond the tip of the peduncle of the outer antennae; the legs of the 1st pair reach almost this tip, while those of the 3rd extend by a little more than the dactyli beyond it, the legs of the 5th pair attain the distal end of the penultimate joint. This difference, however, is only apparent, for it is easily explained by the position of GRUVEL's specimen, when it was photographed. In this male the ischium-joint of the external maxillipeds (Pl. II, fig. 7*a*) appears, when measured in the middle of the outer surface, $15^1/_2$ mm. long and 10 mm. broad, the merus-joint

1) The length of the abdomen could not be measured with certainty, because it was bent inward and because it could not be stretched out.

22 mm. long and $7^1/_2$ mm. broad, while the propodus is 10 mm. long and $5^1/_2$ mm. broad; in the male, long 23 cm., of *Panul. ornatus* (Fabr.) from Stat. 71 (Pl. II, fig. 7*c*) these numbers, however, are, in the same succession, 12 mm. and 9 mm,, 19 mm. and $7^1/_2$ mm., $7^1/_2$ mm. and 5 mm. (Confer also the other numbers at this page). In the adult male from Sinabang-Bay the exopodite of the penultimate or 2nd pair of maxillipeds, which is but a little, viz. $^1/_7$, shorter than the merus-joint, appears truncate at the distal extremity (Pl. II, fig. 7) and bears a short flagellum, which is $2^1/_2$ mm. long. and $1^1/_2$ mm. broad; this flagellum, that just reaches beyond the merus, has a wine-red colour, appears not articulate and is fringed with some brown hairs along its margins. Abdominal somites quite smooth, without a trace of transverse furrows. The acute spines with which the posterior margin of the 6th somite is armed, are longer and more prominent than in GRUVEL's figure.

The other specimen from Simalur, which is 280 mm. long, is still half soft, owing, no doubt, to exuviation, but it apparently agrees with the described male.

The largest of the 18 specimens that were collected by the "Siboga", is an adult male from Ternate, long 310 mm. from the anterior margin of the carapace to the end of the telson; the carapace is 120 mm. long, the abdomen 190 mm. It fully agrees with the male from Sinabang-Bay, some of the smaller spinules of the carapace are, however, partly worn off, owing to the old age of this specimen, so e. g. those that are situated just in front of the transverse furrow near the posterior margin of the carapace. The general pattern of the coloration is quite the same, but the white stripe by which the broad, dark-bluish black band on the posterior margin of the abdominal somites and pleura is traversed, appears in the male from Ternate 0,75 mm. broad, in the male from Sinabang-Bay 1,4 to 1,5 mm., appearing here distinctly broader. The large patches, marbled with white, on the branchial regions and the smaller ones just in front of the transverse furrow near the posterior margin of the carapace are, in the male from Ternate, dark-bluish black, in the male from Sinabang-Bay pale brick-colored, but this difference may, in my opinion, be explained by a different action of the spirits. The small, hairy flagellum of the exopodite of the 2nd pair of maxillipeds is $3^1/_2$ mm. long and $1^3/_4$ mm. broad, it just reaches beyond the distal extremity of the merus. The external maxillipeds extend by their terminal joint beyond the anterior margin of the epistome; measured in the middle, the ischium appears $21^1/_2$ mm. long and $12^3/_4$ mm. broad, the merus-joint $29^1/_2$ mm. long and $9^1/_2$ mm. wide, the propodus long 13 mm. and $6^3/_4$ mm. broad. The antennular peduncle extends by the terminal joint and one-fourth of the 2nd beyond the peduncle of the outer antennae.

The female from Stat. 131 is 152 mm. long, the carapace measuring 54 mm., little more than one-third of the whole length. The supra-orbital spines are broken off and the antennal flagella also. The beautiful characteristic coloration has partly changed, the blue ground-colour of the thoracic legs has become isabel and likewise, except the 2 or 3 first ones, the blue on the posterior border of the abdominal somites and on the calcareous basal part of the caudal fan, as also of the inner antennae. Those patches and flecks on the branchial regions and near the posterior groove of the carapace, which in the male from Sinabang-Bay are pale brick-coloured, are in this specimen entirely wanting, while the other patches on the carapace and the antennal peduncles are of a verdigris colour. The carapace of this female appears

much more spinulose than in the older specimens already described, especially on the regions posterior to the cervical groove. Just in front of this groove the gastric region bears posteriorly several small spinules, that do no more occur in the older specimens and two of which are placed in the median line; the rest of the gastric region and the hepatic area are like in the adult. Eighteen or 19 very small spinules stand on the cardiac region between the submedian double row of larger spines, traces of these 18 or 19 spinules are still visible in the male from Sinabang-Bay, but they are fully wanting in the old male from Ternate, in which even the 3 larger spines on either side of the middle are much worn off, especially the 2 posterior pairs. The pale-coloured, longitudinal band that extends from the base of the antennal peduncle to the postero-lateral angle of the carapace, bears 16 or 17 generally small spinules, of which in the male from Sinabang-Bay only traces are visible, while this band is almost fully smooth in the male from Ternate. The rest of the branchial region and the intestinal region appear also much more spinulose. The 2nd abdominal tergum bears, immediately in front of the posterior blue band, a shallow, transverse groove, which is everywhere covered with short hairs; this furrow is interrupted in the middle and each half narrows somewhat laterally. A faint trace of a similar groove, already glabrous however, exists on the 3rd tergum, but on the following somite it has already fully disappeared.

The antennular tergum carries 4 slender, acuminate spines, that stand in a quadrangle, those of the posterior pair are little shorter than the anterior. The internal antennae are 220 mm. long, the peduncle that measures 62 mm., is little longer than the carapace; the shorter flagellum measures 100 mm. The peduncle extends by its terminal joint beyond the distal end of that of the outer antennae.

The small flagellum of the exopodite of the 2nd pair of maxillipeds is $2^1/_4$ mm. long and almost 3-times as long as broad, not articulate, fringed with hair and it reaches barely beyond the distal end of the merus-joint.

Like in the two preceding specimens the external angle of the upper surface of the coxa is armed, in the legs of the 5th pair, with a short acute spine, instead of it one observes in the male of *Panul. ornatus* (Fabr.) from Stat. 71 an obtuse prominence.

The larger female from Stat. 301 is 120 mm. long, the colour has been apparently typical, but has changed and faded away still more than in the preceding specimen. The carapace appears as much spinose as in the female from Stat. 131. The 2nd and the 3rd abdominal terga bear each a shallow, transverse groove covered with hair and interrupted in the middle; the interruption is twice as broad on the 3rd somite as on the 2nd and the groove of the 3rd somite is only half as long as that of the 2nd. The flagellum of the exopodite of the 2nd maxillipeds is not yet one millimeter long and barely reaches the distal end of the merus-joint. Spine on the coxa of the 5th legs well developed, the legs of the 3rd pair are the longest. The abdominal appendages agree with those of the preceding specimens. The exopodites are beautifully wine-red coloured on their distal half and are traversed in the middle by 3 yellow lines, of which the middle one extends to the end of the plate, the two others are shorter.

The other female from this Station is 65 mm. long, the flecks on the upper surface of

the carapace and on the antennal peduncle are conspicuous and of a fine dark-blue, the pale lateral band, that narrows from before backward, is white and the more narrow bands that border the cardiac region laterally and, curving obliquely backward, separate the intestinal region from the branchial regions, are also white. The dark band on the posterior margin of the abdominal somites is of the same blue, while the white stria on this band is rather broad. The ground-colour of the thoracic legs is violaceous, the longitudinal striae whitish. The coloration of this specimen is just the same as that of the two young specimens from the Bay of Bima, Sumbawa, which, described by me in 1892 (l. c.) under the name of *Pal. fasciatus* Fabr., are lying again before me, except that in the younger of the two the dark flecks on the carapace and the antennal peduncles are dark-green instead of dark-blue. The carapace is as spinulose as in the other female and the transverse interrupted grooves on the 2nd and 3rd tergum show the same characters. The internal antennae of this young specimen are 100 mm. long, 4-times as long as the carapace; the peduncle, 25 mm. long, reaches by its terminal joint beyond that of the outer antennae. The flagellum of the exopodite of the 2nd maxillipeds is very small. The 3rd pair of legs, the longest, extend by their terminal joint beyond the antennal peduncle. The spine at the coxa of the 5th legs is still rudimentary. The abdominal appendages agree with those of the larger female, but the endopodite of all the somites appears comparatively much smaller.

All the other specimens are much smaller than the just described female.

The larger specimen from Stat. 234, a male, in which the genital apertures are still inconspicuous, is 35 mm. long, the blue has changed in a rufous colour on the body and in a rosy one on the legs, the W-shaped, white figure on the carapace is well developed, the blue band on the posterior margin of the abdominal somites is rosy and the white stria is rather broad and separates the rosy band from the transverse, interrupted grooves that are quite distinct on the 2nd and 3th terga, while even a trace of a groove, though glabrous, is visible on the 4th. The other specimen, 26 mm. long, is also a male, according to the pleopods, the genital apertures are still wanting. The white W-shaped figure is conspicuous on the greenish ground-colour of the carapace, the dark band on the posterior margin of the abdominal somites is violet and separated by a broad white band from the rest of the terga; interrupted grooves on the 2nd and 3rd distinct.

The largest specimen from Ambon is a male long 39 mm. The grooves are distinct on the 2nd and 3rd terga. The internal antennae are 43 mm. long, 3-times as long as the carapace, their peduncle, long 12½ mm., projects by its greater half beyond the distal end of the antennal peduncle. The two other individuals are 24 and 25 mm. long and agree with the two young specimens from the Java Sea, which I have described in 1896 (l.c.) as *Palinurus* sp., mentioned three years later by Borradaile (l.c.) under the name of *Panul. demani*; traces of a transverse, interrupted groove are, however, visible on the 2nd somite of the smaller specimen. The longitudinal lines on the thoracic legs are, however, in the specimens from Ambon more or less discernible, while they had fully disappeared in the specimens from the Java Sea; the ground-colour of the latter, which are again lying before me, is yellow-brown, in the specimens from Ambon it is a darker brown, which is red-brown on the carapace.

The specimen from Stat. 209 is 27 mm. long and resembles the last mentioned, the shallow grooves on the 2nd and 3rd terga of the abdomen are, however, already present.

The 4 specimens from Stat. 258, all 24 mm. long, agree also with the last mentioned specimens (*Panulirus demani*) and in some of them traces of the transverse grooves are already discernible; the outer antennae are $2^1/_2$-times as long as the body.

The male from Goenoeng Sitoli, Nias, is 31 mm. long, the ground-colour is a pale brown; on the carapace the whitish W-shaped figure is visible, like also the whitish transverse band near the posterior margin of the abdominal somites. The interrupted transverse grooves on the 2nd and 3rd abdominal somites are discernible.

The two other specimens from Nias are $22^1/_2$ mm. and $23^1/_2$ mm. long. In these three specimens from Nias the anterior pair of spines on the antennular segment are well-developed, those of the posterior pair, however, are in the male, long 31 mm., very short; in the individual, long $22^1/_2$ mm., the spinules of the posterior pair are rudimentary and in the specimen, long $23^1/_2$ mm., even wanting at all. Also in some of the very young specimens from the other Stations, that are shorter than 25 mm., the two posterior spines are often rudimentary or wanting.

General distribution: *Panulirus versicolor* (Latr.) is at present with certainty known from the following localities: Mauritius (Gruvel, as *Panul. taeniatus*), Mascate (Nobili, Gruvel), Seychelles Bank (Borradaile), Christmas Island (Calman), Java (Heller, Gruvel), Java Sea (de Man), Larentuka (Thallwitz), Banda Sea (de Man), Aru Islands (de Man), Ternate (de Man), North Celebes (Thallwitz), New Holland (Lamarck), New Britannia (Pfeffer), Matupi (Pfeffer), Mortlock (Pfeffer), Fiji Islands (Pfeffer), Samoa Islands (Pfeffer), Japan (de Haan, as *Pal. fasciatus*).

The "Natant"-stage of *Panulirus versicolor* (Latr.), *puerulus spiniger* Ortm. (Pl. II, Fig. 8—8*e*).

Puer spiniger A. E. Ortmann, in: Jenaische Denkschriften, VIII, 1894, p. 19, Taf. II, Fig. 2 and 2*i*.

Confer: W. T. Calman, The Genus *Puerulus* Ortmann and the Post-larval Development of the Spiny Lobsters (Palinuridae), in: Annals Mag. Nat. Hist. Ser. 8, Vol. III, 1909.

Bouvier, E. L., Le Stade "Natant" ou "puerulus" des Palinuridés, in: "The Transactions of the Second Entomolog. Congress, 1912.

Stat. 86. June 18/19. Anchorage off Dongala, Palos-bay, Celebes. 36 m. Fine, grey mud (river mud). 1 specimen.

Stat. 181. Sept. 5/11. Amboina. Reef. 9 specimens.

Stat. 234. Nov. 19/20. Nalahia-bay, Nusa-Laut-Island. 46 m. Bottom stony. 2 specimens, collected together with 2 young specimens of *Panulirus versicolor* (Latr.).

Stat. 250. Dec. 6/7. Kur-Island. Reef. 1 specimen.

Though this form is considered by Dr. Calman and, as I think, rightly, to be the "Natant-stage" of *Panulirus versicolor* (Latr.), the following remarks will probably be welcome.

The specimens are nearly all of the same size, the largest are 24 mm. long, measured in the middle line from the anterior margin of the carapace to the end of the telson. In the largest individuals the carapace is 9 mm. long, the abdomen 15 mm.; both are smooth, though

the abdomen appears finely punctate when examined under a magnifying-glass. Immediately behind the subacute, supra-orbital teeth stands a much smaller, though more acute tooth and another, of the same size, occurs somewhat more outward and a little farther backward. The two last named teeth are just as far distant from one another as the corneae of the eye-stalks when the eyes are directed laterally outward. The antero-lateral angles of the carapace are very sharp, acuminate and slightly directed outward. Like in *Puerulus angulatus* (Sp. Bate), the lateral sides of the carapace are perpendicular and make distinct though obtuse ridges with the upper surface; at the anterior extremity of these ridges, at the level of the limit between the gastric and the cardiac regions, one observes an acute tooth as large as those that stand near the supra-orbital teeth. In front of the cervical groove the lateral borders of the carapace are rounded; the cervical groove is shallow. The gastric region carries a pair of two very small, subacute or obtuse tubercles, which ORTMANN does not mention and which are situated a little nearer together than the supra-orbital teeth; in front of them two still smaller, obtuse prominences are often discernible. The cardiac region is distinctly carinate in the middle line, the carina subacute; the intestinal region, however, is rounded. A shallow groove separates the median regions of the carapace from the lateral.

Abdominal terga rounded, making no distinct ridges with the pleura. On either side the 2nd—5th terga show a trace of a shallow, transverse groove, when examined under a magnifying-glass; the pleura of the 2nd—6th somites end in a sharp tooth that is directed backward, but the much smaller pleura of the 1st somite are obtuse. The straight, posterior margin of the 6th tergum bears a sharp spine at the angles. The elongate telson measures one-third the length of the abdomen; the calcified part, which is one and a half as broad as long, carries two pairs of small spinules on its upper surface; the spinules of the anterior pair are a little smaller and a little more approximate than those of the posterior. The lateral margins end posteriorly in a spine, a smaller one occurs somewhat more inward and a third still smaller spine is found between both at the base of the outer. The outer margins of the calcified part of the uropods terminate also in a spine that carries 2 or 3 spinules on its inner margin.

The eye-peduncles extend laterally as far outward as the acute antero-lateral angles of the carapace. Antennular tergum smooth, unarmed, though one observes anteriorly, just behind the anterior margin, traces of 2 very small, acute tubercles, that are rather far distant from one another; the antennular tergum is rather broad, a little broader than long and appears sometimes slightly carinate in the middle line. The inner antennae are nearly as long as the carapace and their flagella that are nearly of equal length, but the outer of which is thicker than the other, are as long as the peduncle; of the latter the 2nd and the 3rd joint taken together are nearly as long as the 1st.

External antennae 3-times as long as the body. The peduncle that reaches to the middle of the antennular flagella, is smooth and armed with rather few spines. The 1st joint carries only one spine at the distal end of its outer margin; the 2nd carries on the upper surface two spines near the inner and two near the outer border, one also near the proximal articulation; the lower face is unarmed, except a small spine on the distal margin which articulates with the 3rd joint. This joint, a little longer than the 2nd, but less broad, bears 3 spines on the

inner margin, 2 or 3 on the outer, 3 other ones stand on the upper surface not far from the outer margin and a 4th spine occurs in the middle near the inner margin; the lower side is unarmed, except a spine on the distal border near the inner margin and a smaller one more outward.

The truncate or slightly concave, anterior margin of the epistome is unarmed; the epistome is smooth, though there is a longitudinal furrow in the middle on the posterior third or fourth part. Exopod of external maxillipeds rudimentary, appearing as a small blunt process on the outer side of the base. In a specimen, long 23 mm., the ischium-joint is 0,8 mm. long, the merus 1,2 mm., the carpus 0,56 mm., the penultimate joint 0,62 mm., the conical dactylus is 0,8 mm. long, (inclusive the terminal spine that measures 0,06 mm.); the joints decrease gradually in width, the ischium being 0,51 mm. broad, the merus 0,44 mm., the carpus 0,4 mm., the propodus 0,3 mm. and the dactylus 0,24 mm. at its base. The slender spines into which the lateral margins of the last thoracic sternum are produced backward, are slightly curved inward.

The thoracic legs are smooth, glabrous, quite unarmed; these legs that terminate all in a slender, pointed dactylus (also the 5th), decrease in length from the 2nd to the last. A genital aperture was not observed, neither on the coxae of the 3rd nor on those of the 5th pair of legs.

The abdominal appendages of the 2nd—5th somites show all the same form and characters and resemble those of the "Natant stage" of Boas (Studier over Decapodernes Slaegtskabsforhold, Kobenhavn, 1880, Tab. V, fig. 184, 184*a*). All are biramous, consisting of 2 foliaceous plates, not very broad, fringed with ciliated hairs and articulated with a stalk which is about as long as or somewhat shorter than the exopod. The inner branch, a little longer and a little less broad than the outer, carries, at $^1/_4$ of its length from the base, a styliform, slender Appendix interna, that slightly tapers and that is provided at the tip with some coupling-hooks. In a specimen, long 23 mm., the outer branch of the pleopods of the 2nd somite is 1,3 mm. long and 0,48 mm. broad, somewhat behind the middle, and narrowing to the tip; the endopod is 1,4 mm. long, 0,4 mm. broad in the middle, also narrowing to the tip, while the Appendix interna is 0,6 mm. long and 0,1 mm. broad proximally. The measurements of the pleopods of the 5th somite in this specimen are as follows: outer branch 1,48 mm. long and 0,54 mm. broad, inner branch 1,58 mm. long and 0,42 mm. broad, Appendix interna 0,6 mm. long and 0,11 mm. broad at the base.

Some specimens show a yellowish, other ones a tawny colour. The white lateral bands on the carapace are sometimes distinct, in most specimens, however, not, while the converging bands of the W are not discernible. The abdominal terga are often marked on either side with a brownish C-shaped fleck on a pale ground-colour, with the concavity turned outward, while the posterior margin often presents traces of the dark and pale bands, that are characteristic of *Panul. versicolor*. The antennae and antennulae, like also the legs, are marked with the longitudinal bands and stripes that occur in this species.

General distribution: The "natant"-stage of *Panul. versicolor*, *pueruluss spiniger*, has hitherto been observed at Amboina (Ortmann) and at Christmas Island (Calman).

Family SCYLLARIDAE.

The family Scyllaridae is represented in this Collection by seven species of the genus *Scyllarus* Fabr., two of which are new to science, and by *Parribacus antarcticus* (Lund).

LIST OF ALL THE SPECIES OF SCYLLARIDAE, KNOWN AT PRESENT, AUGUST 1915 [1]).

Scyllarus Fabr. 1775.

SPECIES	HABITAT	REMARKS
americanus (S. J. Smith) 1869. .	Gulf of Mexico. Caribbean Sea.	Syn.: *Gundlachi* v. Mart. 1872.
arctus (L.) 1767	Mediterranean, Adriatic. Eastern Atlantic from the Canaries to Great Britain. East coast of America from Cape Hatteras to Rio de Janeiro. Pacific coast of Mexico. Western Indian Ocean.	
arctus (L.) var. *paradoxus* Miers 1881.	Goree Bay, Senegambia.	
***bicuspidatus** (de Man) 1905 . .	Flores Sea.	
crenatus (Whitelegge) 1900. . .	New South Wales.	
crenulatus (Bouv.) 1905	Bay of Porto Santo.	
cultrifer (Ortm.) 1897	Arafura Sea, Japan.	
delfini (Bouv.) 1909	Juan Fernandez.	
depressus (S. I. Smith) 1881 . .	Off the South coast of New England.	
***gibberosus** (de Man) 1905 . . .	Indian Archipelago.	
**Haanii* Berthold 1845	China; Indian Archipelago.	
immaturus (Sp. Bate) 1888 . . .	Off the Canary Islands. Off Cape Verde.	
**Martensii* Pfeffer 1881	From Japan and the Hawaiian Islands to Zanzibar.	This species is perhaps identical with *Scyll. rugosus* Latr.

1) The species collected by the "Siboga" are marked with an asterisk and the new species are printed in a more heavy type.

SPECIES	HABITAT	REMARKS
Nobilii (de Man) 1905	Persian Gulf.	
**orientalis* (Sp. Bate) 1888	From the Philippine Islands to the Arabian Sea.	
Paulsoni Nob. 1905	Red Sea.	
pumilus Nob. 1905.	Red Sea.	
pygmaeus (Sp. Bate) 1888. . . .	Canary Islands.	
rubens (Alcock and Anderson) 1894.	Gulf of Manár.	
rugosus Latr.	Pondichery.	
**sordidus* (Stimpson) 1860	From Hongkong, the Philippine Islands and Australia to the Gulf of Manár.	
tuberculatus (Sp. Bate) 1888 . .	From the sea between New Guinea and Australia to Japan, Singapore and the Gulf of Manár.	
**vitiensis* (Dana) 1852	Fiji Islands; North coast of Celebes; Amboina.	
Scyllarides Gill 1898.		
aequinoctialis (Lund) 1793 . . .	From the Bermuda-Islands to Rio de Janeiro.	
brasiliensis Rathb. 1906.	Bahia, Brazil.	
Elisabethae (Ortm.) 1894	South Africa; St. Helena.	
Haanii (von Siebold) 1841 . . .	Japan; Amboina; Aru Islands.	According to Miss RATHBUN this species should probably be only a variety of *Scyllarides squamosus* (H. M.-Edw.).
latus (Latr.) 1803	Mediterranean; Portugal. Azores; West Africa, including islands. Cuba.	*Scyll. Dehaani* from Boutry, West Africa and *Scyll. Herklotsii* Pel from the same locality, described by HERKLOTS in 1851, are considered by Miss RATHBUN as identical with *Scyll. latus* (Latr.).
nodifer (Stimpson) 1866.	West Indies.	
sculptus (Lam.) 1825.	New South Wales.	
squamosus (H. M.-Edw.) 1837 . .	Japan; Hawaiian Islands; Sydney; Indian Ocean; Zanzibar.	With this species *Scyll. Sieboldi* (de Haan) is identical.
Ibacus Leach 1815.		
alticrenatus Sp. Bate 1888 . . .	West of New Zealand.	
alticrenatus Sp. Bate, var. *septemdentata* Grant 1905	Off Port Jackson.	
brevipes Sp. Bate 1888	Key Islands.	
ciliatus (von Siebold) 1824 . . .	Japan.	
novemdentatus Gibbes 1850. . .	Hongkong.	
Peronii Leach 1815	Southern Seas; Sydney; Valparaiso.	
verdi Sp. Bate 1888.	Cape Verde Islands; Philippine Islands. South Africa.	

SPECIES	HABITAT	REMARKS
Parribacus Dana 1852.		
**ursus major* (Herbst) 1793 . . .	Throughout the whole Indopacific, from Japan, the Hawaiian Islands and Australia to Mauritius and Réunion, though not yet recorded from the Red Sea. Caribbean Sea. Coast of Brazil.	Syn.: *Parrib. papyraceus* Rathb. (1906).
ursus major (Herbst), var. *carinata* Pfeffer 1881	South Sea.	
Parrae (H. M.-Edw.) 1837 . . .	Antilles.	The validity of this species is still doubtful.
Pseudibacus Guérin 1855.		
The species of this genus are considered by BOUVIER to be the Natant-stage of species of the genus *Scyllarides* Gill.		
Gerstaeckeri Pfeffer 1881	Atlantic Ocean.	According to BOUVIER perhaps the Natant-stage of *Scyll. aequinoctialis* (Lund).
Pfefferi Miers 1882	Mauritius; Galapagos Islands.	According to BOUVIER perhaps the Natant-stage of *Scyll. squamosus* (H. M.-Edw.).
Veranyi Guérin 1855	Nizza.	According to BOUVIER perhaps the Natant-stage of *Scyll. latus* (Latr.).
sp. Richters 1873	Habitat unknown.	
sp. Boas 1880.	Brazil.	
Evibacus S. J. Smith 1869 [1]).		
princeps S. J. Smith 1869 . . .	Lower California.	
Nisto Sarato 1885.		
The two species of this genus are considered by BOUVIER to be different Natant-stages of a species of *Scyllarus* Fabr.		
asper Sarato 1885	Nizza.	
laevis Sarato 1885	Nizza.	
Thenus Leach 1815.		
orientalis (Lund) 1793.	Indian Archipelago. Indian Ocean. Persian Gulf; Red Sea.	

