

ZOOLOGISCHE MEDEDEELINGEN

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D^r. E. D. VAN OORT

DIRECTEUR VAN HET MUSEUM

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ZOOLOGISCHE MEDEDEELINGEN

UITGEGEVEN VANWEGE

's RIJKS MUSEUM VAN NATUURLIJKE HISTORIE

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XII. — THE CATOMETOPOUS GENUS *MACROPTHALMUS* AS REPRESENTED IN THE COLLECTION OF THE LEIDEN MUSEUM. BY Dr. J. J. TESCH. — (WITH PLATES V—IX).

Though not laying any claim to being considered a pioneer in this systematic treatise on the genus *Macrophthalmus*, a thorough account of which has been given by Ortmann in 1897, I hope a renewed investigation may be not unwelcome to carcinologists. The discrimination of the species of this genus, notwithstanding they are easily to be grouped around certain well-characterized forms, remains a troublesome task. As far as I know Ortmann (Zool. Jahrb. Abt. Syst., Bnd. 10, 1897, p. 340—342) was the first to give an analytical key of the species then known. Several authors, among whom we may name Miss Rathbun, Nobili, Stimpson and Laurie, have since described new species or cleared several yet undecided questions about imperfectly known forms, but it is especially to the accomplished carcinologist de Man that we owe the most important contributions to our knowledge in this respect and the minutest descriptions. ¹⁾

The rather rich collection of *Macrophthalmus* in the Leiden Museum has induced me to give a new account of it, taking as base Ortmann's revision of 1897. I much regret, that the terrible war that actually is devastating most of the civilized countries of Europe, has prevented me from getting informations about doubtful species, as it is impossible now to get access to type-specimens preserved in Museums of warfaring countries. ²⁾ So I had to restrict myself almost entirely to the material of

¹⁾ I have to thank my fellow-countryman for several informations and advices in doubtful cases.

²⁾ Notwithstanding the war, Prof. Vanhöffen of the Berlin Zoological Museum has at my request taken the trouble of studying an original specimen of Herbst and I am glad to express my best thanks for his obligingness.

the Leiden Museum and it has been impossible to fill all the gaps left open by Ortmann.

The number of names used for species of the genus under discussion is rather large. I give here a full list of the names that have come to my knowledge, alphabetically arranged, with reference to the first paper in which they were published.

- M. affinis* Guérin. Voy. „Favorite”, t. 5, 2^e part., p. 172, pl. 50, f. 2. 1839.
 „ *bicarinatus* Heller. Crust. „Novara”-Reise, p. 36, pl. 4 f. 2. 1868.
 * „ *brevis* Herbst (*nec* Hilgendorf, de Man). Naturgesch. Krabben u. Krebse, Bnd. 3 Heft 4, p. 9, pl. 60 f. 4. 1804.
 * „ *brevis* Hilgendorf (*nec* Herbst). Baron v. d. Decken’s Reisen in Ost-Afrika, Bnd. 3. Crust. p. 86, pl. 3 f. 4. 1869.
 „ *carinimanus* (Latreille) H. Milne-Edwards. Hist. nat. d. Crustacés, t. 2 p. 65. 1837.
 „ *compressipes* Randall. Journ. Nat. Sc. Philadelphia, v. 8, p. 123. 1839.
 * „ *consobrinus* Nobili. Bull. d. Mus. d’Hist. nat. Paris, t. 12, p. 265. 1906.
 * „ *convexus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97. 1858.
 * „ *crassipes* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 157. 1852.
 * „ *crinitus* Rathbun. Proc. U. S. Nat. Mus. Washington, v. 44 p. 618, pl. 75 f. 3. 1913.
 * „ *definitus* Adams & White. Zool. Voy. „Samarang”, Crust., p. 51. 1848.
 * „ *dentatus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97. 1858.
 * „ *depressus* Rüppell. 24 kurzschwänz. Krabben d. rothen Meeres, p. 17, pl. 4 f. 6. 1830.
 * „ *dilatatus* de Haan. Fauna Japonica. Crustacea, p. 55, pl. 15 f. 3. 1835.
 * „ *erato* de Man. Journ. Linn. Soc. London, v. 22, p. 125, pl. 8 f. 12-14. 1888.
 „ *guérini* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158. 1852.
 „ *graeffei* A. Milne-Edwards. Journ. Mus. Godeffroy, Heft 4, p. 81, pl. 13 f. 5. 1873.
 * „ *grandidieri* A. Milne-Edwards. Ann. Soc. entom. France, t. 7 p. 285. 1867.
 „ *inermis* A. Milne-Edwards. Ann. Soc. entom. France, t. 7 p. 286. 1867.
 * „ *japonicus* de Haan. Fauna Japonica. Crustacea, p. 54, p. 15 f. 2 (♂), pl. 7 f. 1 (♀). 1835.
 „ *laevimanus* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 157. 1852.
 „ *laevis* A. Milne-Edwards. Ann. Soc. entom. France, t. 7 p. 287. 1867.
 „ *laniger* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 746, pl. 23 f. 15. 1894.
 * „ *latifrons* Haswell. Proc. Linn. Soc. N. S. W., v. 6 p. 549. 1882.
 * „ *latipes* Borradaile. Fauna Maldive etc., v. 1, prt 4; p. 433, f. 114. 1903.
 * „ *latreillei* (Desmarest). Hist. nat. d. Crust. foss., p. 99, pl. 9 f. 1-4. 1822.
 * „ *pacificus* Dana. Crust. U. S. Expl. Exp., prt. 1, p. 314, pl. 19 f. 4. 1852.

- M. parvimanus* (Latreille) Guérin. Iconogr. d. Règne animal, t. 3, Crust. p. 7, pl. 4 f. 1. 1829—43.
- * „ *pectinipes* Guérin. Voy. „Favorite” t. 5, 2^{me} part., p. 169, pl. 49. 1839. 1)
„ *podophthalmus* Souleyet. Voy. „Bonite”, Zool., t. 1 p. 241, pl. 3 f. 6. 1841.
„ *polleni* Hoffmann. Crust. et Echinod. d. Madagascar, p. 19, pl. 4 f. 27-30. 1874.
- * „ *punctulatus* Miers. Zool. Voy. „Alert” 1881-82, p. 237, pl. 25 f. a. 1884.
* „ *quadratus* A. Milne-Edwards. Nouv. Arch. Mus. d’Hist. nat. Paris, t. 9 p. 280, pl. 12 f. 6. 1873.
„ *serratus* Adams & White. Zool. Voy. „Samarang”. Crust. p. 51. 1848.
* „ *setosus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159. 1852.
„ *simplicipes* Guérin. Voy. „Favorite”, t. 5, 2^{me} part., p. 51, pl. 50 f. 1. 1839.
* „ *sulcatus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 156. 1852.
* „ *telescopicus* (Owen). Zool. Capt. Beechey’s Voy. „Blossom”, p. 78, pl. 24 f. 1. 1839.
* „ *tomentosus* Souleyet. Voy. „Bonite”, Zool., t. 1 p. 243, pl. 3 f. 8. 1841.
* „ *transversus* (Latreille). Nouv. Dict. d’Hist. nat., 2^e éd., t. 13 p. 297. 1817.
„ *verreauxi* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 9 p. 358. 1848. 2)

Some of these names are involved in much obscurity and may remain so, unless the type-specimens be again examined. These names are:

- M. laevimanus*.
„ *laevis*.
„ *parvimanus*.

Other names have proved with more or less certainty to be synonyms of already known ones; they are the following:

- M. affinis* = *M. depressus*.
„ *carinimanus* = *M. brevis* (Herbst nec Hilgendorf).
„ *compressipes* = *M. telescopicus*.
„ *guérini* = *M. pectinipes*.
„ *graeffei* = *M. convexus*.
„ *inermis* = *M. convexus*.
„ *laniger* = *M. latreillei*.
„ *podophthalmus* = *M. telescopicus*.

1) H. Milne-Edwards erroneously cites p. 167 (Ann. Sc. nat. sér. 3, Zool., t. 18. 1852. p. 158).

2) *Cleistostoma hirtipes* Jacquinot et Lucas (Voyage au pôle sud et dans l’Océanie sur les corvettes „l’Astrolabe” et „la Zélée”, Zoologie p. Hombron et Jacquinot, t. 6 p. 68, pl. 6 f. 3 et C), said to occur at Samoa, is implicitly referred to *Macrophthalmus* by G. M. Thompson (Ann. Mag. Nat. Hist. ser. 7, v. 10 p. 462) without however providing more information about his statement. The original specimen of Hombron and Jacquinot has been so badly preserved, that even H. Milne-Edwards in 1852 (l. c. s., p. 161) has been unable to decide the question as to its generic relation.

- M. polleni* = *latreillei*.
 „ *serratus* = *M. latreillei*.
 „ *simplicipes* = *M. pectinipes*.
 „ *verreauxi* = *M. telescopicus*.¹⁾

So there remain 25 names referring to well defined species and marked with an asterisk in the complete list of names.

The following key may serve in distinguishing these species²⁾:

1. Carapace with large spinous tubercles, conspicuously visible to the naked eye; posterior margin of propodites of walking legs in the penultimate pair with a row of large, curved spines. *M. pectinipes*.

Carapace differently shaped, either transversely broadened and conspicuously twice as broad as long, or more or less subquadrangular, but always smooth or with rounded obtuse tubercles; walking legs mostly hairy or smooth, but not spinous at the propodites. 2.

2. Ocular peduncles much elongated, projecting more or less far beyond the external orbital angle. 3.

Ocular peduncles shorter, in extreme cases reaching a little way beyond the external orbital angle (only for the length of the corneae). 5.

3. Length of carapace to breadth about as 1 : 1.60, smooth; eye-stalks projecting beyond the external orbital angle for about half their length. 4.

Length of carapace to breadth about as 1 : 2.40, with very declivous branchial regions and a longitudinal row consisting of 3—4 denticulated tubercles on these regions; eye-stalks projecting for a third of their length beyond the external orbital angle. *M. transversus*.

4. The two last joints of the hinder pair of legs flattened, penultimate joint nearly circular. *M. latipes*.

The two last joints of the hinder pair of legs not differing from the joints of the foregoing legs. *M. telescopicus*.

5. Carapace nearly exactly twice as broad as long, sometimes even broader; outer surface of the palm of the male cheliped with an elevated rim running close to and parallel with the under margin (sometimes modified into a row of small granules). 6.

Carapace more subquadrangular and always less than twice as broad as long, palm of the male cheliped nearly smooth, mostly without rim, which may be however faintly visible on the immovable finger. 13.

1) This list does not agree in several respects, as I am fully aware, with long accepted views of former authors, but I shall have occasion to sustain my opinion in discussing the various species.

2) I do not consider the species provided with a musical crest in the male sex a natural group within the genus, as Ortmann seems inclined to do (Zool. Jahrb. Abt. Syst., Bnd. 10, 1897, p. 340) and consequently I have not separated those species from the rest.

6. Inner surface of the palm of the male cheliped with a distinct tooth, placed not far from the proximal end of the palm. 7.

Inner surface of the palm of the male cheliped without tooth. 12.

7. External orbital angle and first lateral tooth of the carapace near together and placed crosswise: the longitudinal axis of the orbital angle is placed nearly perpendicularly to the axis of the first lateral tooth, which apparently forms the outer orbital angle. 8.

External orbital angle and first lateral tooth of the carapace separated by a distinct incision and both pointing in about the same direction. 9.

8. Outer orbital angle directed somewhat backward, first lateral tooth pointing transversely; eye-stalks projecting slightly beyond the sides of the carapace. *M. sulcatus.*

Outer orbital angle directed transversely outward, first lateral tooth pointing both outward and forward; eye-stalks shorter, scarcely reaching the inner margin of the first lateral tooth. *M. grandidieri.*

9. Outer surface of the palm of the male cheliped coarsely granulated in the upper part, median part smooth, under part with a distinct elevated rim, immovable finger without larger tooth on the cutting margin. *M. dilatatus.*

Outer surface of the palm of the male cheliped smooth to the naked eye, very finely granulated or punctate when examined with a magnifying glass, under part of the palm with a row of rather large granules that are placed on a more or less distinctly elevated rim; immovable finger with a large, denticulated tooth. 10.

10. Upper border of the orbital groove very much curved, the top of this curve is in about the same level with the tip of the outer orbital angle; palm of the male cheliped very much elongated, its length (without immovable finger) about four times the greatest height. *M. brevis.*

Upper border of the orbital groove less curved, sloping, the top of the curve reaching far beyond the tip of the outer orbital angle; palm of the male cheliped short, its length (without immovable finger) only about twice the greatest height. 11.

11. Upper margin of the palm distinctly serrated, movable finger granulated; carapace nearly smooth, regularly rounded in a transverse direction, without verrucose tubercles on the branchial regions; first lateral tooth of the carapace larger and projecting farther forward than the external orbital angle; incision between these teeth rather wide. *M. hilgendorfi.*

Upper margin of the palm and movable finger smooth; carapace conspicuously granulated, transverse grooves strongly pronounced,

branchial regions declivous, with two verrucose tubercles, the one behind the other, and a third transversely elongated one just before the lateral end of the hinder transverse groove; external orbital angle and first lateral tooth not much differing in size and separated by a narrow incision.

M. crassipes.

12. Outer surface of the palm of the male cheliped granulated in its upper part, smooth beneath, with a strong rim running close to and parallel with the under margin, inner surface of the palm and of the fingers hairy, mobile finger without larger tooth at the cutting margin; breadth of carapace more than twice its length. *M. consobrinus.*

The whole outer surface of the palm of the male cheliped with small scattered granules, larger granules arranged in a row parallel with the under margin, inner surface of the palm naked, that of the fingers hairy, mobile finger with a small, but distinct quadrilateral tooth at the cutting margin near the base of the finger; breadth of carapace in adult specimens nearly exactly twice its length, in young specimens less broad.

M. convexus.

13. Inner surface of the palm of the male cheliped with a distinct spine; a horny crest („musical ridge”) close to the inner margin of the arm (meropodite) of the cheliped; outer part of the under margin of the orbital groove with two oblique tubercles.

M. erato.

Inner surface of the palm of the male cheliped without spine, a „musical crest” at the arm of the cheliped may be present, but is mostly wanting.

14. Sides of the carapace with four teeth, including the external orbital angle. 15.

Sides of the carapace with three teeth (the last one very small), including the external orbital angle. 16.

15. Carapace (at least in adult specimens) nearly subquadrangular, length to greatest breadth about as 1:1.50—1.60, closely covered with conspicuous rounded granules and (in young specimens) also with hairs.

M. latreillei.

Carapace somewhat broader, length to greatest breadth about as 1:1.67, smooth and glossy, except towards the branchial regions, where there are two longitudinal rows of obtuse tubercles, no hairy covering, sides distinctly convergent distally.

M. dentatus.

16. Greatest breadth of carapace between the outer orbital angles (sometimes subquadrate). 17.

Carapace narrowed anteriorly, so that the greatest breadth is lying between the tips of the first lateral teeth, or farther behind, on each branchial region two parallel, longitudinal rows of closely placed larger granules (except in the small *M. crinitus*).

20.

17. Outer orbital angle sharp; a short „musical crest” at the fore margin of the arm of the male cheliped; three obtuse tubercles in the outer half of the under orbital border; immobile finger with a large tooth occupying nearly the whole distal half of the finger. *M. quadratus*.

Outer orbital angle rectangular or somewhat sharp, in the latter case not projecting farther than the antero-lateral tooth of the carapace; no „musical crest” at the fore margin of the arm of the male cheliped; immobile finger with or without larger tooth. 18.

18. Immobile finger without larger tooth; a row of granules near the under border of the palm. 19.

Immobile finger with a large tooth, outer surface of palm smooth, without a row of granules; carapace subquadrate; front occupying one-third of the greatest width of the carapace; outer orbital angle not projecting farther outward than the antero-lateral tooth, both teeth of nearly the same shape. *M. punctulatus*.

19. Outer orbital angle rectangular; sides of the carapace convergent posteriorly; immobile finger not deflexed, in the same line with the lower border of the palm. *M. setosus*.

Outer orbital angle somewhat pointed; sides of the carapace arched; immobile finger deflexed, forming a curved line with the lower border of the palm. *M. latifrons*.

20. Carapace and legs very much hairy; no longitudinal rows of granules on the posterior branchial regions. *M. crinitus*.

Carapace with some scattered hairs, with larger or smaller granules, sometimes smooth; on each branchial region two nearly parallel rows of larger granules, among which are inserted very short hairs, above the insertion of the last pair of legs runs a similar but much shorter row, and finally there is a fourth row, that runs transversely at the level of the last lateral tooth of the carapace. 21.

21. Carapace smooth, glossy; immobile finger of male cheliped with a faint longitudinal rim, meropodites of last pair of walking legs with a spine near the distal end. *M. pacificus*.

Carapace granular; meropodites of last pair of walking legs without a spine near the distal end. 22.

22. Carapace conspicuously narrowed anteriorly; a „musical crest” at the fore margin of the arm of the male cheliped; under margin of the orbital groove in its outer fourth part formed by three rounded tubercles. *M. tomentosus*.

Carapace less narrowed anteriorly; no „musical crest” at the fore margin of the arm of the male cheliped; under margin of the orbital groove not modified into obtuse tubercles but wholly crenulated. 23.

23. Immovable finger of male cheliped without a larger tooth before the middle of its length, but only denticulated along the cutting margin, movable finger with a large quadrangular tooth near the base. *M. depressus*.
 Immovable finger of male cheliped with a large tooth before or at the middle of its length. 24.
24. Tooth at the movable finger of male cheliped small or absent, inner surface of palm clothed with hairs. *M. definitus*.
 Tooth at the movable finger of male cheliped large and conspicuous, inner surface of palm naked. *M. japonicus*.

M. pectinipes Guérin.

1839. *M. pectinipes* Guérin. Voy. „Favorite”, t. 5, 2^{me} part., p. 169. pl. 49 (Bombay).
 1839. „ *pectinipes* Guérin. Mag. Zool., t. 8, Crust., Cl. 7. pl. 23 (Bombay).
 1839. „ *simplicipes* Guérin. Voy. „Favorite”, t. 5, 2^{me} part., p. 171. pl. 50 f. 1 (Bombay).
 1839. „ *simplicipes* Guérin. Mag. Zool., t. 8, Crust., Cl. 7. pl. 24 f. 1 (Bombay).
 1852. „ *pectinipes* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158 (no new record).
 1852. „ *Guérini* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 158 (East-Indies).
 1852. „ *semplicipes* H., Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158 (no new record).
 1893. „ *pectinipes* Henderson. Transact. Linn. Soc. London, ser. 2, v. 5 p. 389 (Sind and Penang).
 1897. „ *pectinipes* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 340 (no new record).
 1900. „ *pectinipes* Alcock. Journ. As. Soc. Bengal, v. 69, part. 2. p. 377 (Karachi and Orissa).

This easily recognizable species is best described by Alcock. Except by the comparatively large size this species may attain (Alcock mentions a specimen with a breadth of carapace of 62 mm.), it is distinguished by the „musical crest” in the middle of the anterior margin of the arm of the male chelipeds, by the inferior border of the orbital groove in the male sex being modified in the outer half into four prominent widely separated tubercles ¹⁾, by the large spiniform granules on the carapace, especially on the branchial regions, and by the hinder border of the propodite of the penultimate pair of legs being provided with large, curved spines.

1) According to Alcock the lower border is „unevenly crenulate”.

This last character, as also the conspicuous spiniform granules on the carapace, are sufficient to separate this species at once from all its congeners. The front is very narrow, strongly constricted between the base of the ocular peduncles and bilobed at its free margin. The eye-stalks do not reach beyond the external orbital angle.

Judging after my material, which consists only of four specimens, the species is subject to considerable variation. Firstly two specimens (males) exhibit a much more spinous carapace than the females; in the first case the granules are distributed over the whole surface (though more conspicuous and larger on the branchial regions than on the mesogastric and cardiac area); in the females on the contrary the middle regions of the carapace are nearly perfectly smooth, with only very few scattered granules, on the branchial regions the granules are large, knob-like and of the same character as those in the males, but somewhat fewer in number, and disposed in an irregular longitudinal row. I suppose such females have induced Milne-Edwards to erect a distinct species (*Guérini*), the carapace of which is „à peine granulée” and granulated only on the branchial regions, „où les plus gros sont disposés en une série longitudinale”.

Secondly the spines on the legs are very much variable. The meropodites of the middle pairs of walking legs may be very spinous on the fore margin or only tuberculated in both sexes. Alcock says that only in the penultimate pair of legs the hinder border of the propodite is serrated, but the propodite of the second pair may exhibit this same character, though it is smooth in other cases, in such a way, that the right or left walking legs of the second pair may differ in this respect from those of the other side. For this reason I am much inclined to regard the *M. simplicipes* of Guérin as another (young) variation of *M. pectinipes*; indeed it differs only from this last species by having the legs perfectly smooth, not spinous but hairy, whereas the form of the carapace with its large spiniform granules, the shape and direction of the outer orbital angle and of the lateral teeth, are exactly the same as in *M. pectinipes*.¹⁾ Even the rounded tubercles of the ventral border of the orbital groove (in the male) are indicated in Guérin's figure of *M. simplicipes*.²⁾ These two species were found together in the same localities.

The Leiden Museum possesses 4 specimens (dried), without indication of origin.

1) In Guérin's figure of *M. pectinipes* the second lateral tooth is omitted, though it is mentioned in the text.

2) This author says that the form of the male abdomen in *M. simplicipes* is widely different from that of *M. pectinipes*, but he does not give any further detail nor figures.

The species has hitherto only been found on the continent of British India, it does not seem to occur on the shores of the islands in the Indian Ocean.

My largest specimen (♂) has a greatest breadth of carapace of 56 mm., the length is 33 mm.

M. transversus (Latreille). (Pl. V, Fig. 1).

1817. *Gonoplax transversus* Latreille. Nouv. Dict. d'hist. nat., 2^e éd., t. 13 p. 237 (East-India).
 1837. *M. transversus* H. Milne-Edwards. Hist. nat. d. Crust., t. 2 p. 164 (Pondichéry).
 1844. „ *transversus* H. Milne-Edwards. Règne animal d. Cuvier, 2^e éd., Crust. pl. 16 f. 2 (no new record).
 1852. „ *transversus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 156 („Mers d'Asie”).
 1889. „ *transversus* Cano. Boll. Soc. Nat. Napoli, t. 3 p. 229 (Massowah).
 1892. „ *transversus* de Man. Max Weber's Zool. Ergebn., Bnd. 2 p. 308 (Brandewijnsbaai near Padang).

Prof. Weber has kindly allowed me to examine the specimen mentioned by de Man, who has had occasion to compare it with a typical specimen from the Paris Museum. Though the Padang specimen is much damaged and all the legs are detached (though yet present) it enabled me to state that the specimens of the Leiden Museum belong certainly to the same species. As this species is very little known I shall try to characterize it as fully as possible.

The carapace is more than twice as broad as long and recalls in this respect *M. brevis*. From the tip of the outer orbital angle to the insertion of the last legs the sides are distinctly convergent. The outer orbital angle is pointed, directed straightly outward (in the male from Padang the tip is somewhat curved forward) and separated by a deep incision from the first lateral tooth which is directed somewhat forward and shows a distinct serration on both margins; the second lateral tooth is small but clearly visible and behind it the sides of the carapace are finely denticulated, though this character is somewhat obscured by the hairs at the lateral borders of the carapace.