1) According to E. J. MIERS (in: Proc. Zool. Soc. London, 1882, p. 543) scarcely generically distinct from *Pseudibacus*.

Scyllarus Fabr.

The genus *Scyllarus* Fabr. comprises at present 22 species and 1 variety, the greater part of which are inhabitants of the Indopacific region. *Scyllarus arctus* (L.), the species for which this genus was instituted by FABRICIUS, inhabits the Mediterranean and Adriatic seas, the coasts of western and southern Europe, makes, as the Rev. STEBBING remarks in his "A History of Crustacea", occasionally its appearance in English waters and is also known from the Azores, from Madeira and from the Canary Islands. The distribution of this animal is, however, still much larger, for, as Miss RATHBUN states in her paper "On the Decapod Crustaceans of West Africa, 1900", p. 309, it has also been observed off Cape Hatteras, North Carolina, and near Pensacola, Florida, while it has been recorded in 1900 by DOFLEIN from Rio de Janeiro and in 1903 by CARLOS MOREIRA from the same locality. In the cited paper of Miss RATHBUN *Scyll. arctus* is also stated to occur at Mazatlan, Pacific coast of Mexico, while it has quite recently been recorded by BORRADAILE from off the Amirante bank in the Western Indian Ocean! This species should even be found in Torres Straits, according to HASWELL, but Dr. ORTMANN remarks, in his work on the Decapod Crustacea of the Strassburg Museum, that the specimens, observed off Thursday Island by H. M. S. "Alert", did probably belong to another species. A variety *paradoxus* Miers occurs in Goree Bay, Senegambia.

While the typical species of this genus thus proves to be the most widely distributed of all, of the rest 5 are found in the Atlantic and 16 in the Indopacific. *Scyll. crenulatus* (Bouv.) is known from the Bay of Porto-Santo, *Scyll. pygmaeus* (Sp. Bate) from the Canary Islands, while *Scyll. immaturus* (Sp. Bate), which was established on young specimens, was taken by the "Challenger" both off the Canary Islands and off Cape Verde. *Scyll. depressus* (S. I. Smith) is found off the South coast of New England, while *Scyll. americanus* (S. I. Smith), with which *Scyll. Gundlachi* von Mart. is identical, ranges from Cape Lookout, N. C., to Cape St. Roque, Brazil, inhabiting the Gulf of Mexico and the Caribbean Sea.

Scyll. delfini (Bouv.) is known from the island of Juan Fernandez, off the coast of Chili. The range of *Scyll. Martensii* Pfeffer, which is perhaps identical with *Scyll. rugosus* Latr. of Pondichery, extends from Japan and the Hawaiian Islands to Singapore, the Maldive and Laccadive Archipelagoes and to Zanzibar, while it has been taken by the "Siboga" at various localities of the Indian Archipelago. *Scyll. sordidus* (Stimps.), which was captured by the Siboga Expedition near the Aru Islands and between Misool and New Guinea, is distributed from Australia, the Pelew Islands and the Philippines to Hongkong, the Java Sea, Singapore and the Gulf of Manár. *Scyll. Haanii* Berthold, hitherto only known from China, was obtained by this expedition between Sumbawa and Flores, like also between Ceram and New Guinea. *Scyll. vitiensis* (Dana) is recorded from the Fiji Islands and Amboina, while it was taken by the "Siboga" on the North coast of Celebes. *Scyll. tuberculatus* (Sp. Bate) is distributed from the sea between New Guinea and Australia to Japan, Singapore and the Gulf of Manár, and occurs, no doubt, in the Indian Archipelago, like also *Scyll. cultrifer* (Ortm.), which is known both from the Arafura Sea and from Japan. *Scyll. crenatus* (Whitelegge) has still only been observed on the coast of New South Wales.

Two new forms were obtained by the Siboga Expedition, *Scyll. gibberosus* from the sea between Misool and New Guinea and *Scyll. bicuspidatus* from the Strait between Sumbawa and Flores: with the former *Scyll. Nobilii* (de Man), a species which is found in the Persian Gulf, is probably identical, while *Scyll. bicuspidatus* is most closely related to *Scyll. arctus* (L.). *Scyll. orientalis* (Sp. Bate) ranges from the Philippine Islands to the Arabian Sea, occurs also in the Bay of Bengal and has been dredged by this expedition between Rotti and Timor and off Sumbawa. *Scyll. rubens* (Alcock and Anderson) is still only known from the Gulf of Manár, off Colombo; two species, finally, are recorded from the Red Sea: *Scyll. pumilus* Nob. and *Scyll Paulsoni* Nob.

Seven species have until at present been observed in the Indian Archipelago, but two other ones, *Scyll. tuberculatus* (Sp. Bate) and *Scyll. cultrifer* (Ortm.) will, no doubt, once prove to occur also in it.

The species of this genus are generally found in shallow water and some are even inhabitants of the coralreefs, like *Scyll. sordidus*, *Scyll. vitiensis* and *Scyll. tuberculatus*. The typical *Scyll. arctus* occurs in the Adriatic and the Mediterranean in water of 2—10 fathoms, but the same species was taken at 49 fathoms off Cape Hatteras, N. C., and it was dredged in 25—80 fathoms off the Amirante bank; the variety *paradoxus* Miers was found in Goree Bay between 9 and 15 fathoms. *Scyll. pygmaeus* and *Scyll. depressus* were taken at depths respectively of 78 and 86 fathoms, while *Scyll. americanus* was collected on the reef and in shallow water between 2 and 45 fathoms. *Scyll. Martensii* was dredged off the Hawaiian Islands between 230 and 53 fathoms, but it was captured by this expedition in water of 14—36 meters. *Scyll. orientalis* was obtained off the Madras coast at 91 fathoms and in the Indian Archipelago at depths of 216 and 274 meters, *Scyll. cultrifer* (Ortm.) in the Arafura Sea at 140 fathoms and in Japan at a depth of 145 meters, while *Scyll. rubens* was dredged in the Gulf of Manár between 142 and 400, as also between 180 and 217 fathoms. The other species, finally, are found at a depth of less than 75 fathoms, while about the vertical distribution of *Scyll. pumilus*, *Scyll. Paulsoni* and *Scyll. Nobilii* nothing is known.

Key to the indopacific species of the genus *Scyllarus* Fabr.

a_1 Thoracic legs of 3rd pair subcheliform. Abdominal terga with distinct squamiform sculpture. Proximal (outer) antennal squame with two teeth both on the outer and the inner margin . . . . . *cultrifer* (Ortm.)
(A. E. Ortmann, in: Zoolog. Jahrb., Abth. f. Syst. T. X, 1897, p. 272).

a_2 Thoracic legs of 3rd pair not subcheliform.

b_1 Second and following abdominal terga deeply sulcate transversely, devoid of arborescent markings, at least on the 1st and the 2nd; 3rd somite with a large prominent gibbosity. . . . . *tuberculatus* (Sp. Bate)
(C. Spence Bate, Report Challenger Macrura, 1888, p. 70, Pl. X, fig. 1 and 2).

b_2 Abdominal terga not deeply sulcate transversely.

c_1 Abdominal terga without any distinct arborescent markings,

smooth; 2nd to 5th terga slightly carinate, the 2nd higher than the rest . . . . . *crenatus* (Whitelegge)

(Th. Whitelegge, in: Mem. Australian Museum, Sydney, IV, 1900, p. 194, fig. 14).

c_2 Abdominal terga with more or less distinct arborescent markings or squamiform sculpture.

d_1 Proximal antennal squame dorsally traversed by two oblique ridges, both edges serrated. Some squamiform sculpture on the abdominal terga, especially on the 6th, and on the pleura . . . . . *rubens* (Alcock and Anderson)

(A. Alcock and A. R. S. Anderson, Journal Asiatic Soc. Bengal, LXIII, 1894, pt. 2, p. 165).

d_2 Proximal antennal squame dorsally traversed only by one ridge [1]).

e_1 Squamiform sculpture inconspicuous on first abdominal tergum and on the anterior half of second and third; proximal antennal squame with one tooth on the outer and three on the inner margin . . . . . *vitiensis* (Dana)

e_2 Squamiform sculpture distinctly developed on all the abdominal terga.

f_1 Propodi of 2nd and 3rd legs distinctly broadened, compressed and nearly of the same form, propodi of 4th and 5th legs subcylindrical, distinctly longer than those of 2nd and 3rd, and of a quite different form. Dactyli of 2nd legs nearly of the same form and length as those of the 1st.

g_1 Proximal (outer) antennal squame with both edges serrated by several teeth; anterior, unsculptured part of 2nd abdominal tergum smooth, not grooved transversely . . . . . *orientalis* (Sp. Bate)

g_2 Proximal (outer) antennal squame with the outer edge armed with two teeth, the inner with one; anterior unsculptured part of 2nd abdominal tergum with two transverse parallel grooves . . . . . *Haanii* Berthold

f_2 Propodi of 2nd and 3rd legs, though slightly compressed, not broadened, those of 2nd legs distinctly tapering, styliform; propodi of 4th and 5th legs nearly of the same form and the same length as those of 3rd, though decreasing in width; dactyli of 2nd legs longer and slenderer than those of 1st.

1) In *Scyll. Martensii* one observes a short second ridge on the outer half of the upper surface of the proximal squame near the base, but this species differs from *Scyll. rubens* by the strong development of squamiform sculpture on the whole abdomen.

g_1 Abdominal terga not at all prominent.

h_1 Anterior extremity of sternum with a deep triangular notch.

i_1 First abdominal somite with a dark, oval spot in the middle. Calcified portion of the telson terminating in four teeth . . . . . *sordidus* (Stimps.)

i_2 First abdominal somite with no dark, oval spot in the middle. Calcified portion of the telson terminating in two teeth . . . . . *pumilus* Nob.

(G. NOBILI, Faune Carcinolog. de la Mer Rouge, Décapodes et Stomatopodes, 1906, p. 87).

h_2 Notch at the anterior extremity of sternum not deep and triangular, but presenting only a minute incision in the middle of the truncate, posterior margin.

i_1 Carapace with 2 teeth in the middle line before the cervical groove and with 2 minute teeth, situated abreast, between the posterior tooth and that groove. Of the five teeth on the inner edge of the proximal (outer) antennal squame the first is much larger than the following. A species of small size. . . . . *bicuspidatus* (de Man)

i_2 Carapace with 3 teeth in the middle line before the cervical groove, the pair of minute teeth between the posterior tooth and that groove wanting. Of the five teeth on the inner edge of the proximal (outer) antennal squame the second is the largest and the difference between this tooth and the following is not so great. A species of large size. . . . . *arctus* (L.)

(H. MILNE-EDWARDS, Hist. Nat. Crustacés, II, 1837, p. 282).

g_2 One of the abdominal terga much more prominent in the middle line than the others.

h_1 Third abdominal tergum more prominent than the rest. . . . . *Martensii* Pfeffer and *rugosus* Latr.

(H. MILNE-EDWARDS, Hist. Nat. Crustacés, II, 1837, p. 283).

h_2 Fourth abdominal tergum more prominent than the rest. . . . . *gibberosus* (de Man) and *Nobilii* (de Man).

The name *Nobilii* was proposed by me in 1905 (in: Tijdschr. Ned. Dierk. Vereen. (2) Dl. IX, p. 589) for a new species from the Persian Gulf, which by a lapsus calami had been

described by Dr. Nobili, in: Bull. Mus. Paris, 1905, p. 160, under the name of *Scyll. sordidus* (Stimpson), — when it should prove to be indeed different from *Scyll. gibberosus*. When I now, however, compare the type of *gibberosus* with Nobili's more detailed description of *Scyll. Nobilii*, in: Bull. Scientif. France et Belgique, XL, 1906, p. 56, Pl. IV, fig. 15 and Pl. VI, fig. 27, I find only these differences, 1° that the anterior segment of the sternum appears in *gibberosus* more deeply emarginate with the antero-lateral angles obtusely-pointed, a difference perhaps owing to the young age of this specimen, which is only 21 mm. long, while the specimens, described by Nobili under the name of *Scyll. sordidus*, were almost twice as long, viz. 36 and 37 mm., 2° because the "petite pièce élargie en marteau" described by Nobili as situated in front of the anterior tooth of the carapace, presents a somewhat other form.

When the two species afterwards once might prove to be identical, then the name of *gibberosus* has, of course, the priority. —

Scyll. Paulsoni Nob. is not included in this key, because in Nobili's description (Faune Carcinologique de la Mer Rouge, 1906, p. 87) nothing is said about the thoracic legs and too little about the abdomen. *Scyll. delfini* (Bouv.), which apparently belongs to the American Fauna, is also omitted.

1. *Scyllarus vitiensis* (Dana). (Pl. II, Fig. 9, 9*a*).

Arctus vitiensis J. D. Dana, U. S. Exploring Exped. Crustacea, 1852, p. 517, Pl. 32, fig. 7.
Arctus vitiensis J. G. de Man, in: Archiv f. Naturges. 53. Jahrg. 1888, p. 485.

Stat. 115. July 9/11. East side of Pajunga Island, Kwandang Bay. Reef. 1 young specimen.

This specimen is $16^1/_2$ mm. long from the anterior extremity of the outer antennae to the end of the telson, but this species attains a length of 25 mm. The distance between the antero-external angles of the carapace measures 5,5 mm.; when the antennular somite is included and when measured in the middle line, the carapace appears to be 5,2 mm. long. The upper surface of carapace and outer antennae is covered with short, minute plumes. The median tooth on the anterior border of the carapace is small and sharp, but that of the gastric region is much larger, directed obliquely upward, rather sharp in a lateral view, obtuse when seen from above; the squamiform prominences posterior to it, are barely distinguishable, not at all prominent, but a small tubercle on either side of the gastric tooth is distinct. For the rest the gastric region appears quite smooth and shining, there where the plumes are wanting. A much lower placed couple of small, little prominent and obtuse teeth occur immediately behind the cervical groove in the middle line, and on each side of it one observes an obtuse tooth; the squamiform prominences of the cardiac region are, however, barely discernible, those of the intestinal region are more distinct. The lateral carinae are much prominent on the inner side of the orbits and cut into two subacute teeth; that part of the lateral carinae which is situated posterior to the cervical groove, is little prominent, rounded, covered with low, squamiform prominences and ends anteriorly in a subacute tooth. The orbits are circular. The posterior margin of the carapace is slightly concave in the middle.

The 1st somite of the abdomen is smooth, apparently not sculptured. The terga of the 2nd—5th somites are transversely furrowed, like in other species, at either side of the middle line, so that they are divided into a larger anterior and a smaller posterior part; both the anterior and the posterior part are cut each in 4 or 5, respectively 5 or 6, areolae by secondary oblique furrows, and, while the areolae of the anterior part increase in size towards the pleura, those of the posterior become gradually smaller laterally. The transverse main furrow is continued on to the pleura, dividing each of them into a larger, slightly concave, unsculptured, anterior and a smaller, areolate, posterior part. According to DANA in the adult species the anterior half of the 2nd and 3rd abdominal segments is but faintly divided into a few areolets, so that we may conclude that in young specimens the areolation on the anterior half of these segments is more developed. The posterior margin of the first four terga presents, in the middle, a small, narrow notch, which is a little deeper on the 2nd and 3rd terga than on the 1st and 4th; the posterior border of the 5th bears a small, sharp tooth in the middle. The ridge or carina in the middle of the 2nd—5th terga is quite obtuse, their lobulation anteriorly is still indistinct and they are rounded transversely, like also longitudinally; as in *Scyll. Martensii*, the carina of the 3rd tergum is distinctly more prominent than those of the other ones.

In this young individual the distal squame of the outer antennae reaches still beyond the extremity of the proximal squame, while, according to DANA, the latter extends in adult specimens beyond the distal squame. The outer margin of the proximal squame carries a single, acute tooth and one observes, as in DANA's figure 7*a*, a trace of a second behind it; in our specimen both teeth are situated a little nearer to the extremity of the squame than in Fig. 7*a*, that may be owing also to its younger age. The inner border of the proximal squame bears one acute tooth, which is followed by three or four much smaller ones. The distal squame presents 6 lobes, 4 on the anterior margin, of which the 1st is obliquely truncate, the 2nd, 3rd and 4th obtuse and rounded, moreover 2 sharp lobes on the inner border; the longitudinal ridge on the upper surface is smooth.

The sternum agrees with DANA's figure, the notch on the anterior extremity is, however, sharper; the sternum is little concave.

The appendages of the 2nd—5th abdominal somites are biramous, slender.

The ground-colour is pale bluish, marbled with white or yellow, as e. g. the median parts of the abdominal terga, the median teeth and the lateral carinae of the carapace, like also the greater part of the antennae.

This species bears some resemblance to *Scyll. Martensii* Pfeffer and still more to *Scyll. gibberosus* (de Man). Both in *Martensii* and in *vitiensis* the third abdominal tergum is the most prominent, but *Scyll. Martensii* differs in most other characters much from DANA's species, so by the strongly developed sculpture of carapace and abdomen, by the cardiac region being more prominent than the gastric, while in *Scyll. vitiensis* the tooth on the middle of the gastric region is the most prominent of all, by the less slender shape of the propodite of the 2nd pair etc.

The thoracic legs show the same form in *Scyll. vitiensis* and in *Scyll. gibberosus*, but in the latter the frontal tooth is larger and a rounded tooth or tubercle occurs between it and

the tooth on the middle of the gastric region, that does not exist in *Scyll. vitiensis*; the squamiform prominences and the sculpture on the abdominal somites are more developed and more conspicuous than in *Scyll. vitiensis*. In DANA's species the carina of the 3rd tergum is the most prominent of all, but in *Scyll. gibberosus* it is the fourth.

General distribution: Fiji Islands (DANA); Amboina (DE MAN).

2. *Scyllarus orientalis* (Sp. Bate).

Arctus orientalis C. Spence Bate, Report on the Challenger Macrura, 1888, p. 68, Pl. IX, fig. 4.
Arctus orientalis A. Alcock, A descriptive Catalogue of the Indian Deep-Sea Crustacea, Decapoda Macrura and Anomala, in the Indian Museum, Calcutta, 1901, p. 181.

Stat. 302. Febr. 2, 1900. 10° 27'.9 S., 123° 28'.7 E. 216 m. Bottom: sand and coral sand. 1 adult egg-laden female.
Stat. 312. Febr. 14, 1900. 8° 19' S., 117° 41' E. Saleh-bay, north coast of Sumbawa. 274 m. Bottom: fine, sandy mud. 1 young male and 1 young female.

The adult, ova-bearing female measures 80 mm. from the anterior extremity of the distal squame of the outer antennae to the end of the telson; the carapace, measured in the middle line, is 24 mm. long, the distance between the antero-lateral angles $25^3/_4$ mm. Conform to ALCOCK's description the 3rd joint of the antennular peduncle reaches by more than half its length beyond the distal squame and in the two young specimens the whole 3rd joint extends beyond it; the description in the Report on the Challenger Macrura, according to which already the 2nd joint should reach the extremity of the distal squame, appears therefore erroneous, as is proved by the figure 4 and by the fact that the two specimens, obtained by that expedition, were also adult. BATE's statement that the 2nd, i. e. the 4th, joint of the antennal peduncle projects as far as, if not slightly beyond, the distal squame is likewise wrong.

In the adult female the orbits are 4 mm. broad, measured in the middle, and here $2^3/_4$ mm. distant from the lateral margin of the carapace, so that they are only one and a half as broad as distant from that margin; in the younger female from Stat. 312 the orbits are $2^3/_5$ mm. broad, the distance from the lateral margin $1^3/_5$ mm. In fig. 4 of the Challenger Report, which figure is for the rest quite accurate, the distance between the orbits and the lateral margin appears a little too large. The anterior notch of the lateral margin appears in that figure a little too deep.

In the adult female the outer border of the proximal squame is armed with 4 teeth, of which the 1st and the 4th are rudimentary; of the two other teeth, which are well developed, the anterior appears a little larger than the posterior; the inner edge carries 3 or 4 small teeth, in the younger specimens 5 or 6.

The very numerous, globular eggs are small, 0,4—0,42 mm. broad.

The general colour of the three specimens is that of honey, in the larger female the postero-lateral angles of the carapace are red. In the two younger specimens the smooth anterior part of the 1st abdominal tergum is beautifully red coloured, the squamiform tubercles on the carapace are reddish and the first 3 or 4 abdominal terga are marked with small red spots.

Scyll. orientalis (Sp. Bate) is closely related to *Scyll. Haanii* Berthold and both species form a small section of this genus, which is characterized by the median carinae of the abdominal terga being nowhere prominent or projecting and by the propodi of the 2nd and 3rd pairs of thoracic legs being compressed and broadened. There are, however, several differences between both species. In *Scyll. Haanii*, which does not reach the size of *Scyll. orientalis*, the orbits are situated nearer to the lateral margin of the carapace, their diameter being more than twice or even 3-times as broad as their distance from the lateral margin. The teeth of the median and of the sublateral ridges on the carapace are sharper. The abdominal terga and pleura are more conspicuously sculptured than those of *Scyll. orientalis*: the smooth, anterior part of the terga, which is overlapped by the preceding somite, is marked with two parallel, transverse grooves, while these grooves are entirely wanting in *Scyll. orientalis*. The proximal antennal squame is constantly armed only with two teeth on the outer and with one on the inner border. The sternum of *Scyll. Haanii* is broader posteriorly, less deep and presents anteriorly also a different form. Of *Scyll. Haanii* the thoracic legs are a little stouter. The colouration, finally, is different, the 1st abdominal tergum of *Scyll. Haanii* presenting three large wine-red spots, one in the middle and one at either side (Pl. II, fig. 10*a*).

General distribution: Between Bohol and Zebu (Spence Bate); Bay of Bengal, off Madras coast (Alcock); Arabian Sea, off Calicut (Alcock).

3. *Scyllarus Haanii* Berthold. (Pl. II, fig. 10—10*d*).

Scyllarus Haanii A. A. Berthold, in: Nachr. Georg-Augusts-Univ. u. der kön. Gesells. Wiss. Göttingen, 1845, p. 45.

Scyllarus Haanii A. A. Berthold, Ueber verschiedene, neue oder seltene Reptilien aus Neu-Granada und Crustaceen aus China, in: Abhandlungen der kön. Gesells. der Wissenschaften zu Göttingen, Bd. III, 1847, p. 23, Tab. II, fig. 2, 3.

Nec: *Arctus Haanii* A. E. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. VI, 1891, p. 42 (pr. parte, Ex. a) and Bd. X, 1897, p. 271.

Stat. 49a. April 14. 8° 23′.5 S., 119° 4′.6 E. Sapeh Strait. 70 m. Bottom: coral and shells. 1 young specimen.

Stat. 51. April 19. Madura-bay and other localities in the southern part of Molo-strait. 54—90 m. Bottom: fine grey sand; coarse sand with shells. 3 males and 1 female without eggs.

Stat. 166. August 22. 2° 28′.5 S., 131° 3′.3 E. 118 m. Bottom: hard coarse sand. 1 young specimen.

These specimens agree perfectly well with the accurate description and figures of Berthold. The principal characters of *Scyll. Haanii* are the following. The carapace carries in the middle line two small teeth. The anterior tooth on the anterior margin is in a line with the interspaces between the teeth at the inner orbital angles; the acute tip of the somewhat larger, second tooth is situated in a line with the posterior margins of the orbits. A double row of squamiform tubercles, situated close near one another, occurs in the middle line of the cardiac region, the foremost pair, overhanging the cervical groove, are a little more prominent, almost dentiform; on either side of this row one observes a group of squamiform tubercles on the

cardiac region. Similar tubercles occur also between the posterior tooth and the cervical groove and on either side of them the gastric region carries some similar prominences. The transverse intestinal region and the posterior border of the carapace, which is separated from it by a deep groove, are covered with similar squamiform prominences. The carina, running from either inner-orbital angle backward and outward, is armed at the distal end with a sharp tooth and with a somewhat larger one immediately behind it, both at the inner angle of the orbits; a little farther backward one observes a third acute tooth and a transverse line, uniting these two teeth, appears, in the middle line, twice as far distant from the cervical groove as from the posterior median tooth. Behind the third tooth the lateral carinae carry squamiform prominences until the posterior margin. A longitudinal row of small prominences is observed in the furrow between the median regions of the carapace and the lateral carinae. For the rest that part of the carapace which is bounded by the lateral carinae, is smooth.

The anterior margin of the antennular somite which is about twice as broad as long, is distinctly notched in the middle and also near the outer angles that are dentiform and obtuse; a transverse arcuate furrow runs, like in other species, near the anterior margin of the carapace, parallel with it, on each half of this somite, while the postero-external angles are somewhat dentiform.

The large circular orbits are situated close to the lateral border of the carapace, their diameter is about twice as large as their distance from the lateral border; a small acute tooth at the outer angle of the orbits.

Antero-lateral angles of the carapace acute, prominent, reaching somewhat beyond the level of the antennular somite; the lateral margins that distinctly converge backward, are armed with two acute teeth, a hepatic tooth immediately behind the orbits and a branchial tooth, that is situated just behind the level of the third tooth of the lateral carinae. Posterior to the branchial tooth the lateral margins carry squamiform tubercles; between the lateral margin and the lateral carina the carapace is smooth, except some squamiform tubercles posteriorly and near the lateral carinae and except a small group near the hepatic tooth. The majority of these squamiform tubercles are fringed with short hairs. It may be still remarked that the upper border of the posterior median tooth, i. e. the upper surface of the gastric region, appears almost in a horizontal line with the cardiac region, when the carapace is looked at laterally, and that the posterior margin of the carapace is notched in the middle line.

The abdomen cannot be said to be carinate in the middle, though the mid-dorsal line on the 2nd and 3rd terga and on the anterior half of the 4th is rather conspicuous. The 2nd, the 3rd and the 4th pleura terminate in an acute point, that is somewhat directed backward; the 5th ends in an obtuse point, like also the 6th. The squamiform sculpture on the abdominal terga and pleura resembles closely that of *Scyll. Martensii* Pfeffer, as regards the form and arrangement of the tubercles or prominences, but they are more numerous in Berthold's species and the principal transverse groove, that separates the two sets of prominences from one another and that is interrupted in the middle line, appears somewhat narrower in *Scyll. Haanii*. On the 2nd—5th terga the prominences form an arborescent figure in the middle line. The anterior part of the telson terminates posteriorly in four acute spinules, one at the end

of the lateral margin and one somewhat nearer to the middle line than to the former: all are slightly directed outward. The basal joint of the caudal swimmerets ends in a flattened spinule, like also the outer border of the proximal, not membranaceous part of the lateral swimmerets.

The inner antennae reach by their flagella beyond the distal lobe of the outer; the terminal joint of their peduncle is little more than half as long as the penultimate.

The basal joint of the outer antennae i. e. the 2nd and 3rd joint coalesced, presents an acute tooth on the anterior border of its upper surface, somewhat nearer to the dentiform, inner angle than to the outer, and also a sharp tooth on its outer margin, outside of the inner orbital angle; this last-named tooth extends backward and outward over the eye-peduncle. The 4th joint, i. e. the proximal (outer) antennal squame, which is somewhat longer than broad, is traversed by a rather prominent midrib, that runs just in the middle of this joint. The outer margin is cut into two large acute teeth; the distance between the tips of these two teeth is somewhat shorter than the distance between the tip of the anterior tooth and the extremity of the squame. The inner margin is armed with one single acute tooth, but it should be remarked that the proximal end of this margin carries also an acute, much smaller tooth, which is directed straight forward; this tooth has not been described by Berthold, but it is distinctly visible in his figure, on the left antenna, just near the antennular peduncle. This tooth, however, that exists also in other species, as e. g. in *Scyll. sordidus* (Stimps.), is not counted as a tooth of the inner margin. The anterior margin of the upper surface of the 5th joint bears a small flattened tooth at the outer and another acute one at the inner angle. Of the distal squame or flagellum, that reaches slightly beyond the proximal one, the anterior margin is deeply cut into five cusps; the 1st, on the outer angle, is obtusely pointed, the following are sharp, especially the 5th; the three outer cusps are nearly of equal width, the two following become gradually narrower. The inner margin carries moreover a quite small, acute tooth, at the base of the 5th cusp.

Sternum broad, one and a half as long as broad posteriorly. Its anterior extremity is truncate (Pl. II, Fig. 10) and one-fourth as broad as its posterior border; this truncate, anterior border, that presents a minute notch in the middle line, is one of the three sides of a triangular, equilateral groove at the anterior end of the sternum, that reaches but little farther backward than the anterior border of the basipodites of the 2nd legs. The sternum, though coarsely pitted, is smooth and not tuberculate in the middle line.

The thoracic legs of the 1st pair resemble closely those of *Scyll. sordidus* (Stimps.), but they are much more furrowed. The anterior legs of *Scyll. sordidus* bear only one single furrow, namely on the outer surface of ischium and merus, just near and parallel with their lower edge. The outer surface of the merus-joint of *Scyll. Haanii* is marked, besides with the just described furrow, still with another, that runs close to and parallel with its upper border; the upper border of the carpus is rather sharp and slightly furrowed on the inner side, the outer surface carries one or two grooves. The upper border of the propodus is fringed with short hairs internally and a deep furrow runs on its outer surface near the upper border and parallel with it. The legs of the 2nd and of the 3rd pair are especially characteristic of this species. The outer side of the slender merus of the 2nd legs (Pl. II, fig. 10*b*) is traversed,

along its whole length, by a furrow near and parallel with the upper border and another runs near the lower, but reaches only a little beyond the middle. A shallow groove occurs on the outer side of the carpus near its rounded, upper border. The compressed propodus is one and a half as long as the carpus and somewhat more than twice as long as broad; in the largest specimen (♂) from Stat. 51 the carpus is $2^1/_3$ mm., the propodus 3 mm. and the dactylus $2^1/_3$ mm. long, the propodus is $1^1/_3$ mm. broad. The propodus, that presents its greatest width in the middle, narrows somewhat towards the distal end; its slightly curved, upper border is fringed with short hairs on the inner side, its lower border is straight. The outer surface of the propodus carries two deep grooves, respectively near and parallel with the upper and the lower margin; neither of them reaches the distal extremity and the lower groove is a little shorter than the other. The merus of the 3rd legs, (Pl. II, fig. 10*c*), which is a little longer but less broad than that of the 2nd pair, is traversed on its outer surface only by one furrow, namely that near the upper border. The three following joints resemble those of the 2nd pair, but the compressed propodus is a little broader in proportion to its length: the carpus is $2^1/_3$ mm., the propodus 3 mm. and the dactylus $2^1/_3$ mm. long, while the propodus is $1^2/_3$ mm. broad. The two furrows on the outer side are equally long and extend almost to the distal end. The 4th and the 5th pair of legs have a quite different appearance, because their propodi are considerably longer and slenderer. The legs of the 4th pair (Pl. II, fig. 10*d*) reach as far forward as the anterior tooth on the outer margin of the proximal antennal squame, those of the last pair as far as the antero-lateral angles of the carapace; both pairs of legs are traversed on the outer surface of their joints by a longitudinal furrow.

The 1st abdominal somite is destitute of appendages, both in the male and in the female. Those of the 4 following somites agree substantially with those of *Scyll. cultrifer* (Ortm.) = *sordidus* (Sp. Bate) and with those of *Scyll. orientalis* (Sp. Bate). In the male the pleopods of the 2nd somite are biramous, the two branches falcate-foliaceous, somewhat unequal in length and breadth; of those of the three following somites one branch is foliaceous, the other is a rudimentary process. In the female the appendages of the 2nd somite are biramous, the two branches broadly-foliaceous and the endopodite, which is little less broad than the outer plate, carries a styliform, internal appendix, 0,5 mm. long, furnished with a few setae at the distal end, but destitute of cincinnuli; those of the three following pairs are biramous, one branch foliaceous, spathulate, fringed with plumose hairs, the other slender, 3-jointed and supplied with long plain setae.

The carapace of the largest specimen, a male from Stat. 51, is $11^1/_4$ mm. long, measured in the middle line and without the antennular somite, the abdomen is 23 mm. long, the distance between the antero-external angles of the carapace $12^3/_4$ mm. broad, the whole length from the anterior margin of the distal squame of the outer antennae to the end of the telson 40 mm. In younger specimens the distance between the antero-external angles does also slightly surpass the length of the carapace, measured in the middle, so e. g. the carapace of another specimen is 11 mm. long, that distance, however, 11,5 mm. The carapace of the female from Stat. 51 is 10,7 mm. long, the abdomen 19 mm., the distance between the antero-external angles 11,2 mm., the whole length, the outer antennae included, 36 mm.

Scyll. Haanii Berthold is a beautifully coloured species. The ground-colour of carapace and antennae is a yellowish olive-green, the tubercles and prominences are white, the hairs with which they are fringed, brown; the abdomen is of pale ground-colour, but the 1st tergum is marked (Pl. II, fig. 10*a*) on each side, near the pleura, with a large round, wine-red fleck and with a few smaller ones on the posterior margin; the 2nd and especially the 3rd tergum are also wine-red coloured.

Dr. Ortmann refers (locis citatis) some specimens from an unknown or uncertain locality also to *Scyll. Haanii*. The propodi of the 2nd and 3rd thoracic legs were also compressed, with sharp upper and lower margins, the lower not prolonged distally; the outer margin of the proximal antennal squame was, however, armed only with one single tooth and the upper surface of the carapace presented also only one tooth. Ortmann's species is therefore probably different from that of Berthold.

According to the same author *Scyll. sordidus* (Stimps.) from Hongkong should be identical with *Scyll. Haanii* Berthold. This opinion, however, is quite erroneous, for not only Berthold's species, but also *Scyll. Haanii* of Ortmann are certainly different from *Scyll. sordidus* (Stimps.). *Scyll. sordidus* (Stimps.) differs at first sight by the following characters. The carapace is armed with three teeth in the mid-dorsal line, one observes namely a third strong tooth immediately behind the cervical groove. The anterior extremity of the sternum is not truncate, but deeply notched by a triangular incision. The posterior tooth on the outer margin of the proximal antennal squame is rudimentary. The lobes or cusps into which the free margin of the distal squame is cut, are rounded, obtuse. The thoracic legs show a quite different shape, so e.g. are the propodi of the 2nd pair slender, not compressed, nor furrowed, and tapering distally, while the dactyli are almost as long as the propodi. The barely compressed propodi of the 3rd pair are 4-times as long as broad and are also not furrowed, those of the following legs are shorter, less slender. The colouration, finally, is quite different, *Scyll. sordidus* presenting a large, transverse, oval black fleck on the middle of the 1st abdominal tergum, a character described also by Stimpson.

General distribution: China (Berthold).

4. *Scyllarus sordidus* (Stimpson). (Pl. II, Fig. 11, 11*a*).

Arctus sordidus W. Stimpson, in: Proc. Acad. Nat. Sc. Philadelphia, January 1860, p. 23.
Arctus sordidus J. G. de Man, in: Zoolog. Jahrb. Abth. f. Syst. T. IX, 1896, p. 497, Pl. 34, fig. 58 and 58*a*.
Scyllarus sordidus G. Nobili, in: Bollet. Mus. Torino, Vol. XVIII, N° 455, 1903, p. 12.
Arctus vitiensis A. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. X, 1897, p. 270 (nec Dana).
Nec: *Arctus sordidus* C. Spence Bate, Report Challenger Macrura, 1888, p. 66, Pl. IX, fig. 3.

Stat. 162. August 18. Between Loslos and Broken-islands, West coast of Salawatti. 18 m. Bottom: coarse and fine sand with clay and shells. 1 male and 2 females without eggs.
Stat. 273. Dec. 23/26. Anchorage off Pulu Jedan, East coast of Aru Islands (Pearl Banks). 13 m. Bottom: sand and shells. 1 young male.

The three specimens from Stat. 162 agree perfectly well with my description (l. c.) of a young individual from the Java Sea. The largest, a female, is $45^1/_2$ mm. long, from the anterior margin of the outer antennae to the end of the telson: it is almost adult, for, according to STIMPSON, this species attains a length of 56 mm. Measured in the middle line, the carapace appears to be $14^3/_4$ mm. long, the antennular somite included, and $13^3/_4$ mm. without it; the distance between the antero-external angles is 14 mm., so that this specimen is not broader than long, conform to STIMPSON's description. The following may be added to my first description. The three teeth in the mid-dorsal line of the carapace are covered with squamiform prominences and a longitudinal row of 5 or 6 small similar prominences occurs in the furrow that separates the cardiac region from the lateral carinae. The 2nd, 3rd and 4th pleura are obtusely pointed, the 5th is rounded.

The proximal (outer) antennal squame (Pl. II, fig. 11), which is a little longer than wide and traversed, about in the middle, by a moderately prominent, smooth ridge, is armed on its outer margin with an acute tooth, behind which there is a trace of a second; the tip of the larger tooth is situated almost in the middle of the outer margin. The rudimentary posterior tooth has not been described by STIMPSON: examined under the microscope the outer margin appears a little serrulate between the large tooth and the sharp extremity of this joint. While therefore the outer margin resembles closely that of *Scyll. vitiensis* (J. D. Dana, l. c. Pl. 32, fig. 7*a*), the inner carries only one distinct tooth, not three as in DANA's species, for a barely distinguishable trace of a very small, obtuse prominence before this tooth, which was likewise observed in the young specimen from the Java Sea, cannot be regarded as a tooth. While in the male the propodus of the 5th legs is subcylindrical, its lower border terminates in the female, at the distal end, in an acute tooth, which is barely half as long as the somewhat curved, pointed dactylus, with which it forms an incomplete chela.

In the male the abdominal appendages of the 2nd somite are biramous, both rami being falcate-foliaceous, but narrow, with some setae on the distal half of one margin; they are of somewhat unequal length and the longer is also a little broader. The appendages of the three following somites are probably rudimentary. The pleopods of the 2nd somite of the female are biramous, the rami foliaceous, broad; the endopodite which is but little less broad than the other ramus, carries a styliform appendix which, in the largest specimen, is 0,7 mm. long; its distance, 1 mm., from the proximal end of the inner border of the endopodite is a little longer than its own length and about one-third of the distance between its base and the extremity of the endopodite. This internal appendix carries no cincinnuli, but some plain setae at its extremity and these setae are 2 mm. long, 3-times as long as the appendix itself. The pleopods of the three following somites resemble those of *Scyll. Haanii* Berthold.

On a grayish ground-colour the carapace of the largest specimen (♀) is marked with three ochraceous flecks, one in the middle of the cardiac region and one on each side on the declivous branchial regions; except on these red spots, the squamiform prominences show a paler, more whitish colour. The smooth, anterior, underlying part of the three first abdominal terga is of a pale slate-colour, the 1st somite (Pl. II, fig. 11*a*) is marked with a quite characteristic, oval, transverse fleck of a very dark, almost black, slate-

colour, that occupies one-third the width of the tergum. The thoracic legs, except those of the 1st pair, are marked with four slate-coloured rings, which are also mentioned by Stimpson.

The young male from Stat. 273 is 19 mm. long, the outer antennae included; it is of a much paler colour, but the characteristic oval fleck on the 1st abdominal tergum is present. The posterior tooth on the outer margin of the proximal (outer) antennal squame is somewhat more distinct than in the three other individuals.

Ortmann (l. c.) regards this species as identical with *Scyll. vitiensis* (Dana) and in my first description (l. c., p. 501) I myself was also inclined to the supposition that both species once should prove to be identical. This opinion now appears to me to be erroneous. *Scyll. vitiensis* (Dana) differs, indeed, by the following characters. The carapace carries two teeth, instead of three, the tooth immediately behind the cervical suture wanting completely. Dana says "the gastric spine has three or four squamiform tubercles, posterior to it; and then follows a smooth surface"; this is not the case in *Scyll. sordidus* (Stimps.), the cardiac region terminating in this species, anteriorly, in a strong acute tooth. The tergum of the 1st abdominal somite and the anterior half of the 2nd and 3rd terga are "but faintly divided into a few areolets", whereas in *Scyll. sordidus* the squamiform prominences are here as distinctly developed as on the posterior half. The two following somites have also a different appearance. The inner margin of the 4th joint of the external antennae is distinctly armed with 3 well developed teeth. The penultimate joint of the antennular peduncle is but little longer than, and not nearly twice as long, as the last. The carpus and the propodus of the 2nd legs have a slenderer form; in Dana's species the propodus is 7-times as long as thick at its base, in *Scyll. sordidus* 4-times. The notch at the end of the sternum is obtuse at its extremity, but acute in *Scyll. sordidus* (confer J. G. de Man, l. c. fig. 58). The oval dark fleck on the 1st abdominal somite, finally, is wanting in *Scyll. vitiensis*.

General distribution: Hongkong (Stimpson); Java Sea (de Man); Singapore (Nobili).

5. *Scyllarus bicuspidatus* (de Man). (Pl. II, Fig. 12—12*c*).

Arctus bicuspidatus J. G. de Man, in: Tijdschr. d. Ned. Dierk. Vereen. (2) Dl. IX, 1905, p. 589.

Stat. 310. February 12, 1900. 8° 30′ S., 119° 7′.5 E. 73 m. Bottom: sand with few pieces of dead coral. 1 young female.

A new species, most closely resembling *Scyll. arctus* (L.) and also related to *Scyll. Martensii* Pfeffer, with which it will be compared in the following lines. The few differences from *Scyll. arctus* will be mentioned at last.

The whole length from the anterior margin of the outer antennae to the end of the telson is $25^1/_2$ mm.; the carapace, measured in the middle line, is $7^1/_2$ mm. long, the distance between its antero-lateral angles $8^1/_2$ mm., the abdomen 13 mm. The anterior margin of the carapace is armed in the middle line with an acute tooth, directed forward and another somewhat larger acute tooth occurs on the middle of the gastric region, both teeth being directed obliquely upward; midway between the extremity of the gastric tooth and the

faint cervical groove one observes two minute, sharp teeth, situated close abreast. Immediately behind the cervical groove are two similar acute teeth, situated also quite close to one another and a little larger than the anterior pair; the posterior pair of teeth are situated on a lower level than the acute tooth of the gastric region. In *Scyll. Martensii*, on the contrary, there are three rather obtuse teeth on the middle line of the carapace, two on the gastric region and one, immediately behind the cervical groove, situated on a higher level than the two others; the frontal tooth is rudimentary. *Scyll. bicuspidatus* resembles therefore, as regards these median teeth, *Scyll. Haanii* Berthold, but the frontal and the gastric tooth are directed horizontally forward, while in this new species they are slightly turned upward. Between the acute gastric tooth and the groove in front of the posterior border, the carapace is covered, in the middle, with some flattened, squamiform prominences, but they are hardly recognizable, even under a lens. On each side of the middle the gastric region carries 5 or 6 squamiform prominences and one single, more dentiform prominence occurs on each side of the posterior pair of small teeth, just behind the cervical groove. The lateral carinae are interrupted a little behind the orbits, as in *Scyll. Martensii*; the interruption is in a line with the anterior pair of minute teeth on the gastric region. The anterior part of the lateral carinae carries, at the inner angle of the orbits, two acute teeth behind one another, squamiform prominences are barely recognizable on it; there is a small obtuse tooth just behind the interruption and the hardly salient, posterior part of the lateral carinae is covered with a double row of rather large and distinct, squamiform prominences.

The orbits, a little broader than long, are situated about as close by the lateral margin of the carapace as in *Scyll. Martensii*: the width of the orbits, 1,4 mm., is a little more than twice as large as their distance, 0,6 mm., from the lateral margin.

The lateral margins of the carapace, that present two small incisions, resemble those of *Scyll. Martensii*; the distance between the two incisions is a little shorter than that between the anterior incision and the antero-lateral angle of the carapace. The acute antero-lateral angles, which are directed slightly outward, reach as far forward as the antennular segment; the lateral margins carry 3 or 4 sharp squamiform prominences between their anterior extremity and the first incision, two or three between the two incisions and seven or eight behind the posterior one; all are rather large and conspicuous. A few small ones exist just behind the orbits, but for the rest the hepatic and branchial regions are smooth, while they are covered in *Scyll. Martensii*, almost everywhere, with similar prominences. The transverse intestinal region is separated by a deep groove from the posterior border and both are covered with squamiform prominences, which on the intestinal region are a little larger than on the posterior border; the median notch of the latter is shallow, less deep than in *Scyll. Martensii*. Except on the squamiform prominences and on the inner side of the anterior part of the lateral carinae, the upper surface of the carapace is covered with a short pubescence. In *Scyll. Martensii* the upper surface of the carapace bears a much larger number of squamiform prominences that are much more conspicuous and the lateral carinae are posteriorly much more prominent.

The antennular segment is twice as broad as long; it is deeply notched anteriorly in the middle and each half carries anteriorly in the middle a tooth which is distinctly carinate

above. Of *Scyll. Martensii* the antennular segment is broader, 3- or 4-times as broad as long; the median notch is broader, less deep, the anterior margin is in young individuals a little prominent on each side of it, nearly straight in the adult, but there is no carinate tooth.

The areolated, posterior part of the 1st abdominal tergum is distinctly smaller than the smooth, anterior part; the posterior area appears as long in the middle as laterally, whereas in *Scyll. Martensii* it is much longer in the middle. It is divided on each side by a dozen furrows into as many areolets, that are little longer than broad; these furrows run parallel with one another and with the middle line of the abdomen, whereas in *Scyll. Martensii* they show an oblique direction with regard to the middle line (compare fig. 12 with fig. 13*a* on Plate III). The 2nd—5th abdominal terga are obtusely carinate in the middle line, the carinae, however, are not at all salient; the carinae of the 2nd and 3th terga are notched posteriorly, the quite narrow furrow reaches in the former almost to the middle, but in the other it is much shorter. In *Scyll. Martensii* the carinae are much more prominent, especially that of the 3rd somite. On each of these four somites the obtuse carina in the middorsal line appears as the trunk of a regular and symmetrical, arborescent figure, which in *Scyll. Martensii* is rather indistinct or absent. As regards the sculpture and areolation of the 2nd—5th abdominal terga and pleura, in two transverse series on the terga and in a marginal series on the pleura, *Scyll. bicuspidatus* almost fully agrees with *Scyll. Martensii*, it should, however, be remarked that the furrows of the posterior series of the 2nd tergum run nearly parallel with the middorsal line of the abdomen, whereas their direction is very oblique in *Scyll. Martensii*. The shape of the 2nd—5th pleura is also the same in both species, but the lower extremity appears rather sharp in *Scyll. bicuspidatus*, except the 5th. The abdominal terga of *Scyll. Martensii* are slightly broader in proportion to their length than in this new species. The sculpture of the 6th somite and of the anterior, calcified part of the telson does not much differ from *Scyll. Martensii*, but the calcified part of the telson ends posteriorly in four acute spines, of which those at the end of the lateral margins are a little shorter than the two internal ones; the basal joint of the uropods and their outer border terminate also in acute spines. All these spines are wanting in *Scyll. Martensii*.

The internal antennae agree with those of *Scyll. Martensii*, but the two last joints of the peduncle and the joints of the slender flagellum are comparatively broader than in PFEFFER's species.

The tooth on the middle of the basal joint of the outer antennae is very sharp, in *Scyll. Martensii* it is less sharp. The 4th joint, little longer than broad, $3^3/_4$ mm. long, $3^1/_2$ mm. broad, is armed on its outer border with two sharp teeth, about as in *Scyll. Haanii*; the distance between their two tips is a little shorter than the distance between the apex of the anterior tooth from the distal extremity of the squame and than the distance between the apex of the posterior tooth from the proximal end of the outer margin. *Scyll. Martensii* carries four teeth on the outer border. The inner border of this joint is armed with five acute teeth, the first of which is considerably larger than the following that slightly decrease in size distally; there is also an acute tooth at the postero-internal angle of this joint. This last mentioned tooth is obtuse and rudimentary in *Scyll. Martensii* and the teeth on the inner margin show also different characters, because they bear each a secondary

tooth at their base. The ridge on the middle of the upper surface is little prominent, smooth and does not seem to be formed by acute teeth, covering one another like tiles, as in *Scyll. Martensii*; the upper surface which is covered with a short tomentum, carries no trace of the ridge and granules that are observed in *Scyll. Martensii*. The inner border of the 5th joint ends in an acute tooth. The terminal joint or flagellum resembles that of *Scyll. Martensii*; the anterior margin is cut into five lobes or teeth, besides two small ones on the inner margin, the posterior of which is rudimentary and which have the same form as in that species.

The sternum (Pl. II, fig. 12*a*) is less concave and less broad than that of *Scyll. Martensii* (Pl. III, fig. 13). In the larger female of *Scyll. Martensii* from Stat. 313, which has the same size as the female of *Scyll. bicuspidatus*, the sternum, measured in the middle line, appears to be 6 mm. long and 5 mm. broad between the coxae of the 5th pair of legs: in the female of *Scyll. bicuspidatus* it is $5^3/_4$ mm. long and $4^1/_4$ mm. broad. The slightly concave, anterior border of the first sternal somite presents a small notch in the middle line and one on each side of it, so that one observes on each side a rounded prominence. The 1st sternal somite is not hollowed out as in *Scyll. Martensii*, but flattened; it is, however, grooved in the middle and this furrow widens anteriorly. The lateral sides of the sternum are steeper in *Scyll. Martensii* and their surface is more uneven than in *Scyll. bicuspidatus*; in the latter only the 5th sternal joint carries a tubercle in the middle, the sternum is smooth, though distinctly punctate on the sides, but there are no squamiform prominences.