The surface of the carapace is in the female specimens of a bluish-grey colour, perfectly smooth and shining, curved in a longitudinal direction, but almost straight transversely, except for the very declivous, abruptly sloping sides. On the hepatic and branchial regions there are minute granules. The border of the postero-lateral slopes is marked by a longitudinal row of four or five tubercles (already spoken

of by Milne-Edwards), the tip of which is surmounted by a white-coloured large granule; the foremost of these tubercles is situated just before the lateral end of the second transverse lateral groove of the carapace and is somewhat elongated transversely, the other tubercles are lying farther behind on the branchial regions. On the slopes of the carapace there is among the minute granules another longitudinal row of somewhat larger granules. The grooves separating the various regions of the carapace are very inconspicuous, the most distinct ones are those bordering the mesogastric area, the transverse grooves on the hepatical regions are very shallow and between these grooves the carapace is raised towards the margins into a series of very obtuse, ill-defined knobs. At either side of the median line of the carapace, just before the transverse groove separating the gastric and the cardiac area, we may remark a very short, straight, well marked line, which on microscopic examination proves to consist of a shallow groove, immediately before which a series of minute hairs is inserted.

In the male specimen from Padang the carapace is exactly alike, except for the marked difference that the whole surface is covered with closely set granules and is not smooth and glossy as in the females. I have no more specimens and cannot make out whether this difference is a sexual one; perhaps, however, my female specimens represent a local variety of the species.

The front is narrow, constricted between the eye-stalks, faintly bilobed at its free margin and nearly perpendicularly bent downward. The ocular peduncles are very long, though not so as in the following species. According to Milne-Edwards (1852) they project beyond the outer orbital angle for the length of the eye only ¹⁾, but in my female specimens the peduncles are more elongated and project beyond the carapace for about one-fourth of the length of the whole eye-stalk. In the male specimen the ocular peduncles are most unfortunately much damaged and the eyes themselves are torn away. The upper orbital border is faintly convex, serrated, especially along its outer half; the under margin of the orbital groove projects much forward and is beset with minute denticles, curved inward, but the margin disappears laterally at a distance of about one-third of the whole length of the upper orbital border.

The abdomen of the females is extremely broad, nearly semicircular, and the sutures between the anterior joints are peculiarly wavy, not straight.

1) The same character occurs in a very young female specimen from the Harafuera Sea, mentioned by Miers (Rep. Brachyura „Challenger“ Exp. p. 249) and referred by him doubtfully to *M. podophthalmus* (= *M. telescopicus*), but the length of the carapace in proportion to its greatest breadth prevents its being regarded as the species now under discussion (length of carapace 4 mm., breadth 5.5 mm.).

The male cheliped is very peculiarly shaped, inasmuch as the palm is not inflated but compressed and weak. The meropodite (arm) has several curved spines at the second half of the interior margin; there is no „musical crest”; the carpus has two distinct spines at the anterior border, near the joint with the palm; the palm is thin and much elongated, with minute granules on the outer surface and a fur of fine hairs on the inner surface; this fur extends to the fingers. The length of the palm is about twice its greatest height and the lower margin, which is bordered by two parallel serrated crests, passes with a deep curve into the immobile finger; the upper border is much rolled over, especially in its proximal half, and provided with a row of distinct spines. At the insertion of the movable finger a part of the palm seems to be detached, so as to form a separate joint, but the suture separating this part from the rest of the palm is not continued on the inner surface. On this inner surface there is a distinct spine (near which one or two smaller ones are to be seen) near the carpal end of the palm, at the same place therefore as the similar spine on the palm of such species as *M. brevis*, *sulcatus* etc. The fingers are also peculiar; they are weak and compressed, much curved inward and about half the length of the palm; the movable finger keeps about the same height throughout its length and is provided at the cutting margin with five or six small, widely separated denticles, without larger tooth; the immobile finger is very slender and provided before the middle of its length with a high tooth, rising perpendicularly to the longitudinal axis of the finger, the hinder margin of this tooth is finely denticulated, the anterior border is smooth; between this tooth and the tip of the finger there are no denticulations, but only a rather large, simply pointed, second tooth. The female palm is much smaller, though likewise compressed, the length of the palm is but slightly more than its greatest height, the fingers are as long as the palm, somewhat more strongly built than in the male, and provided at the cutting margin with three or four finely pointed denticles.

The ambulatory legs are very long, and, as usual, the middle pairs are much stronger than the first and last pair. The meropodites of the first three pairs have a rather large spine at the anterior border, near its distal end, and the whole anterior border is distinctly tuberculated; the posterior border of the meropodites of the middle legs have several spines, placed somewhat more proximally than the single spine just named. Carpo- and propodite of the penultimate pair of legs are peculiar by their length; they are much longer than those of the foregoing pair. The last legs are slender and weak, hairy along the margins; their length is not much inferior to that of the first pair.

M. transversus has been found in the Red Sea (Massowah), at Pondichéry and at the coast of Sumatra (Brandewijnsbay near Padang). The Leiden specimens (both females) were collected at the north point of Sumatra (Poeloe Weh, Sabang bay), by the late Dr. G. A. J. v. d. Sande, in July 1901.

I give here the dimensions of some specimens in mm.

	1	2	3	4
	♀	♀	♂	♂
Distance between external orbital angles	27.5	26.5	30.3	24.3
Length of carapace	11.5	11.—	12.5	10.—
Least breadth of front	2.75	2.75	—	—
Length of eye-stalks	15.5	15.30	—	—
Length of carpo- and } of penultimate pair of legs	13.5	13.—	—	12.—
propodite together } of last pair of legs	8.—	7.75	—	6.—

1—2 are the Leiden Museum specimens, 3 is the typical specimen of the Paris Museum, measured by de Man, 4 is the specimen collected by Weber near Padang.

M. telescopicus. (Owen) (Pl. V, Fig. 2).

- 1839. *Gelasimus telescopicus* Owen. Zool. Capt. Beechey's Voy. „Blossom”, p. 78. pl. 24 f. 1 (Sandwich-isles).
- 1839. *M. compressipes* Randall. Journ. Ac. Nat. Sc. Philadelphia, v. 8 p. 123 (Sandwich-isles).
- 1841. „ *podophthalmus* Souleyet. Voy. „Bonite”, t. 1 p. 241, Crust. pl. 3 f. 6—7 (Sandwich-isles).
- 1848. „ *Verreauxi* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 9 p. 358 (Australia).
- 1850. „ *compressipes* Gibbes. Proc. Am. Ass. Adv. Sc., 1850, p. 180 (Pacific).
- 1852. „ *Verreauxi* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 155, pl. 4 f. 25 (Australia).
- 1852. „ *podophthalmus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 155 (Sandwich-isles).
- 1852. „ *telescopioides* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 155 (no new record).
- 1852. „ *telescopicus* Dana. Crust. U. S. Expl. Exp., v. 1 p. 314 (Sandwich-isles).
- 1858. „ *telescopicus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Loo-Choo-isles).
- 1865. „ *Verreauxi* Hess. Arch. Naturgesch. Jahrg. 31. 1, p. 142 and 171 (Australia).
- 1880. „ *Verreauxi* de Man. Notes Leyden Museum, v. 2 p. 184 (Red Sea).
- 1882. „ *podophthalmus* Haswell. Cat. Austral. Crust., p. 88 (Holborn Island).

1882. *M. Verreauxi* Haswell. Cat. Austral. Crust., p. 89 (Australia).
 1886. „ *podophthalmus* Miers. Brach. Chall. Rep., p. 249 (Torres Strait).
 1894. „ *telescopicus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 744
 (Carolines, Ponapé).
 1900. „ *Verreauxi* Alcock. Journ. As. Soc. Bengal, v. 69, prt. 2 p. 377
 (Andamans and Mergui archipelago).
 1903. „ *verreauxi* Borradaile. Fauna Maldive etc., v. 1, prt. 4 p. 433
 (Maldive archipelago).
 1906. „ *Verreauxi* Nobili. Ann. Sc. nat., sér. 9, Zool., t. 4 p. 317 (Red Sea,
 Perim and Obock).
 1907. „ *telescopicus* Stimpson. Smithsonian. Inst., Miscell. Coll., v. 49, p. 95
 (Loo-Choo-isles).
 1910. „ *verreauxi* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4
 p. 322 f. 6 (Gulf of Siam).

Most authors agree in uniting Souleyet's *M. podophthalmus* with the *Gelasimus telescopicus* of Owen; indeed, on comparing the original figures of these authors, there is a great probability that the species are identical, the more so, because they were both collected at the Sandwich islands. On the contrary, *M. verreauxi* is generally regarded to be distinct, though Milne-Edwards in 1852 already acknowledged the difficulties of their discrimination. According to Milne-Edwards the chief difference must be sought in the form of the lateral teeth which are flat and depressed in his species, but spiniform in *M. podophthalmus*. Now I have before me two adult female specimens of *M. verreauxi* from the Red Sea (already examined by de Man) and I have only to repeat the words of this author: „the three lateral teeth are sharp, a little depressed and the first tooth is directed transversely outward, but not forward”, so that Milne-Edwards' figure is most likely wrong in the form and disposition of the lateral teeth. If these specimens of our Museum really belong to *M. verreauxi*, which is to me beyond doubt, *M. telescopicus* and *M. podophthalmus* must certainly go with it, for my specimens agree in every detail exactly with the figures of Owen and Souleyet. 1) I have here figured one of de Man's specimens.

This species differs in many respects from *M. transversus*. The most conspicuous features are the length of the eye-stalks, projecting beyond the sides of the carapace for nearly half their length, and the comparative

1) In Souleyet's figure the last lateral tooth is very large, even projecting beyond the external orbital angle, but I am much inclined to regard this as a mistake, as such a feature, so widely differing from all that has been observed in other species of the genus, would not have failed to have been detected by such a keen observer as Souleyet.

narrowness of the carapace, the length of which is two-thirds its greatest breadth. The external orbital angle projects straightly outward and is spiniform but somewhat depressed; the two lateral teeth behind it are much smaller. Nobili has observed the same form of these teeth in his specimens. At the lateral margins of the carapace the fine denticulations (behind the antero-lateral teeth) which are so conspicuous in the preceding species, are here represented by a series of very minute beaded granules, though Souleyet mentions in his species, *M. podophthalmus*, a series of „dentelures très-fines qu'on n'aperçoit que difficilement à cause des long poils qui garnissent les côtés de la carapace". The whole surface of the carapace is nearly smooth, the various grooves are faintly indicated, those circumscribing the cardiac region even being absent, the front is less deflexed than in *M. transversus*, and the carapace itself is evenly rounded, not abruptly sloping at the sides, where only with the aid of a magnifying-glass very small granules may be observed.

The cheliped of the male has a high and short palm ¹⁾, provided with a rather strong ridge parallel with the inferior border, but continued more conspicuously to the tip of the immovable finger. This ridge is already mentioned by Owen and Souleyet and also shown in Miss Rathbun's figure of the male cheliped; but whereas Souleyet rightly remarked that each of the fingers carries a larger denticulated tooth at the cutting margin, such a tooth is not figured by Miss Rathbun at the movable finger. Though the authoress had only young males at her disposal she supposed that Milne-Edwards' figure of the cheliped was taken from a female specimen, as in this figure no teeth at the fingers are shown. In my adult females however the fingers are comparatively much longer, more slender and the palm is compressed and much less high than in the figure of Milne-Edwards; the rim near the under side of the palm is more conspicuous than in the male.

The meropodites of the ambulatory legs have no spines at the posterior border; carpo- and propodite of the penultimate pair are not distinctly longer than those of the preceding pair.

The Museum contains in all five specimens of this species, two adult females and three very young males, collected at Djeddah (Red Sea).

The species has a wide range, extending from the Red Sea along the islands of British India and the Gulf of Siam to the Loo-Choo-isles, Australia and the Sandwich islands. It does not seem to have been found however in the Netherlands' East-Indies nor at the coast of East-Africa.

I give here the dimensions of some specimens in mm.

1) At least in young specimens; the adult males show, according to Nobili, a much longer palm, more than twice as long as the immobile finger.

	1	2	3	4	5	6	7
	♀	♀	♂	♂	♂	♂	♂
Distance between external orbital angles	19.5	18.—	9.25	24.—	25.—	14.—	8.8
Length of carapace	11.5	11.1	5.6	16.—	18.—	9.—	5.9
Length of eye-stalks.	14.—	13.3	7.—	—	—	—	—
Length of carpo- and propodite of the hinder pair of legs	6.—	6.—	5.—	—	—	—	—
Greatest breadth of the propodite of the hinder pair of legs	1.75	1.6	0.75	—	—	—	—

1—3 are specimens of the Leiden Museum, 4 is the „*Gelasimus telescopicus*” of Owen, 5 is the „*M. podophthalmus*” of Souleyet, 6 is a male mentioned by Alcock, 7 a young male spoken of by Miss Rathbun.

We may remark, that the length of the carapace is always about two-thirds its greatest breadth and never half this breadth or less, as in the preceding species.

M. latipes Borradaile.

1903. *M. latipes* Borradaile. Fauna Maldive etc., v. 1, prt 4, p. 433 f. 114.

According to Borradaile's description and figure this species at first sight resembles *M. telescopicus* by the length of the ocular peduncles, as these outreach the outer orbital angle by more than a third of their length; the shape of this orbital angle is also much the same and there are „faint traces of two mounds behind this tooth”. The breadth of the carapace is however somewhat more, the length to the breadth being as 5:8. The chelipeds of the male are small, much shorter than the first pair of walking legs; the palm is much less high than in *M. telescopicus*, apparently without rim near the under margin, and it is only the movable finger that carries a blunt denticulated tooth. The meropodites of the walking legs are slender, much less massive than in the preceding species, and the nails are comparatively longer. The chief difference between the two species consists in the form of the last two or three joints of the hindermost pair of legs, which are remarkably broad and flattened, unlike all other species of *Macrophthalmus* so far as now described. The penultimate joint is broadly oval, nearly circular, and the last joint is also paddle-like. Indeed, except for this character, it is difficult to detect any real difference between the two species here named, for my young specimens of *M. telescopicus* agree almost exactly with Borradaile's species, the external orbital angle and the first lateral tooth of the carapace, as well as the bent of the upper

orbital border, exactly being the same. In *M. latipes* however the front is broader and very strongly bent downward.

The Museum does not possess this small species, the carapace of which attains a length of 5 mm., a breadth of 8 mm. A single (male) specimen was dredged at South Nilandu Atoll (Borradaile).

M. sulcatus H. Milne-Edwards.

1852. *M. sulcatus* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 156 (Mauritius).
1894. „ *sulcatus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 345 (Australia?).
1900. „ *sulcatus* Alcock. Journ. As. Soc. Bengal, v. 69, prt 2, p. 379 (Andamans).
1905. „ *sulcatus* Lenz. Abhandl. Senckenb. Gesellsch., Bnd. 27 p. 366 (no new record).

This species seems to have been often confounded with *M. grandidieri*, *M. brevis* and *M. carinimanus* and the synonymy appears the more intricate as under two of the latter names various authors have referred to different species.

Recently Lenz, who had the opportunity of studying the type-specimens of *M. sulcatus* and *M. grandidieri* in the Paris Museum, has clearly given the differences between these species. In *M. sulcatus* the ocular peduncles are much elongated, reaching (according to Alcock) beyond the anterolateral angle of the carapace. The outer orbital angle is small and directed somewhat backward; it is crossed nearly at a right angle by the much larger anterior lateral tooth, which projects straightly outward. Upper orbital border less curved than in *M. grandidieri*. Male cheliped with a high palm, which shows a strong ridge at the outer surface, close to and parallel with the under margin, and at the inner surface there is in the median line a longitudinal row of denticles (according to Alcock), the first one of which, near the carpal joint, is considerably enlarged. Of the fingers the immovable finger only has a strong molari-form tooth near the base.

Alcock says that the carapace of the males is very broad, the breadth being twice and two-thirds the length, in the females the carapace is somewhat narrower. On each branchial region there are three granular tubercles in a longitudinal row.

I shall have occasion to note various differences between this species and the following which is very nearly related to it, though, according to Lenz, evidently distinct.

The Leiden Museum does not possess this apparently rare species, the range of which seems to embrace the shores of the Indian Ocean and not to extend into the Pacific.

M. grandidieri A. Milne-Edwards (Pl. VI, Fig. 3).

1867. *M. grandidieri* A. Milne-Edwards. Ann. Soc. entom. France, sér. 4, t. 7 p. 285 (Zanzibar).
 1868. „ *grandidieri* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 4 p. 84, pl. 20 f. 8—11 (Zanzibar).
 1881. „ *grandidieri* Lenz et Richters. Beitr. Crust. Fauna Madagascar, p. 3 (Madagascar, Nossi-Bé).
 1894. „ *grandidieri* Ortmann. Jenaische Denkschr. Bnd. 8, p. 58 (Dar-es-Salaam, Kilwa).
 1897. „ *grandidieri* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10, p. 345 (no new record).
 1905. „ *grandidieri* Lenz. Abhandl. Senckenb. Gesellsch., Bnd. 27 p. 365 (Zanzibar).

The following are the principal differences between this and the preceding species, as summed up by Lenz.

	<i>M. sulcatus</i>	<i>M. grandidieri</i>
external orbital angle .	directed slightly backward	directed outward
antero-lateral tooth of carapace	directed outward	„ obliquely forward
inferior orbital border .	regularly crenulated, without intervals	denticles of unequal size, leaving a space between them which is as large as the base of the denticle itself
superior orbital border .	faintly curved	strongly curved
ocular peduncles. . .	reaching beyond the sides of the carapace	reaching to the tip of the first lateral tooth (apparent orbital angle)
second transverse groove of the carapace . .	distinct	less pronounced
branchial regions . .	with three or four denticulated tubercles in a longitudinal row	with faintly pronounced tubercles, which are often entirely absent

The carapace of *M. grandidieri* is minutely granulated, especially on the branchial and cardiac regions. A second (posterior) lateral tooth is not developed in my specimens but may be concealed under the long hairy covering of the lateral margins. The external orbital angle and the anterior lateral tooth, which latter is very bulky, are placed in a most characteristic fashion (as seen in the figure). Ocular peduncles long; according to Lenz they are somewhat shorter than in *M. sulcatus*, in which species they project slightly beyond the tip of the lateral tooth. Upper orbital margin very convex, minutely beaded. The species is remarkable for the long, slender ambulatory legs, and for the bulky size of the male cheliped. In the latter the palm is very high, higher than in any other species I have seen (see the figure); but I must state, that in other specimens the palm is somewhat more slender. On the outer surface there is a distinct ridge, as in many other species of *Macrophthalmus*, which is proximally finely denticulated but simple on the immovable finger. The fingers are very widely gaping at the base; the immobile finger has a larger tooth in about the middle of its length, this tooth however is not very much pronounced in my specimens. Milne-Edwards (1868) has also given a figure of the cheliped, in which the fingers are less gaping and each bearing a larger denticulated tooth, that of the movable finger being found near the base and of a quadrangular shape. I have not succeeded in detecting this latter tooth, but my specimens were preserved in a dry state and the thick hairy coating of the fingers and of the inner surface of the palm has prevented me from getting a distinct view of these parts. The spine at the inner surface of the hand is very conspicuous. The upper margin of the palm is bordered by a regular row of large granules, gradually diminishing in size towards the distal end. Both fingers are very strongly bent inward.

M. grandidieri is also very nearly related to *M. brevis*, but in the latter the upper orbital border is not so strongly curved, the outer orbital angle and the anterior lateral tooth keep the same direction and are not placed crosswise, and the palm of the male cheliped is much less high. The ambulatory legs are also shorter in *M. brevis*.

The Museum contains four specimens (♂) of *M. grandidieri*, all in a dry state, from the Red Sea. They had hitherto been undetermined.

The species has only been found at the coast of East-Africa and Madagascar.

The following is a list of some dimensions of the species in mm.

	1	2	3	4
	♂	♂	♂	sex unknown
Distance between tips of outer orbital angles	23.5	27.5	33.—	30.—
Length of carapace	11.5	13.—	16.—	14.—
Fronts in its narrowest place	3.5	4.—	—	—
Length of palm (immobile finger included)	18.—	21.5	—	—
Height of palm at insertion of mobile finger	8.5	12.—	—	—

1—2 are specimens of the Museum, 3 is a specimen of Milne-Edwards, 4 a specimen (the sex of which is not stated) of Lenz (1905).

M. dilatatus de Haan (Pl. VI, Fig. 4).

1835. *Ocypode (Macrophthalmus) abbreviata* de Haan. Fauna Japonica, Crust., p. 26 (*nomen nudum*).
1835. *Ocypode (Macrophthalmus) dilatata* de Haan. Fauna Japonica, Crust., p. 55, pl. 15 f. 3¹⁾ (Japan).
1852. *M. dilatatus* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 157 („Mers du Japon et de l'Inde”).
1890. „*dilatatus* de Man. Notes Leyden Museum, v. 12. p. 76, pl. 4 f. 9 (no new record).
1894. „*dilatatus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 744 (Tokio Bay).
1897. „*dilatatus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 345 (south-east coast of Japan).
1904. „*dilatatus?* Doflein. Wiss. Ergebn. „Valdivia” Exp., Bnd. 6, Bra-chyura, p. 29 (Padang).

This species closely resembles *M. carinimanus* and in the case of female specimens the discrimination of both species may be often impossible; in *M. dilatatus* however the carapace is somewhat less broad, the outer orbital angle is smaller than the anterior lateral tooth of the carapace (in *M. carinimanus* both teeth are of nearly equal size), the incision between them is narrow and deep and the upper orbital border is not so strongly curved as in the species of Milne-Edwards. The granulation on the carapace is much more conspicuous than in the preceding species. The chief difference is to be found in the palm of the male cheliped, which is already well figured by de Haan and again by de Man; the latter author has clearly shown its principal features. Along the upper border there is a row of rather large, spiniform tubercles, widely sepa-

1) Not f. 2 as is mentioned in the text and copied by H. Milne-Edwards.

rated and diminishing in size towards the distal end of the palm; the outer surface is not smooth, but the upper part is strongly tuberculated and in the middle line, parallel with the margins, 5—6 larger tubercles are arranged in a longitudinal row; between this and the strong ridge near the under border the palm is nearly smooth; the ridge is strongly granulated on the palm, more so than in *M. carinimanus*, but simple on the immobile finger. The fingers are bent downward, a character, already observed by de Haan („digitis inferioribus sigmoïdeis”); the immobile finger has a rather small, very low tooth in the middle of its length; according to de Man the dactylus has no larger tooth, but in reality there does exist a very low one near the base.

Comparing de Man's figures of the male cheliped of *M. carinimanus* (Notes Leyden Museum, v. 12, 1890, pl. 4 f. 8) and that of *M. dilatatus* (ibidem, pl. 4 f. 9) the differences between the two species are at once obvious.

The Museum possesses eight specimens of the species under discussion (four specimens preserved in alcohol), all males except one, from Japan. This locality is the only sure record, for Doffein's specimen (a young female) has by the author himself only with much reservation been referred to *M. dilatatus*.

Five of the Museum specimens present the following dimensions (the first seems to have been measured by de Man, 1890, p. 79).

	1	2	3	4	5
	♂	♂	♂	♂	♂
Distance between external orbital angle	26.5	25.5	25.—	24.75	20.75
Length of carapace.	12.75	12.25	12.—	11.75	9.5

M. brevis ¹⁾ (Herbst). (Pl. VI, Fig. 5).

1804. *Cancer brevis* Herbst (*nec* Hilgendorf, de Man). Naturgesch. Krabben u. Krebse, Bnd. 3 Heft 4. p. 9. pl. 60 f. 4 (East-India).