The 1st pair of thoracic legs are of a stouter shape than those of *Scyll. Martensii*, their joints being broader in proportion to their length; the merus, for instance, is 2,5 mm. long and 1,7 mm. broad proximally, in the larger female of *Scyll. Martensii* from Stat. 313 the merus is just as long, but 1,55 mm. broad. Likewise the following legs are less slender than those of *Scyll. Martensii*. The propodi of the 2nd pair (Pl. II, fig. 12*b*), that are subcylindrical, though tapering towards the distal end, are 2,4 mm. long, measured in the middle of their outer surface, 0,76 mm. broad at the proximal end of their upper margin and 0,52 mm. at the distal extremity; the terminal joints are 1,9 mm. long and 0,42 mm. thick at their base. In the larger female of *Scyll. Martensii* from Stat. 313 the propodus of the 2nd legs is 2,3 mm. long, 0,74 mm. broad at the proximal and 0,52 mm. at the distal end; the dactylus is 2,65 mm. long and 0,42 mm. thick at its base. While the propodi of these legs have the same form in both species, the merus, the carpus and especially the dactylus appear distinctly stouter, less slender than in *Scyll. Martensii*; the dactylus e.g. is shorter than the propodus, instead of longer, and it appears less slender. The propodi of the 3rd legs (Pl. II, fig. 12*c*) are 2,3 mm. long, 0,78 mm. broad a little beyond their proximal extremity and 0,54 mm. at their distal extremity; the dactylus is 1,45 mm. long and 0,42 mm. broad at base. In the larger female of *Scyll. Martensii* from Stat. 313 the propodi of these legs are 2,3 mm. long, 0,7 mm. broad a little beyond their proximal extremity and 0,48 mm. at the distal one; the dactylus is 2,1 mm. long and 0,38 mm. thick at its base. In *Scyll. bicuspidatus* these propodi are $3^1/_2$-times as long as their average width and one and a half as long as the terminal joints, in *Scyll. Martensii* 4-times as long as their average width and little longer than their dactyli. The propodi of the 3rd legs are distinctly somewhat compressed; they present on their outer surface two

longitudinal furrows, like also the merus, and there is one furrow on the carpus. These grooves are not observed in *Scyll. Martensii*. The 4th and the 5th legs are likewise a little stouter and are also furrowed on their outer surface.

The abdominal appendages of the 2nd somite (those of the 1st are wanting) are biramous, the rami equally long, foliaceous, though still narrow; the exopodite is a little broader than the endopodite, that carries on its inner margin a stylamblys, 0,08 mm. long and half as thick, finger-shaped and situated just in the middle of the endopodite. The pleopods of the 3 following somites are biramous; one of the two rami is 1,3 mm. long, spatulate, the widened part 0,45 mm. broad, obtusely pointed and fringed with plumose setae, the other 3-jointed ramus is not yet fully developed, only half as long as the other and tapers to its extremity.

This specimen presents a uniform yellowish colour; the smooth, underlying part of the 1st abdominal tergum is marked with a dark fleck in the middle, nearly as in *Scyll. sordidus*, but less distinctly defined and a dark fleck exists also near the inner border of the distal antennal squame.

Scyll. bicuspidatus is also closely allied to *Scyll. cultrifer* (Ortm.) = *Scyll. sordidus* of the Report on the Challenger Macrura, in which the carapace appears likewise bicuspidate in the middle line. *Scyll. cultrifer*, however, differs at first sight by the subchelate shape of the 3rd pair of legs and also by the following, when the figures in the Challenger Report are indeed accurate. The 3rd joint of the antennular peduncle is not shorter than the 2nd; there are only two teeth on the inner border of the proximal (outer) squame, the teeth of the distal squame show a somewhat other form and the propodi of the 5th legs are longer and slenderer.

Scyll. arctus (L.) of the Mediterranean, however, bears the closest resemblance to this new species. Two male specimens, respectively 54 mm. and 34 mm. long (outer antennae included), from the Leyden Museum are lying before me. The mediterranean species seems only to differ by the carapace presenting three teeth instead of two, in the middle line before the cervical groove. The two very small teeth, which in *Scyll. bicuspidatus* are placed abreast between the posterior tooth and the cervical groove, are wanting in *Scyll. arctus*. Of the teeth with which the inner margin of the proximal (outer) squame is armed, the second is the largest and the difference between these teeth is not so large as in *Scyll. bicuspidatus*. Abdomen, sternum and thoracic legs show no differences at all. The differences, however, are of little importance and it is therefore to be regretted that only one apparently young specimen has been collected.

Haswell records *Scyll. arctus* from Thursday Island, but Ortmann doubts of the correctness of this observation, for he supposes that the author of the Catalogue of the Australian Crustacea has not examined specimens from that locality and that Haswell's description has been taken from another source (A. E. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. VI, 1891, p. 42).

6. *Scyllarus Martensii* Pfeffer. (Pl. III, Fig. 13, 13*a*).

Scyllarus Martensii G. Pfeffer, Die Panzerkrebse und die Clypeastriden des Hamburger Museums, mit einer Tafel. Hamburg 1881, p. 48.

Arctus Martensii A. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. VI, 1891, p. 44.
Scyllarus Martensii L. A. Borradaile, in: The Fauna and Geography of the Maldive and Laccadive Archipelagoes. Vol. II, Pt. 3. 1904, p. 754, Pl. LVIII, fig. 4.
Scyllarus Martensi G. Nobili, in: Bollet. Mus. Torino, Vol. XVIII, 1903, p. 12.
Scyllarus martensi M. J. Rathbun, The Brachyura and Macrura of the Hawaiian Islands. Wash. 1906, p. 896, Pl. XVIII, fig. 2.
Scyllarus martensii H. Balss, Ostasiatische Decapoden. II. Die Natantia und Reptantia, München 1914, p. 79.
Scyllarus arctus, var. W. de Haan, Fauna Japon. Crustacea, 1841, p. 154, Pl. XXXVIII, fig. 2 (second variety).

Stat. 33. March 24/26. Bay of Pidjot, Lombok. 22 m. Bottom: mud, coral and coralsand. 2 ova-bearing females.
Stat. 64. May 4/5. Kambarigi-bay, Tanah Djampeah. Up to 32 m. Bottom: coral, coralsand. 1 young male and 1 young female.
Stat. 71. May 10—June 7. Makassar. Up to 32 m. Bottom: mud, sand with mud, coral. 2 young males.
Stat. 104. July 2/3. Sulu-harbour, Sulu-island. 14 m. Bottom: sand. 2 young females.
Stat. 164. August 20. 1°42′.5 S., 130°47′.5 E. 32 m. Bottom: sand, small stones and shells. 2 males.
Stat. 313. Febr. 14/16. Anchorage East of Dangar Besar, Saleh-bay. Up to 36 m. Bottom: sand, coral and mud. 4 females, 2 of which with eggs, and 2 males.

Though these males and females belong, no doubt, to one and the same species, they show, however, some slight differences from one another, certainly because they have been collected at so remote localities of the Archipelago. The variability of *Scyll. Martensii* is at once established by the fact that two type specimens of this species from the Hamburg Museum, which Prof. PFEFFER has kindly sent me, even not fully agree with one another! One of them, a female without eggs, $22^1/_2$ mm. long from the frontal margin to the end of the telson, is unfortunately of an unknown locality, the other, a little smaller, is an ova-bearing female, on the label of which stands the name of "Amur", but, as Prof. PFEFFER wrote, this name does only indicate that this specimen has been taken on the way from Hamburg to the Amur, so that it may perhaps have been captured in the Indian Archipelago! The incisions which separate from one another the lobes on the anterior margin of the distal antennal squame, are distinctly longer i. e. deeper in the female without eggs than in that with the label "Amur", so that the lobes appear slightly longer and narrower. In this species the tergum of the 1st abdominal somite is elegantly divided by a set of longitudinal ribs in small areolets: in the larger female these ribs run a little more oblique with regard to the posterior border than in the other specimen. The 1st external lobe of the distal squame of the outer antennae is marked in the ova-bearing female with a black fleck, that does not exist in the other. In view of these differences I propose to regard the larger female without eggs as the typical form of this species and the other as a variety.

The larger female with eggs from Stat. 33 is 36 mm. long, from the anterior margin of the distal squame to the end of the telson: it is the largest specimen and will therefore be described. Measured in the middle line, the carapace appears to be 11 mm. long and the abdomen $19^1/_2$ mm.; the antero-lateral angles are 12 mm. distant, so that the carapace appears

a little broader than long. In *Scyll. sordidus* (Stimps.) there is a small tooth just in the middle of the anterior margin of the carapace, immediately behind the antennular segment, and another much stronger tooth occurs on the gastric region; the latter is followed by a third similar tooth just behind the cervical groove. In *Scyll. Martensii* the foremost frontal tooth is rudimentary, but the gastric region carries two teeth in the middle line; both are obtuse and the posterior tooth, measured to the cervical groove, appears twice as long as the anterior; like in *Scyll. sordidus* there is also a tooth immediately behind the faint cervical groove. *Scyll. Martensii* differs therefore from STIMPSON's species by the rudimentary condition of the frontal tooth, while another is observed just in front of the posterior gastric tooth; this species presents therefore also three teeth in the middle line of the carapace. The upper surface of the latter is covered with a larger number of squamiform prominences than in *Scyll. sordidus*, especially behind the cervical groove and on the regions between the lateral margins and the lateral carinae; the latter are somewhat more prominent posteriorly than in STIMPSON's species. The posterior tooth that overhangs the cervical groove, carries a double row of squamiform prominences, that reach until the intestinal region; this tooth, measured until the transverse groove near the posterior margin, appears twice as long as the posterior tooth of the gastric region. The posterior margin of the carapace is more deeply notched in the middle than that of *Scyll. sordidus*. For the rest the upper surface of the carapace nearly resembles that of the last mentioned species.

The orbits are situated just as near the lateral margin of the carapace as in *Scyll. sordidus*; their diameter is twice as large as their distance from the lateral margin. The posterior, areolated part of the 1st abdominal tergum (fig. 13*a*) appears longest in the middle line and narrows regularly towards the lateral angles; it is divided by slightly oblique, longitudinal furrows, 10 or 11 on each side, into as many areolets, that are longer than broad and gradually grow shorter towards the lateral angles; the smooth, underlying, anterior part of this tergum is apparently smaller than the posterior which is areolated. In *Scyll. sordidus*, on the contrary, the posterior part appears considerably smaller than the anterior and it appears much shorter in the middle line than laterally (Pl. II, fig. 11*a*); the longitudinal ribs are all of equal length, except those near the middle, and they are much less conspicuous. Different also from *Scyll. sordidus*, the 4 following terga appear distinctly carinate in the middle line. The hardly prominent carina of the 2nd somite appears bifurcate on its posterior half ("doppelfadenförmige Erhöhung" PFEFFER's); the carina on the 3rd somite is one and a half as long, much more elevated and appears, examined under a lens, coarsely punctate or indistinctly furrowed in the middle line; the carina on the 4th tergum is less prominent than that of the 2nd, the carina of the 5th is still less prominent and both these carinae are undivided, like also that of the 3rd somite.

The abdominal pleura resemble closely those of *Scyll. sordidus* (Stimps.): the pleura of the 2nd, 3rd and 4th somites are obtusely pointed, the 5th are rounded. Also as regards the sculpture and areolation of the 2nd—5th terga and pleura, both species closely agree with one another, the form and the number of the squamiform prominences are even quite similar; only, when the egg-bearing female from Stat. 33 is compared with

the somewhat larger female of *Scyll. sordidus* from Stat. 162, the squamiform prominences appear more prominent and are therefore more conspicuous in PFEFFER's species. In both species they are fringed with very short, stiff setae, that occupy the grooves and furrows between them. The 6th somite shows also the same form and sculpture in both species, but the posterior margin is straight in the middle, whereas it forms in *Scyll. sordidus* a rounded prominence in the middle line. The caudal fan has also the same form in both species, but the sculpture of the telson is much more conspicuous in *Scyll. Martensii*.

As regards the relative length of the terminal joint of the antennular peduncle in proportion to the penultimate, this species agrees with *Scyll. sordidus*, their form is also the same.

The 4th joint or proximal (outer) squame of the external antennae is but little longer than broad, nearly as in *Scyll. sordidus*. Its outer margin is armed with four teeth, of which the 1st and the 4th are smaller, less conspicuous than the two situated in the middle. The inner margin appears serrate along its whole length by seven or eight teeth, that somewhat decrease in size towards the tip; the distal or anterior margin of the upper surface of these teeth is notched at some distance from their apex, so that each presents a small secondary tooth at the base of their anterior margin. This character has also been observed by BORRADAILE (l. c.). The upper surface of this joint is traversed by a moderately prominent, longitudinal ridge, which in a lateral view appears to be smooth and entire, but which, looked at from above, seems to be formed by a row of triangular teeth or scales, that are covering one another like tiles. A few small, acute tubercles are observed on the upper surface between this ridge and the teeth of the inner margin and a row of acute prominences occurs at the base of the teeth of the outer margin, of which the first is the largest and looks like a short ridge. The distal squame, which is somewhat granular above, has its anterior margin deeply cut into five teeth; the 1st or external tooth is almost as broad as the two following taken together and its truncate, anterior margin appears slightly concave. The 4 following become gradually narrower and, while the 2nd, 3rd and 4th are obtusely pointed, the 5th appears rather acute; a small acute tooth occurs moreover on the inner border and a trace of another behind it, so that the distal squame presents seven teeth. All these teeth appear finely crenulate, under a lens, on their outer border, owing to the insertion of the plumose setae.

The sternum (Pl. III, fig. 13) of the egg-bearing female from Stat. 33 appears, when measured in the middle line, to be 8 mm. long; it is $6^1/_2$ mm. broad at its base, being but little longer than broad. The anterior extremity is truncate, though somewhat concave; it shows a minute notch in the middle line and another on each side of it, so that one observes, on each side of the middle line, a small rounded prominence. The 1st joint of the sternum presents a triangular concavity, almost as in *Scyll. Haanii* Berthold; from each antero-lateral angle runs a short ridge backwards and inwards and both ridges meet one another in the middle line. The sternum is more concave than that of *Scyll. sordidus*; a transverse row of small, flattened granules occurs near the anterior margin of the 2nd joint and the upstanding sides of the sternum are covered with similar flattened granules; on the 3 following joints

one observes a tubercle in the middle line and on either side of this tubercle a transverse row of puncta; the last joint bears no tubercle.

The thoracic legs resemble closely those of *Scyll. sordidus*, but the propodi of the 2nd legs are in STIMPSON's species a little slenderer. In the egg-bearing female of *Scyll. Martensii* from Stat. 33 these joints are 3 mm. long and 0,95 mm. broad at the proximal end of their upper margin; in the younger, egg-bearing female from the same locality they are 2,14 mm. long and 0,58 mm. broad, appearing, in this younger individual, comparatively broader. In the largest female of *Scyll. sordidus*, however, the propodus of the 2nd legs is $4^1/_2$ mm. long and 1 mm. broad at the base, in the other female from the same locality 3 mm. long and 0,7 mm. broad.

The abdominal appendages of the 2nd somite of the larger male, long 31 mm. (outer antennae included) from Stat. 164, are biramous, the rami being falcate with concave anterior border; the longer ramus is slender, 3 mm. long, and 12-times as long as broad, ribbon-shaped, tapering only near the extremity; the other is 2,8 mm. long, it gradually broadens until a little beyond the middle, appearing here 0,54 mm. broad and 0,33 mm. at its base; at one-third of its length from the extremity it suddenly narrows, appearing here only 0,27 mm. broad and then it tapers regularly to the pointed extremity; the posterior border of both rami is fringed with long setae, the longer nearly along the whole length, the other only along the widened middle part. The appendages of the 3rd—5th somites are biramous; the larger ramus is spoon-shaped; that of the 3rd somite is 2,5 mm. long, the handle measuring 1 mm., a little less than the spoon which is 0,9 mm. broad, with acute tip and with the margins fringed with very short, plumose setae; the other ramus is very short, quite rudimentary and has the form of a flowerbud, reaching as far as the proximal third part of the "handle" of the other ramus.

The pleopods of the 2nd abdominal somite of the larger, ova-bearing female from Stat. 33 are biramous, the rami foliaceous, fringed with moderately long, ciliated setae; the somewhat spoon-shaped endopodite, which is a little longer than the other ramus, carries a styliform, internal appendix, 0,62 mm. long, 0,16 mm. thick, nearly 4-times as long as thick, with an obtuse extremity, that is provided with long plain setae, measuring 2,4 mm. The appendages of the 3 following somites are biramous and resemble those of *Scyll. Haanii* Berthold.

Eggs very numerous, globular and small, presenting only a diameter of 0,36 mm.

The other egg-bearing female from Stat. 33 is 28 mm. long. The young male from Stat. 64 measures 23 mm., outer antennae included. In the proximal (outer) squame of the right external antenna the two posterior teeth on the outer border are not developed. The female measures only 14 mm., outer antennae included. The two branches of the pleopods of the 2nd somite are still narrow, not broadened and their stylamblys is rudimentary; the slender ramus of the following appendages is also rudimentary. The two males from Stat. 164 show another coloration than the preceding specimens, but they belong certainly to the same species. In both the 2nd tooth of the distal squame of the left antenna is doubled, so that there are 8 teeth instead of 7.

One of the two females with eggs from Stat. 313 is 27 mm. long, outer antennae included. The proximal (outer) squame appears a little longer than usually and the distal squame of both

antennae is apparently regenerated, the lobes or teeth being less in number and somewhat otherwise shaped. In the other female with eggs that measures 31 mm., the distal squame carries also only four teeth, besides a quite small tooth on the inner margin, and the external one of these teeth appears much broader than the rest. In two young specimens, male and female, the posterior tooth, in the middle line of the carapace, appears somewhat higher than usually.

In this species occurs, as has already been described, a double row of five squamiform prominences between the posterior median tooth that overhangs the cervical groove and the intestinal region. In PFEFFER's type specimen from unknown locality each of these five prominences is covered at its base by a smaller one, not, however, in the other type. In the greater part of the "Siboga"-specimens, as e. g. in those from Stat. 33, these secondary prominences are wanting, but they are present in the larger female from Stat. 313 and prove thus to be individual.

In most specimens, as e. g. in those from Stat. 33, the ground-colour is more or less dark-gray, the squamiform prominences on the abdominal somites being whitish or sometimes of a pale bluish tinge; the carinae on the 2nd and 3rd somites are often blood-red coloured posteriorly. The lobes and teeth of the distal squame are of a dark slate colour and their margin is white. Sometimes there is a pale-red fleck on the cardiac region. The two males from Stat. 164 present a different colour. The ground-colour is of a pale yellowish gray, but the carapace is traversed by a broad brown band that runs across the cardiac region to the lateral margins; in the larger specimen it extends farther backward than in the younger one and in both it reaches laterally nearly to the orbits. The 4 posterior pairs of thoracic legs are marked, in all the specimens, with four slate-coloured rings, four on each leg, precisely as in *Scyll. sordidus* (Stimps.).

It appears to me very probable that *Scyll. Martensii* Pfeffer is identical with *Scyll. rugosus* Latr. (H. MILNE-EDWARDS, Hist. Nat. Crustacés, II, p. 283) from Pondichery. The description, indeed, agrees perfectly well with PFEFFER's type specimens. The question, however, must remain undecided, because, as Prof. BOUVIER of Paris informs me, the type specimen of *Scyll. rugosus* Latr. does no more exist in the Paris Museum, having very probably been destroyed in the war of 1870.

I examined also a specimen from Hongkong, which was referred by PFEFFER (l. c.) to *Scyll. rugosus* Latr. In my opinion this specimen should be referred to *Scyll. tuberculatus* (Sp. Bate), described in the Challenger Report. The 1st tooth of the distal squame of the outer antennae, namely that at the outer angle, is rather broad, truncate, but in the figures of the "Challenger" work it appears narrower than the following. In PFEFFER's specimen the four teeth on the outer margin of the proximal squame are carinate and the antero-lateral angles of the carapace are less prominent, but these are perhaps individual differences.

MILNE-EDWARDS describes *Scyll. rugosus* as "très-voisine" to *Scyll. arctus* (L.): this is the case with *Scyll. Martensii*, but not with *Scyll. tuberculatus*, because in the latter the structure and areolation of the abdomen, that are not described in the "Histoire Naturelle des Crustacés", are quite different from what is observed in *Scyll. Martensii*.

General distribution: Japan, Kagoshima (Ortmann); Mulaku, Kolumadulu, Mahlosmadulu and South Nilandu (Maldives and Laccadives) (Borradaile); Singapore (Nobili); Zanzibar (Nobili).

7. *Scyllarus gibberosus* (de Man). (Pl. III, Fig. 14—14*d*).

Arctus gibberosus J. G. de Man, in: Tijdschr. d. Ned. Dierk. Vereen. (2) Dl. IX, 1905, p. 588.

Stat. 99. June 28/29/30. 6° 7'.5 N., 120° 26' E. Anchorage off North-Ubian. 16—23 m. Lithothamnion-bottom. 1 young male.

Stat. 164. August 20. 1° 42'.5 S., 130° 47'.5 E. 32 m. Bottom: sand, small stones and shells. 1 young male.

Closely related, especially as regards its thoracic legs, to *Scyll. sordidus* (Stimps.).

The whole length of the male from Stat. 164, which was collected together with specimens of *Scyll. Martensii* in the sea between the islands of Salawatti and Misool, from the anterior edge of the outer antennae to the end of the telson measures 21 mm.; the carapace, measured in the middle line and the antennular segment included, is 6,8 mm. long, the abdomen 11 mm. and the distance between the antero-lateral angles of the carapace measures 7 mm. Immediately behind the anterior margin the carapace carries in the middle line a tooth and another, somewhat larger, is situated on the middle of the gastric region; looked at from above, both appear rather obtuse, in a lateral view they appear moderately sharp. Between these two teeth, which occur also in *Scyll. sordidus*, this new species carries, however, still a third, which is wanting in Stimpson's *Scyll. sordidus*: looked at from above this tooth appears broadly rounded anteriorly and also in a lateral view it appears rather obtuse. While one observes in *Scyll. sordidus*, immediately behind the cervical groove, a single strong tooth, situated higher than those before it, *Scyll. gibberosus* carries here a couple of two very small and obtuse teeth, situated closely abreast and on a lower level than the gastric tooth, nearly as in *Scyll. bicuspidatus*. The three teeth in front of the quite distinct, cervical groove are covered with squamiform tubercles; they exist also, in two rows, between the couple of small teeth just described and the transverse furrow that separates the intestinal region from the posterior border; small prominences exist on the sides of the gastric region, somewhat larger ones on those of the cardiac. The squamiform prominences on the intestinal region are larger than those on the posterior border; the notch in the middle of the latter is as shallow as in *Scyll. sordidus*. The lateral carinae resemble those of this species, presenting two teeth on the inner side of the orbits and one just behind the interruption of the cervical groove, but behind the latter the carinae are more obvious, because the large squamiform prominences, with which they are covered, are distinctly carinate. In *Scyll. sordidus* the antero-lateral angles of the carapace reach as far or farther forward than the antennular segment, but in *Scyll. gibberosus* the latter reaches farther forward than the antero-lateral angles. The inner surface of the anterior, orbital part of the lateral carinae is covered with small, squamiform prominences, that are here more distinct than in *Scyll. sordidus*. The lateral margins which present two incisions as in this species, are furnished with squamiform prominences and the hepatic and branchial regions are closely covered with them; they are comparatively fewer in number

and larger than in *Scyll. sordidus*, but, examined under a lens, these prominences prove to be subdivided into smaller ones by little grooves.

As regards the shape of the orbits and their situation just near the lateral border of the carapace, both species resemble one another.

The antennular segment resembles more that of *Scyll. bicuspidatus* than that of *Scyll. sordidus*; it is only twice as broad as long and, while it is notched anteriorly and grooved in the middle line, each half presents in the middle a carinate tooth, that projects beyond the anterior margin.

The 1st abdominal somite resembles much that of *Scyll. sordidus*. The posterior areolated part is almost as large as the smooth anterior, it is hardly longer in the middle as laterally and there are on each side 10 or 11 grooves, that run parallel with the mid-dorsal line; the areolae are somewhat longer than broad and the notch in the middle of the posterior margin is as narrow and as deep as in *Scyll. sordidus*. In STIMPSON's species, however, the posterior sculptured part is shorter in the middle than laterally. The 2nd—5th terga are distinctly carinate in the middle line; the carina of the 2nd somite and the somewhat longer and slightly arcuate carina of the 3rd are obtuse and hardly salient, the sculptured part of the 4th somite, however, appears in the middle line distinctly longer than the 3rd and the obtuse, strongly curved carina of this somite is high and prominent, so that this somite presents a gibbose appearance (Fig. 14*b*), from which character the specific name has been derived. The obtuse carina of the 5th tergum is obvious, but very little prominent and appears nearly straight in a lateral view; the 5th tergum is just as long as the 3rd. The 2nd—5th terga show in the mid-dorsal line a symmetrical, arborescent figure, which is more conspicuous than in *Scyll. sordidus*; as regards the sculpture and the form of the squamiform prominences on the terga and pleura and as regards the shape of the latter, both species agree with one another, but the sculpture is more conspicuous in *Scyll. gibberosus*. The 6th somite and the caudal fan present no differences.

In *Scyll. sordidus*, on the contrary, the 2nd—5th terga can hardly be said to be carinate, the carinae are obtuse, not at all prominent and the sculptured part of the 4th tergum is distinctly shorter than that of the 3rd.

The proximal (outer) squame of the outer antennae (Fig. 14) is 3 mm. long and just as broad, whereas in *Scyll. sordidus* it is distinctly longer than broad. The outer margin carries three flattened teeth, that are not very sharp and gradually decrease in size in distal succession; the apex of the 1st is a little farther distant from the rather obtuse extremity of this joint than from its base and the apex of the 2nd tooth is twice as far distant from that of the 1st than from that of the small 3rd tooth. On the left antenna there is a trace of a very small 4th tooth before the 3rd. The inner edge is armed with five or six teeth, the 1st and the 2nd are a little larger than the following; these teeth are somewhat unequal in size and moderately sharp. The ridge on the middle of the upper surface is little prominent and has an eroded appearance, when examined under the microscope; between this ridge and the teeth of the outer margin are situated about a dozen small tubercles or granules, that are wanting in *Scyll. sordidus*. The anterior margin of the flagellum or distal squame is cut into five

rounded lobes or teeth and two smaller ones, also rather obtuse, are moreover observed on its inner margin; the 1st lobe is a little broader than the three following, that are nearly equal, the 5th is a little less broad and the two teeth on the inner margin are smaller and narrower. The 4th lobe reaches farthest forward. In *Scyll. sordidus* the anterior margin presents only four rounded lobes, besides two on the inner margin, so that *Scyll. gibberosus* has one lobe more.

The sternum (Fig. 14*a*), measured in the middle line, appears to be $4^1/_2$ mm. long; it is $3^3/_4$ mm. broad between the coxae of the 5th legs, the proportion between both measurements being the same as in *Scyll. sordidus*. The sternum, however, is a little more concave; the 1st joint is emarginate anteriorly, but the emargination is not triangular, acute, but semicircular and immediately behind it, the 1st joint presents a triangular concavity, that narrows backward. The sternum is smooth, but the 5th joint carries a rounded tubercle in the middle line.

The thoracic legs resemble closely those of *Scyll. sordidus*, the differences are, no doubt, very slight. The subcylindrical, tapering propodi of the 2nd legs (Fig. 14*c*) are a little slenderer, the compressed propodi of the 3rd pair (Fig. 14*d*) appear, on the contrary, slightly broader and they are faintly grooved near the lower border of their outer surface. The similarity between both species is even so large, that the joints of the four posterior pairs are marked with the same, slate-coloured, dark rings as those of *Scyll. sordidus*.

The abdominal appendages are not yet fully developed. While those of the 1st pair are wanting, the pleopods of the 2nd are biramous, the two rami slender, narrow, of unequal length, the longer almost twice as long, but a little less broad than the other; except two short, plumose setae near the extremity of the longer ramus, these appendages are glabrous. The pleopods of the 3rd—5th somites are very small, biramous, the rami slender, narrow, glabrous, nearly equally broad along their whole length, obtuse, one a little longer than the other: those of the 3rd somite are 0,56 mm. long, the longer branch 0,12 mm. longer than the other.

This specimen is grayish coloured with a pale reddish tinge on the abdomen.

The young male from North-Ubian is somewhat younger and fully agrees with the preceding description.

Scyll. gibberosus chiefly differs from *Scyll. arctus* (L.) by the following characters. The three teeth in the middle line of the carapace before the cervical groove are in *Scyll. arctus* all quite sharp, especially the middle one. The squamiform prominences are a little smaller and those of the lateral carinae are not carinate. The antero-lateral angles are sharper and more prominent. The sculptured part of the 4th abdominal tergum, though not shorter than that of the 3rd, is not at all prominent, not higher than the latter. The proximal (outer) squame is distinctly longer than broad and its distal end is sharper. The emargination of the anterior extremity of the sternum has another form. The propodi and dactyli of the 2nd legs are less slender.

Parribacus Dana.

This genus, established by Dana in 1852, seems to be represented only by one species and one variety: *Parribacus ursus major* (Herbst) and *Parrib. ursus major* (Herbst) var. *carinata* Pfeffer. *Parrib. papyraceus*, indeed, a species described by Miss Rathbun in 1906 after two male specimens from the Hawaiian Islands, has turned out to be a juvenile stage of *Parrib. ursus major*, when a young specimen of the latter species from Sagami-bay, Japan, which presented all the characters of *Parrib. papyraceus*, had been compared by Dr. Balss with an adult specimen from the same locality.

As regards *Parrib. Parrae* (H. M.-Edw.) from the Antilles, it has not yet been established with certainty, whether this form should be considered as identical with *Parrib. ursus major* or not (confer: R. Gibbes, in: Proc. Americ. Assoc. advanc. of Science, 1850, p. 193 and E. von Martens, in: Archiv f. Naturg. XXXVIII, 1872, p. 124).

Parrib. ursus major (Herbst), which was probably already known to Rumphius, is distributed not only throughout the whole Indopacific, though it has not yet been observed in the Red Sea and on the east coast of Africa, as far as I know, but it occurs also in the Caribbean Sea and on the coast of Brazil. The variety carinatus was captured in the Pacific.

Parrib. ursus major (Herbst) was taken at a depth of 150 m. in Sagami-bay, Japan, but occurs also in shallower water and even at the surface.

1. *Parribacus ursus major* (Herbst).

Cancer (Astacus) ursus major J. F. W. Herbst, Krabben und Krebse, Bd. II, 1793, p. 82, Tab. XXX, Fig. 2.
Scyllarus antarcticus N. T. Lund, Om Slaegten *Scyllarus*, in: Skrivt. naturh. Selsk. Kjöbenhavn, Bd. 2, Heft 2, 1793, p. 22.
Ibacus antarcticus H. Milne-Edwards, Hist. Nat. Crustacés, II, 1837, p. 287.
Parribacus antarcticus J. D. Dana, U. S. Expl. Exped. Crust. I, p. 517, Pl. XXXII, fig. 6, 1852 (given by error, *Ibacus antarcticus*, with the description).
Paribaccus antarcticus H. Balss, Ostasiatische Decapoden II. Die Natantia und Reptantia, München 1914, p. 81.
Synon.: *Parribacus papyraceus* M. J. Rathbun, The Brachyura and Macrura of the Hawaiian Islands, Wash. 1906, p. 897, Pl. XVIII, fig. 5.

Stat. 131. July 24/25. Anchorage off Beo, Karakelang-islands. 13 m. Bottom mud and sand. 1 male.

This specimen is not yet adult, measuring 125 mm. from the distal end of the external antennae to the extremity of the telson; the carapace is 41 mm. long, measured in the middle line, without the rostrum, and 46 mm., the rostrum included, while the distance between the antero-lateral angles of the carapace measures 57 mm.

The outer margin of the 4th joint of the external antennae is armed on the right with 7 teeth, on the left with 6, but the spine at the anterior extremity of the left joint carries a small secondary spine on the middle of its outer margin. This fact was already observed by de Haan in japanese specimens of this species. Conformable to this author also the terminal

squame terminates in this specimen in 8 spines, one of which is situated on the inner border; MILNE-EDWARDS speaks only of 7 teeth.

Quite recently BALSS has pointed out that *Parrib. papyraceus* Rathb. from the Hawaiian Islands must be considered as a juvenile stage of LUND's species, as Miss RATHBUN herself has already suggested.

In my paper on the Crustacea, described and figured by RUMPHIUS (in: RUMPHIUS Gedenkboek, 1702—1902. Uitgegeven door het Koloniaal Museum te Haarlem. 15 Juni 1902, p. 101), I have called to memory that DE HAAN has first pointed out that the figure C on Plate II of RUMPHIUS's work does not agree with this species.

General distribution: Probably the whole Indopacific, this species having been observed in Japan, at the Hawaiian Islands, Carysfort-Island, Tahiti, the Indian Archipelago, Australia, Mauritius and Reunion, though not yet in the Red Sea, as far as I am aware. *Parrib. ursus major* occurs, however, also in the Caribbean Sea and on the coast of Brazil.

Family NEPHROPSIDAE.

The six species, obtained by this expedition, belong to the genera *Nephrops* Leach and *Nephropsis* W.-Mas.: two of the three species of *Nephrops* proved to be new to science. Of the nine genera, included at present in this family, *Eutrichocheles* W.-Mas., *Homarus* H. M.-Edw., *Homoriscus* M. J. Rathbun, *Eunephrops* S. I. Smith and *Thaumastocheles* W.-Mas. have not been observed in the Indian Archipelago. The genus *Homarus* H. M.-Edw. is represented by three species, the european and the american Lobster and by a third which seems to be confined to South Africa. *Eunephrops* S. I. Smith and *Homoriscus* M. J. Rathbun are only known from the West-Indies, of the two species of *Thaumastocheles* one likewise inhabits the Caribbean Sea, the other the coasts of Japan. Of the only species of *Eutrichocheles*, finally, but two specimens have hitherto been taken: the specimen on which this genus was founded by Wood-Mason, was probably captured in the Bay of Bengal or on the coasts of India, the other, described by Herbst in 1794, should have been taken in the East-Indies, so that this extremely rare form will probably once prove to occur also in the Indian Archipelago. Of the four or probably only three species of the genus *Enoplometopus* A. M.-Edw. two occur in the Indian Archipelago. Of the two species of *Phoberus* A. M.-Edw., *Phoberus tenuimanus* Sp. Bate, which is regarded by Col. Alcock as a variety of the West-indian *Phob. caecus*, was taken by the "Challenger" in the Arafura Sea. Besides the three species of *Nephrops*, obtained by the "Siboga", still a fourth will probably prove to occur in some parts of the Archipelago, viz. *Nephrops Thomsoni* Sp. Bate, a species recorded from the Philippine Islands and from Formosa. Of the genus *Nephropsis*, finally, three species are now known to inhabit the Indian Archipelago, a fourth, *N. Carpenteri* W.-Mas., does no doubt also occur there, this species being known both from the Bay of Bengal and Japan.

LIST OF ALL THE SPECIES OF NEPHROPSIDAE, KNOWN AT PRESENT, OCTOBER 1915 [1]).

SPECIES	HABITAT
Enoplometopus A. M.-Edw. 1862.	
antillensis Lütken 1864	West-Indies.
dentatus Miers 1880 [2])	St. Helena.
longirostris de Man 1888	Amboina.
occidentalis (Randall) 1839	Réunion; Mauritius; Amboina; Hawaiian Islands.
Eutrichocheles W.-Mas. 1876.	
modestus (Herbst) 1794	East-Indies.
Homarus H. M.-Edw. 1837.	
americanus H. M.-Edw. 1837	From Labrador to Delaware.
capensis (Herbst) 1792	Table Bay; Algoa Bay.
gammarus (Linné) 1758	West coast of Europe from Tromsö to Portugal; Mediterranean.
Homoriscus M. J. Rathbun 1901.	
portoricensis M. J. Rathbun 1901	Porto Rico.
Nephrops Leach 1815.	
**andamanicus* W.-Mas. 1892	Andaman Sea; Bali Sea.
***arafurensis** de Man 1905	Kei Islands.
Challengeri Balss 1914	Between Australia and New Zealand.
japonicus Tapp.-Can. 1873	Japan.
norwegicus (Linné) 1758	South coast of Iceland; West coast of Europe; Mediterranean.
rubellus Moreira 1903	Coast of Brazil.
***Sibogae** de Man 1916	Off the Kei Islands.
**Thomsoni* Sp. Bate 1888	Philippine Islands; Formosa.
Eunephrops S. I. Smith 1885.	
Bairdii S. J. Smith 1885	Gulf of Darien.

1) The species collected by the "Siboga" are marked with an asterisk and the new species are printed in a more heavy type.

2) This species, described by MIERS in "Annals and Mag. Nat. Hist. for March 1880, p. 41, Pl. XV, Fig. 7", is probably identical with *Enopl. antillensis* Lütken. LÜTKEN's description in: "Vidensk. Meddelelser fra den naturh. Forening i Kjöbenhavn for Aaret 1864. Kjöbenhavn, 1865, p. 265—268", has unfortunately not been recorded neither in the "Zoological Record" for 1864, nor in that for the following years. Owing to this omission MIERS has apparently been ignorant of LÜTKEN's paper, when describing his *Enopl. dentatus*, for he only compares this species with *Enopl. pictus* A. M.-Edw. = *occidentalis* (Randall).

SPECIES	HABITAT
Phoberus A. M.-Edw. 1881.	
caecus A. M.-Edw. 1881	Antilles.
tenuimanus Sp. Bate 1888	South of New Guinea; Arabian Sea.
Nephropsis W.-Mas. 1873.	
Agassizii A. M.-Edw. 1880	Coast of Florida; off the Bermudas; off the south coast of New England.
atlantica Norman 1882	Off the north of Scotland; off the south-west coast of Ireland; Faeroe Channel; Bay of Biscay; South Africa; Arabian Sea.
Carpenteri W.-Mas. 1885	Bay of Bengal; Yodomi, Japan.
ensirostris Alcock 1901	Arabian Sea; Bay of Bengal; Andaman Sea; Bali Sea.
malhaensis Borr. 1910	Off Saya de Malha.
occidentalis Faxon 1893	Off Acapulco, Mexico.
Stewarti W.-Mas. 1873	Andaman Sea; Bay of Bengal; Arabian Sea; off the Kei Islands.
Suhmi Sp. Bate 1888	Aru Islands; Strait of Makassar; Arabian Sea.
Thaumastocheles W.-Mas. 1874.	
japonicus Calman 1913	Sagami Bay, Japan.
zaleucus (Willemoes-Suhm) 1873	Sombrero Island, West-Indies.

Nephrops Leach.

The genus *Nephrops* comprises at present 8 species, 6 of which are inhabitants of the Indopacific region. *Nephr. norwegicus* (Linné), the Norway Lobster, is found on all the Scandinavian coast, on that of Scotland, Holland, Belgium and France, all round the Irish coasts, like also on the South coast of England, in the Mediterranean and Adriatic and finally on the coast of Morocco. It has, however, not yet been recorded from the Hebrides, Shetlands or Faeroes, but the Norway Lobster is so plentiful off the south coast of Iceland, that it forms there the chief food of the cod (C. M. Selbie). *Nephr. rubellus* Moreira is known from the coast of Brazil between 43° and 43° 30′ W. of Greenwich; this species presents, in distinction from *Nephr. norwegicus*, the characters common to the indopacific species and appears much related to *Nephr. japonicus* Tapp. Can. This species was described in 1903 by Carlos Moreira in a paper, entitled: "Estudos preliminares. Crustaceos. Rio de Janeiro, 1903 (Sociedade Nacional de Agricultura. Campanhas de Pesca do hiate "Annie", dos Srs. Bandeira and Bravo)", a paper that has not been recorded in the "Zoological Record" neither for this nor for the following years.

Nephr. japonicus Tapp. Can., described in 1873, is confined to the seas of Japan and was observed in the Bays of Tokyo and Sagami. *Nephr. Thomsoni* Sp. Bate is known from Formosa and from the Philippines, *Nephr. Challengeri* Balss from the sea between Australia and New Zealand and *Nephr. andamanicus* W.-Mas. from the Andaman Sea and from the

Bali Sea, where a well-preserved, almost adult, male specimen was captured by the "Siboga". Two new species were discovered by this expedition, firstly *Nephr. Sibogae*, a form closely allied to *Nephr. Thomsoni* and *Nephr. Challengeri* and nine well-preserved and adult specimens of which were taken off the Kei-islands, and finally *Nephr. arafurensis* from the same Station.

The indopacific species and *Nephr. rubellus* from the coast of Brazil have some characters in common, which are wanting in *Nephr. norwegicus*, the european representative of this genus. Posterior to the cervical groove the carapace is provided in the former with 7, in *Nephr. norwegicus* only with 5 longitudinal ridges; in the former the margins of the rostrum are continued backwards to near the cervical groove, as a pair of strong outstanding carinae, formed by three or more trenchant spines which decrease in size from before backwards, but these outstanding carinae are wanting in the Norway Lobster; in the latter the antennal spine is very small, in the other species, however, one observes a great trenchant, wing-like spine, the scaphocerite, finally, narrow and lanceolate in the Norway Lobster, appears broader and often almost circular in the other species.

Nephr. norwegicus occurs, according to C. M. Selbie (The Decapoda Reptantia of the coasts of Ireland, London, 1914, p. 48) "in greatest numbers in depths of 10—40 fathoms in the Irish Sea, on the west coast it also extends into deep water down to more than 300 fathoms". The greatest depth is recorded by Senna, a specimen having been taken west of Sicily, at 416—450 fathoms. *Nephr. rubellus* occurs at depths between 33 and 55 fathoms. The indopacific species are also found in rather deep water, so e. g. *Nephr. Thomsoni* at 100 fathoms, *Nephr. andamanicus* at depths varying between 185 and 405 and *Nephr. Sibogae* at 172 fathoms.

Key to the indopacific species of the genus *Nephrops* Leach.

a_1 Carapace smooth or finely granulate and pubescent.

b_1 Terga of 2nd—5th abdominal somites appearing conspicuously sculptured to the naked eye. First pair of legs with the longitudinal ridges on the chelae very prominent and spinulose.

c_1 Largest spines at base of rostrum directed inward, with their upper border distinctly curved downward; posterior to these spines 4 or 5 pairs of smaller spines. Two pairs of spines on 6th somite of abdomen . . . . . *japonicus* Tapp. Can.

(C. Tapparone Canefri, Intorno ad una nuova specie di *Nephrops*, genere di Crostacei decapodi Macruri, Torino, 1873, in: Mem. R. Accad. Sc. Torino, Ser. II, T. XXVIII).

c_2 Largest spines at base of rostrum directed obliquely upward and slightly outward, with the upper margin straight; posterior to these spines only 2 pairs of smaller ones. No two pairs of spines on 6th somite of abdomen . . . . . *andamanicus* W.-Mas.

b_2 Terga of 2nd—5th abdominal somites appearing to the naked eye almost smooth. First pair of legs with the longitudinal ridges on the chelae not very prominent, more or less granulate.

c_1 Cardiac region traversed by a spinulose longitudinal ridge.

d_1 Terga of 2nd—5th abdominal somites marked with a single, deep, transverse groove which is broadly interrupted in the middle. Posterior margin of hepatic groove spinulose . . *Thomsoni* Sp. Bate

(C. Spence Bate, Report on the Challenger Macrura, 1888, p. 185, Pl. XXV, fig. 1 and XXVI, fig. 1—9).

d_2 Terga of 2nd—5th abdominal somites presenting at each side only an inconspicuous, transverse row of shallow puncta. Posterior margin of hepatic groove unarmed . . . . . *Sibogae* n. sp.

c_2 Cardiac region smooth, not traversed by a spinulose, longitudinal ridge.

Terga of 2nd—5th abdominal somites smooth, without a deep transverse groove . . . . . *Challengeri* Balss

(H. Balss, Ostasiatische Decapoden, II. Die Natantia und Reptantia. München 1914, p. 84).

a_2 Carapace distinctly spinulose.

Terga of 2nd—5th abdominal somites conspicuously sculptured, though otherwise than in *Nephr. japonicus* and *andamanicus*. Largest spines at base of rostrum, like in *Nephr. andamanicus*, with 4 pairs of smaller spines behind them. . . . . *arafurensis* de Man.

1. *Nephrops andamanicus* W.-Mas. (Pl. III, Fig. 15).

Nephrops andamanicus J. Wood-Mason, Illustrations Zool. "Investigator", Part I, Crustacea, Pl. IV, 1892 and Part II, Pl. VIII, Fig. 5, 1894.
Nephrops andamanicus A. Alcock, in: Annals Mag. Nat. Hist. Ser. 6. Vol. XIII, March 1894, p. 226.
Nephrops andamanicus A. Ortmann, in: Zoolog. Jahrb. Abth. f. Syst. Bd. X, 1897, p. 273.
Nephrops thomsoni var. *andamanica* A. Alcock, A descr. Catal. Indian Deep-Sea Crustacea, Calcutta 1901, p. 153.

Stat. 12. March 14. 7° 15′ S., 115° 15′.6 E. 289 m. Bottom: mud and broken shells. 1 male, bearing on the right side of the carapace a Bopyrid.

This species, first recognized and accurately figured by Wood-Mason, has afterwards been described by Col. Alcock in his "Descriptive Catalogue" as a variety of *Nephrops Thomsoni* Sp. Bate: this fact, in my opinion, can only be explained by supposing that the author of this work had no occasion to study specimens of the species collected by the "Challenger": already in Alcock's first description of 1894 the abdominal somites of *Nephr. andamanicus* were described as corresponding to all points with those of *Nephr. Thomsoni* Sp. Bate, their terga being sculptured in the same way. The differences between both species are, however, so important that it is quite impossible to consider Wood-Mason's species as a variety of the other.

The male, captured by the "Siboga", is 144 mm. long, while, according to Alcock, this species should attain a length of 174 mm.; the carapace without the rostrum is 43 mm.

long, the rostrum included, 67 mm. It fully agrees with the cited description and figures. In Fig. 5 of Plate VIII of the "Illustrations" one observes 4 spines between the frontal margin and the hepatic groove, on Plate IV only 3; the 4th spine wanting on Plate IV is that which in the other figure occurs just below a line that unites the spine at the upper end of the hepatic sulcus with the foremost spine just behind the frontal margin. The male from the Bali Sea carries on the left side 3 spines exactly as on Plate IV, but on the right a 4th spine occurs immediately behind the foremost one, a spine of the same size: this 4th spine seems to be the same which in Fig. 5 of Plate VIII is seen somewhat posterior to the foremost spine, in the same horizontal line, just in front of the hepatic groove. Behind the cervical groove the animal presents, at each side of the median carina, three ridges, like in *Nephr. Thomsoni*, *Nephr. Challengeri* and *Nephr. Sibogae*: it is, of course, an individual abnormality, that the 2nd ridge, both on the right and on the left side, does not end anteriorly in a spinule.

The legs of the 1st pair are equal, 109 mm. long, and comparatively somewhat shorter with regard to the whole length than in the adult male figured on Plate IV, a difference probably owing to the difference of age.

Nephr. andamanicus now may easily be distinguished from *Nephr. Thomsoni* Sp. Bate, *Nephr. Challengeri* Balss and the new *Nephr. Sibogae* by the more prominent and more conspicuously denticulated ridges on the chelae of the anterior legs and by the more strongly sculptured abdomen. In *Nephr. Thomsoni* indeed (H. Balss, Ostasiatische Decapoden II, München 1914, Pl. I, Fig. 1) the terga of the 2nd—5th abdominal somites are marked only with a single, though deep, transverse groove, which is broadly interrupted in the middle, while in the two other species the abdomen appears smooth and shining to the naked eye: in *Nephr. Challengeri* the somites of the pleon are described by Spence Bate as "smooth and free from the transverse depressed line that is conspicuous" in *Nephr. Thomsoni*, in *Nephr. Sibogae*, finally, one observes (Pl. IV, fig. 18) only a transverse row of shallow impressed puncta, also broadly interrupted in the middle. There are, however, still other differences. In *Nephr. Thomsoni* four spinules are observed on the posterior margin of the hepatic groove between the hepatic spine and the spine at the upper end of this groove (C. Spence Bate, Report Challenger Macrura, Pl. XXVI, fig. 1), in *Nephr. andamanicus*, *Nephr. Sibogae* and probably also in *Nephr. Challengeri* these 4 or 5 spinules are wanting at all. The flattened ridge along the posterior margin of the carapace appears in *Nephr. andamanicus* less broad in the middle than in the three other species. The scaphocerite of the outer antennae has about the same form in three species, being regularly rounded on the inner margin and hardly longer than broad, but in *Nephr. Challengeri* it appears distinctly longer. In the male of *Nephr. andamanicus* from the Bali Sea the antennal scale is $9^1/_4$ mm. long and $7^1/_4$ mm. broad; in a male of the same size of *Nephr. Sibogae* from the Kei-islands the scaphocerite is $9^1/_2$ mm. long and 8 mm. broad. The rostrum of *Nephr. andamanicus* appears a little broader between the eyes than in *Nephr. Sibogae* and the two sub-dorsal ridges on the gastric region are also a little farther distant from one another than in the new species that was taken near the Kei-islands. The cervical groove is situated a little more forward, so that that part of the carapace which is lying behind the groove, appears a little longer in proportion

to the length of the gastric region than in *Nephr. Sibogae*. In three of the four species the cardiac region is traversed in the middle by a denticulated ridge, but in *Nephr. Challengeri* this ridge is wanting completely, the cardiac region being here smooth and unarmed.