1837. *M. carinimanus* H. Milne-Edwards. (*nec* Hilgendorf) Hist. nat. d. Crust., t. 2 p. 65 (no record).

1) Besides the synonyms here named yet two names should perhaps be included in the list, though very little is known about the specimens referred to them. The first, *M. laevimanus* (H. Milne-Edwards, Ann. Sc. nat. sér. 3, Zool., t. 18, 1852, p. 157) is only distinguished from *M. carinimanus* by the lack of the elevated ridge near the inferior border of the palm of the male cheliped. The second, *M. parvimanus* (H. Milne-Edwards, Hist. nat. d. Crustacés, t. 2, 1837, p. 65 and Ann. Sc. nat. sér. 3, Zool., t. 18, 1852, p. 157) has very short and compressed chelipeds, even in the male, and whereas the author in 1837 remarked that the ocular peduncles are much elongated, this character is not mentioned in the Ann. Sc. nat., where the species is classed among the species with short eye-stalks. Perhaps this species, as well as the „*Ocypode microcheles*”, of Bosc (Hist. nat. Crust. t. 1 p. 199, 1802) and the *Macrophthalmus parvimanus* of Guérin (Iconogr. Règne animal, Crust. pl. 4 f. 1) have been founded on females of *Uca* (*Gelasimus*).

1847. *M. carinimanus* Gray. Cat. Crust. British Museum, p. 37 (Singapore).
 1852. „ *carinimanus* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18
 p. 156 (Pondichéry and Mauritius).
 1880. „ *carinimanus* de Man. Notes Leyden Museum, v. 2 p. 69 (Celebes).
 1890. „ *carinimanus* de Man. Notes Leyden Museum, v. 12 p. 78, pl. 4
 f. 8 (no new record).
 1897. „ *carinimanus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd 10 p. 344
 (no new record).
 1902. „ *carinimanus* de Man. Abhandl. Senckenb. Gesellsch., Bnd 25 p. 492
 (Halmahera).

There has been some confusion about the original *Cancer brevis* of Herbst and the *Macrophthalmus carinimanus* of Milne-Edwards, owing to the insufficient description of these authors. Indeed it is only after the minute diagnosis of de Man, that the latter species became better known.

Hilgendorf (Baron v. d. Decken's Reisen in Ost-Afrika, Bnd. 3, 1869, Crustacea, p. 86, pl. 3 f. 4) described and figured a specimen of *Macrophthalmus* under the name *M. brevis* and declared that this specimen exactly agreed with Herbst's original specimen; he further united with it *M. carinimanus*, as Milne-Edwards himself, though with some hesitation, had suggested already in 1852. Later, however, Hilgendorf changed his opinion as to the identity of the two species (Monatsber. Ak. Wiss. Berlin, 1878, p. 806), as he had acknowledged that the original specimen of Herbst was different from his own specimens from East-Africa; the latter were now designated under the name *M. carinimanus*.

To decide this question I wrote to Prof. Vanhöffen of the Berlin Zoological Museum to compare Herbst's specimen with the descriptions of Hilgendorf and de Man, adding a drawing of the habitus of *M. carinimanus* to my letter. Prof. Vanhöffen most obligingly informed me, that the *Cancer brevis* indeed, except for some small differences, seemed to be identical with *M. carinimanus*, so that the first name must have the priority. The drawings of the lateral teeth of the carapace and of cheliped of Herbst's original specimen, made by Prof. Vanhöffen with the aid of the *camera lucida* and kindly placed at my disposal, have fully convinced me of the correctness of Milne-Edwards's surmise. Hilgendorf's specimens on the contrary belong to another species, which I have named *M. hilgendorfi*.

De Man (1880, p. 69) rightly remarked, that the species now under discussion very much resembles *M. dilatatus*; indeed, the conspicuous granulation on the carapace and the verrucous tubercles on the branchial regions occur in both species. In *M. brevis* (= *M. carinimanus*) however, the carapace is yet more transversely broadened; the external

orbital angle and the first lateral tooth are somewhat differently shaped and the transverse furrows on the lateral regions of the carapace are much more pronounced than in the Japanese species.

The external orbital angle is directed obliquely forward and may project as far as the upper orbital margin; in some cases however the direction is less oblique and the tip remains a little way behind the level of the upper orbital margin (see de Man 1902). The first lateral tooth is of nearly the same size (in the original *Cancer brevis* it appears to be slightly larger), the incision between the teeth is sometimes triangular and wide, in other cases very narrow and de Man (1880 p. 76) has described a specimen, in which the teeth are placed closely together and only separated at the tip. Behind the second lateral tooth there is a row of indentations at the lateral borders of the carapace, varying both in number and in size (see de Man 1902).

The chelipeds of the male, remarkable for their elongated palm, the length of which is not less than four times its height, have been made so well-known by de Man (1880 and 1890) that it is needless to re-describe them. The drawing, made by Prof. Vanhöffen, of the cheliped of *Cancer brevis* agrees exactly with de Man's figure (1890). The outer surface is nearly smooth, somewhat granulated at the upper border¹⁾, a strong ridge runs at the under margin, parallel with it, and is continued on the immobile finger; the inner surface of palm and fingers are much hairy and there is a distinct spine not far from the carpal end on the palm.

The Museum contains six specimens (4 ♂, 2 ♀) of this species, collected at the coasts of Celebes, and already spoken of by de Man (1880). These specimens seem first to have been preserved in a dry state and afterwards put in alcohol, as may be inferred from the extreme liability of the legs to detach themselves; it is for this reason that I have abstained from measuring the chelipeds.

Dimensions of some specimens	1	2	3	4	5
	♂	♂	♀	♀	♂
Distance between external orbital angles	21.75	21.5	21.—	17.25	21.65
Length of carapace	9.75	9.5	9.5	8.25	9.75

1—4 are Museum specimens, 5 is the ♂ from Halmaheira (de Man, 1902, p. 493).

1) From the few notes provided by Hilgendorf about the original specimen of Herbst's *Cancer brevis* (Monatsber. Ak. Wiss. Berlin, 1878, p. 807) we may infer already with confidence, that this specimen really does belong to *M. carinimanus*, as it is described as having a long palm, scarcely increasing in height towards the end, and without a granulated ridge along the upper border, as in the next species, which is founded on Hilgendorf's specimen.

The length of the carapace is to its breadth as 1 : 2.20, except in the smaller female, where the proportions are as 1 : 2.09; whereas in *M. dilatatus* these proportions are as 1 : 2.10.

Some dimensions of the original specimen of *Cancer brevis*, kindly delivered by Prof. Vanhöffen, may be inserted here:

Distance between external orbital angles	18.—
Length of carapace.	8.5
Length of palm (index excluded).	11.—
Length of dactylus.	5.6
Least breadth of front	3.—

M. brevis has been found at Mauritius, at Pondichéry and at Celebes and Halmaheira.

M. hilgendorfi n. n. (Pl. VII, Fig. 6).

1851. *M. carinimanus* Bianconi. Spec. zool. mossamb., Fasc. 5 p. 85 (Mozambique).
 1869. „ *brevis* Hilgendorf (*nec* Herbst). Baron v. d. Decken's Reisen in Ost-Afrika, Bnd. 3, Crust., p. 86, pl. 3 f. 4 (Zanzibar and Red Sea).
 1878. „ *carinimanus* Hilgendorf (*nec* Milne-Edwards). Monatsber. Ak. Wiss. Berlin 1878, p. 806 (Mozambique).
 1880. „ *brevis* de Man. Notes Leyden Museum, v. 2 p. 70 (Bay of Pasandawa, Madagascar).
 1906 „ *brevis*? Nobili. Ann. Sc. nat. sér. 9, Zool., t. 4 p. 318 (Red Sea and Perim).

I have already explained how Hilgendorf in 1869 referred a specimen from Zanzibar to *Cancer brevis* of Herbst and afterwards, recognizing the difference, regarded this specimen and another from Mozambique as *M. carinimanus*. As the species of Herbst and of Milne-Edwards have turned out to be identical, but do not agree with that of Hilgendorf I am obliged to create a new name for Hilgendorf's species.

Nobili synonymises the *M. brevis* of Hilgendorf with *M. grandidieri* M. Edw., as his specimens agreed very well with description and figure of the first-named species and also with an original specimen of the species of Milne-Edwards. I am unable to explain this discordance, unless it be presumed that Nobili's specimens are referable to a transitional subspecies. The author states, however, that the dactylus of the male cheliped has no large tooth, which character is not referable to any of the species here named. I am inclined to believe that Nobili's specimens are to be regarded as the present species.

The differences between this and the preceding species are many. The carapace is less widened, finely granulated (not provided with the large granules of *M. brevis* and *M. dilatatus*) and destitute of the longitudinal

row of verrucous tubercles on the branchial regions. The transverse furrows on the carapace are much less pronounced. The general form of the carapace is much like that of *M. dilatatus*, but the external orbital angle projects less outward than the anterior lateral tooth which is larger and directed obliquely forward, as shown in the figure.

The specimen of the Museum agrees exactly with Hilgendorf's figure, but the front is somewhat broader. The ocular peduncles reach to the tip of the external orbital angle; according to Hilgendorf they are twice as long as the front between the eye-stalks (though it does not appear so in his figure, in which the latter are three times as long as the front); in my specimen the length of the eye-stalks keeps an intermediate place between Hilgendorf's description and figure.

The main character of the species is again to be found in the male cheliped. The arm bears a thick fur of hairs on the inner side; the wrist has only one spine, at the under side, near the articulation with the palm, but none at the inner border; the palm is much less elongated than in the preceding species, its length being scarcely twice the height, the outer surface has a very distinct ridge near the under margin and is slightly granular towards the upper margin, which shows a regular row of spiniform tubercles; the inner surface of palm and fingers is much hairy and there is a spine near the carpal end. The cutting margin of the movable finger is, as has been rightly observed by Hilgendorf, concealed by a closely set hairy covering, on close inspection we may see a distinct rectangular tooth near the base of the finger, which tooth does not seem to have been detected either by Hilgendorf or by de Man. The cutting margin of the index is free from hairs and the proximal half is occupied by a large tooth, crenulated on the free margin, except for the abruptly sloping fore side. In the preceding species this tooth on the index has a much smaller base and is more distinctly sloping towards the base of the finger.

This East-African species is represented in the Leiden Museum by a single specimen (♂) from the Bay of Pasandava (Madagascar); it has been already spoken of by de Man.

Its dimensions and those of Hilgendorf's specimen from Zanzibar are the following:

Distance between external orbital angles	22.5	32.—
Length of carapace	11.5	15.—
Breadth of front between the eye-stalks.	3.5	—
Length of the palm with index	14.— ¹⁾	23.—
Height of the palm	6.—	—

1) de Man gives a length of 15.5 mm. to the hand, but I cannot explain this, unless it be presumed that the author has measured to the tip of the opened dactylus.

M. crassipes H. Milne-Edwards (Pl. VII, Fig. 7).

1852. *M. crassipes* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 157 (Australia).
1865. „ *crassipes* Hess. Arch. Naturgesch., Jahrg. 31. 1. p. 142 (East-Australia).
1882. „ *crassipes* Haswell. Cat. Austral. Crust., p. 89 (no new record).
1890. „ *crassipes* de Man. Notes Leyden Museum, v. 12 p. 76, pl. 4 f. 7 (Carolines).
1894. „ *crassipes* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 744 (Carolines).
1897. „ *crassipes* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 345 (Australia and China).
1910. „ *crassipes* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Række, v. 4 p. 323 (Gulf of Siam).

As has been stated by de Man, this species shows the greatest resemblance with *M. dilatatus*; this author notes, however, the following differences:

1. the incision between the external orbital angle and the antero-lateral tooth is narrower in *M. crassipes*;
2. the ocular peduncles reach to the tip of the external orbital angle, or even a little way beyond it, in *M. crassipes*, but are shorter in *M. dilatatus*.

Judging after my only specimen I can add, that the crenulation of the upper orbital border is coarser and stronger in *M. crassipes*, that the front is comparatively narrower (compare the figures 4 and 7) and that the granulation of the carapace is much more pronounced in the species now under discussion, extending to the cardiac area and to the hinder part of the mesogastric area, which parts are nearly smooth in *M. dilatatus*; close to the margins there may be observed in *M. crassipes* some conspicuous granules on the branchial regions, larger than the other. The meropodites of the ambulatory legs are somewhat more slender than in *M. dilatatus* and, contrary to all other species of the genus, there is no spine at the anterior border of the meropodite near its distal end.

The male chelipeds of the two species are widely different, as has been described by de Man (p. 77). In comparison with the bulky shape of the chelipeds of *M. crassipes* those of *M. dilatatus* are weak and small. The arm of the first species shows a thick patch of hairs on the fore side; the outer surface is provided with some small granules, already observed by Milne-Edwards. The wrist is large and, as in *M. dilatatus*, its bears two spines, one in the middle of the inner border, and another at the under side near the distal end. The palm is very large, the outer

surface is slightly granular towards the upper margin, which itself has no row of spiniform tubercles but only a dense crowding of somewhat larger granules; a large and distinct crest runs close to and parallel with the under margin and is continued on the index. Inner surface of palm and fingers much hairy, a spine at the inner surface of the palm near the carpal joint. Fingers hairy along the cutting margin; the dactylus has an extremely small quadrangular tooth close to the base, the index is provided with a much larger tooth, the base of which is about as large as the height, the free margin of the tooth is coarsely granulated, except for the abruptly sloping fore side.

The differences between the species here named and *M. carinimanus* (= *M. brevis*) are also clearly indicated by de Man. I need not enlarge upon these differences here as I have nothing but to repeat de Man's statements.

M. crassipes is represented in the collection only by a single specimen (♂), this very specimen has been already described by de Man, who gave also the dimensions of the carapace (distance between external orbital angles 22.5 mm., length of carapace 10.25 mm.); it originates from the Carolines.

The range of this species has recently been extended to the Gulf of Siam; as it occurs also at the shores of China, of Australia and of the Carolines, it is remarkable that it has never been recorded from our East-Indian Archipelago.

M. convexus Stimpson (Pl. VII, Fig. 8).

1858. *M. convexus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Loo-Choo-isles).
1867. „ *inermis* A. Milne-Edwards. Ann. Soc. ent. France, sér. 4, t. 7 p. 286 (Sandwich-isles).
1873. „ *inermis* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9 p. 277, pl. 12 f. 5 (New Caledonia).
1873. „ *graeffei* A. Milne-Edwards. Journ. d. Museums Godeffroy, Heft 4 p. 81, pl. 13 f. 5 (Upolu, Samoa).
1880. „ *convexus* Miers. Ann. Mag. Nat. Hist. ser. 5, v. 5 p. 307 (Mauritius, Penang, Singapore and Australia).
1882. „ *convexus* Haswell. Cat. Austral. Crust., p. 89 (Australia).
1888. „ *convexus* de Man. Arch. Naturgesch., Jahrg. 53. 1.p. 354, pl. 15 f. 4 (Amboina).
1894. „ *convexus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 745 (Carolines, Fidsji-isles, Tahiti and German New Guinea).
1897. „ *convexus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 344 (no new record).

1897. *M. graeffei* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 343 (no new record).
1900. „ *convexus* Alcock. Journ. As. Soc. Bengal, v. 69 prt. 2. p. 378 (Andamans).
1902. „ *convexus* de Man. Abhandl. Senckenb. Gesellsch., Bnd. 25 p. 493, pl. 19 f. 6—6a (Ternate and Halmaheira).
1906. „ *inermis* Rathbun. Bull. U. S. Fish Comm. v. 23, prt. 3, p. 834, (Hawaiian Islands).
1907. „ *convexus* Stimpson. Smithson. Inst., Miscell. Coll., v. 49 p. 97 pl. 13 f. 2 (Loo-Choo-isles).
1910. „ *convexus* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4 p. 323, pl. 2 f. 3 (Gulf of Siam).

Miers already advanced that *M. inermis* of Milne-Edwards might be identical with Stimpson's *M. convexus*, and this has been confirmed by de Man (1888), who could study the type-specimens of *M. inermis*.

I think that the *M. graeffei* is founded on a very young male specimen ¹⁾ of the species now under discussion. Indeed *M. graeffei* shows exactly the same shape of the lateral teeth and notably the external orbital angle is sharp and pointed, directed obliquely forward and much larger than the lateral teeth, the curve of the upper orbital border is also alike and the ocular peduncles project slightly beyond the sides of the carapace; the latter is stated by Milne-Edwards to be „dépourvue de granulations ou de tubercules, à peine piquetée sur les régions branchiales”. In this young specimen I presume that the verrucous tubercles on the branchial regions are not yet fully developed. Moreover the chela of *M. graeffei* is covered with hairs only at the inner side of the fingers, whereas the inner surface of the palm is naked, quite as in Milne-Edwards' figure of the adult chela of „*M. inermis*” in the Nouv. Arch. t. 9, pl. 12 f. 5^a.

In all the species as yet treated of, the external orbital angle is either smaller than the anterior lateral tooth of the carapace or these teeth are alike in size. The only exception is formed by *M. telescopicus* with its long ocular peduncles. In *M. convexus* the external orbital angle on the contrary is much larger than the anterior lateral tooth, it is directed obliquely forward in such a way, that the tip (in adult specimens at least) may be on the same level with the upper orbital border ²⁾. By

1) According to Milne-Edwards the breadth of the carapace is 14 mm., the length 7 mm.; in his figure 5^a, where the dimensions of the carapace are given in natural size, these dimensions are much less (breadth 8 mm., length 5.5 mm.). There must be an error either in the text or in the figure.

2) In Stimpson's figure (1907) however the upper orbital border projects much farther forward than the outer orbital angle.

this character the species at first sight resembles somewhat a small *Uca* (= *Gelasimus*) and this resemblance is increased by the narrow front ¹⁾ being much constricted between the eye-stalks, and by the dark green colour of the carapace of nearly all my specimens in spirit-preservation. The carapace is nearly wholly smooth and glossy, only towards the sides there are some minute granules. The anterior lateral tooth is much smaller than the external orbital angle and the posterior one is nothing but a faint knob. On the branchial regions there is the same row of verrucous tubercles, three on each side, as we have met with in most of the preceding species. The furrows on the carapace are very faintly marked. The meropodites of the ambulatory legs are robust and armed with a small spine near the distal end of the fore margin, as de Man (1902, p. 494) rightly remarked, except in the case of the hindmost legs, though Stimpson (1907) has here figured a similar spine.

The chelipeds of the male have been described and figured by de Man in 1888 and again, yet more minutely, by the same author in 1902. There is no need to repeat his statements here; we may however remind to the fact that, contrary to all the species with short eye-stalks and with a carapace twice as broad as long, *M. convexus* has no spine on the inner surface of the palm, which is almost wholly naked, only the inner side of the fingers and the neighbouring parts of the palm are fringed with hairs, as has been already stated by Milne-Edwards for his *M. inermis*. In some cases however the inner surface of the palm seems to be covered with hairs, as both Stimpson, in his final description of the type-specimen, and Alcock state that the hand is hairy within. The outer surface of the palm is very finely granular and bears a faint ridge close to the under margin. Both fingers are armed with a larger tooth at the cutting margin, that of the dactylus being small and quadrangular, the tooth of the index is angular and sloping backward. In young specimens these teeth are much less developed than in the adults ²⁾ as may be inferred on comparing the chela of *M. graeffei* (Milne-Edwards, 1873, pl. 13 f. 5^b—5^c) and of a young specimen of *M. convexus* with a breadth of carapace of 16,6 mm. (de Man, 1888, pl. 15 f. 4) with that of a full-grown specimen (de Man, 1902, pl. 19 f. 6), whose breadth of carapace measured 27,5 mm. The fingers are also bent much more downward in the adult.

The Leiden Museum possesses several specimens, viz.: three specimens

1) According to de Man (1902, p. 494) the breadth of the front at the fore margin is only $\frac{1}{2}$ of the entire breadth of the carapace.

2) de Man (1902, p. 494) states that in young males, whose breadth of carapace is about 14 mm., the teeth on both fingers are already present.

(1 ♂, 2 ♀) from the Pacific, without further indication, two (1 ♂, 1 ♀) from Ternate (already mentioned by de Man, 1902), and one young female from Sekroë (Dutch New Guinea).

The species seems to be widely distributed through the Pacific region, but it has been found also in the East-Indian archipelago, in the Gulf of Siam, at Singapore, at Penang and even at Mauritius and in the Red Sea.

I give here the dimensions of some specimens in mm.; from these measurements we may conclude, that in adult specimens the breadth of the carapace is nearly twice its length, but in the young stages considerably less (proportion about 1.70:1).

	1	2	3	4	5	6	7
Distance between external orbital angles	♂ 20.5	♂ 24.5	♀ 13.—	♂ 16.6	♂ 27.5	♀ 24.5	sex not stated 25.—
Length of carapace.	10.5	12.5	8.—	9.2	14.—	13.—	13.—

1—3 are specimens of the Museum, 4 is a specimen of de Man (1888), 5—6 also specimens of de Man (1902), 7 is a specimen mentioned by Milne-Edwards.

M. consobrinus Nobili.

1906. *M. consobrinus* Nobili. Bull. Mus. d'Hist. nat. Paris t. 12 p. 265 (Rikitea, Tuamotu archipelago).
 1907. „ *consobrinus* Nobili. Mem. Acc. Torino ser. 2, t. 57 p. 408 (no new record).

The description of the type-specimen in the Bull. runs as follows: „♂. Voisin de *M. convexus*. Carapace deux fois aussi large que longue: Régions gastrique et cardiaque lisses, régions hépatiques et branchiales finement granuleuses, les granules formant un amas longitudinal sur chaque région branchiale. Dent orbitaire externe très aiguë, dirigée en avant et en dehors; une seule dent après, aiguë, dirigée en dehors; aucune trace de 3^e dent. Pédoncules oculaires atteignant l'extrémité de l'orbite. Chélicèdes égaux, bords du mérus finement granulés, pourvus de long poils clairs. Bord interne du carp marginé par une ligne granuleuse, quelques granules aigus à l'angle interne. La moitié supérieure de la face externe de la main granulée, l'inférieure lisse; bord supérieur occupé par deux petites crêtes granulées, bord inférieur avec une forte crête lisse s'étendant jusqu'à l'extrémité du doigt fixe. Doigt mobile avec une faible crête dentelée, sans dent molariforme au bord préhensile; doigt fixe avec une grosse dent molariforme. Face interne de la main feutrée, sans épines. Mérus des 3 premières paires de pattes ambulatoires avec une épine

apicale, bords du mérus, du carp et du propodite finement dentelés, les denticules disposés en 2—3 séries sur le mérus. Longueur 16.5 mm.; largeur 34 mm. — Rikitea”.

Death has prevented this distinguished Italian carcinologist from completing the preliminary diagnosis of his species in the Bull. by drawings and figures. From the quoted description we may infer that *M. conso-brinus*, which is nearly related to *M. convexus*, differs from this species by the direction of the anterior lateral tooth which points straightly outward, by the strong ridge near the under margin of the palm of the male cheliped (this ridge is only faintly marked in the preceding species) and by the dactylus bearing no larger tooth near the base. The species seems to attain a larger size than *M. convexus* and in the adult the carapace is fully twice as broad as long (not nearly so, as in the preceding species).

M. erato de Man (Pl. VIII, Fig. 9).

1888. *M. erato* de Man. Journ. Linn. Soc. London, v. 22 p. 125, pl. 8 f. 12—14 (Mergui achipelago).
1895. „ *erato* de Man. Zool. Jahrb. Abt. Syst., Bnd. 8 p. 579 (Malakka).
1900. „ *erato* Alcock. Journ. As. Soc. Bengal, v. 69 prt. 2 p. 381 (Mergui archipelago and Akyab).
1910. „ *erato* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4 p. 323 (Gulf of Siam).

This small species, which is fully described by de Man (1888), is subquadrangular in outline, the length of the carapace being two-thirds of its greatest breadth, and the latter is to be found between the tips of the anterior lateral teeth; the external orbital angles are less prominent. Both teeth are directed obliquely outward. Upper orbital border nearly straight, faintly curved, eyes not reaching end of orbits, ocular peduncles thick, nearly straight. The sides of the carapace are nearly parallel.

The grooves are well marked, as de Man observed and there is a faint ridge at the postero-lateral side of the carapace, just above the insertion of the last legs. The middle regions of the carapace are free from granules, only finely punctate, the other parts, especially the lateral parts, are provided with large granules, scattered under a rather thick hairy covering, which is also found in the grooves, separating the various regions, but I have seen no hairs in the grooves separating the branchial region from the cardiac area. Front broad, not constricted between the eye-stalks, and occupying one-fifth (de Man) to two-ninths (Alcock)

the breadth of the carapace. ¹⁾ For further particulars I may refer to de Man's accurate and elaborate description.

This author has also given a full account of the inferior orbital margin, which, owing to the presence of a „musical ridge” in the male, is peculiarly modified. De Man says (1888, p. 127): „the inferior orbital margin presents in its middle a broad, though little prominent, slightly triangular lobe, which is directed somewhat downward, its obtuse tip being found at the internal or median side; the upper surface of this lobe is slightly concave. Behind this lobe, the inferior margin of the orbits presents a second, also obtuse, much smaller lobule, which is found at the external end of the under margin; whereas the internal or median part of the under margin, lying between the larger middle lobe and the epistome, is armed with a row of seven or eight minute rounded granules, the external one of which is the largest, whereas the others successively decrease in size towards the epistome, *i. e.* towards the inner end of the orbital margin”. De Man rightly remarks, that this structure of the inferior orbital margin distinguishes this species very well from the nearly allied *M. quadratus*.

The chelipeds of my only male specimen were equal (according to de Man they are sometimes unequal in size). The musical crest at the middle of the inner margin of the short, triquetrous arm is obliquely parallel with this border ²⁾. The palm is much compressed, smooth, hairy at the inner surface, crenulated at the upper margin, and without crest externally; there is a faint crest however running from the tip of the index to the palm, where it soon disappears. According to de Man the length of the palm (index not included) is in proportion to its greatest height, at the articulation with the dactylus, as 15 : 11, and I found the same proportion, though in my specimen the palm was comparatively much smaller (see the dimensions below). De Man also states the spine at the inner surface of the palm near the carpal end, which is characteristic in this species. The fingers are short, with a rather wide gap between their bases, and with horny, excavated, hairy tips; the dactylus has a small rectangular tooth at the base and the index a much larger one, rising slightly above the general level of the cutting margin and occupying nearly the whole distal half of the latter.

The middle pairs of the ambulatory legs have very massively built meropodites with an extremely small spine near the distal end of the

1) de Man wishes it to be understood, that he takes here the distance between the external orbital angles

2) Alcock states the same, whereas the musical ridge of de Man's specimens seems to be exactly parallel with it.

anterior margin. The legs are remarkable for their hairiness, indeed they are thickly covered with a brownish fur, with only a few longer hairs. In my specimens this coating is most conspicuous on the carpo- and propodite of the penultimate pair of legs, so as to conceal the underlying joints in dorsal view, at the under side these joints, like all the legs, are wholly naked. De Man says nothing about this hairy covering, but Alcock states that „the upper surface of the legs, especially in the case of the third pair, is hairy”. The first named author rightly remarked, that the distal half of the under margin of the meropodites, especially those of the middle pairs, are minutely denticulate.

The Museum is in the possession of 4 specimens (1 ♂, 3 ♀) collected at the south coast of Madoera a few years ago by Mr. Buitendijk.

The range of this small species is now known to extend from the Mergui archipelago to the Gulf of Siam, Malakka and Madoera.

Finally I give here the dimensions of some specimens in mm.:

	1 ♂ ¹⁾	2 ♀	3 ♂	4 ♀
Distance between external orbital angles	11.25	14.75	9.5	11.—
Distance between the antero-lateral teeth	11.5	15.—	9.8	11.4
Length of carapace	8.25	10.75	6.5	7.6
Breadth of the front between the ocular peduncles	2.5	2.75	2.—	2.15
Length of the palm (index included).	7.25	6.25	8.—	4.75
Greatest height of palm at insertion of dactylus	3.75	2.—	—	—
Length of carpo- and propodite of the penultimate pair of legs	7.5	10.—	—	—

1—2 are specimens of the Museum, 3—4 are those measured by de Man (1888, p. 129).

M. latreillei (Desmarest).

- 1822. *Gonoplax Latreillii* Desmarest. Hist. d. Crust. foss. p. 99, pl. 9 f. 1, 4 (East-India and Luzon).
- 1837. *M. Latreillii* H. Milne-Edwards. Hist. nat. d. Crust., t. 2 p. 66 (record?).
- 1839. „ *Desmaresti* Lucas. Ann. Soc. entom. France, t. 8 p. 567, pl. 20 (Malakka).
- 1847. „ *serratus* Gray. Cat. Crust. British Museum, p. 37 (Philippines).

1) This specimen bears a *Sacculina* at the abdomen, which may have influenced the development of the chelipeds; indeed, though the specimen is larger than that of de Man (n° 3), the length of the palm is less.

1848. „ *serratus* Adams & White. Zool. Voy. „Samarang”, p. 51 (Philippines).
1852. „ *serratus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159 (no new record).
1858. „ *serratus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Hongkong).
1865. „ *latreillei* A. Milne-Edwards. Ann. Sc. nat., sér. 5, Zool., t. 3, p. 193 (record?).
1873. „ *latreillei* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9, p. 278, pl. 13 f. 3 (New Caledonia).
1874. „ *Polleni* Hoffmann. Crust. et Echinod. Madagascar, p. 19, pl. 4 f. 27—30 (Sakatia, Madagascar).
1879. „ *Polleni* de Man. Notes Leyden Museum, v. 1 p. 66 (no new record).
1881. „ *Polleni* Lenz & Richters. Beitr. Crustaceenfauna Madagascar, p. 4 f. 24—27 (Nossi Bé).
1886. „ *serratus* Miers. Rep. Brachyura „Challenger”, p. 250 pl. 20 f. 1 (*partim*) (Philippines).
1894. „ *latreillei* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7. p. 747 (Philippines, Luzon).
1894. „ *laniger* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 746, pl. 23 f. 15 (Bay of Tokio, Kochi, Japan).
1906. „ *latreillei* Laurie. Rep. Pearl-Oyster Fish. Ceylon, t. 5, Brachyura, p. 427, pl. 2, f. 3 textfig. 12 (Gulf of Manaar, Philippines, Singapore).
1907. „ *serratus* Stimpson. Smithson. Inst., Miscell. Coll., v. 49, p. 96, pl. 13 f. 3 (Hongkong).
1910. „ *serratus* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v 4 p. 323 (Gulf of Siam).
1910. „ *latreillei* Rathbun. Bull. Mus. comp. Zool. Harvard Coll. Cambridge, Mass., v. 52 p. 306 (Makassar).

This species has been long known in a fossil state only, until A. Milne-Edwards in 1865 supposed that it might also be found living in the Indian Ocean; his surmise was corroborated by the discovery of living specimens at New Caledonia (1873). Afterwards Ortmann established the identity of *M. serratus* with *M. latreillei*.

The various names attributed to this species are due not only to the different designation of geologists and zoologists (who first called this species *M. serratus*) but also to the variability this species evidently displays in the succeeding stages of age. Indeed, if we compare Stimpson's figure of a young specimen of *M. serratus* and its cheliped (1907) with

Ortmann's figure of *M. laniger*, it is impossible to find any difference, except for the woolly hairy covering of the carapace in the latter case. Laurie however has shown, that a hairy carapace is found in young specimens and that it is „associated indifferently either with „flat, not thorn-like” carapace-teeth¹⁾, or with acute, upturned carapace-teeth, or with a somewhat intermediate form”.

De Man has already spoken of the probability that the *M. Polleni* of Hoffmann is identical with *M. latreillei*; Ortmann and Laurie agree with him. I cannot but confirm de Man's supposition; though Hoffmann has made no mention of the fourth lateral tooth (including in the number of teeth the external orbital angle) it is indeed present, as I could convince myself in examining Hoffmann's specimen, still preserved in the Museum.

There is no need to give new figures of this easily recognizable species, as it is well figured by A. Milne-Edwards (1873) and by Miers; drawings of young specimens are given by the latter author, by Ortmann (*M. laniger*) and by Stimpson (1907).

Finally Laurie gave photographic reproductions of four specimens; we conclude from this series that the shape of the carapace may vary considerably, in some cases being nearly equilateral, in other much more elongated transversely. The whole surface is closely covered with large granules and, in young specimens, with hairs, which gradually disappear in older stages. On each branchial region there may be seen two longitudinal rows of small granules. The grooves on the carapace are not very conspicuous, only those circumscribing the mesogastric and cardiac area being usually distinct; it is in these latter grooves, that slight traces of the original hairy covering of the carapace may remain in adult specimens.

The external orbital angle is large and directed obliquely forward or straightly outward, dentated at the margins; the three following lateral teeth gradually diminish in size distally. All the carapace-teeth may be either spiniform or flat (Laurie); the first type seems to be the usual one in young specimens. The upper orbital border is nearly straight and has slightly any curve in adult specimens; in young specimens there may be a more pronounced curve, though the orbital border does not project farther forward than the external orbital angle. The front is very narrow, occupying about one-tenth of the breadth of the carapace between the external orbital angles.

The male chelipeds are remarkably small; they may attain a large size only in the largest specimens known. The palm is granulated on

1) Ortmann has given this character of the carapace-teeth as another feature to distinguish his species from *M. latreillei*.

both surfaces, but naked and without spine near the carpal end at the inner surface. Inner surface of the fingers hairy. Dactylus with a large tooth near the base; index regularly denticulate at the cutting margin, without larger tooth. In the adult the immobile finger is curved downward, in young specimens, however, this finger is in a line with the inferior margin of the palm. Unlike nearly all other species of the genus, *M. latreillei* is characterized by having a spine at the distal end of the meropodites of the last legs, as in the preceding ambulatory legs.

This species, which is distributed throughout nearly the whole Indo-pacific region, is represented in the collection of the Museum only by Hoffmann's type-specimen of *M. Polleni*, from the Bay of Sakatia, Madagascar. Its carapace is nearly wholly equilateral, the breadth between the outer orbital angles being 32 mm., the length 30 mm. Though it is naked, except for some hairs in the grooves, Ortmann's specimen of *M. laniger* with a carapace-breadth of 41 mm. and a length of 28 mm. is wholly covered by hairs. The carapace may be much more elongated transversely, though not so as in the next species. Milne-Edwards mentions a specimen, the carapace of which attains a breadth of 50 mm., a length of 35 mm.

M. dentatus Stimpson.

1858. *M. dentatus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Hongkong).
 1907. „ *dentatus* Stimpson. Smithson. Inst., Miscell. Coll., v. 49 p. 96, pl. 15 f. 1 (Hongkong).
 1910. „ *dentatus* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4 p. 322 (Gulf of Siam).

The present species is placed next to *M. latreillei* on account of its having also four lateral carapace-teeth in all, but in other respects the general form of the carapace is much more like that of *M. convexus*, though the transverse diameter of the carapace is less (length to breadth as 1 : 1.67 according to Stimpson). This carapace is naked, without hairs, smooth ¹⁾, „except towards the postero-lateral angle, where there are two slightly raised, plicated longitudinal ridges” (Stimpson, 1907). In the figure there appear indeed on each branchial region two parallel rows

1) The figure 3c of Laurie (see the list of synonyms of the preceding species) very much recalls the present species in general form; yet the chief difference between such transversely elongated specimens of *M. latreillei* and *M. dentatus* is to be found in the surface of the carapace being distinctly granular in the first species and smooth in the latter. Besides, in *M. dentatus* the fingers of the chela are comparatively shorter, and both fingers have a larger tooth, whereas such a tooth is wanting at the index of *M. latreillei*.

of obtuse tubercles, parallel with the distinctly converging sides of the carapace. The upper orbital border is elegantly curved and ends in a sharp, obliquely pointing tooth, which reaches as far forward as the upper orbital margin. The following lateral teeth of the carapace are much smaller, all directed obliquely forward. The eyes do not at all reach the external orbital angle. Front narrow, bilobed at the free margin. Grooves on the carapace all distinct.

The chelipeds of the male are rather long and are everywhere smooth, also on the palm. The fingers are very short, their length being about one half of the length of the palm (without index), clothed with hairs at the inside. The immobile finger has a large tooth at about the middle of its length, the dactylus bears a smaller, but well-defined tooth near the base. As in the preceding species there seems to be a spine at the anterior margin of the meropodites of the last pair of legs, near the distal end, though Stimpson does not particularly make mention of it.

This small species, with a carapace-breadth of 13 mm. (measured between the tips of the outer orbital angles) and a length of about 8 mm., has been found originally at Hongkong; it appears to be not uncommon in the Gulf of Siam. The Museum does not possess it.

M. quadratus A. Milne-Edwards (Pl. VIII, Fig. 10).

1873. *M. quadratus* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9, p. 280, pl. 12 f. 6 (New Caledonia).

The species at first sight is very much like *M. erato*, but, except for the differently shaped inferior orbital margin in the male, it is distinguished by the much stronger curve of the superior orbital border, by the outer orbital angle being more strongly pronounced and reaching farther outward than the next lateral tooth of the carapace, and finally by the lesser hairiness of the walking legs and the slenderness of their meropodites.

Nearly the whole surface of the carapace is granulated; the granules are most crowded on the branchial regions, on the hepatic regions they are more scattered and extend towards the mesogastric area. The ridge in the broad, not constricted, nearly vertically deflexed front is rather deep, especially between the transverse epigastric ridges, immediately behind which it bifurcates. As Milne-Edwards remarked, the carapace is covered by short hairs, somewhat more crowded on the lateral regions. The outer orbital angle projects obliquely forward, its tip is pointed and its hinder margin presents some small dentations. The first antero-lateral tooth is slightly shorter, its anterior margin is directed less forward than

the same margin of the outer orbital angle, and the curved side margin presents three or four distinct indentations. The second lateral tooth is very small, separated from the preceding by a distinct incision and presenting at the side margin likewise some four indentations. Behind the teeth the sides of the carapace are distinctly convergent. On the branchial regions there is no trace of longitudinal granulated rows. The upper border of the orbital groove is finely crenulated, the crenulations being more conspicuous in the outer half of the border and continued upon the fore margin of the external angle. The inferior orbital margin is regularly crenulated in the female, but in the male it presents three large, obtuse lobules in its outer half, with the tips directed inward; between the inner tubercle and the epistome there is a short row of 7—8 extremely minute denticles.

Like *M. erato* the three-faced arm of the cheliped bears a „musical crest”, about at the same place, viz. in the middle of the inner margin, and parallel to this margin ¹⁾. The carpus presents some sharp granules at the inner angle of the anterior side. The palm is inflated and very short, its height at the insertion of the dactylus being not much less than the length (index excluded); inner surface densely hairy, but there is no spine near the carpal end, as in *M. erato*. Parallel with the superior border of the palm and close to it runs an inconspicuous ridge, which, like the border itself, is minutely granular; the whole outer surface proves to be somewhat granulated, when examined with rather strong magnifying power, but appears smooth to the naked eye. The fingers are short, much more so than the palm, and there is a wide space between their bases, the fingers meeting only at the tips, which are horny, excavated, spoon-like as in *M. erato*, and show a few short, yellow hairs at the inner border. The immobile finger has a faint longitudinal ridge at its outside, this ridge is not so easily visible as in *M. erato*; the cutting margin is occupied in its whole second half by a very long crenulated tooth, continued to the tip of the finger, the first half of the index being unarmed. The dactylus bears a distinct, rectangular tooth not far from the base; between this tooth and the tip of the finger the cutting margin shows several indentations. In the shape of the palm there is very much resemblance with *M. erato* (see de Man, Journ. Linn. Soc. London, v. 22, 1888, pl. 8 f. 14), but as this author pointed out, the palm is somewhat higher and comparatively shorter in *M. quadratus*. The ambulatory legs again agree with those of *M. erato* in having

1) In my only ♂ of *M. erato* the crest forms a certain angle with the margin and the same has been observed by Alcock (see p. 180).

an extremely minute spine at the fore margin of the meropodites in the middle pairs of legs, near the distal end of the meropodite, but this spine is wanting in the anterior and posterior legs (though Milne-Edwards figures a spine in the hinder pair), and further in the granulation of the hinder margin of these meropodites. The legs differ however in several particulars: firstly the meropodites are much more slender and cylindrical in dorsal view (though three-faced in transverse section as in all other species); secondly the legs are much less hairy and nowhere show thick patches of hair; and finally the carpo- and propodite of the middle pairs of walking legs are much shorter than in *M. erato*, as is shown in the figures and in the dimensions given below of *M. quadratus* and those of *M. erato* on p. 181.

This rare species, which has been found nowhere else than at New Caledonia, is represented in the Museum by a single male specimen, received from Milne-Edwards himself, and likewise originating from the said locality.

Its presents the following dimensions:

Distance between external orbital angles	11.—
Length of carapace.	8.—
Breadth of front.	2.25
Length of palm (index included)	8.—
Greatest height of palm at insertion of dactylus.	4.75
Length of carpo- and propodite of the penultimate pair of legs	5.25

M. punctulatus Miers.

1884. *M. punctulatus* Miers. Zool. Voy. „Alert” 1881—82, p. 237, pl. 25 f. a (Port Jackson).

The species is most closely related to *M. quadratus* as may be inferred from the following description of Miers¹⁾: „the carapace is nearly quadrate and relatively narrow, being but little broader than long; the cervical suture is in its posterior part very distinctly defined; the surface is uneven, punctulated, without spines or tubercles, but clothed with a few scattered hairs, which are more numerous, though not dense, on the postero-lateral parts of the branchial regions; the front is about one-third of the total width of the anterior part of the carapace, with its anterior margin nearly straight; the antero-lateral margins are nearly straight and 3-toothed (the tooth at the external orbital angle included); the posterior

1) I am much indebted to Dr. de Man for a full transcription of Miers' diagnosis, together with a calque of the original figure, as I myself had no opportunity to consult the paper quoted.

lateral tooth is very small. The male postabdominal segments are all of them distinct. The first two joints of the slender antennal peduncle are contained within the large inner orbital hiatus; the epistome is transverse and very short, almost linear; the merus-joint of the outer maxillipedes is truncated at its distal end and nearly as large as the preceding joint. The chelipedes (for so small a specimen) are well developed and are sub-equal; merus and carpus are smooth, without spines or tubercles, merus more or less hairy on its inner surface and upper margin; the palm is but little longer than its greatest vertical depth, which is at the articulation with the mobile finger, smooth and polished externally, its upper margin not carinated, its inner surface with a dense patch of hair; the lower margin of the immobile finger is in a straight line with the lower margin of the palm, its upper or inner margin is denticulated and has a strong tooth or lobe in the middle; the inner margin of the mobile finger has a smaller tooth near its base; the fingers, when closed, meet only toward their apices, having a hiatus between them, which is hollowed out into a deep, nearly semicircular cavity at the base of the immobile finger; this cavity is margined with hairs. The ambulatory legs are slender, somewhat compressed and the margins somewhat thinly clothed with hair. Colour, in spirit, brownish. Length of carapace nearly 3 lines (6 mm.), breadth $3\frac{1}{2}$ lines (somewhat over 7 mm.); length of chelipede about $5\frac{1}{2}$ lines (over 11 mm.)".

In the figure the external orbital angle has a convex outer margin and does not project farther outward than the antero-lateral tooth of the carapace, both teeth are of nearly the same shape and size. Besides by this marked character the species is moreover distinguished from the preceding by a much more quadrate carapace, by comparatively longer chelipeds, by the front being one-third of the total breadth of the carapace (one-fourth in *M. quadratus*) and by the short eye-stalks, the length of which does not exceed the breadth of the front¹⁾. The last feature, together with the shortness of the ischiopodite of the last maxillipeds, which joint nearly equals in length the meropodite of these extremities, very nearly approaches *M. punctulatus* to *Euplax boscii* (Audouin). The species of Miers is however more quadrate in outline and in *Euplax* the sides of the carapace are armed with only 2 teeth in all.

1) Miers himself gives as differences between his species and *M. quadratus*, that in the latter species only two lateral teeth in all are present at each side of the carapace, and that there is no tooth on the inner margin of the immobile finger. In reality however there are two lateral teeth (besides the external orbital angle) at each side of the carapace in *M. quadratus* and the cutting margin of the index is occupied by a very broad, crenulated tooth in the distal half of the finger; this tooth seems only to be better defined towards the tip of the finger in the species of Miers.

M. latifrons Haswell.

1882. *M. latifrons* Haswell. Proc. Linn. Soc. N. S. W., v. 6 p. 549 (Port Philip).

1882. „ *latifrons* Haswell. Cat. Austral. Crust., p. 90 (no new record).

„Carapace about once and a half as broad as long; surface very finely granulate. Front broad, about one-fourth of the total breadth. Orbits nearly transverse. Lateral borders arched, with three teeth separated by deep fissures, the first two broad, the third small. Anterior limbs in the male very large, finely granular like the carapace; hands unarmed, with a granular raised line on the outer surface near the lower border. Immobile finger much bent downwards, regularly denticulated on its inner edge; inner edge of mobile finger with a denticulated elevation near the base. Inner surface of the arm, edge of carapace, and basal joints of legs, with scattered slender hairs; a thicker coating on the fourth and fifth joints of the ambulatory legs. Length of carapace $\frac{3}{4}$ th inch; greatest breadth $1\frac{1}{8}$ th inch” (Haswell, Cat. Austr. Crust.).

Haswell's species seems to be nearly related to *M. erato*, especially by the breadth of the front and the hairy coating of the legs, which, as in my specimens of *M. erato*, show a thick coating of hair on the carpo- and propodite. The chelipeds of the male appear however to be larger in *M. latifrons*, there is a granular line near the lower border of the palm, the inner surface of the latter is unarmed, and the „musical crest” on the arm of *M. erato* seems to be absent. The index is much bent downward in *M. latifrons*, but is in the same line with the lower border of the palm in *M. erato*. The species of Haswell also seems to attain a larger size (about 28 mm. broad and 18.75 mm. long).

This species, like the preceding, is not represented in the Leiden Museum, and I am unable to give further information.

M. setosus H. Milne-Edwards.

1852. *M. setosus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159 (Australia).

1882. „ *setosus* Haswell. Cat. Austral. Crust., p. 89 (Port Jackson, Australia).

1888. „ *setosus* de Man. Arch. Naturgesch., Jahrg. 53. 1, p. 356, pl. 9 f. 2—2^a (no new record).

1897. „ *setosus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 343 (Moreton Bay).