Nephr. japonicus Tapp. Can. is also a different species, which has pretty well been figured in: Memorie della R. Accademia d. Scienze di Torino, Ser. II, T. XXVIII, 1873, but the sculpture of the abdominal terga appears on that plate, at least in my copy of this paper, rather indistinct. Prof. Döderlein of Strasburg has been so kind to send me for examination 2 of the 9 specimens of *Nephr. japonicus* from the Bay of Tokyo, mentioned by Dr. Ortmann in: Zool. Jahrb. Abt. f. Syst. T. VI, 1891, p. 6. These specimens are an adult male long 212 mm. and a somewhat younger female long 185 mm. Their examination proved in the first place that the sculpture of the abdomen is exactly the same in the male and in the female, so that the dimorphism, which was supposed by Ortmann (l. c. 1897) to occur in this species, does in fact not exist. Dr. H. Balss, by whom several adult male and female specimens of *Nephr. japonicus* were examined (l. c. p. 84), was also unable to find a dimorphism with regard to the sculpture of the abdomen. As was already remarked above, the sculpture of the abdomen has not been clearly figured on Tapparone Canefri's plate, but in Ortmann's paper of 1897 (Pl. 17, fig. 1) a lateral view of the abdomen of a female was published, with which the two cotypes of *Nephr. japonicus*, that are lying before me, fully agree. When this figure is now compared with the quoted figures of *Nephr. andamanicus* and with our male from the Bali Sea, the sculpture of *Nephr. japonicus* appears more complicate: the raised band along the posterior margin and the raised submedian parts of the upper surface of the terga are in *Nephr. japonicus* grooved and subdivided, in *Nephr. andamanicus* not.

In his quoted work of 1914 Balss has figured on Plate I, fig. 2 an adult male of *Nephr. japonicus* from Japan. Now I must call attention to the remarkable fact that this figure closely resembles *Nephr. andamanicus*, except only as regards the large spines at the base of the rostrum. In this figure indeed the abdominal terga do not show the subdivision of the posterior and submedian raised parts of the upper surface, described above: the sculpture therefore fully agrees with that of our male from the Bali Sea, referred to *Nephr. andamanicus* and with the figures of this species in the "Illustrat. Zool. Investigator".

In *Nephr. japonicus* the 6th somite of the abdomen carries in the middle line two pairs of acute spines, placed behind one another; these spines are clearly visible in Tapparone Canefri's figure, like also in a lateral view in Ortmann's figure of 1897, and they are also distinctly developed in the two cotypes from Strasburg. In the figure of Balss, however, these spines seem to be wanting also! These two differences from the typical *japonicus*, shown by this figure, are for the present for me inexplicable. The rostrum indeed looks like that of the typical *japonicus*, the large spines at the base reach the anterior margin of the eyes and are clearly curved inward and downward like in *japonicus*, while in the male of *Nephr. andamanicus* from the Bali Sea they extend only to the middle of the eyes and are straight and turned outward; the lateral ridges, posterior to the rostrum, seem to carry, however, in the figure of Balss, only 3 spines, not 5 or 6 as in *japonicus*. The anterior pair of legs also

agree with those of the male from the Bali Sea, though I must remark that these legs do not much differ in the two species. Other differences between *Nephr. japonicus* and *Nephr. andamanicus* are the following. The rostrum of the japanese species is probably a little longer, especially in the female, a difference already mentioned by ORTMANN (l. c.). In the adult male of *Nephr. japonicus*, lying before me, the rostrum appears to be $37^1/_2$ mm. long until the frontal margin, while the distance between this margin and the posterior border, i. e. the length of the carapace, measures 60 mm.; in the male of *Nephr. andamanicus* from the Bali Sea these numbers are respectively 24 mm. and 43 mm. In the female of *Nephr. japonicus* they are 34 mm. and 51 mm., the rostrum appears here comparatively longer and reaches also a little farther forward. The lateral outstanding carinae on the gastric region are armed, on each side, in *Nephr. andamanicus* only with three spines (Pl. III, fig. 15); the foremost is much larger than the two following and the third is a little smaller than the 2nd, while the more slender spine on the lateral margins of the rostrum has a length intermediate between that of the 2nd and 3rd spine of the lateral carinae. The three spines are all slightly directed outward. The two carinae run parallel, though we must observe that the distance ($9^1/_2$ mm.) between the spines of the 2nd pair is a little larger than the distance (8 mm.) between those of the 3rd and even a little more than the distance (9 mm.) between the spines of the 1st pair.

In *Nephr. japonicus* on the contrary the lateral carinae on the gastric region carry on each side five or six spines, that also decrease in length backward. In this species also the foremost spine is much larger than the following, but it has another form. In *Nephr. andamanicus* this spine is directed obliquely upward and slightly outward, the upper margin is straight and the spine reaches hardly beyond the middle of the eyes; in *Nephr. japonicus*, however, the spines of the foremost pair reach the distal end of the eye-peduncles and extend to the base of the lateral spines of the rostrum, they are much slenderer, more acuminate and distinctly directed inward and downward, while their upper border is regularly curved.

Though the legs of the 1st pair show nearly the same form and characters in both species, they appear, however, still more spinulose in *Nephr. japonicus*.

General distribution: Andaman Sea.

2. *Nephrops Sibogae* n. sp. (Pl. IV, Fig. 18—18*d*).

Stat. 254. Dec. 10. 5° 40′ S., 132° 26′ E. 310 m. Bottom fine, grey mud. 5 males and 4 females, 2 of which are ova-bearing.

It was Dr. H. BALSS of Munich who in 1914 has first pointed out that the male and the females of *Nephr. Thomsoni*, described by SPENCE BATE in his work on the "Challenger" Macrura, of which the male was taken off Tablas Island, while the two female specimens had been captured between Australia and New Zealand, in fact belong to two different species, so that for the latter the name of *Nephr. Challengeri* was proposed by him (H. BALSS, Ostasiatische Decapoden II, München, 1914, p. 84). The characters by which the new species, discovered by the "Siboga", differs from *Nephr. Thomsoni* and *Nephr. Challengeri*, are intermediate

between those of these two species and it is quite remarkable that the locality where *Nephr. Sibogae* has been taken, is situated between the Philippine Islands and New Zealand. Nevertheless, in my opinion, the validity of *Nephr. Sibogae* cannot be called in question.

The largest male is 184 mm. long from tip of rostrum to the end of the telson, the largest female 175 mm., while the two egg-laden females measure 128 mm. and 135 mm. In the largest male the rostrum (Pl. IV, fig. 18) reaches as far forward as the antennal peduncle, but the distal extremity, beyond the tooth of the lower margin, is apparently regenerated, so that its shortness is no doubt abnormal: in all the other specimens the rostrum slightly projects beyond that peduncle. The rostrum presents the same form and the same armature as in *Nephr. Thomsoni*; the proximal half (Pl. IV, fig. 18*d*) is slightly declivous, the distal half obliquely directed upward, so that the acute tip is situated in a line with the upper margin of the cephalothorax or slightly above it. Just in the middle the lateral margins are armed with a small spine, which is directed obliquely forward; while the posterior half of the upper surface is concave, the distal upturned half appears distinctly carinate, the carina gradually arising just in front of the lateral spines. The carinate, lower margin of the rostrum is armed with an acute tooth a little beyond the lateral spines and is situated a little farther distant from the tip of the rostrum than from the latter; the three spines are of the same size. Like in *Nephr. Thomsoni* and *Nephr. Challengeri*, the lateral margins of the rostrum are continued into two parallel ridges that reach backward to near the cervical groove, but, otherwise than in these two species, in all our specimens of *Nephr. Sibogae* the two ridges are armed with four spines and not with three. The two spines of the foremost pair are strong and very slightly directed outward, the three posterior pairs which are considerably smaller, gradually decrease in size, so that the spines of the penultimate pair are of the same size as the lateral spines of the rostrum and those of the last pair still smaller. Just in front of the penultimate pair of spines one observes, like in *Nephr. Thomsoni* and like probably also in *Nephr. Challengeri*, a small tubercle in the mid-dorsal line of the carapace, from which tubercle a low and obtuse carina runs forward to the rostrum and backward to near the cervical groove; that part which is situated posterior to the tubercle, is flattened and slightly broader than that which runs in front of it. On each side of this sometimes rather inconspicuous crest and contiguous to it, one observes, in the middle between the two large spines of the foremost pair, a very small, low and rounded tubercle or elevation; these two small tubercles are often inconspicuous. The flattened and compressed antennal tooth is large and acute like in *Nephr. Thomsoni*; the anterior part of its outer margin is directed straight forward, or slightly outward or slightly inward and posteriorly it gradually curves inward towards the hepatic groove. On a somewhat lower level than the antennal spine one observes, immediately behind the hepatic groove, a small acute spine, like in the two other species; this spine has about the same size as the lateral spines of the rostrum. The hepatic groove is quite distinct; it is directed obliquely upward, more or less S-like curved, towards the 4th or last pair of post-rostral spines, but it reaches only to just beyond the middle of the distance between the hepatic spine and the post-rostral ridge. At the upper end of the groove there is a very small spine, much smaller than the hepatic spine and about of the same size as the 4th pair of post-rostral spines; between this small spine and the hepatic spine in

Nephr. Thomsoni four other spinules stand on the posterior margin of the hepatic sulcus (C. Spence Bate, l. c. p. 186, Pl. XXVI, fig. 1), in *Nephr. Sibogae*, however, these four spinules are wanting altogether, the posterior margin presenting even no trace of them. Unfortunately Spence Bate, when indicating (l. c. p. 191) the differences between the female specimens and the male, collected by the "Challenger", makes no mention of these four spinules, so that it remains uncertain whether they exist also in *Nephr. Challengeri* or not.

Between the small spine at the upper end of the hepatic groove and the frontal margin there are usually, like in the "Challenger" female (*Nephr. Challengeri*), three small spines; the foremost one, just behind the orbital margin, is situated a little nearer to the antennal spine than to the large first post-rostral spine and is very small, as small as the 4th post-rostral spine; the 2nd, which is still smaller than the foremost one, is placed one and a half as far distant from the antennal spine as from the post-rostral ridge, the 3rd spine, finally, a little larger than the 1st or foremost, is situated, in a line uniting the 2nd spinule with that at the upper end of the hepatic groove, about twice as far distant from this spine as from the 2nd spinule. Sometimes the 2nd spinule, the smallest of the three, is not developed at all: in one male and in one female it is wanting on each side of the carapace, in two males and in one female on one side, either the right or the left.

Cervical groove deep and hairy. The cardiac and branchial regions fully agree with those of *Nephr. Thomsoni* and therefore differ from those of *Nephr. Challengeri*. The cardiac region is traversed in the middle line by a prominent ridge; at the anterior end of this ridge there is a pair of anteriorly-directed spines, that have the same size as the penultimate pair of post-rostral spines and, posterior to these spines, the ridge carries on each side 6 or 7 spinules, in pairs, usually sharp, sometimes, however, partly worn off, though never wanting altogether. On each side of the median ridge the carapace is traversed by three obtuse and little prominent carinae, arranged and running like in *Nephr. Thomsoni* and also defined anteriorly by a small spinule. In the largest male and in a very large female there are two small spinules instead of one at the anterior extremity of the left submedian carina, abnormal of course. The lateral or inferior carina, which, beginning near the postero-lateral angle of the carapace, gradually diverges from the lower margin, is a little closer and a little more coarsely granulated than the surrounding parts of the upper surface, but this is not the case with the other carinae. The carapace appears almost smooth to the naked eye, but, when examined under a lens, one observes a fine granulation, especially on the branchial regions, while the cardiac region is marked moreover with transverse rugosities and posteriorly the median ridge is even united with the submedian carinae by two low transverse elevations on each side. The carapace presents also a fine pubescence. The cardiac and branchial regions are, like in *Nephr. Thomsoni*, separated by a deep groove from the broad, flattened and finely punctate, though not granulate band that borders the posterior margin of the carapace and that is traversed by the median cardiac ridge.

As regards the general shape of the abdomen (Pl. IV, fig. 18 and 18*a*) *Nephr. Sibogae* resembles the two species collected by the "Challenger". In all the specimens, however, taken by the "Siboga" the 2nd—5th terga appear smooth and shining to the naked eye; the

transverse groove on each side of the terga, which in *Nephr. Thomsoni* is described as deep, in *Nephr. Sibogae* is only represented by a narrow impressed line, quite shallow and usually only consisting of a transverse row of shallow impressed puncta: on the 5th tergum this transverse row of puncta is even very inconspicuous. In this character *Nephr. Sibogae* therefore apparently agrees with *Nephr. Challengeri*, while it differs from *Nephr. Thomsoni* by the deep sulcus wanting altogether. The abdominal terga are finely punctate, though the puncta are of different size. The pleura of the 2nd—5th somites also apparently resemble those of *Nephr. Challengeri*; when Fig. 1 of Plate XXVI is indeed accurate, the lower extremity of the pleura of the 2nd somite should, in *Nephr. Thomsoni*, be more elongate than in our new species, but this figure may perhaps be inaccurate, for in Fig. 1 of Plate XXV the pleura show the same form as in *Nephr. Sibogae*. Like in the two species collected by the "Challenger" the 6th somite carries a spinule in the middle of its posterior margin, while the lateral ridge, that separates the tergum from the pleura, appears finely denticulate on its anterior half externally and armed with a small spine near the centre. A 4th spinule, not found in the two other species, occurs in the midline of the somite near the anterior fourth part and these four spinules are about of the same size; a trace of a 5th, often wanting at all, is observed also in the midline just in front of the spinule on the posterior margin and, midway between this spinule and that which is situated at the anterior fourth, one observes, at either side of the midline and close to it, also the trace of a rudimentary spinule. The telson which is quadrate, just as wide as long, and the uropods resemble those of *Nephr. Challengeri*, but the submedian elevated parts of the upper surface of the telson bear often 3 or 4 small spinules of unequal size, posterior to the anterior pair of spines.

In the largest specimen, the male long 184 mm., the internal antennae, measured from the frontal margin of the carapace, prove to be 105 mm. long, the inner flagellum measuring 78 mm., the other 56 mm.; they are almost twice as long as the carapace without the rostrum (55 mm.), i. e. about one-third the whole length. The 1st joint of the peduncle, that measures 12 mm. and that is about twice as long as the two following joints taken together (7 mm.), appears rather flattened beneath, while, according to Spence Bate, it should in *Nephr. Thomsoni* be here convex; the spinule at the inner distal angle is very small. The 3rd joint is but little shorter than the 2nd and, like in *Nephr. Thomsoni*, the outer flagellum appears distinctly more robust than the inner.

The external antennae, measured also from the frontal margin, are 320 mm. long, the peduncle 30 mm., so that they prove to be one and three-fourth times as long as the body, 6-times as long as the carapace without the rostrum and 3-times as long as the internal antennae. They closely resemble those of *Nephr. Thomsoni*. The peduncle is a little shorter than the rostrum and bears a sharp spine at the distal extremity of the curved outer margin of the 2nd joint; the scaphocerite (Fig. 18*b*) that just reaches the distal margin of the 4th or penultimate joint of the peduncle, presents the same form as in *Nephr. Thomsoni*, but the slightly arcuate, outer margin is unarmed at the distal extremity and does here not terminate in a tooth or spine; the upper surface presents a slight pubescence and the antero-internal margin is rounded. The scaphocerite is hardly longer than broad, in the largest male it is 12 mm. long and 11 mm.

broad, in the largest female that measures 160 mm., these numbers are $11^1/_4$ mm. and 10 mm. In younger specimens the antennal scale reaches as far forward, but appears a little less broad: so e. g. in a young male, long 115 mm., the scaphocerite is $7^1/_2$ mm. long and $5^4/_5$ mm. broad, in the egg-laden female, measuring 130 mm., it is $8^1/_2$ mm. long and $6^4/_5$ mm. broad. Of *Nephr. Challengeri* the scaphocerite is comparatively longer and its outer margin terminates in a small spinule.

The external maxillipeds (Pl. IV, fig. 18*c*) extend, both in the male and in the female, about as far forward as the antennal peduncle. The outer surface of the ischium gradually widens anteriorly, its slightly curved inner margin is faintly denticulate along its whole length and carries a small acute tooth at the distal extremity, the inner margin is slightly concave and bears a still smaller tooth distally. The inner margin of the inner surface is armed with 20—25 acute spines of different size. The merus is nearly as long as the preceding joint, its inner margin is armed with 5 to 7 acute spines of different length, the distal spine being the largest; the distal extremity of this joint is also acute. The lower margin of the carpus ends distally in a small acute tooth. Propodus enlarged, a little more than twice as long as broad, dactylus also depressed, its greatest width one-third its length.

Unfortunately the external maxillipeds of *Nephr. Thomsoni* have not been described by Spence Bate; his figure *i* on Plate XXVI, however, is probably inexact, for, when it is compared with the figure 18*c* on Plate IV of this work, representing the outer foot-jaws of *Nephr. Sibogae*, these appendages should rather considerably differ, which in so closely allied species appears improbable.

Of the adult male the legs of the 1st pair are equal, 212 mm. long, somewhat longer than the body. The merus, strongly compressed and flattened above, is armed with a sharp, strong, compressed spine at the distal end of its inner margin and with a somewhat smaller one at that of the upper border; both margins are granulate, the granules are a little larger than those of the upper and lower surface, that disappear posteriorly, especially on the upper surface; usually 2 or 3, rarely 4 or 5, granules of the inner margin are a little larger than the rest and more or less spiniform. The preceding joint, the ischium, appears both above and below quite smooth, though slightly granular on its inner margin. The cylindrical carpus, which is somewhat shorter than the merus, is everywhere granulated, the granules, however, are on the inner side larger than on the outer; it bears 3 sharp teeth distally, one at the distal extremity of the inner border, another somewhat more outwards, the third which is the smallest of all, at the distal end of the lower border, while there is a fourth acute tooth at the base of the outer border and a small obtuse tubercle on the upper surface not far from the articulation with the merus. The chela is 125 mm long; the palm, 70 mm. long, gradually widens towards the articulation of the fingers, where it is $16^1/_2$ mm. broad, so that the palm appears about 4-times as long as broad. The nearly straight, inner border of the palm is distinctly granulate, the outer border of the chela appears slightly arcuate from the carpal articulation to the end of the immobile finger; the outer border is somewhat flattened with the margins more distinctly granulated. The upper and the lower surface of the palm are more coarsely granulated on the obtuse crest that runs from the carpal articulation to that of the dactylus

than between this ridge and the lateral borders. The fingers, which are somewhat shorter than the palm, shut close together and their pointed tips are crossing one another; both fingers are somewhat flattened and gradually narrow towards the tip. The immobile finger is armed with a larger, subacute, compressed tooth, situated a little nearer to the articulation than to the tip of the finger and furthermore along its whole length to near the extremity with numerous much smaller teeth of different size, larger teeth alternating with smaller ones; similar small teeth of different size occur also along the whole length of the dactylus, but 5 or 6 proximal ones are larger than the rest. In the male of *Nephr. Thomsoni* there is a spine near the centre of the inner margin of the palm, but in *Nephr. Sibogae*, like also in the female of *Nephr. Challengeri*, this spine is wanting. The 1st pair of legs of younger male specimens agree with those of the adult male just described, but the granulation is less conspicuous. In a young male, long 116 mm., the carpus of the right cheliped carries a spine at the proximal third of its inner margin, an abnormality indeed.

Of the female the 1st pair of legs agree with those of the male. In the largest female, that measures 178 mm., the left leg is 166 mm. long, almost as long as the body, the right is somewhat shorter; the chela measures 94 mm., the palm is 50 mm. long and 13 mm. broad at the articulation of the fingers. In another female, also without eggs and measuring 165 mm., the carapace is 49 mm. long without the rostrum and 77 mm., when it is included: in this specimen the 1st pair of legs are considerably smaller than in the female long 178 mm., the right leg measuring 122 mm., the other 111 mm. In this specimen, like in the young male, long 116 mm., the carpus of both legs is armed with a sharp tooth at the proximal third of its inner margin and the carpus of the left leg carries 2 spines instead of one, as usually, near the proximal end of the outer margin. In the two egg-laden females, finally, which are 135 mm. and 128 mm. long, the accidental spine on the inner margin of the carpus occurs on the right leg, but not on the left. In the female of *Nephrops Challengeri* (C. Spence Bate, l. c., p. 191, Pl. XXV, fig. 2) "a small sharp tooth is present at the external base of the dactylos", this tooth now is wanting in *Nephr. Sibogae*, both in the male and in the female. In the adult male, long 184 mm., a small sharp tooth is observed at the base of the dactylus, not externally, but both on its upper and on its lower side; immediately behind these teeth another similar tooth occurs on the distal end of the palm. When the dactylus is now looked at from the inner side, one observes therefore, at each side of the articulation, two small sharp teeth which are directed forward; in younger specimens these teeth are rudimentary or wanting at all.

The other legs apparently agree with those of *Nephr. Thomsoni*. In the adult male the 2nd pair extends as far forward as the carpus of the 1st, the 4th pair reaches nearly as far, but the legs of the 3rd pair are distinctly shorter and those of the 5th attain only the distal extremity of the merus.

The globular eggs show a diameter of 2—2,1 mm.

3. *Nephrops arafurensis* de Man. (Plate III, Fig. 16, 16*a*).

Nephrops arafurensis J. G. de Man, in: Tijdschr. d. Ned. Dierk. Vereen. (2) Dl. IX, Afl. 3, 1905, p. 587.

Stat. 262. Dec. 18. 5° 53'.8 S., 132° 48'.8 E. 560 m. Solid bluish grey mud, upper layer more liquid and brown mud. 1 male.

It is a great pity not only that of this interesting new species, discovered amidst the Kei-islands in the Arafura Sea, but one single specimen has been collected, but especially that even this specimen is in a so much mutilated condition. The posterior half of the abdomen is wanting, the 4 first somites are only present, though partly broken, and the legs of the 1st pair, like also the antennal flagella, are lost!

This new species differs, however, at first sight from the other indopacific representatives of this genus by its much more spinulose cephalothorax and by the sculpture of the abdominal terga which agree more with those of the european *Nephr. norwegicus* than with the three, already mentioned, indopacific species. In its general appearance the carapace resembles that of *Nephr. Sibogae*. The slender rostrum has the same form and appears but very little longer; its length, measured to the upper orbital margin of the carapace, amounts to $22^1/_2$ mm., the carapace itself is 34 mm. long; in a male of *Nephr. Sibogae* of the same size, in which the carapace is also 34 mm. long, the rostrum has a length of $21^1/_2$ mm. Like in the other indopacific species the rostrum is slightly declivous in its basal half, while the acuminate distal half is turned upward. The rostrum appears also nearly equally broad in proportion to its length and it carries on either side a sharp tooth which is directed obliquely upward, forward and slightly outward; these spines stand just in front of the eyes, posterior to the middle of the rostrum, so that their distance from the foremost spine of the lateral ridges on the gastric region is distinctly shorter than their distance from the tip of the rostrum; in *Nephr. Sibogae*, on the contrary, these lateral spines are placed a little farther forward, on the middle of the rostrum. Like in the other species the declivous proximal part is furrowed, the upturned part distinctly carinate and the carinate lower edge is armed, just in front of the lateral spines, with an acute spine that reaches as far forward as the antennal peduncle, beyond which the rostrum projects by one-fourth of its length. Like in the other species the lateral margins of the rostrum are continued backwards, nearly as far as the broad and deep cervical groove, as a pair of strong outstanding carinae; while these carinae run parallel with one another in *Nephr. Thomsoni*, *Nephr. Challengeri*, *Nephr. Sibogae* and in *Nephr. andamanicus*, they at first slightly diverge and afterwards distinctly converge backward in *Nephr. arafurensis*, like in *Nephr. japonicus*. These carinae are each cut into five sharp spines; the foremost is the largest, much larger than the rostral spines, the following decrease regularly in size and length, all are directed obliquely upward and very slightly outward. The spines of the foremost pair extend almost as far forward as the eye-peduncles and as far as the spinule on the outer angle of the basal joint of the external antennae; their tips are $5^3/_4$ mm. distant, those of the 2nd pair $6^3/_4$ mm., those of the 3rd $5^1/_2$ mm., those of the 4th $4^1/_2$ mm., while the apices of the small teeth of the last pair, that stand a little nearer to the midline of the carapace, are only 2 mm. distant. The interspace between the two carinae is, like in other species, ridged in the middle and likewise elevated to a small tubercle which is situated at the level of the limit between the 2nd and 3rd spines.