De Man, who has had occasion to examine an original specimen of this species from the Paris Museum, revealed its main characters. In

general form it resembles somewhat *M. convexus*, but the carapace is narrower, and the whole surface is granulated, with the exception of the middle parts; there are no denticulated tubercles on the branchial regions and the carapace is regularly rounded transversely. The upper orbital border is much sloping backward, so that the outer orbital angle is lying behind the level of the convex curve of this upper border; the outer orbital angle itself is rounded, not at all sharp, and somewhat like that of *M. pacificus* and *M. japonicus*. The antero-lateral tooth of the carapace seems scarcely at all defined, anteriorly it is separated from the preceding orbital angle by a distinct incision, but distally there is scarcely an indication of an incision to separate it from a second lateral tooth. Sides of the carapace distinctly convergent posteriorly.

The palm of the male cheliped is, according to de Man's figure, twice as long as high, slightly granulated, and provided at the outer surface, close to the under margin, with a row of granules that is continued upon the immobile finger. Inner surface of palm and fingers densely hairy. Immobile finger much bent downward, so that the under margin of the palm and that of the said finger form a concave line; the finger is crenulated throughout at the cutting margin, but has no larger tooth. Such a tooth is well represented upon the dactylus, and between the tooth and the tip of the finger there are larger or smaller indentations.

There are, as far as I am aware, no dimensions published of this species, but according to de Man's figure, *M. setosus* seems to belong to the middle-sized species, the breadth of the carapace between the outer orbital angles being about 31 mm., the length about 17 mm. The Leiden Museum has no specimen.

M. pacificus Dana. (Pl. VIII, Fig. 11)

1851. *M. pacificus* Dana. Proc. Ac. Nat. Sc. Philadelphia, 1851, p. 248 (Upolu, Samoa).
 1852. „ *pacificus* Dana. U. S. Expl. Exp., Crust., prt. 1 p. 314, pl. 19 f. 4 (same record).
 1858. „ *pacificus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Loo-Choo-isles).
 1868. „ *bicarinatus*? Heller. Crust. „Novara” Reise, p. 36, pl. 4 f. 2 (Nicobars).
 1890. „ *pacificus* de Man. Notes Leyden Museum, v. 12, p. 79, pl. 4 fig. 10 (locality unknown).
 1895. „ *pacificus* de Man. Zool. Jahrb. Abt. Syst., Bnd. 8 p. 579 (Penang and Pontianak).

1897. *M. pacificus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 342 (no new record).
1902. „ *bicarinatus* de Man. Abhandl. Senckenb. Gesellsch., Bnd. 25, p. 496 (no new record).
nec 1910. *M. pacificus* Rathbun. Bull. Mus. comp. Zool. Harvard Coll., Cambridge, Mass., v. 52 p. 307, pl. 1 f. 3 (= *M. crinitus* Rathbun).

Unfortunately there is some confusion in the right interpretation of Dana's species, owing to the fact that the figure of this author seems to be incomplete, and that Heller's *M. bicarinatus* is not wholly reliable with respect to the form of the lateral teeth of the carapace.

De Man in 1890 first determined the very specimens of the Leiden Museum as *M. pacificus*; later, in 1902, however, he changed his opinion, and regarded these specimens as the true *M. bicarinatus*, whereas another specimen collected by Prof. Kükenthal at Halmaheira, was referred by de Man to *M. pacificus*.

Miss Rathbun recently (1913) supposed, that this latter specimen of de Man belonged to a new species created by her, *M. crinitus*, that the Leiden Museum specimens ought to be referred to *M. pacificus*, as de Man had formerly done (1890) and that *M. bicarinatus* „is too unlike the species under consideration to be united with either” (Proc. U. S. Nat. Mus., v. 44, p. 619).

Unless the type-specimen of Heller be examined again, this question must remain undecided, but I think it the safest way to suppose that *M. pacificus* and *M. bicarinatus* are really identical and for the rest to agree with Miss Rathbun's opinion in referring de Man's Halmaheira specimen to *M. crinitus*.

The Leiden Museum specimens have been so amply described by de Man in 1890, that it is useless to give a fresh description here. The carapace, smooth and glossy to the naked eye, is nearly equilateral, its greatest breadth (which is lying between the postero-lateral teeth, so that the carapace is narrowed anteriorly) being to the length as 7:5. The external orbital angle is not at all pointed, but rectangular, and separated from the next lateral tooth by a distinct incision. On the branchial regions there are two longitudinal, slightly pubescent lines on each side, a third row is lying before them and running in a transverse direction, and finally there is a similar, but very short and concave line just above the insertion of the posterior legs. This arrangement recalls one strongly to that found in species as *M. japonicus* and *M. tomentosus*; and it is chiefly on account of the fact, that these lines are not represented in Dana's figure of *M. pacificus*, that the confusion above alluded

to has been created; the lines are on the contrary partly represented in Heller's figure of *M. bicarinatus*.¹⁾

The palm of the male cheliped is peculiar in having no ridge whatever close to the under margin, in being smooth to the naked eye, and in the inner surface being unarmed and naked; there are only hairs near the insertion of the fingers and at the inner surface of the latter. Both fingers have horny, excavated, spoon-like tips; the dactylus has a large, quadrangular tooth somewhat before the middle, the immobile finger on the contrary has no larger tooth, but is crenulated throughout, is in a line with the under margin of the palm and shows a faint ridge at the outside. Contrary to the usual case in the genus, the ambulatory legs are only slightly hairy, even the posterior legs have only few, short hairs along the margin. It seems to have been overlooked by de Man, that (in my specimens at least) the hinder legs have a small spine at the anterior margin of the meropodite, near its distal end, quite as occurs in the preceding legs, and this character the species shares, as far as I know, only with very few of its congeners (*M. latreillei*, *M. dentatus* (?)).

The dimensions of two of the Museum specimens (1 ♂, 3 ♀) have been given by de Man (1890, p. 82—83); one of these, the largest female, was again and more fully measured by the same author on another occasion (1902, p. 498).

M. crinitus Rathbun.

1902. *M. sp.* de Man. Abhandl. Senckenb. Gesellsch., Bnd 25 p. 495 (Halmahera).
 1910. " *pacificus* Rathbun (*nec* Dana). Bull. Mus. comp. Zool. Harvard Coll., Cambridge, Mass., v. 52 p. 307, pl. 1 f. 3 (Amboyna).
 1913. " *crinitus* Rathbun. Proc. U. S. Nat. Mus., v. 44 p. 619, pl. 75 f. 3 (same record).

This species is most closely allied to the preceding one, so that at first sight it was confounded with the latter by Miss Rathbun, but it cannot be denied that it bears even a greater resemblance to *Euplax boscii* (Audouin).

The carapace is nearly wholly subquadrate, its breadth only slightly exceeding the length; it is convex, evenly rounded above, smooth in the middle parts and irregularly granulate towards the sides, but here the

1) This figure, as de Man observes, is probably wrong in presenting the carapace much narrower than it really is, and there is a remarkable contradiction between Heller's figure and text, as regards the dimensions of his species (see also de Man, 1902, p. 495).

surface is everywhere covered by hairs. Like the preceding species the carapace is narrowed anteriorly and attains its greatest breadth at the postero-lateral teeth. The external orbital angle and the lateral teeth seem to offer no marked difference with those of *M. pacificus* ¹⁾. The upper orbital border appears to be slightly more sinuous. There is no trace of longitudinal pubescent lines on the postero-lateral sides of the carapace, but above the insertion of the posterior legs there is a similar short, curved line as in the preceding species.

The cheliped of the male, except for its being densely clothed with hairs along nearly the whole inner face, is again very much like that of *M. pacificus*, but the granulation on the wrist and on the outer surface of the palm seems to be somewhat coarser. The dactylus has the same, large, conspicuous, quadrangular tooth at the middle of its length.

The ambulatory legs of *M. crinitus* are, like the carapace, densely covered with hairs; mero-, carpo- and propodite of the penultimate pair of legs are comparatively longer than in *M. pacificus* (see de Man, p. 498); the first to third pair of walking legs bear a small spine at the anterior margin of their meropodites, near the carpal end, but the spine is concealed by the thick hairy covering of these joints.

M. crinitus, as has been remarked above, is nearly related to *Euplax boscii* (Audouin), but in *Euplax* the sides of the carapace are armed with only two teeth in all, the meropodite of the third pair of maxillipeds is nearly as long as the preceding joint, these maxillipeds themselves leave a wide gap between them, and the outer margins of the external orbital angles are convergent posteriorly, whereas in the present species of *Macrophthalmus* there are three teeth in all at the sides of the carapace (external orbital angle included), the meropodite of the third pair of maxillipeds is shorter than the preceding joint, the maxillipeds have only a narrow gap between them, and the outer margins of the external orbital angles are divergent posteriorly or parallel.

The species is not represented in the collection of the Leiden Museum.

The length of the carapace of a type male specimen, measured by Miss Rathbun, is 11.2 mm., the breadth 15.3 mm., the width of the front below 2.5 mm.

M. tomentosus Souleyet. (Pl. IX, Fig. 12).

1841. *M. tomentosus* Souleyet. Voy. „Bonite”, Zool., t. 1 p. 243, Crust., pl. 3 f. 8 (Manilla, Philippines).

1) According to de Man (p. 497) the outer orbital angle is distinctly sharper in the present species.

1852. *M. tomentosus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159 (no new record).
1873. „ *tomentosus* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9 p. 279 (New Caledonia and Aroe-isles).
1888. „ *tomentosus* de Man. Journ. Linn. Soc. London, v. 22 p. 122 (Mergui Archipelago).
1900. „ *tomentosus* Alcock. Journ. As. Soc. Bengal, v. 69, prt. 2, p. 382 (same record as that of de Man).

Though at first sight this species is much like *M. japonicus* and *M. depressus*, as de Man observed, it may be easily distinguished by the carapace being considerably narrowed anteriorly (so that the external orbital angle, which is very much rounded off, projects less outward than the first lateral tooth), by the finer granulation of the carapace and the hairiness of the meropodites of the walking legs.

De Man has furnished us with a full description of this species. The greatest breadth of the carapace is found between the tips of the postero-lateral teeth, behind which the sides are parallel or even slightly bulging. ¹⁾ The outer orbital angle is rectangular and very large, the side margins of the angles diverging towards the incision which separates the first lateral tooth anteriorly. This latter tooth projects farther outward and has a convex lateral margin, which passes nearly without incision into the very small second lateral tooth, situated (in my specimen at least) a little way before the middle of the lateral margin of the carapace. ²⁾ The granulation of the carapace, though very distinct, is represented perhaps somewhat too coarse in my figure; the granules are especially crowded on the branchial regions, but the middle parts of the carapace (the mesogastric and the median part of the anterior cardiac area) are smooth. Towards the postero-lateral sides we may observe the same arrangement of granulated rows as has been mentioned (in the shape of pubescent lines) in *M. pacificus*. Firstly there are at each side two obliquely-longitudinal hairy rows, composed of closely set granules that are larger than those on the rest of the carapace; in *M. japonicus* the granules composing these rows are fewer in number, more scattered

1) In Souleyot's figure the sides of the carapace in the posterior part are very irregular, presenting some conspicuous prominences. To judge from my specimen the carapace is somewhat broadened behind the small second lateral teeth, with a regular, convex outline, but details are obscured by the rather thick hairy coating of the surface.

2) De Man mentions three (not two) incisions; the posterior incision, situated behind the middle of the lateral margin, is very indistinct and may easily be overlooked. I have not found it in my specimen.

and not larger than the surrounding granules on the carapace. Secondly there is a transverse row, apparently proceeding from the second lateral tooth, and finally we may observe an oblique row just above the insertion of the posterior legs. All the borders of the carapace are crenulated or finely beaded. The upper border of the orbit is elegantly curved, straight; the inferior border projects much more forward, is convex and much more conspicuously crenulated than the upper border; in the male the outer fourth of the under orbital border is occupied by three rounded tubercles, with the tips directed inward, which formation, as usual, is associated with the presence of a „musical crest”. Front narrow, deeply grooved in the middle, much constricted between the eye-stalks; the latter are straight, stoutish and do not reach to the external orbital angle.

The chelipeds of the only male specimen in the Museum are, unlike the usual case in this genus, unequal, the right being the larger. ¹⁾ Upper and inner border of the arm furnished with long hairs, inner surface of the arm with a short horny „musical crest”, running close to and parallel with the inner margin of the arm, and lying in the beginning of the distal half of the latter. Wrist armed with a row of tubercles along the inner margin and some spines at the anterior border, near the palm. Palm rather low, not increasing much in height towards the distal end, outer surface smooth, without ridge near the under margin, somewhat granular towards the superior border. Fingers about as long as the palm, with horny, excavated, spoon-like tips, densely clothed with hair at these tips, but the inner surface of the fingers as well as that of the palm is nearly naked. ²⁾ This last character the species shares with *M. japonicus*. The cutting margin of both fingers are armed with a large tooth, that on the dactylus being narrow, rectangular and placed near the base, that on the index being larger and higher, sloping backward; between the tooth and the tip both fingers are minutely denticulate. The ambulatory legs have strong and thick meropodites, which in the first to third pair are armed with a spine at the fore margin and densely clothed with hairs at the upper surface; these hairs are also visible on the carpus and the proximal half of the propodite in the middle pairs of legs. Nails very much compressed and broad, hairy at the margins.

The only specimen of the Museum (♂) is one of those, described by de Man, from the Mergui archipelago; it has been measured by this author already (p. 124).

1) De Man states that the chelipeds in the adult specimens are „nearly equal to one another”.

2) De Man observed at the inner surface of the palm „a close down of hairs”, but in adult specimens these hairs are, according to the author, „nearly wanting, being probably worn off, so that the inner surface of the palm appears glabrous”.

M. depressus Rüppell. (Pl. IX, Fig. 13).

1830. *M. depressus* Rüppell. 24 kurzschwänz. Krabben d. Rothen Meeres, p. 19, pl. 4 f. 6 (Red Sea).
1837. „ *depressus* H. Milne-Edwards. Hist. nat. d. Crust., t. 2 p. 66 (same record).
1839. „ *affinis* Guérin. Voy. „Favorite”, t. 5, 2^{me} part., p. 172, pl. 50 f. 2 (Bombay and Pondichéry).
1839. „ *affinis* Guérin. Mag. Zool., t. 8, cl. 7, Crust., p. 4, pl. 24 f. 2 (no new record).
1852. „ *depressus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159 (no new record).
1852. „ *affinis* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158 (no new record).
1861. „ *depressus* Heller. Sitzungsber. K. K. Ak. Wis. Wien, Bd. 43. 1. p. 362 (Red Sea).
1875. „ *depressus* Paulson. Rech. Crust. Mer Rouge, p. 66, pl. 6 f. 5—7¹⁾ (Red Sea).
1881. „ *depressus* de Man. Notes Leyden Museum, v. 3 p. 235 (Djeddah, Red Sea).
1882. „ *affinis?* Haswell. Cat. Austral. Crust., p. 88 (Holborn Island, North Australia).
1888. „ *depressus* de Man. Arch. Naturgesch., Jahrg. 53. 1, p. 356, pl. 15 f. 3 (no new record).
1888. „ *depressus* de Man. Journ. Linn. Soc. London, v. 22 p. 124 (Mergui archipelago).
1893. „ *depressus* Henderson. Transact. Linn. Soc. London, ser. 2, v. 5, p. 389 (Rameswaram, Ceylon).
1895. „ *depressus* de Man. Zool. Jahrb. Abt. Syst., Bd. 8, p. 578 (Atjeh).
1897. „ *depressus* Ortmann. Zool. Jahrb. Abt. Syst., Bd. 10 p. 342 (no new record).
1900. „ *depressus* Alcock. Journ. As. Soc. Bengal, v. 69 prt. 2, p. 380 (Mergui archipelago and Aden).
- 1906 „ *depressus* Nobili. Bull. Sc. France et Belgique, v. 40 p. 155 (Persian Gulf).
- 1906 „ *depressus* Nobili. Ann. Sc. nat. sér. 9, Zool., t. 4 p. 318 (Suez, Massowah).

Several authors (de Man, Henderson, Ortmann) have pointed out, that the *M. affinis* of Guérin most probably is identical with *M. depressus*,

1) Cited after Nobili.

and I think this to be right, also on account of Guérin's statement, that the immobile finger has no larger tooth, the very character by which this species is distinguished from the closely related *M. japonicus*. I agree with de Man (1895) in his doubt about the identity of Haswell's species with that of Guérin (Haswell himself was not quite certain about his determination), for the palm is described as having „a faint longitudinal linear depression close to the lower border”, whereas de Man (1888, in Arch. Naturgesch.) expressly states that a ridge or granular row is absent in *M. depressus*.

It has been again de Man, who on several occasions pointed out the main characters of this species. The form of the carapace is nearly exactly the same as in *M. japonicus*, but *M. depressus* never seems to attain the size of this species. The sides are nearly parallel, not distinctly convergent posteriorly ¹⁾; the length of the carapace is about two-thirds its greatest breadth, which latter is found between the tips of the first lateral teeth. The whole surface, with exception of the middle parts, is granular, and on the branchial regions there are at each side two longitudinal hairy rows of granules, the outer of which is somewhat convex, a transverse similar row is observed near the insertion of the posterior legs. The outer orbital angle is rectangular and projects less outward than the obtusely rounded antero-lateral tooth, which has a convex outer margin and is minutely crenulate; the second tooth is extremely small and separated from the preceding by a minute incision. Carapace hairy towards the sides, a row of long hairs along the margins. Front narrow, constricted, about one-eighth the breadth of the carapace. Upper orbital border nearly straight, under border distinctly and regularly crenulate. Eye-stalks slender, reaching nearly to the external orbital angle.

In the chelipeds of the male the differences between *M. depressus* and *M. japonicus* are clearly pronounced (de Man, 1881). In the first named species the arm is shorter, and the whole inner and outer surface are closely covered with hairs, whereas in *M. japonicus* such hairs are much more scarcely distributed and arranged especially along the margins. The upper border of the palm is somewhat crenulate in *M. japonicus*, smooth and slightly granular in *M. depressus*; in the first named species the inner surface of the palm and the fingers are naked, or nearly so, the upper surface of the dactylus is granular, and the index bears a large tooth and is curved downward; in *M. depressus* on the contrary the inner surface of the palm and the fingers are densely hairy, the

1) De Man (1888, in Arch. Naturgesch.) however has figured the carapace with posteriorly convergent sides.

upper surface of the dactylus is smooth, not granular, and the index has no large tooth, but is coarsely denticulated at the cutting margin and not curved downward. In both species here named the mobile finger has a large rectangular tooth near its base.

The ambulatory legs of *M. depressus* are remarkable for their massively-built meropodites in the middle pairs of legs; these meropodites have convex anterior and posterior margins and their thickness is more than one-third the length, in the case of the first to third pair there is a distinct spine at the anterior margin, at the usual place. Mero-, carpo- and propodite of the second and third pair of ambulatory legs are densely clothed with hairs, both at the upper and under surface (only in the second pair the carpo- and propodite are naked at the under surface).

This species which ranges throughout the whole Indian Ocean, though it has not as yet been found at the east coast of Africa, is represented in the Museum by several specimens: four (3 ♂, 1 ♀) from Djeddah at the Red Sea, already spoken of by de Man (1881), one (♂, dried) from an unknown locality (found by me in a lot of *M. japonicus*, but certainly erroneously associated with that species, as both have never been recorded to occur in the same localities) and finally four (all ♀, dried) from the Red Sea and received as co-types from Rüppell himself.

The dimensions of the largest specimens at my disposal are

	1 ♂	2 ♀
Distance between external orbital angles	19.5	29.—
Greatest breadth of carapace (at the middle of the lateral margin of the antero-lateral teeth)	20.5	30.5
Length of carapace	14.—	20.—
Least breadth of front	2.5 (scarcely constricted)	2.5 (much constricted).

The species may be in some cases more transversely elongated, for Alcock mentions a specimen, the length of which is the same as in my male specimen, but with a carapace-breadth of 22 mm.

M. definitus Adams & White.

1847. *M. definitus* Gray. Cat. Crust. British Museum, p. 37 (Philippines).
 1848. „ *definitus* Adams & White. Zool. Voy. „Samarang“, Crust., p. 51 (Philippines).
 1894. „ *depressus* Ortmann, nec Rüppell. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 745 (locality unknown).

1897. *M. definitus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10, p. 342 (Philippines).
1910. „ *definitus* Rathbun. Bull. Mus. comp. Zool. Harvard Coll., Cambridge, Mass., v. 52 p. 307, pl. 2 f. 1 (Makassar).

Miss Rathbun recently made known the female and it is her description and figure we take as base for the diagnosis of this species, which is not in the collection of the Leiden Museum.

In general appearance *M. definitus* is again very much related to *M. japonicus*, but the carapace is broader, the length being three-fourths the greatest breadth, which latter is found rather far behind, behind the lateral teeth; the lateral margins of the carapace are nearly parallel and not at all convergent posteriorly. The whole surface is covered with granules; on each epigastric lobe, immediately behind the base of the front, there is a transverse row of granules, concave forward; the mesogastric and cardiac area, besides the neighbouring parts of the hepatic and branchial regions, are smooth, with a polished appearance. There seem to be no longitudinal rows of granules on the branchial regions, but the transverse row at the level of the postero-lateral teeth of the carapace is clearly visible. Front constricted, deeply furrowed, and beaded along the side margins, like the upper orbital border which is straight and elegantly curved. Outer orbital angle rectangular, projecting less outward than the first lateral tooth of the carapace; the latter tooth with a convex outer margin; second lateral tooth scarcely, if at all, defined. Ocular peduncles slender and short, not reaching the outer orbital angle.

Male cheliped with a naked under surface of arm (hairy in *M. japonicus*); upper border of palm coarsely granulate, inner surface densely hairy, as also the inside of the fingers; both fingers with a large tooth at the cutting margin, that on the dactylus however is much smaller than in *M. japonicus* and that on the immobile finger is lower, much more sloping than in the Japanese species and placed nearly in the middle of the finger, whereas in the other species it is situated nearer to the base. Meropodites of the middle pairs of ambulatory legs narrowing towards the distal end, the spine at the anterior border is very small and nearly wholly concealed under the woolly fur with which the meropodites are clothed. There is a transverse ridge on the third abdominal segment in the male (in the female also on the preceding segment) which is absent in *M. japonicus*.

This apparently very local species has been measured by Miss Rathbun and for the sake of completeness I give here the dimensions of the two sexes.

	1	2
	♂	♀
Distance between external orbital angles.	27.8	22.2
Greatest breadth of carapace posteriorly.	30.—	25.—
Length of carapace	23.2	19.6

The species attains the same size as *M. japonicus*.

M. japonicus de Haan. (Pl. IX, Fig. 14).

1835. *Ocypode (Macrophthalmus) japonica* de Haan. Fauna japonica, Crust., p. 54, pl. 7 f. 1 (♀, sub nomine *O. (M.) depressa* pl. 15 f. 2¹) (♂) (Japan).
1847. *M. japonicus* Gray. Cat. Crust. British Museum, p. 38 (Japan).
1848. „ *japonicus* Adams & White. Zool. Voy. „Samarang”, Crust., p. 51 (Meiacoshima).
1852. „ *japonicus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158 (Japan).
1894. „ *japonicus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd 7, p. 746 (Bay of Tokio and Nagasaki).
1897. „ *japonicus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd 10, p. 343 (no record of locality).

De Haan has excellently characterized this species. Carapace in its greatest breadth (at the middle of the convex margin of the anterolateral teeth) about $1\frac{1}{2}$ the length, wholly covered with conspicuous granules, except for the epi- and mesogastric area and the middle of the cardiac area, the granules are largest on the hepatic regions. All the margins are distinctly crenulate, which is most pronounced in the proximal half of the side borders. On the branchial regions we observe at each side the same granular rows as are present in *M. pacificus*, *M. depressus* and *M. tomentosus*, viz. a transverse row at the level of the posterolateral teeth, two longitudinal rows²⁾, parallel to the side margins and an obliquely transverse row above the base of the posterior legs. The granules composing these rows are not larger, rather smaller than the surrounding ones, contrary to what is the case in *M. tomentosus*. Carapace not much narrowed anteriorly (as in the latter species). Outer orbital angle somewhat more pointed, though scarcely projecting, antero-

1) Not f. 3, as is mentioned by misprint in the text.

2) The inner one of these is broken up in two rows, one behind the other, which forms a certain very obtuse angle; this arrangement appears also in de Haan's figure of the male.

lateral tooth very high, with obtuse tip, second tooth very small, though distinct. Front narrow, constricted, bilobed at the free margin, very deeply furrowed, a rounded group of granules on each epigastric lobe (where there is a concave series of such granules in *M. definitus*). Upper orbital border with a deep curve, so that the inner curve near the base of the front is at about the same level as the outer orbital angle; the border itself is strongly crenulate, more so than in other species of the genus (except *M. pectinipes*); inferior orbital border nearly straight throughout four-fifths of its length and strongly dentate, the outer fifth part abruptly sloping. Ocular peduncles slender, eyes reaching nearly to the end of the orbit, but not surpassing it. Grooves on the carapace very conspicuous and broad, the grooves circumscribing the gastric area very deep, the lateral transverse ones somewhat sigmoid-shaped, especially the hinder groove, clothed with short hairs.

Chelipeds of the male, as de Haan rightly observed, short or long, according to age; in young specimens scarcely as long as the breadth of the carapace, in the adult twice as long. Arm slender, with a bunch of hairs at the under surface and a row of hairs at the upper border. Palm elongated, slightly granular at the outer surface; inner surface naked, without hairs, but wholly covered with granules, the larger ones being found towards the carpal end and there is a longitudinal row of granules not far from the upper border; the latter finely crenulate and a parallel row of granules immediately behind it, in the proximal half of the palm. Mobile finger much curved, granular, especially at the upper border, cutting margin with a distinct large, quadrangular tooth near the base, between the tooth and the tip of the fingers a series of fine dentations. Index likewise granular, much curved downward, so that it forms a concave line with the inferior border of the palm, some few hairs near the tip at the inner surface, cutting margin provided with a large, sloping tooth and for the rest crenulate towards the tip of the finger.

Meropodites of walking legs broad, though not narrowed towards the distal end (as in *M. depressus*), armed with a spine at the fore margin in the case of the first to third pairs of legs, and hairy along this margin, but not at the upper and under surface, as is so conspicuously pronounced in *M. depressus*. Both margins of the meropodites are strongly serrate. Nails lanceolate, very broad, hairy at the margins.

The Leiden Museum contains a great many specimens, all from Japan and apparently collected by Burger and v. Siebold. Only two (♂ and ♀) were preserved in alcohol, the rest (23 ♂, 11 ♀) were all dried up; among them I recognized the type male of de Haan, figured by him on pl. 15 f. 2.

The specimens were in all stages of age and I can fully confirm Ortmann's observation (1894) that the chelipeds of the young males are of a female character, with only faint development of teeth on the fingers; it is only in full-grown specimens that the chelipeds attain a large size.

M. japonicus seems to have been found only in Japan, where it replaces *M. depressus*. Evidently it is not uncommon there, for Ortmann (1894) mentions a series of no less than 47 ♂ and 24 ♀ collected in the Bay of Tokio by Döderlein.

The dimensions of some of my specimens are the following:

	1	2	3	4
	♂ ¹⁾	♂ ²⁾	♂	♀
Distance between outer orbital angles	31.—	30.5	22.5	24.—
Distance between antero-lateral teeth	33.—	31.75	24.—	25.5
Length of carapace	21.—	20.75	15.5	17.5
Least breadth of front	2.5	2.5	2.—	2.25

Of the 25 species of *Macrophthalmus* here accepted, the following (16) are represented in the collection of the Leiden Museum:

<i>M. pectinipes</i> Guérin.	<i>M. convexus</i> Stimpson.
" <i>transversus</i> (Latreille).	" <i>erato</i> de Man.
" <i>telescopicus</i> (Owen).	" <i>latreillei</i> (Desmarest).
" <i>grandidieri</i> A. Milne-Edwards.	" <i>quadratus</i> A. Milne-Edwards.
" <i>dilatatus</i> de Haan.	" <i>pacificus</i> Dana.
" <i>brevis</i> (Herbst).	" <i>tomentosus</i> Souleyet.
" <i>hilgendorfi</i> n. n.	" <i>depressus</i> Rüppell.
" <i>crassipes</i> H. Milne-Edwards.	" <i>japonicus</i> de Haan.

Nine species therefore are absent:

<i>M. latipes</i> Borradaile.	<i>M. latifrons</i> Haswell.
" <i>sulcatus</i> H. Milne-Edwards.	" <i>setosus</i> H. Milne-Edwards.
" <i>consobrinus</i> Nobili.	" <i>crinitus</i> Rathbun.
" <i>dentatus</i> Stimpson.	" <i>definitus</i> Adams & White.
" <i>punctulatus</i> Miers.	

Leiden Museum, October 1915.

1) Type male specimen of de Haan (dried).

2) Specimen here figured (preserved in alcohol).

APPENDIX.

My paper was already finished and under press, when I became acquainted with Laurie's important treatise on the Brachyura of the Sudanese Red Sea (Journ. Linn. Soc. London, v. 31 n^o 209), published in July of this year. In this paper (p. 470), *M. graeffei* A. Milne-Edwards is treated of as a distinct species, different from *M. convexus*. The author states, that in *M. graeffei* the eye-stalks are longer, reaching slightly beyond the tip of the outer orbital angle, whereas in *M. convexus* these eye-stalks are shorter, falling short of the outer orbital angle, but in my figure we may observe, that the pigmented region of the eye touches exactly the tip of this outer angle, so that the difference anyhow seems to be not very great. Further there is some slight difference in the shape and the direction of the external orbital angle and the anterolateral teeth of the carapace, which in *M. graeffei* are more spiniform and more transversely disposed than in *M. convexus*. As to the subterminal spine at the anterior border of the meropodites of the walking legs, such a spine exists in the case of the first to third pairs of these legs in both species; that such a spine really does exist at the hindermost walking legs is indicated in Stimpson's figure (1907) of *M. convexus*, but I am inclined to regard this as an aprioristic presumption. The extremely small spine at the meropodites of the first pair of walking legs may easily escape notice, so that Alcock did not mention it.

Laurie's figures of the cheliped however seem to prove the right of existence of *M. graeffei* as a distinct species, for even in the larger specimens, of about the same dimensions as the adult *M. convexus*, the fingers have no larger teeth.

Moreover Laurie (with Miss Rathbun, 1906) denies the synonymy of *M. convexus* and *M. inermis*, on account of the fact, that both Alcock and Stimpson state that the inner surface of the palm of the cheliped of the male is hairy in *M. convexus*, whereas Milne-Edwards says that this inner surface is naked in *M. inermis*. I regard this as a difference of little importance, perhaps due to age. It is further true, that Milne-Edwards has not figured subterminal spines on the meropodites of the walking legs of *M. inermis*; these spines may have been overlooked, I suppose. For the rest de Man has had occasion to examine typical specimens of *M. inermis* and declared them to be identical with *M. convexus*.

EXPLANATION OF PLATES.

Pl. V.

- Fig. 1. *Macrophthalmus transversus* (Latreille), ♀, magn. 2. — 1^a cheliped of female, magn. 4. — 1^b cheliped of male, magn. 3.
 » 2. *Macrophthalmus telescopicus* (Owen), ♀, magn. 2.

Pl. VI.

- Fig. 3. *Macrophthalmus grandidieri* A. Milne-Edwards, ♂, magn. 2. — 3^a external orbital angle and antero-lateral tooth of the right side of the carapace, magn. 3. — 3^b cheliped of male, magn. 2.
 » 4. *Macrophthalmus dilatatus* de Haan, ♂, magn. 2.
 » 5. *Macrophthalmus brevis* (Herbst), ♂, magn. 2.

Pl. VII.

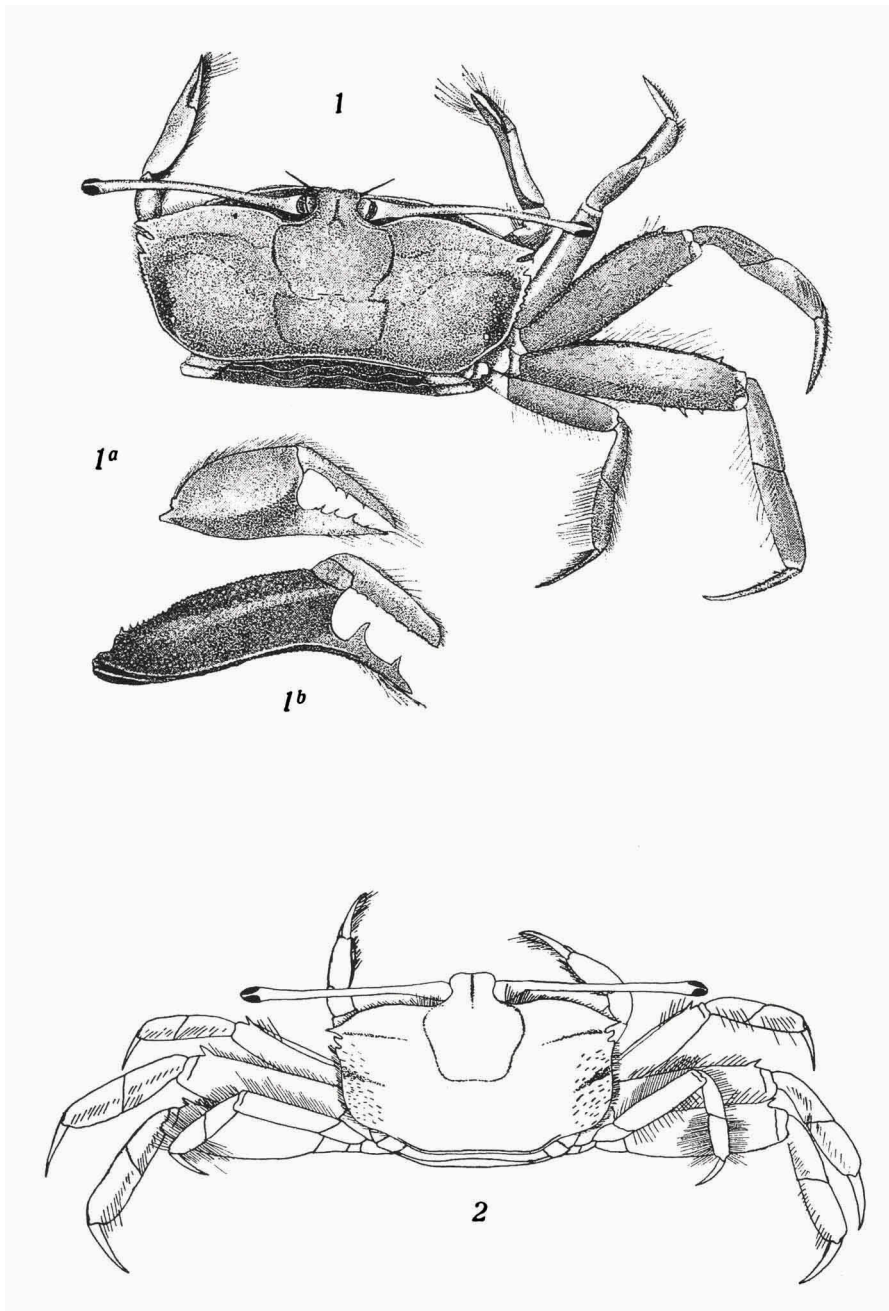
- Fig. 6. *Macrophthalmus hilgendorfi* n. n., ♂, magn. 2. — 6^a external orbital angle and antero-lateral tooth of the right side of the carapace, magn. 4. — 6^b cheliped of male, magn. 2.
 » 7. *Macrophthalmus crassipes* H. Milne-Edwards, ♂, magn. 2.
 » 8. *Macrophthalmus convexus* Stimpson, ♂, magn. 2.

Pl. VIII.

- Fig. 9. *Macrophthalmus erato* de Man, ♂, magn. 3. — 9^a outer orbital angle and antero-lateral tooth of the right side of the carapace, magn. 6. — 9^b under border of the left orbit, magn. 10.
 » 10. *Macrophthalmus quadratus* A. Milne-Edwards, ♂, magn. 3. — 10^a cheliped of male, magn. 4.
 » 11. *Macrophthalmus pacificus* Dana, ♂, magn. 2.

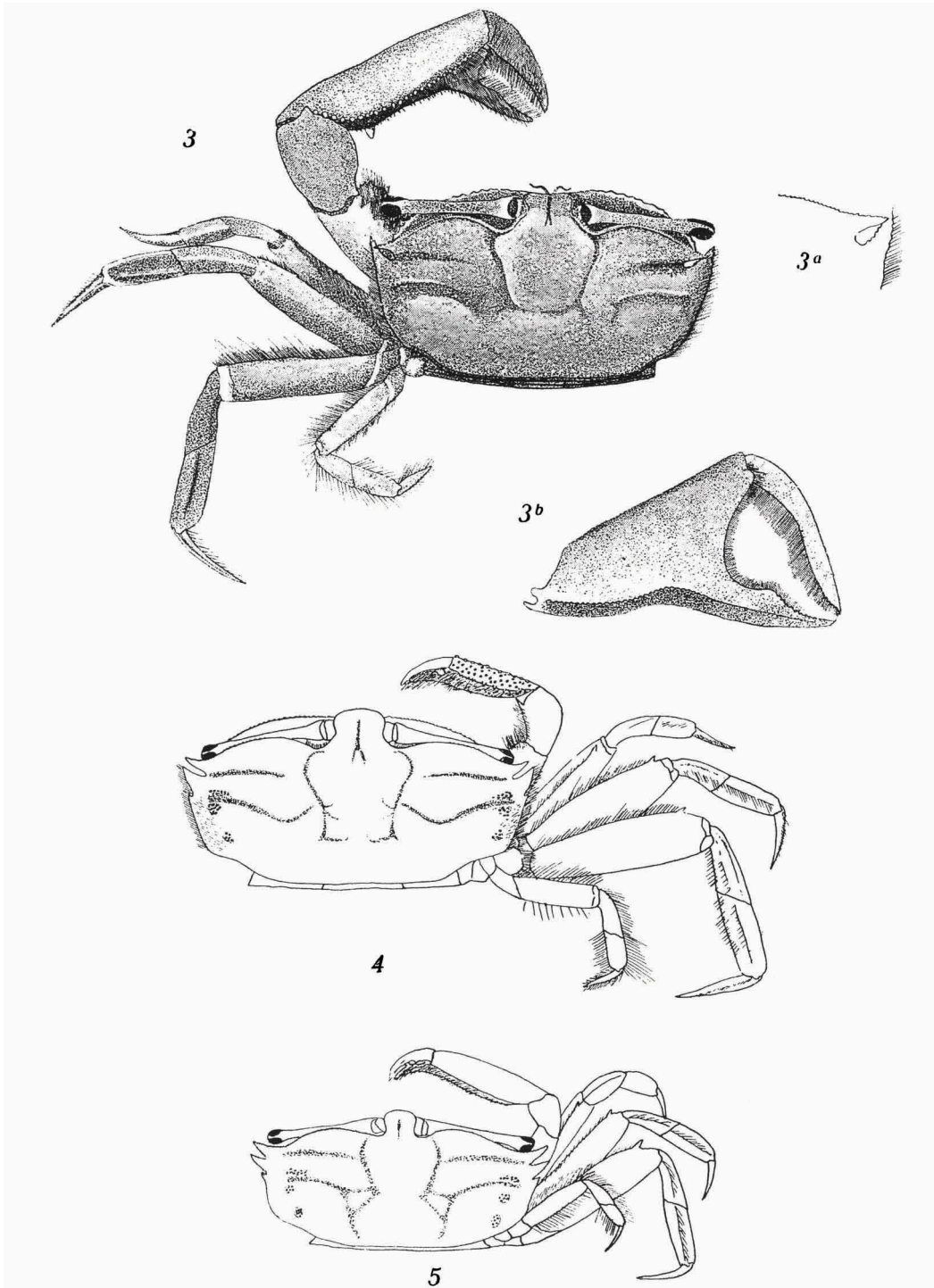
Pl. IX.

- Fig. 12. *Macrophthalmus tomentosus* Souleyet, ♂, magn. 2. — 12^a cheliped of male, magn. 2.
 » 13. *Macrophthalmus depressus* Rüppell, ♂, magn. 2.
 » 14. *Macrophthalmus japonicus* de Haan, ♂, magn. 2.



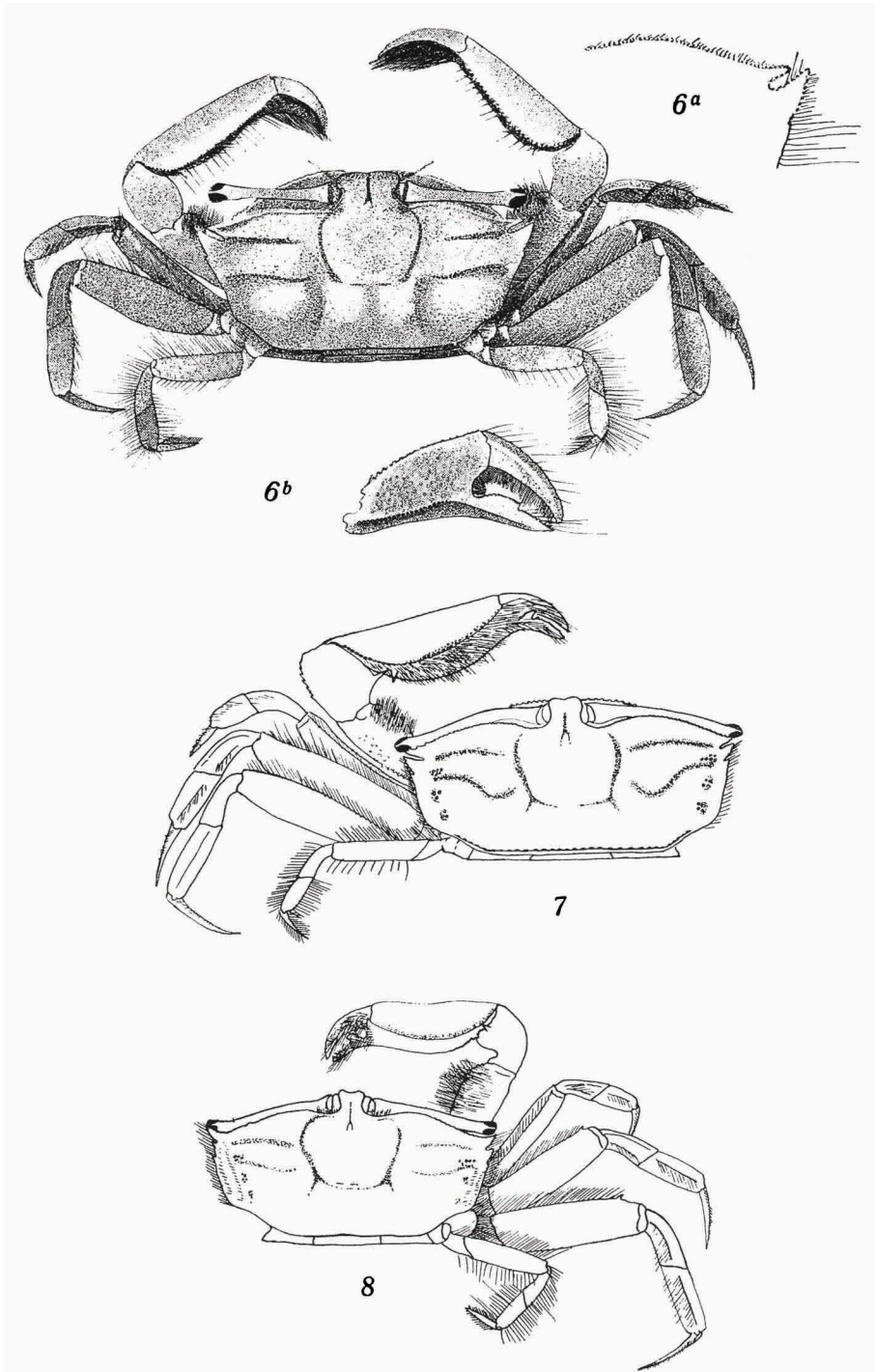
Tesch del.

1. *Macrophthalmus transversus*. 1^a female cheliped. 1^b male cheliped.
2. *M. telescopicus*.



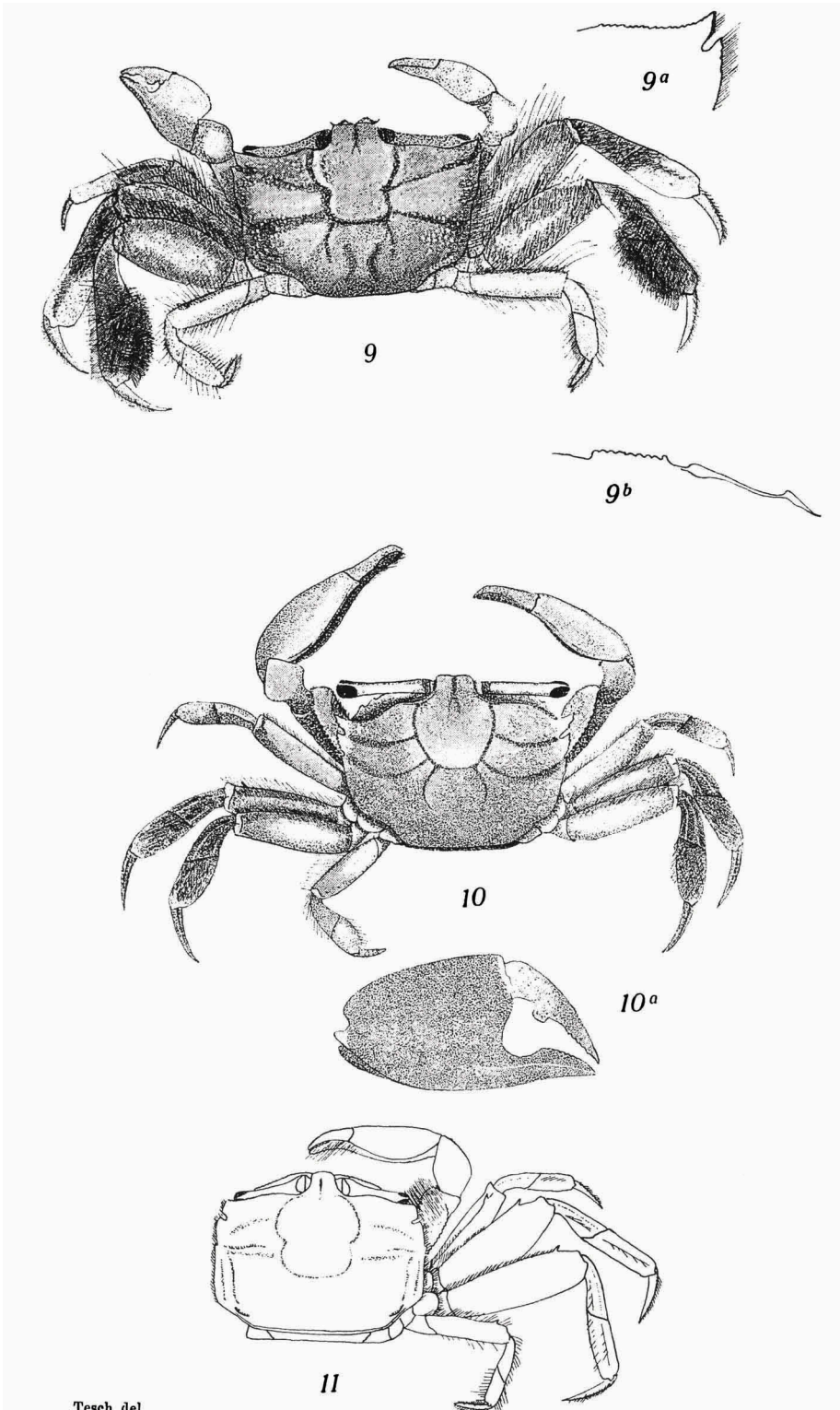
Tesch del.