The broad and deep cervical groove is comparatively as far distant from the posterior

border of the carapace as in *Nephr. Sibogae.* Measured just outward of the lateral carinae, the hinder edge of the cervical groove proves to be 20 mm. distant from the upper orbital margin and 14 mm. from the posterior border of the carapace. The post-antennal spine is large like in *Nephr. Sibogae* and reaches probably just beyond the eye-peduncles: it remained uncertain because the extremity of the left is broken off, while the right spine is still more mutilated. Just behind and below it one observes the hepatic spine which is somewhat directed inward. There is also a small spine at the upper end of the hepatic groove; of the two spines situated between this groove and the anterior border of the carapace, the posterior is twice as large as the anterior and two smaller spinules stand just before it. The upper surface of the carapace is covered, between the outstanding lateral carinae and the post-antennal and hepatic spines, with many small spinules of different size, which are more crowded and somewhat larger posteriorly than anteriorly; a few, 4 or 5, very small spinules are seen on the interspace between the lateral carinae. Behind the cervical groove the carapace is, like in the other species, longitudinally traversed by 7 ridges, 3 on each side of the median ridge which is in fact double, presenting two longitudinal rows each of 6 spines, that decrease in length backward. The 1st and the 2nd ridge, on each side of the median ridge, are spinulose, the 1st presenting about a dozen spinules, the 2nd still more, though smaller; the 3rd ridge is covered with acute granules and carries a small sharp spine at the anterior end. The cardiac and branchial regions are also covered between these ridges with sharp spinules, more crowded and smaller on the branchial regions than on the cardiac. The infero-lateral sides of the carapace between the inferior border, the hepatic sulcus, the hepatic spine and the 3rd lateral ridges are covered with small acute granules that disappear towards the inferior border. The posterior border of the carapace, bounded anteriorly by a groove, is smooth. The general surface of the carapace is finely pubescent.

The first four abdominal somites resemble much those of *Nephr. norwegicus.* In the Norway Lobster the posterior, bandlike part of the 1st tergum is separated from the larger anterior overlapped part by a transverse furrow, which is continued to near the lateral margin of the pleura. In *Nephr. arafurensis* this transverse groove does not proceed on to the pleura, but ends at their antero-internal angle; the pleura are, however, grooved by a narrow furrow, that runs parallel with the posterior border from the outer margin of the pleura towards the anterior groove. The anterior angle of the 1st pleura ends in a small spinule.

The posterior part of the 2nd, 3rd and 4th somites is also separated from the anterior, overlapped portion by a transverse furrow, that issues at the anterior angle of the pleura, and, like in *Nephr. norwegicus*, the posterior part presents a transverse groove, which is interrupted in the middle by a narrow median ridge, so that it is divided into two bands which pass into one another on the lateral margin of the terga. In *Nephr. arafurensis* the anterior band or ridge is intersected by a narrow, oblique groove, which is wanting in *Nephr. norwegicus*; this groove runs near the lateral end of the band and unites the anterior groove with that which separates the two bands from one another. On the 4th (and also on the 5th) tergum of *Nephr. norwegicus* the transverse furrow between the two bands or ridges curves near the middle forward, intersecting the anterior band and terminating into the anterior

transverse groove, so that the narrow median ridge is bounded on each side by a furrow; this intersection does not exist on the 4th tergum of *Nephr. arafurensis*, but the median part of the anterior band, between the two oblique grooves, carries on each side 4 or 5 small pubescent impressions and a few exist also on the lateral parts of the tergum. Two or three large puncta occur also, on each side of the middle, on the anterior band of the 2nd and 3rd terga, the terga are moreover finely punctate in the middle, more coarsely laterally, while the grooves are pubescent; we must still remark that a transverse, granular ridge runs in the transverse groove between the two bands parallel with the latter, rather distinctly on the 2nd tergum, less so on the two following.

The pleura of the 2nd, 3rd and 4th somites resemble those of *Nephr. Sibogae*, their margins are, however, more distinctly serrate, the cavities or pits on their upper surface are deeper, especially near the pointed, acute, lower angle, their granulation is coarser and one observes a small spinule on the middle of the pleura of the 2nd somite; the cavities and pits are hairy.

The eye-peduncles and both pairs of antennae resemble those of *Nephr. Sibogae*, even in minute particulars. The internal antennae are 45 mm. long, just twice as long as the rostrum and the basal joint of their peduncle bears likewise a small spinule at the distal end of their inner border. The antennal peduncle resembles closely that of *Nephr. Sibogae*; the scaphocerite is triangular, narrow at its base, rounded anteriorly, has probably a small spinule at the distal end of the outer border and is $7^1/_4$ mm. long and $5^1/_2$ mm. broad.

The external maxillipeds which just project beyond the antennal peduncles, also not differ from those of *Nephr. Sibogae*; the lower margin of the ischium is finely serrate and terminates at the distal end in a small spinule, that of the merus is armed with 7 or 8 spines, the foremost of which is the largest and there is also a small tooth at the far end of the carpus.

The thoracic legs of the 2nd—5th pair resemble likewise those of *Nephr. Sibogae* and this is also the case with the pleopods.

Nephropsis W.-Mas.

The genus *Nephropsis* W.-Mas., at first sight distinguished from *Nephrops* by the absence of an antennal scale and by the obsolescent eyes, is represented by 8 species, most of which occur in the Indopacific. *Nephropsis atlantica*, described in 1882 by Canon Norman from a single specimen taken by the "Knight Errant" off the North of Scotland, has also been captured in the Färoe Channel, off the South-West coast of Ireland and occurs also in the Gulf of Gascony, but this species has afterwards been observed not only at Cape Natal, South Africa, but even in the Arabian Sea near the Laccadives and to the northwards, so that it proves to be more widely distributed than any other species of this genus. *Nephropsis Agassizii* A. M.-Edw. = *aculeata* S. J. Smith inhabits the coasts of Florida, the Bermudas and the South coast of New England; this species is considered by Wood-Mason and Alcock to be identical with *Nephropsis Stewarti* W.-Mas. *Nephropsis rosea* Willem.-Suhm, captured by the "Challenger" off Bermuda, was considered by Spence Bate as probably identical with *Nephropsis Agassizii*, while both forms were indeed identified by Walter Faxon. *Nephropsis occidentalis* Fax., a species likewise

closely related to *Nephropsis Stewarti*, but at once distinguished from this and other species by the prominent spine at the base of the telson, occurs on the west coast of Mexico.

Besides *Nephropsis atlantica*, five species are found in the Indopacific. *Nephropsis Stewarti* W.-Mas. and *Nephropsis ensirostris* Alcock occur in the Arabian Sea, the Bay of Bengal and the Andaman Sea: both forms have been taken by the "Siboga", the former off the Kei-islands, the latter in the Bali Sea. *Nephropsis Carpenteri* W.-Mas. is closely allied, inhabits the Bay of Bengal, but is also recorded from Jodomi, Japan. *Nephropsis Suhmi* Sp. Bate occurs at the Aru Islands, but also in the Arabian Sea and a young female was taken by the "Siboga" in the Strait of Makassar. *Nephropsis malhaensis* Borr., finally, closely related to *Nephropsis atlantica*, was dredged off Saya de Malha in the Indian Ocean.

The species of *Nephropsis* are all inhabitants of deep water, not exceeding, however, 1000 fathoms, except *Nephropsis Suhmi* which was taken by the "Siboga" at the great depth of 2029 m., i. e. about 1100 fathoms, the greatest depth on record of the species of this genus. *Nephropsis Suhmi* is therefore a truly abyssal species: it was captured by the "Challenger" at a depth of 800 fathoms, while, according to Dr. Alcock, it is found in the Arabian Sea in water of 865 to 947 fathoms. *Nephropsis atlantica* and *Nephropsis ensirostris* occur in the Arabian Sea respectively at 636—740 and 636 fathoms, but the three other Indian species are found in shallower water, at depths varying between 180 and 465 fathoms. *Nephropsis occidentalis* was dredged between 660 and 676 fathoms, *Nephropsis rosea* at 690 fathoms, but *Nephropsis Agassizii* which was captured on the coast of Florida in water of 830 fathoms, was also dredged by the U. S. Fish Commission, on the South Coast of New England, at 100, 120 and 126 fathoms.

Key to the indopacific species of the genus *Nephropsis* W.-Mas. [1]).

a_1 The exopodite of the tail-fan is transversely fissured.

b_1 Rostrum with lateral spines: no distinct spines behind the cervical groove.

c_1 Abdominal terga without any trace of a median carina; no second pair of small spines behind the rostrum.

d_1 Body covered with a close short fur; no two rows of granules converging from just before the median gastric tubercle towards the spines at the base of the rostrum . . . . . *Stewarti* W.-Mas.

d_2 No fur on the body; two rows of granules start just before the median gastric tubercle on each side and converge towards the spines at the base of the rostrum . . . . . *malhaensis* Borr.

(L. A. Borradaile, Trans. Linnean Soc. London, 2nd Ser. Zoology, Vol. XIII, Part 2, 1910, p. 262).

c_2 Abdominal terga faintly carinated in the middle line.

1) This key is partly taken from that which was given by Dr. Alcock in his work of 1901.

d_1 Behind the pair of large spines at the base of the rostrum is a second pair of small spines; a spine near the middle of the anterior border of the 2nd abdominal pleura . . . . *atlantica* Norman
(A. M. Norman, Proc. Roy. Soc. of Edinburgh, Vol. XI, 1881—82, p. 684).

d_2 Behind the pair of spines at the base of the rostrum no second pair of small spines occurs; no spine on the anterior border of the 2nd abdominal pleura . . . . . *Carpenteri* W.-Mas.
(J. Wood-Mason, Proc. Asiatic Soc. Bengal, 1885, p. 70).

b_2 Rostrum without lateral spines: a pair of small spines overhang the cervical groove from behind, in the middle line . . . . . *ensirostris* Alcock

a_2 The exopodite of the tail-fan is not fissured; rostrum with lateral spines; at least one spine on the anterior edge of the 2nd, 3rd and 4th abdominal pleura . . . . . *Suhmi* Sp. Bate.

1. *Nephropsis Stewarti* W.-Mas. (Pl. III, Fig. 17).

Nephropsis Stewarti J. Wood-Mason, in: Journal Asiatic Soc. of Bengal, Vol. XLII, Pt. II, 1873, p. 40.
Nephropsis Stewarti A. Alcock, A descriptive Catalogue of the Indian Deep-Sea Crustacea, Calcutta, 1901, p. 159. — Illustrations of the Zoology of the Investigator, Crustacea, Plate XXVII, fig. 1.

Stat. 262. December 18. 5° 53′.8 S., 132° 48′. 8 E. 560 m. Solid bluish grey mud, upper layer more liquid and brown mud. 1 young female, without eggs.

This specimen is 60 mm. long, the rostrum measuring 10 mm., the carapace 17 mm., the abdomen 33 mm. The rostrum, the extremity of which is slightly turned upwards, extends by one-fourth of its length beyond the antennular peduncles. The fine groove that runs in the mid-dorsal line of the rostrum up to the small, oval, gastric tubercle, is bounded on each side by a ridge; these two ridges that diverge from one another at the level of the large teeth near the base of the rostrum, are denticulate from just behind the lateral spines as far as the small gastric tubercle, the sharp teeth, however, very small on the posterior divergent parts of the ridges, are larger and spiniform on the proximal half of the rostrum. Wood-Mason describes these ridges as granulated (l. c. p. 41), but neither he nor Alcock makes mention of spiniform teeth.

The abdominal pleura appear to project somewhat more outward, when the animal is looked at from above, than in the figure 1 of Plate XXVII of the quoted "Illustrations", and the basal joint of the caudal swimmerets ends posteriorly in a small sharp spine. Alcock says: "the abdominal terga have no trace of median carination". In the young specimen from the Kei-islands the 6th tergum presents a very low and obtuse, median carina and a less distinct trace of it is even recognizable on the 5th. The posterior border of the telson is a little more curved than in the figure of the "Illustrations".

The flagella of the external antennae are 110 mm. long, almost twice as long as the body; in figure 1 of the "Illustrations" they appear just as long as the body, but in

WOOD-MASON's original description (l. c. fig. 1), however, the outer antennae are as long as in our specimen.

The larger chelipeds, (Pl. III, fig. 17), which are covered with a shaggy tomentum, are equal, 35 mm. long, just as long as the abdomen. The merus that reaches as far forward as the antennal peduncle, is armed with a spine a little behind the distal end of its upper margin and with another at the end of the lower surface on the inner side. Measured on its upper surface, the carpus proves to be $6^3/_4$ mm. long and $4^1/_2$ mm. broad, just one and a half as long as broad, and appears therefore somewhat broader in proportion to its length than in the figure 1 of the "Illustrations"; it carries a spine at the end of its inner border, another somewhat behind it, also one at the end of its lower surface, and these spines are larger than in the quoted figure. The hands, 15 mm. long, are as long as the merus and the ischium combined; the fingers, the pointed tips of which cross one another when closed, are a little longer than the palm and the latter is 6 mm. broad, being about 1 mm. longer than broad. The chelae appear therefore somewhat less slender than in figure 1 of the "Illustrations", but this stouter shape of the chelipedes is, no doubt, a sexual difference and depends perhaps also on the younger age of our specimen.

The fingers are of a beautiful red colour on their distal half, but their pointed naked apices are white.

The propodite of the 5th pair of legs ends at the distal extremity of its lower border in a short acute tooth. The carapace has a pale green colour, except the branchial regions which are whitish; the extremity of the rostrum and the 6 large spines are reddish with paler tips.

The closely related *Nephropsis Carpenteri* W.-Mas. differs by a shorter rostrum, by the cervical groove being farther distant from the posterior margin of the carapace, so that the cardiac area appears longer than broad, and by a more distinct carination of the abdominal terga.

General distribution: Andaman Sea; Bay of Bengal; Arabian Sea.

2. *Nephropsis ensirostris* Alcock.

Nephropsis ensirostris A. Alcock, A descriptive Catalogue of the Indian Deep-Sea Crustacea, Calcutta, 1901, p. 162, Pl. I, fig. 2.

Stat. 314. February 17, 1900. 7° 36′ S., 117° 30′.8 E. 694 m. Fine sandy mud. 1 adult female, without eggs.

This specimen that fully agrees with ALCOCK's description and figures, shows the following measurements. The rostrum is 8 mm. long, but the apex seems to have been broken off and to have been regenerated afterwards; the carapace is 21 mm. long, the abdomen 45 mm., so that this specimen appears one-fourth longer than that described by Prof. ALCOCK. The rostrum reaches therefore only the distal end of the antennal peduncles, while it extends in the type specimen even a little beyond those of the inner antennae. It carries an obtuse crest in the middle line; this crest, finely grooved longitudinally, consists of two ridges, which at the base of the rostrum at first diverge and, passing along the small, compressed, gastric tubercle, converge afterwards again towards the cervical groove. One observes a 5th spinule, immediately behind the inner spinule on the left side of the posterior transverse row of spinules, an abnormality

of course. The two small spinules which on the cardiac region overhang anteriorly the cervical groove, are a little larger than in the quoted figures of the "Illustrations". The cardiac region, that appears one and a half as broad as long, is defined laterally from the branchial regions by rather prominent ridges. There is no carina distinguishable in the mid-dorsal line of the 1st abdominal tergum and also barely one on the 2nd, but on the four following they appear gradually more distinct. The telson, which is 11 mm. long and $6^1/_2$ mm. broad, is comparatively longer than that of *Nephropsis Stewarti* W.-Mas., which, in the female, described p. 112, is $7^3/_4$ mm. long and $5^1/_2$ mm. broad. The exopodite of the caudal swimmerets bears a small spinule on its outer border at the outer extremity of the very fine, transverse suture. The abdominal appendages (of the female) are similar to those of *Nephropsis Stewarti*.

The eye-peduncles also fully agree with this species and are covered by the rostrum.

Internal antennae little longer than the carapace, the rostrum excluded; the 3rd joint of the peduncle, which is 10 mm. long, just as long as the carapace is broad anteriorly, is about equal in length to the 1st and 2nd taken together. The flagella, of which the outer is distinctly thicker than the other, are one and a half as long as the peduncle. External antennae 150 mm. long, about twice as long as the body and about 7-times as long as the carapace, without the rostrum, and somewhat more than 3-times as long as the abdomen; the peduncle reaches the middle of the 3rd joint of that of the inner antennae, as far forward as the external maxillipeds.

The right cheliped, a little larger than the left, is 42 mm. long, nearly as long as the abdomen. There is a longitudinal row of 4 short spines on the lower border of the merus and a 5th near the distal end of the inner, one spine just behind the distal end of the upper border and another at the end of the outer. These legs appear much slenderer than those of the female of *Nephropsis Stewarti*. The carpus of the right leg, indeed, is 8 mm. long and just half as broad, while that of the female of *Nephropsis Stewarti* is one and a half as long as broad. This joint carries above 4 spines, arranged exactly as in Figure 2 of the "Illustrations" and a 5th at the end of the lower side. The hand is 16 mm. long, twice as long as the carpus; the dactylus is a little longer than the inner border of the palm and the palm is $4^1/_5$ mm. broad near the articulation of the fingers, so that the chela appears almost 4-times as long as broad, while the chelae of the female of *Nephropsis Stewarti* are $2^1/_2$-times as long as broad. The little shorter left leg agrees with the right and both are covered with a shaggy tomentum.

The following legs look like in the "Illustrations", the propodite of the 5th pair terminates, like in *Nephropsis Stewarti*, in a sharp tooth at the end of its lower border.

General distribution: Arabian Sea; Bay of Bengal, off Ceylon; Andaman Sea.

3. *Nephropsis Suhmi* Sp. Bate.

Nephropsis suhmi C. Spence Bate, Report on the Challenger Macrura, 1888, p. 181, Pl. XXIII, fig. 3, Pl. XXIV, fig. 2.

Nephropsis Suhmi A. Alcock, A descriptive Catalogue of the Indian Deep-sea Crustacea. Calcutta 1901, p. 163.

Stat. 76. June 9. 4° 22'.1 S., 118° 16'.9 E. 2029 m. Fine, grey mud. 1 young female without eggs.

Before going to describe this rare animal, I may call attention to the fact that the figures on Plate XXIV of the Report on the Challenger Macrura are wrongly numbered, because, e. g., Figure 1 that represents an individual looked at from the ventral side, cannot belong to *Nephropsis rosea*, for in this species the abdominal pleura carry no sharp tooth on their anterior margin. The inner antenna, represented Fig. *b*, differs so much from that of Fig. 1 on Plate XXIII, the joints of the longer flagellum being more elongate and much less numerous, that these two figures also cannot belong to one and the same species. Figure 1 seems to represent, not *Nephropsis rosea*, but *Nephropsis Suhmi*, Figure *b* remains uncertain, because in the specimen which is lying before me, these flagella are composed of a much larger number of joints.

The specimen, collected by the "Siboga" expedition, is 42,8 mm. long, a little longer than that which was described by SPENCE BATE and which was 38 mm. long; according to ALCOCK, however, *Nephropsis Suhmi* becomes twice as large, viz. 84 mm. The rostrum is 9,4 mm. long, the carapace 12,4 mm., the abdomen 21 mm.; the rostrum that measures three-fourths the length of the carapace, conform to ALCOCK's description, appears somewhat shorter than in the "Challenger" type. I must, however, remark that Fig. 3 of Plate XXIII does not agree with the description; the rostrum, indeed, is described as being "more than half the length of the carapace", but in the figure both seem to be equally long. The rostrum is at first somewhat declivous, its distal third slightly turned upward; it is slender, the extremity acuminate. The rostrum is armed on each side with two slender spines, the anterior pair immediately behind the middle, the posterior midway between the anterior and the base; the two posterior spines are a little shorter than the anterior ones. The lower edge of the rostrum is smooth and unarmed; its lateral margins that are for the rest unarmed, are fringed with ciliated hairs and the distal half of the rostrum, beyond the anterior pair of spines, carries on each side of the median ridge some longer plain hairs. The proximal half of the rostrum shows between the lateral spines two rows of small, acute granules, each granule tipped with a fine hair; the two ridges diverge at the base of the rostrum and, enclosing between them a small, rounded tubercle in the mid-dorsal line of the gastric region, at the level of the hepatic grooves, converge towards the cervical suture, forming thus immediately before it a narrow furrow. At the base of the rostrum one observes at either side a strong spine, as long as the anterior spine of the lateral margin, but somewhat thicker at its base, and immediately behind them the described divergent ridges on the gastric region are armed with sharp spinules that gradually diminish in length and size backwards; the foremost pair of these spinules are half as long as the posterior lateral spines of the rostrum. The post-antennal spines that are directed forward, outward and upward, are somewhat longer than those at the base and on the lateral margins of the rostrum; these 4 pairs of spines are all directed forward.

Figure 3 on Plate XXIII of the Challenger Report, that represents certainly the same species as that which I am describing, appears also inexact, as regards the position of the cervical groove. In this figure, indeed, that part of the cephalothorax which is situated before the cervical groove, appears much smaller than the posterior part, but in the specimen lying before me, just the contrary is observed, the anterior part being considerably larger than the

posterior. The very deep, uninterrupted, cervical groove is situated, indeed, much more backward and is curved forward in the middle, nearly as in *Nephropsis rosea* (C. Spence Bate, Pl. XXIII, Fig. 2); measured in the mid-dorsal line, its distance from the concave posterior border of the carapace proves to be one-third the length of the latter. According to Alcock the cardiac region should be faintly carinated in the middle line, in the young specimen from Stat. 76 a carination is not yet perceptable, but there is a small tubercle in the middle line posteriorly, immediately before the smooth, flattened and somewhat elevated band that traverses the posterior and infero-lateral borders of the carapace. The groove that defines posteriorly and inferiorly the hepatic lobe like also that by which the former communicates with the cervical sulcus, are rather deep. The branchial regions are strongly flattened and almost vertically deflexed downward; they are separated from the cardiac region by a distinct granulated ridge and inferiorly by a prominent, slightly arcuate, granulated, but obtuse carina, that runs not far from and parallel with the lower border of the carapace until the lower end of the cervical groove. The carapace is covered with small, acute granules, mostly tipped with a fine hair, and these granules are somewhat larger and more crowded on the cardiac and branchial regions than anteriorly; near the anterior margin of the carapace the granules are very rare, the surface appearing here almost smooth. Near the upper extremity of the hepatic groove, immediately behind the level of the gastric tubercle, the carapace presents on each side a small sharp spinule; when a line uniting this spinule with the large spine at the base of the rostrum is continued backward to the cervical groove, the described spinule proves to be almost twice as far distant from the cervical groove as from the spine at the base of the rostrum.

In the Report on the Challenger Macrura the rostrum is described as being armed on each side with two large and seven small teeth, in figure 3 of Plate XXIII these teeth stand indeed on the lateral margins themselves; I suppose, however, that these teeth are those with which the ridges are armed that are continued on to the gastric region and this opinion agrees with Alcock's description.

The abdomen is very little shorter than the carapace, the rostrum included. The terga of the first five somites are smooth, though rather coarsely pitted; the 2nd, the 3rd and the 4th are provided with a shallow transverse furrow, which is interrupted in the middle and which runs somewhat nearer to the posterior than to the anterior border. The anterior angle of the 1st somite is produced to an obtuse tooth, but the posterior angle bears a sharp spine. The terga are separated from the pleura by prominent, longitudinal crests. The anterior border of the 2nd pleuron carries a sharp tooth, that of the 3rd is a little smaller and somewhat farther distant from the lower extremity; the anterior border of the 4th carries a very small granule instead of a spine and a quite minute granule occurs on the anterior border of the 5th pleuron. A transverse groove bordering the anterior margin of the 2nd—5th somites (which, however, is rather indistinct on the 5th) passes downward on to the pleura, just near their anterior border, about to the middle of these plates; the ridge between the anterior border and this furrow is granular on the 2nd pleuron, but smooth on the following. A row of small granules runs down on the pleura from the transverse crest that separates them from the terga, to the lower extremity and this row of granules occurs also on the 1st somite. The posterior border of the

2nd—5th pleura is a little denticulate in the middle, for the rest the pleura are smooth. Different from the preceding terga the 6th is covered with acute granules; the furrow near the anterior border of the pleura curves backward nearly to the posterior border of the somite, the surface appears almost smooth and the postero-lateral angle is produced to a spine. The telson and the appendages of the 6th somite agree with Fig. 2z of Plate XXIV, but the two postero-lateral spines are curved slightly inward, not outward. The two ridges on the upper surface, which is slightly furrowed longitudinally in the middle, are somewhat granular and a double row of minute sharp granules occur between them. The caudal swimmerets are smooth, though a little hairy and on each of them a longitudinal rib runs from the base down the middle; on the exopodite a trace of a second ridge is visible near the base, on the outer side of the other. The small spine on the outer border of the exopodite is a little farther distant from the base than from the distal end, different from the quoted figure; the basal joint is produced to a spine. The abdomen is furnished above with some short fine hairs.

The abdominal appendages of the 1st somite are uniramous, very short, about $^3/_4$ mm. long. Those of the 4 following pairs are biramous, the two branches are slender and narrow, fringed with long ciliated hairs; all are provided with a very slender styliform stylamblys, which in the 2nd pleopod is 1,16 mm. long and 0,05 mm. broad; it bears some cincinnuli at the extremity and it is a little longer than its distance from the proximal end of the endopodite.

The eye-peduncles are shorter than the 1st joint of the antennular peduncle, quite devoid of pigment, of a whitish colour and are visible from above, when they are directed laterally.