3. *M. grandidieri*. 3a External orbital angle and anterior lateral tooth
4. *M. dilatatus*. of the carapace. 3b male cheliped.
5. *M. brevis*.



Tesch del.

6. *M. hilgendorfi*. 6^a External orbital angle and anterior lateral tooth of the carapace. 6^b male cheliped.
7. *M. crassipes*.
8. *M. convexus*.



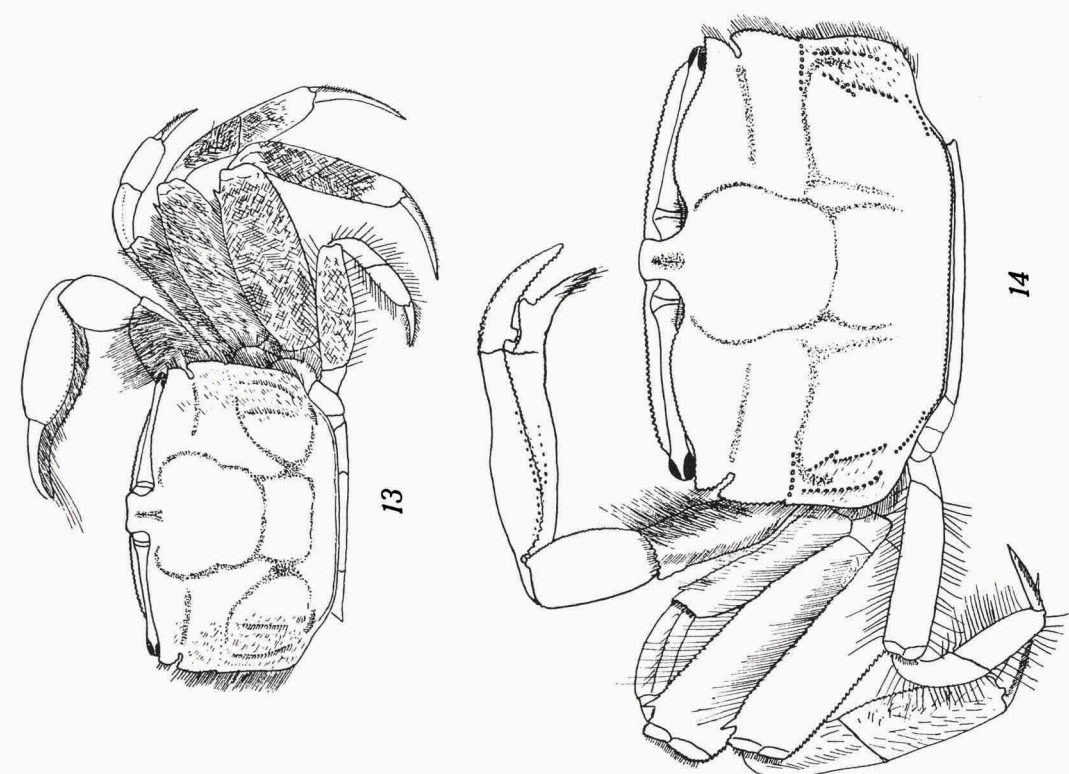
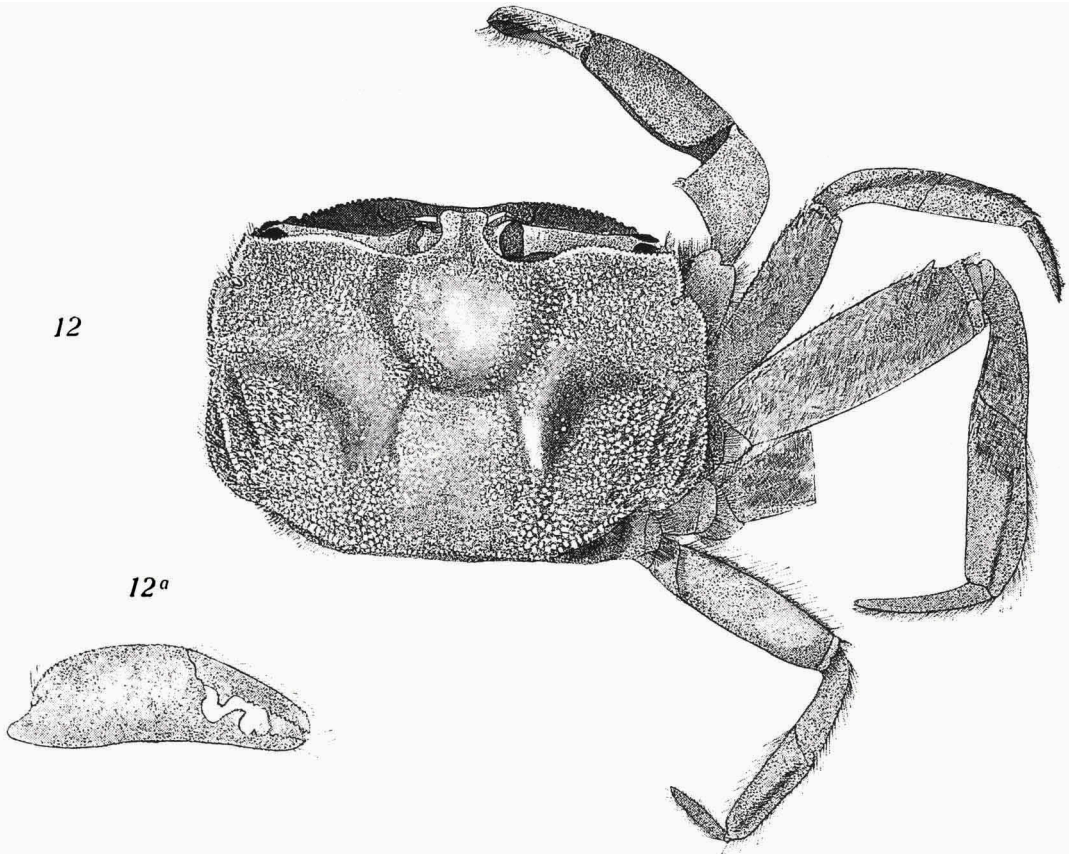
Tesch del.

9. *M. erato*.

9^a External orbital angle and anterior lateral tooth of the carapace. 9^b under border of the left orbit.

10. *M. quadratus*. 10^a male cheliped.

11. *M. pacificus*.



Tesch del.

12. *M. tomentosus*. 12^a male cheliped. 13. *M. depressus*. 14. *M. japonicus*.

binde der Vfgl. prominenter, die weissen Bindchen ebenfalls markanter. Auf den Hfgl. erscheint der gelbliche Vorhof des schwarzen Intramedianflecks wesentlich grösser als bei Exemplaren aus anderen Fundorten und zeigt somit eine Eigentümlichkeit vieler Niasfalter.

Patria: Insel Nias, Type ein ♀ im Leidener Museum.

Thysonotis wallacei hermogenes Fruhst.

(Societas Entomologica 1915, p. 49).

Exemplare kleiner als Felder's Figur von *Th. wallacei wallacei* Feld.

Das weisse Feld der Hfgl. und die Diskalmakeln der Vfgl. reduziert.

Patria: Insel Misool und Insel Salawati. Type im Museum in Leiden.

Thysonotis danis panätius Fruhst.

(Societas Entomologica 1915, p. 50).

Oberseits dicht graubraun überpudert und dadurch mehr an *Th. danis*

hermes Sm. erinnernd als an *Th. danis apollonius* Feld. Unterseite erheblich von *apollonius* differenziert durch den nur noch fadendünnen grünen Subkostalstreifen der Vfgl.

Patria: Insel Salawati. Type ein ♀ im Museum in Leiden.

Diese beiden neuen Rassen wurden l. c. beschrieben im Zusammenhang mit einer monografischen Revision der Gattung *Thysonotis*.

Eine Wiederholung der Diagnosen ist aber hier am Platze weil die Typen im Museum in Leiden sich befinden.

ZOOLOGISCHE MEDEDEELINGEN

UITGEGEVEN VAN WEGE

's RIJKS MUSEUM VAN NATUURLIJKE HISTORIE

Deel I.	te LEIDEN	Aflevering 3—4.
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XII. — THE CATOMETOPOUS GENUS MACROPHthalmus AS REPRESENTED IN THE COLLECTION OF THE LEIDEN MUSEUM.

BY DR. J. J. TESCH. — (WITH PLATES V—IX).

Though not laying any claim to being considered a pioneer in this systematic treatise on the genus *Macrophthalmus*, a thorough account of which has been given by Ortmann in 1897, I hope a renewed investigation may be not unwelcome to carcinologists. The discrimination of the species of this genus, notwithstanding they are easily to be grouped around certain well-characterized forms, remains a troublesome task. As far as I know Ortmann (Zool. Jahrb. Abt. Syst., Bnd. 10, 1897, p. 340—342) was the first to give an analytical key of the species then known. Several authors, among whom we may name Miss Rathbun, Nobili, Stimpson and Laurie, have since described new species or cleared several yet undecided questions about imperfectly known forms, but it is especially to the accomplished carcinologist de Man that we owe the most important contributions to our knowledge in this respect and the minutest descriptions. ¹⁾

The rather rich collection of *Macrophthalmus* in the Leiden Museum has induced me to give a new account of it, taking as base Ortmann's revision of 1897. I much regret, that the terrible war that actually is devastating most of the civilized countries of Europe, has prevented me from getting informations about doubtful species, as it is impossible now to get access to type-specimens preserved in Museums of warring countries. ²⁾ So I had to restrict myself almost entirely to the material of

¹⁾ I have to thank my fellow-countryman for several informations and advices in doubtful cases.

²⁾ Notwithstanding the war, Prof. Vashöffen of the Berlin Zoological Museum has at my request taken the trouble of studying an original specimen of Herbst and I am glad to express my best thanks for his obligingness.

the Leiden Museum and it has been impossible to fill all the gaps left open by Ortmann.

The number of names used for species of the genus under discussion is rather large. I give here a full list of the names that have come to my knowledge, alphabetically arranged, with reference to the first paper in which they were published.

- M. affinis* Guérin. Voy. „Favorite”, t. 5, 2^e part., p. 172, pl. 50, f. 2. 1839.
 * „*bicarinatus* Heller. Crust. „Novara”-Reise, p. 36, pl. 4 f. 2. 1868.
 * „*brevis* Herbst (nec Hilgendorf, de Man). Naturgesch. Krabben u. Krebse, Bnd. 3 Heft 4, p. 9, pl. 60 f. 4. 1804.
 * „*brevis* Hilgendorf (nec Herbst). Baron v. d. Decken's Reisen in Ost-Afrika, Bnd. 3. Crust. p. 86, pl. 3 f. 4. 1869.
 * „*carinimanus* (Latreille) H. Milne-Edwards. Hist. nat. d. Crustacés, t. 2 p. 65. 1837.
 * „*compressipes* Randall. Journ. Nat. Sc. Philadelphia, v. 8, p. 123. 1839.
 * „*consobrinus* Nobili. Bull. d. Mus. d'Hist. nat. Paris, t. 12, p. 265. 1906.
 * „*convexus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97. 1858.
 * „*crassipes* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 157. 1852.
 * „*crinitus* Rathbun. Proc. U. S. Nat. Mus. Washington, v. 44 p. 618, pl. 75 f. 3. 1913.
 * „*definitus* Adams & White. Zool. Voy. „Samarang”, Crust., p. 51. 1848.
 * „*dentatus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97. 1858.
 * „*depressus* Rüppell. 24 kurzschwänz. Krabben d. rothen Meeres, p. 17, pl. 4 f. 6. 1830.
 * „*dilatatus* de Haan. Fauna Japonica. Crustacea, p. 55, pl. 15 f. 3. 1835.
 * „*erato* de Man. Journ. Linn. Soc. London, v. 22, p. 125, pl. 8 f. 12-14. 1888.
 * „*guérini* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158. 1852.
 * „*graeffei* A. Milne-Edwards. Journ. Mus. Godeffroy, Heft 4, p. 81, pl. 13 f. 5. 1873.
 * „*grandidieri* A. Milne-Edwards. Ann. Soc. entom. France, t. 7 p. 285. 1867.
 * „*inermis* A. Milne-Edwards. Ann. Soc. entom. France, t. 7 p. 286. 1867.
 * „*japonicus* de Haan. Fauna Japonica. Crustacea, p. 54, p. 15 f. 2 (♂), pl. 7 f. 1 (♀). 1835.
 * „*laevimanus* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 157. 1852.
 * „*laevis* A. Milne-Edwards. Ann. Soc. entom. France, t. 7 p. 287. 1867.
 * „*laniger* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 746, pl. 23 f. 15. 1894.
 * „*latifrons* Haswell. Proc. Linn. Soc. N. S. W., v. 6 p. 549. 1882.
 * „*latipes* Borradaile. Fauna Maldive etc., v. 1, prt 4, p. 433, f. 114. 1903.
 * „*latreillei* (Desmarest). Hist. nat. d. Crust. foss., p. 99, pl. 9 f. 1-4. 1822.
 * „*pacificus* Dana. Crust. U. S. Expl. Exp., prt. 1, p. 314, pl. 19 f. 4. 1852.

- M. parvimanus* (Latreille) Guérin. Iconogr. d. Règne animal, t. 3, Crust. p. 7, pl. 4 f. 1. 1829-43.
 * „*pectinipes* Guérin. Voy. „Favorite” t. 5, 2^{me} part., p. 169, pl. 49. 1839. 1)
 * „*podophthalmus* Souleyet. Voy. „Bonite”, Zool., t. 1 p. 241, pl. 3 f. 6. 1841.
 * „*polleni* Hoffmann. Crust. et Echinod. d. Madagascar, p. 19, pl. 4 f. 27-30. 1874.
 * „*punctulatus* Miers. Zool. Voy. „Alert” 1881-82, p. 237, pl. 25 f. a. 1884.
 * „*quadratus* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9 p. 280, pl. 12 f. 6. 1873.
 * „*serratus* Adams & White. Zool. Voy. „Samarang”. Crust. p. 51. 1848.
 * „*setosus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159. 1852.
 * „*simplicipes* Guérin. Voy. „Favorite”, t. 5, 2^{me} part., p. 51, pl. 50 f. 1. 1839.
 * „*sulcatus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., f. 18 p. 156. 1852.
 * „*telescopicus* (Owen). Zool. Capt. Beechey's Voy. „Blossom”, p. 78, pl. 24 f. 1. 1839.
 * „*tomentosus* Souleyet. Voy. „Bonite”, Zool., t. 1 p. 243, pl. 3 f. 8. 1841.
 * „*transversus* (Latreille). Nouv. Dict. d'Hist. nat., 2^e éd., t. 13 p. 297. 1817.
 * „*verreauxi* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 9 p. 358. 1848. 2)

Some of these names are involved in much obscurity and may remain so, unless the type-specimens be again examined. These names are:

M. laevimanus.

„*laevis*.

„*parvimanus*.

Other names have proved with more or less certainty to be synonyms of already known ones; they are the following:

M. affinis = *M. depressus*.

„*carinimanus* = *M. brevis* (Herbst nec Hilgendorf).

„*compressipes* = *M. telescopicus*.

„*guérini* = *M. pectinipes*.

„*graeffei* = *M. convexus*.

„*inermis* = *M. convexus*.

„*laniger* = *M. latreillei*.

„*podophthalmus* = *M. telescopicus*.

1) H. Milne-Edwards erroneously cites p. 167 (Ann. Sc. nat. sér. 3, Zool., t. 18. 1852. p. 168).

2) *Cleistostoma kirtipes* Jacquinot et Lucas (Voyage au pôle sud et dans l'Océanie sur les corvettes „l'Astrolabe” et „la Zélée”, Zoologie p. Hombrou et Jacquinot, t. 6 p. 68, pl. 6 f. 8 et C), said to occur at Samoa, is implicitly referred to *Macrophthalmus* by G. M. Thompson (Ann. Mag. Nat. Hist. ser. 7, v. 10 p. 463) without however providing more information about his statement. The original specimen of Hombrou and Jacquinot has been so badly preserved, that even H. Milne-Edwards in 1852 (l. c. s., p. 161) has been unable to decide the question as to its generic relation.

- M. polleni* = *latreillei*.
 " *serratus* = *M. latreillei*.
 " *simplicipes* = *M. pectinipes*.
 " *verreauxi* = *M. telescopicus*.¹⁾

So there remain 25 names referring to well defined species and marked with an asterisk in the complete list of names.

The following key may serve in distinguishing these species²⁾:

1. Carapace with large spinous tubercles, conspicuously visible to the naked eye; posterior margin of propodites of walking legs in the penultimate pair with a row of large, curved spines. *M. pectinipes*.

Carapace differently shaped, either transversely broadened and conspicuously twice as broad as long, or more or less subquadrangular, but always smooth or with rounded obtuse tubercles; walking legs mostly hairy or smooth, but not spinous at the propodites. 2.

2. Ocular peduncles much elongated, projecting more or less far beyond the external orbital angle. 3.

Ocular peduncles shorter, in extreme cases reaching a little way beyond the external orbital angle (only for the length of the cornea). 5.

3. Length of carapace to breadth about as 1 : 1.60, smooth; eye-stalks projecting beyond the external orbital angle for about half their length. 4.

Length of carapace to breadth about as 1 : 2.40, with very declivous branchial regions and a longitudinal row consisting of 3—4 denticulated tubercles on these regions; eye-stalks projecting for a third of their length beyond the external orbital angle. *M. transversus*.

4. The two last joints of the hinder pair of legs flattened, penultimate joint nearly circular. *M. latipes*.

The two last joints of the hinder pair of legs not differing from the joints of the foregoing legs. *M. telescopicus*.

5. Carapace nearly exactly twice as broad as long, sometimes even broader; outer surface of the palm of the male cheliped with an elevated rim running close to and parallel with the under margin (sometimes modified into a row of small granules). 6.

Carapace more subquadrangular and always less than twice as broad as long, palm of the male cheliped nearly smooth, mostly without rim, which may be however faintly visible on the immovable finger. 13.

1) This list does not agree in several respects, as I am fully aware, with long accepted views of former authors, but I shall have occasion to sustain my opinion in discussing the various species.

2) I do not consider the species provided with a musical crest in the male sex a natural group within the genus, as Ortmann seems inclined to do (Zool. Jahrb. Abt. Syst., Bd. 10, 1897, p. 340) and consequently I have not separated those species from the rest.

6. Inner surface of the palm of the male cheliped with a distinct tooth, placed not far from the proximal end of the palm. 7.

Inner surface of the palm of the male cheliped without tooth. 12.

7. External orbital angle and first lateral tooth of the carapace near together and placed crosswise: the longitudinal axis of the orbital angle is placed nearly perpendicularly to the axis of the first lateral tooth, which apparently forms the outer orbital angle. 8.

External orbital angle and first lateral tooth of the carapace separated by a distinct incision and both pointing in about the same direction. 9.

8. Outer orbital angle directed somewhat backward, first lateral tooth pointing transversely; eye-stalks projecting slightly beyond the sides of the carapace. *M. sulcatus*.

Outer orbital angle directed transversely outward, first lateral tooth pointing both outward and forward; eye-stalks shorter, scarcely reaching the inner margin of the first lateral tooth. *M. grandidieri*.

9. Outer surface of the palm of the male cheliped coarsely granulated in the upper part, median part smooth, under part with a distinct elevated rim, immovable finger without larger tooth on the cutting margin. *M. dilatatus*.

Outer surface of the palm of the male cheliped smooth to the naked eye, very finely granulated or punctate when examined with a magnifying glass, under part of the palm with a row of rather large granules that are placed on a more or less distinctly elevated rim; immovable finger with a large, denticulated tooth. 10.

10. Upper border of the orbital groove very much curved, the top of this curve is in about the same level with the tip of the outer orbital angle; palm of the male cheliped very much elongated, its length (without immovable finger) about four times the greatest height. *M. brevis*.

Upper border of the orbital groove less curved, sloping, the top of the curve reaching far beyond the tip of the outer orbital angle; palm of the male cheliped short, its length (without immovable finger) only about twice the greatest height. 11.

11. Upper margin of the palm distinctly serrated, movable finger granulated; carapace nearly smooth, regularly rounded in a transverse direction, without verrucose tubercles on the branchial regions; first lateral tooth of the carapace larger and projecting farther forward than the external orbital angle; incision between these teeth rather wide. *M. hilgendorfi*.

Upper margin of the palm and movable finger smooth; carapace conspicuously granulated, transverse grooves strongly pronounced,

branchial regions declivous, with two verrucose tubercles, the one behind the other, and a third transversely elongated one just before the lateral end of the hinder transverse groove; external orbital angle and first lateral tooth not much differing in size and separated by a narrow incision. *M. crassipes*.

12. Outer surface of the palm of the male cheliped granulated in its upper part, smooth beneath, with a strong rim running close to and parallel with the under margin, inner surface of the palm and of the fingers hairy, mobile finger without larger tooth at the cutting margin; breadth of carapace more than twice its length. *M. consobrinus*.

The whole outer surface of the palm of the male cheliped with small scattered granules, larger granules arranged in a row parallel with the under margin, inner surface of the palm naked, that of the fingers hairy, mobile finger with a small, but distinct quadrilateral tooth at the cutting margin near the base of the finger; breadth of carapace in adult specimens nearly exactly twice its length; in young specimens less broad. *M. convexus*.

13. Inner surface of the palm of the male cheliped with a distinct spine; a horny crest („musical ridge”) close to the inner margin of the arm (meropodite) of the cheliped; outer part of the under margin of the orbital groove with two oblique tubercles. *M. erato*.

Inner surface of the palm of the male cheliped without spine, a „musical crest” at the arm of the cheliped may be present, but is mostly wanting. 14.

14. Sides of the carapace with four teeth, including the external orbital angle. 15.

Sides of the carapace with three teeth (the last one very small), including the external orbital angle. 16.

15. Carapace (at least in adult specimens) nearly subquadrangular, length to greatest breadth about as 1:1.50—1.60, closely covered with conspicuous rounded granules and (in young specimens) also with hairs. *M. latreillei*.