Internal antennae 17 mm. long, almost twice as long as the rostrum; the 3rd joint of the peduncle which is 5 mm. long, is almost as long as the two other joints combined. The thicker flagellum is composed of about 40 joints (1 or 2 at the extremity are wanting); the 1st is as long as the 4 following together, most joints are about as long as thick, the 8 or 9 last ones are slightly longer than thick. The other flagellum is composed of 39 joints, which are distinctly longer than thick and of a somewhat different length.

The external antennae are probably 80 mm. long, the flagella are not complete, having lost a few joints, the longer is 68 mm. long and the peduncle, measured on its lower side, is $5^1/_2$ mm. long; looked at from above, it appears a little shorter than the antennular peduncles. Like in the two other species the outer antennae are twice as long as the body.

The external maxillipeds reach as far forward as the antennal peduncle.

Of the larger chelipedes the right one has lost carpus and chela; the left is $27^1/_2$ mm. long, about two-thirds the length of the body. According to Alcock's description these legs should differ from those of *Nephropsis Stewarti* only by presenting a few additional spinules on merus and carpus. These words are not in harmony with what we observe when comparing this specimen with the female of *Nephropsis Stewarti*, described above, for the chelipeds of the latter show a quite different, much stouter shape. The merus-joint is $9^1/_2$ mm. long and $1^1/_2$ mm. broad in the middle of its outer surface; it carries a strong spine at the end of its upper border and 4 or 5 much smaller ones behind it; there is a similar, though somewhat smaller spine at the end of its lower margin and the merus is moreover covered with small sharp granules, each of which tipped with a long fine hair. The carpus, $4^3/_5$ mm.

long, is 3-times as long as thick; it is armed at the distal end with 4 spines, a 5th occurs on the middle of its inner border and it presents also several acute granules tipped with long fine hairs like on the merus and arranged in longitudinal rows. The slender chela is $11^1/_4$ mm. long and the fingers, the apices of which pass farther beyond each other when closed than in the other species, appear just as long as the palm; the latter widens somewhat distally, so that it is $2^1/_2$ mm. broad near the articulation of the fingers, about half as broad here as it is long. The outer border of the chela is straight until the curvation of the apices and the palm is covered with rather sharp granules, that are tipped each with a fine long hair. The fingers are smooth, somewhat hairy and their cutting-edges are finely denticulate along their whole length.

The fingers of the 2nd legs measure about one-third of their palm, those of the 3rd pair measure one-fifth the whole length of the chela; there is no sharp tooth at the distal end of the propodite of the 5th pair.

General distribution: Off Dobba, Aru Islands (Spence Bate); Arabian Sea (Alcock).

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Note. — Synonyms are printed in Italics. The more important pages are indicated by heavier type.

EXPLANATION OF THE PLATES.

All the figures have been drawn by myself, excepting those of *Nephrops Sibogae* n. sp., which have been drawn by Mr. J. F. Obbes of Apeldoorn, Holland.

PLATE I.

Fig. 1. *Stereomastis trispinosa* (de Man), the adult ova-bearing female from Stat. 316, Nat. Size;
1*a* lateral view of the abdomen of a young female, long 56 mm., from Stat. 38, × 3;
1*b* lateral view of the pleura of the adult, ova-bearing female from Stat. 316, × 1½.

Fig. 2. *Stereomastis andamanensis* (Alcock), adult male from Stat. 85, Nat. Size;
2*a* lateral view of the abdomen of this male, × 1½;
2*b* right leg of the 5th pair of this male, viewed from the lower side, × 2.

Fig. 3. *Polycheles Carpenteri* (Alcock), right leg of the 5th pair, lower side, of the adult male from Stat. 126, × 2.

Fig. 4. *Polycheles baccatus* Sp. Bate, male from Stat. 38, × 1½;
4*a* lateral view of the abdomen of this male, × 1½.

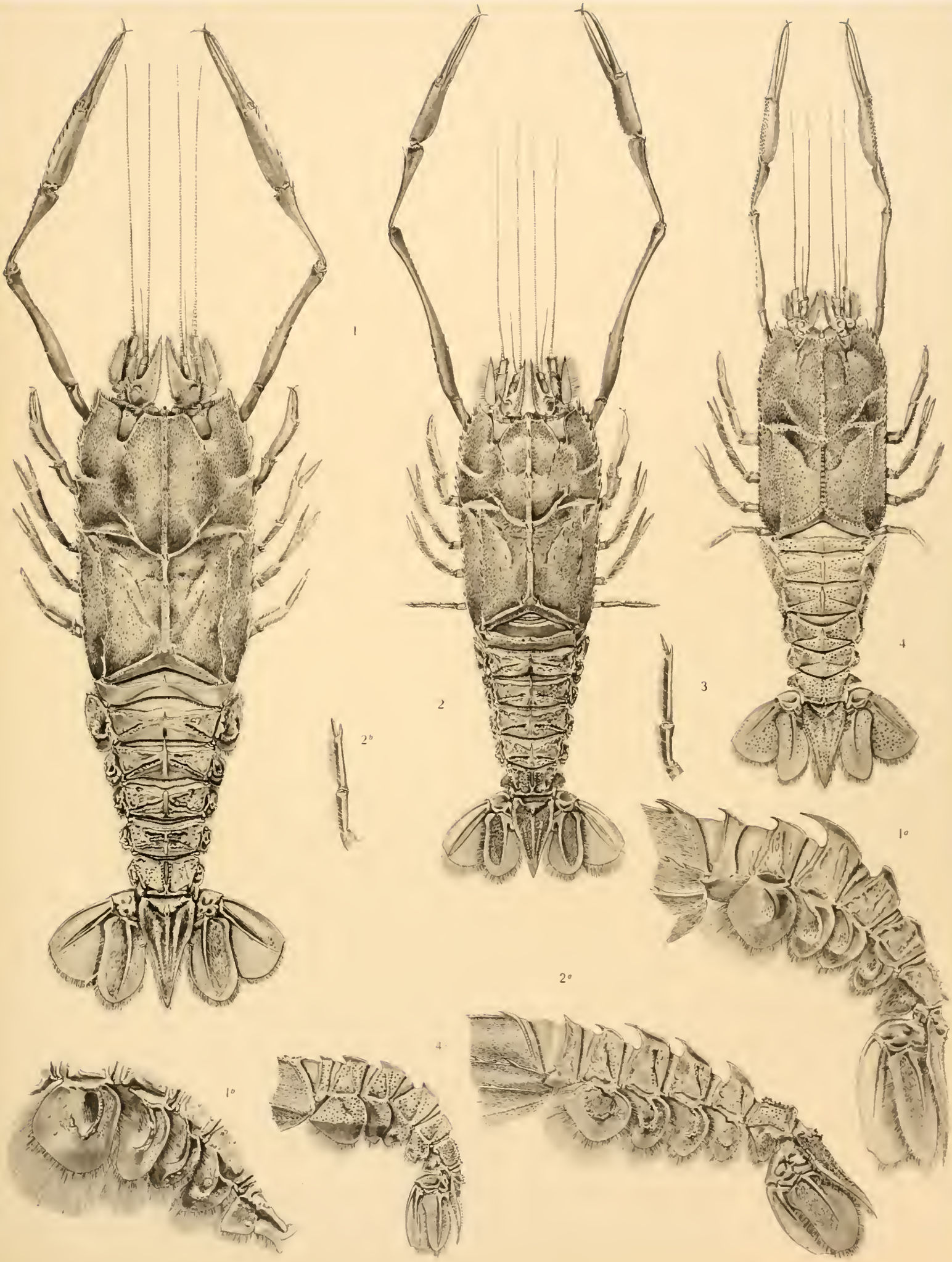

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PLATE II.

Fig. 5. *Puerulus angulatus* (Sp. Bate), male from Stat. 297, long 133 mm., armed with a small rostrum in the middle of the anterior margin, Nat. Size;
5*a* maxilliped of the 1st pair of a female, long 170 mm., from Stat. 38, × $1^1/_2$;
5*b* maxilliped of the 2nd pair of the same female, × $1^1/_2$.

Fig. 6. *Panulirus penicillatus* (Oliv.), antennular segment with the two pairs of spines, the lateral of which are coalesced at base, of a male, long 225 mm., from West-Nias, × 2; *z* right frontal spine.

Fig. 7. *Panulirus versicolor* (Latr.), exopod with rudimentary flagellum and adjacent part of the merus-joint of the 2nd or penultimate maxilliped of the adult male from Sinabang-Bay, the carapace of which is 91 mm. long, × 2;
7*a* external maxilliped of the same specimen, Nat. Size;
7*b* exopod and adjacent part of the merus-joint of the 2nd or penultimate maxilliped of the adult male of *Panul. ornatus* (Fabr.) from Makassar, × 2;
7*c* external maxilliped of the same male, Nat. Size.

Fig. 8. The "Natant"-stage of *Panulirus versicolor* (Latr.), *puerulus spiniger* Ortm. Anterior part of the carapace with the two pairs of antennae and the eye-peduncles, × 3;
8*a* epistome, × 10;
8*b* external maxilliped with the rudimentary exopod *z*, × 10;
8*c* third segment of the abdomen, × 5;
8*d* pleopod of the 2nd pair, × 10;
8*e* distal extremity of the styliform Appendix interna, with the coupling-hooks, × 50.
All the figures are taken from a specimen, long 22 or 23 mm., collected at Amboina.

Fig. 9. *Scyllarus vitiensis* (Dana), the young specimen from Stat. 115, cephalothorax looked at laterally and somewhat obliquely from above, × 10;
9*a* abdomen, except caudal fan, × 10.

Fig. 10. *Scyllarus Haanii* Berthold, anterior half of sternum, × the basis of right 2nd leg, × 6;
10*a* first abdominal somite, presenting on either side a wine-red fleck, formed by wine-red coloured hairs or setae, × the posterior margin of the carapace, × 6;
10*b* right leg of the 2nd pair, × 6;
10*c* right leg of the 3rd pair, × 6;
10*d* left leg of the 4th pair, × 6.
All the figures are taken from the largest specimen from Stat. 51, a male long 40 mm. from the anterior extremity of the outer antennae to the end of the telson.

Fig. 11. *Scyllarus sordidus* (Stimpson), left orbita, left antenna and left half of the antennular somite of a female, long 45,5 mm., from Stat. 162, × 3;
11*a* first abdominal somite of the same female, × 3.

Fig. 12. *Scyllarus bicuspidatus* (de Man), the young female from Stat. 310, × 6;
12*a* sternum, × 6;
12*b* leg of the 2nd pair, × 6;
12*c* leg of the 3rd pair, × 6.

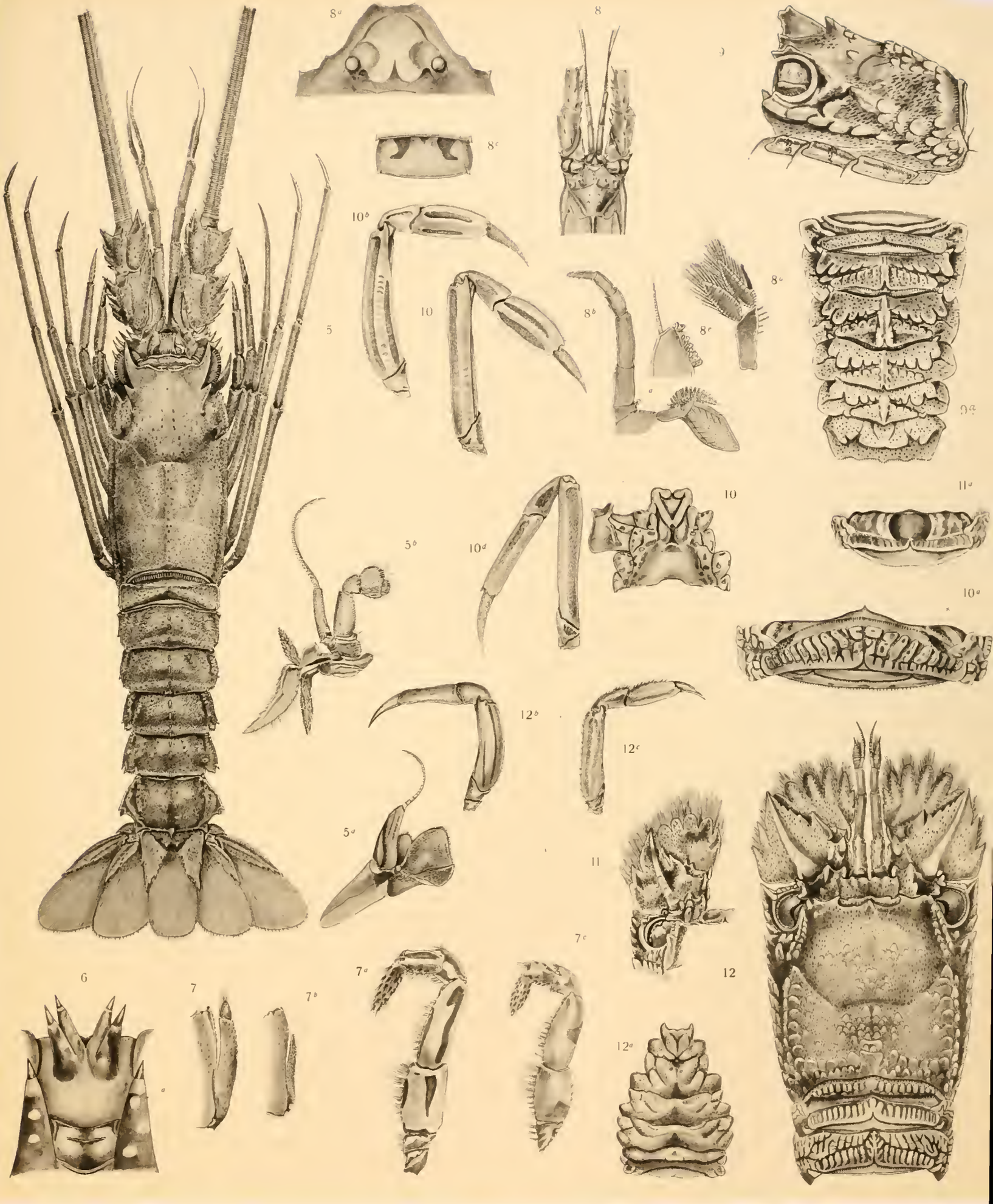
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PLATE III.

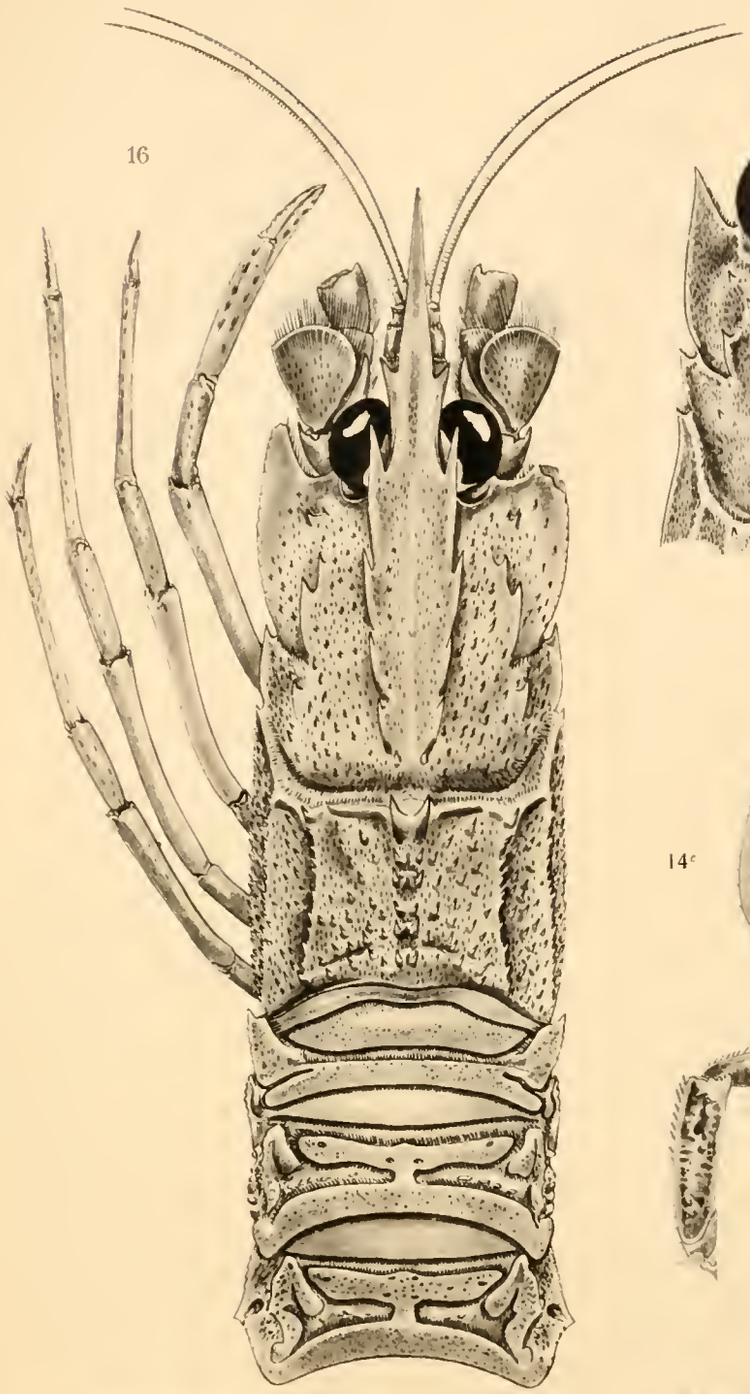
Fig. 13. *Scyllarus Martensii* Pfeffer, larger female with eggs from Stat. 33, sternum, × 8;
13*a* first somite of the abdomen, × 6.

Fig. 14. *Scyllarus gibberosus* (de Man), cephalothorax and antennae;
14*a* sternum;
14*b* lateral view of the five first segments of the abdomen;
14*c* and 14*d* right leg of the 2nd and of the 3rd pair.
All the figures are taken from the female from Stat. 164 and all are magnified 8-times.

Fig. 15. *Nephrops andamanicus* W.-Mas., anterior part of the carapace of the male from Stat. 12, × $1^1/_2$.

Fig. 16. *Nephrops arafurensis* de Man, male from Stat. 262, × 2;
16*a* lateral view of the abdomen as far as it is still preserved, × 2 (the tergum of the fully broken 4th somite has not been figured).

Fig. 17. *Nephropsis Stewarti* W.-Mason, right cheliped of the female from Stat. 262, × 2.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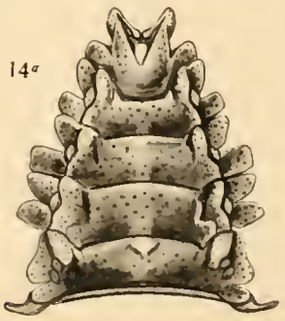
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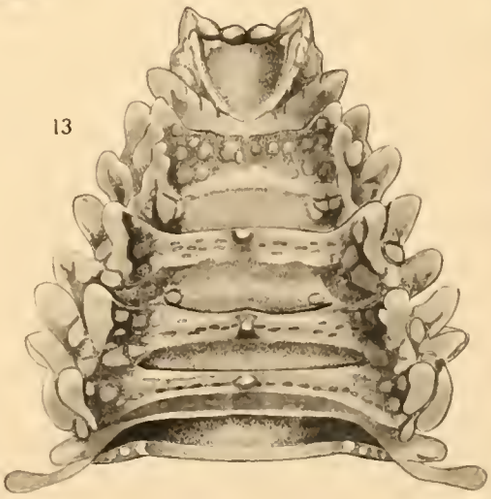
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PLATE IV.

Fig. 18. *Nephrops Sibogae* n. sp., the largest male from Stat. 254, in which the rostrum reaches only as far forward as the antennal peduncle, its distal part being regenerated and a little too short;

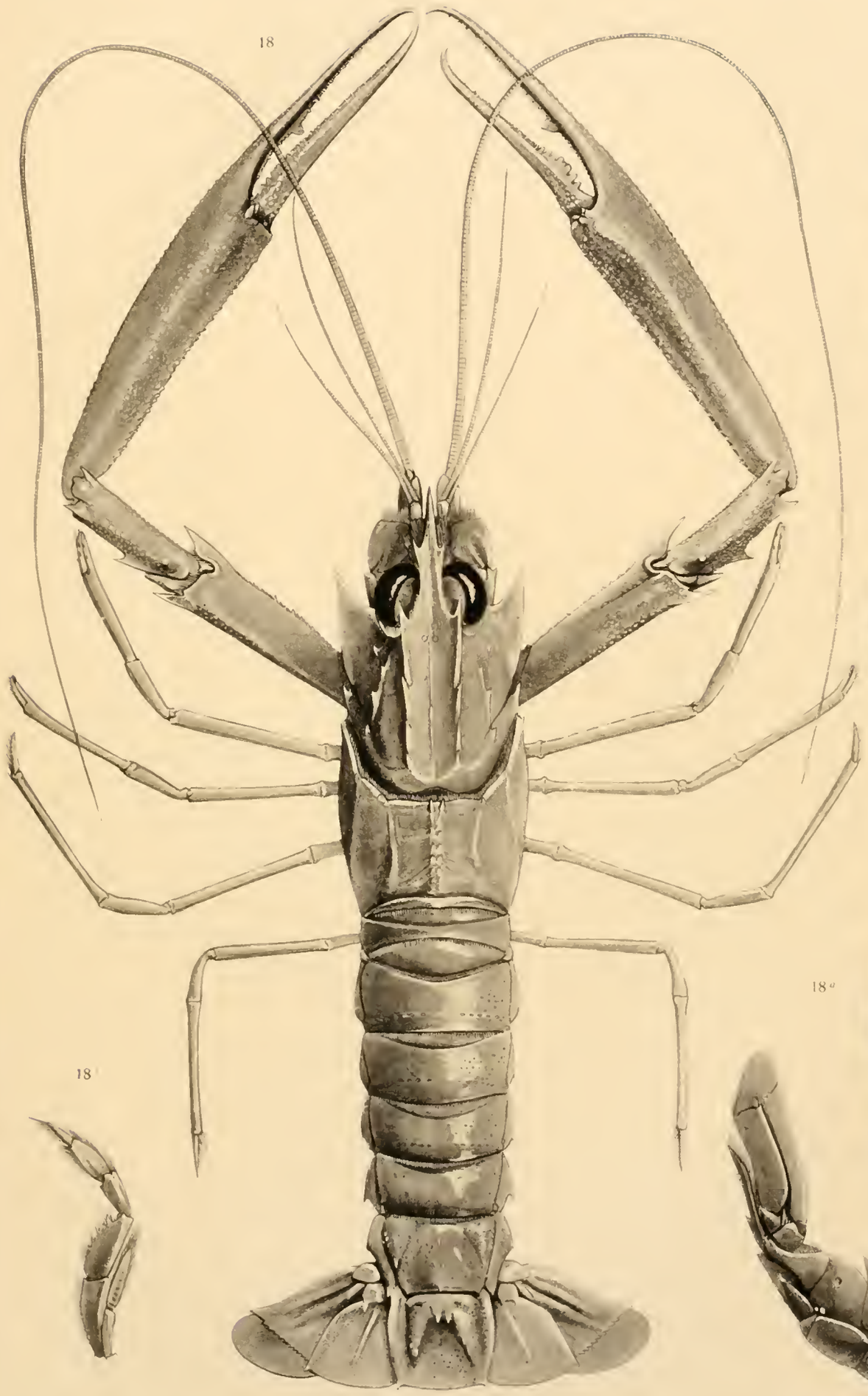
18*a* lateral view of the same specimen;

18*b* right antennal peduncle with scaphocerite and

18*c* outer foot-jaw of the same male;

18*d* lateral view of the carapace of a female without eggs, long 170 mm., from the same Station.

All the figures, in natural size, have been drawn by Mr. J. F. OBBES, of Apeldoorn.



RÉSULTATS DES EXPLORATIONS
ZOOLOGIQUES, BOTANIQUES, OCÉANOGRAPHIQUES ET GÉOLOGIQUES
ENTREPRISES AUX
INDES NÉERLANDAISES ORIENTALES en 1899—1900,
à bord du SIBOGA
SOUS LE COMMANDEMENT DE
G. F. TYDEMAN
PUBLIÉS PAR
MAX WEBER
Chef de l'expédition.

Siboga-Expeditie

THE
DECAPODA OF THE SIBOGA EXPEDITION

PART III

Families ERYONIDAE, PALINURIDAE, SCYLLARIDAE AND NEPHROPSIDAE

BY

Dr. J. G. DE MAN
Ierseke (Holland)

With 4 plates

Monographe XXXIX*a*[2] of:

UITKOMSTEN OP ZOOLOGISCH, BOTANISCH, OCEANOGRAPHISCH EN GEOLOGISCH GEBIED

verzameld in Nederlandsch Oost-Indië 1899—1900

aan boord H. M. Siboga onder commando van
Luitenant ter zee 1e kl. G. F. TYDEMAN

UITGEGEVEN DOOR

Dr. MAX WEBER
Prof. in Amsterdam, Leider der Expeditie

(met medewerking van de Maatschappij ter bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën)

BOEKHANDEL EN DRUKKERIJ
VOORHEEN
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