Carapace somewhat broader, length to greatest breadth about as 1:1.67, smooth and glossy, except towards the branchial regions, where there are two longitudinal rows of obtuse tubercles, no hairy covering, sides distinctly convergent distally. *M. dentatus*.

16. Greatest breadth of carapace between the outer orbital angles (sometimes subquadrate). 17.

Carapace narrowed anteriorly, so that the greatest breadth is lying between the tips of the first lateral teeth, or farther behind, on each branchial region two parallel, longitudinal rows of closely placed larger granules (except in the small *M. crinitus*). 20.

17. Outer orbital angle sharp; a short „musical crest” at the fore margin of the arm of the male cheliped; three obtuse tubercles in the outer half of the under orbital border; immobile finger with a large tooth occupying nearly the whole distal half of the finger. *M. quadratus*.

Outer orbital angle rectangular or somewhat sharp, in the latter case not projecting farther than the antero-lateral tooth of the carapace; no „musical crest” at the fore margin of the arm of the male cheliped; immobile finger with or without larger tooth. 18.

18. Immobile finger without larger tooth; a row of granules near the outer border of the palm. 19.

Immobile finger with a large tooth, outer surface of palm smooth, without a row of granules; carapace subquadrate; front occupying one-third of the greatest width of the carapace; outer orbital angle not projecting farther outward than the antero-lateral tooth; both teeth of nearly the same shape. *M. punctulatus*.

19. Outer orbital angle rectangular; sides of the carapace convergent posteriorly; immobile finger not deflexed, in the same line with the lower border of the palm. *M. setosus*.

Outer orbital angle somewhat pointed; sides of the carapace arched; immobile finger deflexed, forming a curved line with the lower border of the palm. *M. latifrons*.

20. Carapace and legs very much hairy; no longitudinal rows of granules on the posterior branchial regions. *M. crinitus*.

Carapace with some scattered hairs, with larger or smaller granules, sometimes smooth; on each branchial region two nearly parallel rows of larger granules, among which are inserted very short hairs, above the insertion of the last pair of legs runs a similar but much shorter row, and finally there is a fourth row, that runs transversely at the level of the last lateral tooth of the carapace. 21.

21. Carapace smooth, glossy; immobile finger of male cheliped with a faint longitudinal rim, meropodites of last pair of walking legs with a spine near the distal end. *M. pacificus*.

Carapace granular; meropodites of last pair of walking legs without a spine near the distal end. 22.

22. Carapace conspicuously narrowed anteriorly; a „musical crest” at the fore margin of the arm of the male cheliped; under margin of the orbital groove in its outer fourth part formed by three rounded tubercles. *M. tomentosus*.

Carapace less narrowed anteriorly; no „musical crest” at the fore margin of the arm of the male cheliped; under margin of the orbital groove not modified into obtuse tubercles but wholly crenulated. 23.

23. Immovable finger of male cheliped without a larger tooth before the middle of its length, but only denticulated along the cutting margin, movable finger with a large quadrangular tooth near the base. *M. depressus*.
 Immovable finger of male cheliped with a large tooth before or at the middle of its length. 24.
24. Tooth at the movable finger of male cheliped small or absent, inner surface of palm clothed with hairs. *M. definitus*.
 Tooth at the movable finger of male cheliped large and conspicuous, inner surface of palm naked. *M. japonicus*.

M. pectinipes Guérin.

1839. *M. pectinipes* Guérin. Voy. „Favorite”, t. 5, 2^{me} part., p. 169. pl. 49 (Bombay).
 1839. „ *pectinipes* Guérin. Mag. Zool., t. 8, Crust., Cl. 7. pl. 23 (Bombay).
 1839. „ *simplicipes* Guérin. Voy. „Favorite”, t. 5, 2^{me} part., p. 171. pl. 50 f. 1 (Bombay).
 1839. „ *simplicipes* Guérin. Mag. Zool., t. 8, Crust., Cl. 7. pl. 24 f. 1 (Bombay).
 1852. „ *pectinipes* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158 (no new record).
 1852. „ *Guérini* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 158 (East-Indies).
 1852. „ *simplicipes* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158 (no new record).
 1893. „ *pectinipes* Henderson. Transact. Linn. Soc. London, ser. 2, v. 5 p. 389 (Sind and Penang).
 1897. „ *pectinipes* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 340 (no new record).
 1900. „ *pectinipes* Alcock. Journ. As. Soc. Bengal, v. 69, part. 2. p. 377 (Karachi and Orissa).

This easily recognizable species is best described by Alcock. Except by the comparatively large size this species may attain (Alcock mentions a specimen with a breadth of carapace of 62 mm.), it is distinguished by the „musical crest” in the middle of the anterior margin of the arm of the male chelipeds, by the inferior border of the orbital groove in the male sex being modified in the outer half into four prominent widely separated tubercles ¹⁾, by the large spiniform granules on the carapace, especially on the branchial regions, and by the hinder border of the propodite of the penultimate pair of legs being provided with large, curved spines.

1) According to Alcock the lower border is „unevenly crenulate”.

This last character, as also the conspicuous spiniform granules on the carapace, are sufficient to separate this species at once from all its congeners. The front is very narrow, strongly constricted between the base of the ocular peduncles and bilobed at its free margin. The eye-stalks do not reach beyond the external orbital angle.

Judging after my material, which consists only of four specimens, the species is subject to considerable variation. Firstly two specimens (males) exhibit a much more spinous carapace than the females; in the first case the granules are distributed over the whole surface (though more conspicuous and larger on the branchial regions than on the mesogastric and cardiac area); in the females on the contrary the middle regions of the carapace are nearly perfectly smooth, with only very few scattered granules, on the branchial regions the granules are large, knob-like and of the same character as those in the males, but somewhat fewer in number, and disposed in an irregular longitudinal row. I suppose such females have induced Milne-Edwards to erect a distinct species (*Guérini*), the carapace of which is „à peine granulée” and granulated only on the branchial regions, „où les plus gros sont disposés en une série longitudinale”.

Secondly the spines on the legs are very much variable. The meropodites of the middle pairs of walking legs may be very spinous on the fore margin or only tuberculated in both sexes. Alcock says that only in the penultimate pair of legs the hinder border of the propodite is serrated, but the propodite of the second pair may exhibit this same character, though it is smooth in other cases, in such a way, that the right or left walking legs of the second pair may differ in this respect from those of the other side. For this reason I am much inclined to regard the *M. simplicipes* of Guérin as another (young) variation of *M. pectinipes*; indeed it differs only from this last species by having the legs perfectly smooth, not spinous but hairy, whereas the form of the carapace with its large spiniform granules, the shape and direction of the outer orbital angle and of the lateral teeth, are exactly the same as in *M. pectinipes*. ¹⁾ Even the rounded tubercles of the ventral border of the orbital groove (in the male) are indicated in Guérin's figure of *M. simplicipes*. ²⁾ These two species were found together in the same localities.

The Leiden Museum possesses 4 specimens (dried), without indication of origin.

1) In Guérin's figure of *M. pectinipes* the second lateral tooth is omitted, though it is mentioned in the text.

2) This author says that the form of the male abdomen in *M. simplicipes* is widely different from that of *M. pectinipes*, but he does not give any further detail nor figures.

The species has hitherto only been found on the continent of British India, it does not seem to occur on the shores of the islands in the Indian Ocean.

My largest specimen (♂) has a greatest breadth of carapace of 56 mm., the length is 33 mm.

M. transversus (Latreille). (Pl. V, Fig. 1).

1817. *Gonoplax transversus* Latreille. Nouv. Dict. d'hist. nat., 2^e éd., t. 13 p. 237 (East-India).
 1837. *M. transversus* H. Milne-Edwards. Hist. nat. d. Crust., t. 2 p. 164 (Pondichéry).
 1844. " *transversus* H. Milne-Edwards. Règne animal d. Cuvier, 2^e éd., Crust. pl. 16 f. 2 (no new record).
 1852. " *transversus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 156 („Mers d'Asie").
 1889. " *transversus* Cano. Boll. Soc. Nat. Napoli, t. 3 p. 229 (Massowah).
 1892. " *transversus* de Man. Max Weber's Zool. Ergebn., Bnd. 2 p. 308 (Brandewijnsbaai near Padang).

Prof. Weber has kindly allowed me to examine the specimen mentioned by de Man, who has had occasion to compare it with a typical specimen from the Paris Museum. Though the Padang specimen is much damaged and all the legs are detached (though yet present) it enabled me to state that the specimens of the Leiden Museum belong certainly to the same species. As this species is very little known I shall try to characterize it as fully as possible.

The carapace is more than twice as broad as long and recalls in this respect *M. brevis*. From the tip of the outer orbital angle to the insertion of the last legs the sides are distinctly convergent. The outer orbital angle is pointed, directed straightly outward (in the male from Padang the tip is somewhat curved forward) and separated by a deep incision from the first lateral tooth which is directed somewhat forward and shows a distinct serration on both margins; the second lateral tooth is small but clearly visible and behind it the sides of the carapace are finely denticulated, though this character is somewhat obscured by the hairs at the lateral borders of the carapace.

The surface of the carapace is in the female specimens of a bluish-grey colour, perfectly smooth and shining, curved in a longitudinal direction, but almost straight transversely, except for the very declivous, abruptly sloping sides. On the hepatic and branchial regions there are minute granules. The border of the postero-lateral slopes is marked by a longitudinal row of four or five tubercles (already spoken

of by Milne-Edwards), the tip of which is surmounted by a white-coloured large granule; the foremost of these tubercles is situated just before the lateral end of the second transverse lateral groove of the carapace and is somewhat elongated transversely, the other tubercles are lying farther behind on the branchial regions. On the slopes of the carapace there is among the minute granules another longitudinal row of somewhat larger granules. The grooves separating the various regions of the carapace are very inconspicuous, the most distinct ones are those bordering the mesogastric area, the transverse grooves on the hepatic regions are very shallow and between these grooves the carapace is raised towards the margins into a series of very obtuse, ill-defined knobs. At either side of the median line of the carapace, just before the transverse groove separating the gastric and the cardiac area, we may remark a very short, straight, well marked line, which on microscopic examination proves to consist of a shallow groove, immediately before which a series of minute hairs is inserted.

In the male specimen from Padang the carapace is exactly alike, except for the marked difference that the whole surface is covered with closely set granules and is not smooth and glossy as in the females. I have no more specimens and cannot make out whether this difference is a sexual one; perhaps, however, my female specimens represent a local variety of the species.

The front is narrow, constricted between the eye-stalks, faintly bilobed at its free margin and nearly perpendicularly bent downward. The ocular peduncles are very long, though not so as in the following species. According to Milne-Edwards (1852) they project beyond the outer orbital angle for the length of the eye only¹⁾, but in my female specimens the peduncles are more elongated and project beyond the carapace for about one-fourth of the length of the whole eye-stalk. In the male specimen the ocular peduncles are most unfortunately much damaged and the eyes themselves are torn away. The upper orbital border is faintly convex, serrated, especially along its outer half; the under margin of the orbital groove projects much forward and is beset with minute denticles, curved inward, but the margin disappears laterally at a distance of about one-third of the whole length of the upper orbital border.

The abdomen of the females is extremely broad, nearly semicircular, and the sutures between the anterior joints are peculiarly wavy, not straight.

1) The same character occurs in a very young female specimen from the Harafoera Sea, mentioned by Miers (Rep. Brachyura „Challenger" Exp. p. 249) and referred by him doubtfully to *M. podophthalmus* (= *M. telescopicus*), but the length of the carapace in proportion to its greatest breadth prevents its being regarded as the species now under discussion (length of carapace 4 mm., breadth 5.5 mm.).

The male cheliped is very peculiarly shaped, inasmuch as the palm is not inflated but compressed and weak. The meropodite (arm) has several curved spines at the second half of the interior margin; there is no „musical crest”; the carpus has two distinct spines at the anterior border, near the joint with the palm; the palm is thin and much elongated, with minute granules on the outer surface and a fur of fine hairs on the inner surface; this fur extends to the fingers. The length of the palm is about twice its greatest height and the lower margin, which is bordered by two parallel serrated crests, passes with a deep curve into the immobile finger; the upper border is much rolled over, especially in its proximal half, and provided with a row of distinct spines. At the insertion of the movable finger a part of the palm seems to be detached, so as to form a separate joint, but the suture separating this part from the rest of the palm is not continued on the inner surface. On this inner surface there is a distinct spine (near which one or two smaller ones are to be seen) near the carpal end of the palm, at the same place therefore as the similar spine on the palm of such species as *M. brevis*, *sulcatus* etc. The fingers are also peculiar; they are weak and compressed, much curved inward and about half the length of the palm; the movable finger keeps about the same height throughout its length and is provided at the cutting margin with five or six small, widely separated denticles, without larger tooth; the immobile finger is very slender and provided before the middle of its length with a high tooth, rising perpendicularly to the longitudinal axis of the finger, the hinder margin of this tooth is finely denticulated, the anterior border is smooth; between this tooth and the tip of the finger there are no denticulations, but only a rather large, simply pointed, second tooth. The female palm is much smaller, though likewise compressed, the length of the palm is but slightly more than its greatest height, the fingers are as long as the palm, somewhat more strongly built than in the male, and provided at the cutting margin with three or four finely pointed denticles.

The ambulatory legs are very long, and, as usual, the middle pairs are much stronger than the first and last pair. The meropodites of the first three pairs have a rather large spine at the anterior border, near its distal end, and the whole anterior border is distinctly tuberculated; the posterior border of the meropodites of the middle legs have several spines, placed somewhat more proximally than the single spine just named. Carpo- and propodite of the penultimate pair of legs are peculiar by their length; they are much longer than those of the foregoing pair. The last legs are slender and weak, hairy along the margins; their length is not much inferior to that of the first pair.

M. transversus has been found in the Red Sea (Massowah), at Pondichéry and at the coast of Sumatra (Brandewijnsbay near Padang). The Leiden specimens (both females) were collected at the north point of Sumatra (Poeloe Weh, Sabang bay), by the late Dr. G. A. J. v. d. Sande, in July 1901.

I give here the dimensions of some specimens in mm.

	1	2	3	4
	♀	♀	♂	♂
Distance between external orbital angles	27.5	26.5	30.3	24.3
Length of carapace	11.5	11.—	12.5	10.—
Least breadth of front	2.75	2.75	—	—
Length of eye-stalks	15.5	15.30	—	—
Length of carpo- and } of penultimate pair of legs	13.5	13.—	—	12.—
propodite together } of last pair of legs	8.—	7.75	—	6.—

1—2 are the Leiden Museum specimens, 3 is the typical specimen of the Paris Museum, measured by de Man, 4 is the specimen collected by Weber near Padang.

M. telescopicus. (Owen) (Pl. V, Fig. 2).

1839. *Gelasimus telescopicus* Owen. Zool. Capt. Beechey's Voy. „Blossom”, p. 78. pl. 24 f. 1 (Sandwich-isles).
1839. *M. compressipes* Randall. Journ. Ac. Nat. Sc. Philadelphia, v. 8 p. 123 (Sandwich-isles).
1841. „*podophthalmus* Souleyet. Voy. „Bonite”, t. 1 p. 241, Crust. pl. 3 f. 6—7 (Sandwich-isles).
1848. „*Verreauxi* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 9 p. 358 (Australia).
1850. „*compressipes* Gibbs. Proc. Am. Ass. Adv. Sc., 1850, p. 180 (Pacific).
1852. „*Verreauxi* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 155, pl. 4 f. 25 (Australia).
1852. „*podophthalmus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 155 (Sandwich-isles).
1852. „*telescopicus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 155 (no new record).
1852. „*telescopicus* Dana. Crust. U. S. Expl. Exp., v. 1 p. 314 (Sandwich-isles).
1858. „*telescopicus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Loo-Choo-isles).
1865. „*Verreauxi* Hess. Arch. Naturgesch. Jahrg. 31. 1, p. 142 and 171 (Australia).
1880. „*Verreauxi* de Man. Notes Leyden Museum, v. 2 p. 184 (Red Sea).
1882. „*podophthalmus* Haswell. Cat. Austral. Crust., p. 88 (Holborn Island).

1882. *M. Verreauxi* Haswell. Cat. Austral. Crust., p. 89 (Australia).
 1886. " *podophthalmus* Miers. Brach. Chall. Rep., p. 249 (Torres Strait).
 1894. " *telescopicus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 744
 (Carolines, Ponapé).
 1900. " *Verreauxi* Alcock. Journ. As. Soc. Bengal, v. 69, prt. 2 p. 377
 (Andamans and Mergui archipelago).
 1903. " *verreauxi* Borradaile. Fauna Maldive etc., v. 1, prt. 4 p. 433
 (Maldivé archipelago).
 1906. " *Verreauxi* Nobili. Ann. Sc. nat., sér. 9, Zool., t. 4 p. 317 (Red Sea,
 Perim and Obock).
 1907. " *telescopicus* Stimpson. Smithson. Inst., Miscell. Coll., v. 49, p. 95
 (Loo-Choo-isles).
 1910. " *verreauxi* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4
 p. 322 f. 6 (Gulf of Siam).

Most authors agree in uniting Souleyet's *M. podophthalmus* with the *Gelasimus telescopicus* of Owen; indeed, on comparing the original figures of these authors, there is a great probability that the species are identical, the more so, because they were both collected at the Sandwich islands. On the contrary, *M. verreauxi* is generally regarded to be distinct, though Milne-Edwards in 1852 already acknowledged the difficulties of their discrimination. According to Milne-Edwards the chief difference must be sought in the form of the lateral teeth which are flat and depressed in his species, but spiniform in *M. podophthalmus*. Now I have before me two adult female specimens of *M. verreauxi* from the Red Sea (already examined by de Man) and I have only to repeat the words of this author: "the three lateral teeth are sharp, a little depressed and the first tooth is directed transversely outward, but not forward", so that Milne-Edwards' figure is most likely wrong in the form and disposition of the lateral teeth. If these specimens of our Museum really belong to *M. verreauxi*, which is to me beyond doubt, *M. telescopicus* and *M. podophthalmus* must certainly go with it, for my specimens agree in every detail exactly with the figures of Owen and Souleyet.¹⁾ I have here figured one of de Man's specimens.

This species differs in many respects from *M. transversus*. The most conspicuous features are the length of the eye-stalks, projecting beyond the sides of the carapace for nearly half their length, and the comparative

¹⁾ In Souleyet's figure the last lateral tooth is very large, even projecting beyond the external orbital angle, but I am much inclined to regard this as a mistake, as such a feature, so widely differing from all that has been observed in other species of the genus, would not have failed to have been detected by such a keen observer as Souleyet.

narrowness of the carapace, the length of which is two-thirds its greatest breadth. The external orbital angle projects straightly outward and is spiniform but somewhat depressed; the two lateral teeth behind it are much smaller. Nobili has observed the same form of these teeth in his specimens. At the lateral margins of the carapace the fine denticulations (behind the antero-lateral teeth) which are so conspicuous in the preceding species, are here represented by a series of very minute beaded granules, though Souleyet mentions in his species, *M. podophthalmus*, a series of „dentelures très-fines qu'on n'aperçoit que difficilement à cause des long poils qui garnissent les côtés de la carapace". The whole surface of the carapace is nearly smooth, the various grooves are faintly indicated, those circumscribing the cardiac region even being absent, the front is less deflexed than in *M. transversus*, and the carapace itself is evenly rounded, not abruptly sloping at the sides, where only with the aid of a magnifying-glass very small granules may be observed.

The cheliped of the male has a high and short palm¹⁾, provided with a rather strong ridge parallel with the inferior border, but continued more conspicuously to the tip of the immovable finger. This ridge is already mentioned by Owen and Souleyet and also shown in Miss Rathbun's figure of the male cheliped; but whereas Souleyet rightly remarked that each of the fingers carries a larger denticulated tooth at the cutting margin, such a tooth is not figured by Miss Rathbun at the movable finger. Though the authoress had only young males at her disposal she supposed that Milne-Edwards' figure of the cheliped was taken from a female specimen, as in this figure no teeth at the fingers are shown. In my adult females however the fingers are comparatively much longer, more slender and the palm is compressed and much less high than in the figure of Milne-Edwards; the rim near the under side of the palm is more conspicuous than in the male.

The meropodites of the ambulatory legs have no spines at the posterior border; carpo- and propodite of the penultimate pair are not distinctly longer than those of the preceding pair.

The Museum contains in all five specimens of this species, two adult females and three very young males, collected at Djeddah (Red Sea).

The species has a wide range, extending from the Red Sea along the islands of British India and the Gulf of Siam to the Loo-Choo-isles, Australia and the Sandwich islands. It does not seem to have been found however in the Netherlands' East-Indies nor at the coast of East-Africa.

I give here the dimensions of some specimens in mm.

¹⁾ At least in young specimens; the adult males show, according to Nobili, a much longer palm, more than twice as long as the immobile finger.

	1	2	3	4	5	6	7
	♀	♀	♂	♂	♂	♂	♂
Distance between external orbital angles	19.5	18.—	9.25	24.—	25.—	14.—	8.8
Length of carapace	11.5	11.1	5.6	16.—	18.—	9.—	5.9
Length of eye-stalks.	14.—	13.3	7.—	—	—	—	—
Length of carpo- and propodite of the hinder pair of legs	6.—	6.—	5.—	—	—	—	—
Greatest breadth of the propodite of the hinder pair of legs	1.75	1.6	0.75	—	—	—	—

1—3 are specimens of the Leiden Museum, 4 is the „*Gelasimus telescopicus*” of Owen, 5 is the „*M. podophthalmus*” of Souleyet, 6 is a male mentioned by Alcock, 7 a young male spoken of by Miss Rathbun.

We may remark, that the length of the carapace is always about two-thirds its greatest breadth and never half this breadth or less, as in the preceding species.

M. latipes Borradaile.

1903. *M. latipes* Borradaile. Fauna Maldive etc., v. 1, prt 4, p. 433 f. 114.

According to Borradaile's description and figure this species at first sight resembles *M. telescopicus* by the length of the ocular peduncles, as these outreach the outer orbital angle by more than a third of their length; the shape of this orbital angle is also much the same and there are „faint traces of two mounds behind this tooth”. The breadth of the carapace is however somewhat more, the length to the breadth being as 5:8. The chelipeds of the male are small, much shorter than the first pair of walking legs; the palm is much less high than in *M. telescopicus*, apparently without rim near the under margin, and it is only the movable finger that carries a blunt denticulated tooth. The meropodites of the walking legs are slender, much less massive than in the preceding species, and the nails are comparatively longer. The chief difference between the two species consists in the form of the last two or three joints of the hindermost pair of legs, which are remarkably broad and flattened, unlike all other species of *Macrophthalmus* so far as now described. The penultimate joint is broadly oval, nearly circular, and the last joint is also paddle-like. Indeed, except for this character, it is difficult to detect any real difference between the two species here named, for my young specimens of *M. telescopicus* agree almost exactly with Borradaile's species, the external orbital angle and the first lateral tooth of the carapace, as well as the bent of the upper

orbital border, exactly being the same. In *M. latipes* however the front is broader and very strongly bent downward.

The Museum does not possess this small species, the carapace of which attains a length of 5 mm., a breadth of 8 mm. A single (male) specimen was dredged at South Nilandu Atoll (Borradaile).

M. sulcatus H. Milne-Edwards.

1852. *M. sulcatus* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 156 (Mauritius).
 1894. „ *sulcatus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 345 (Australia?).
 1900. „ *sulcatus* Alcock. Journ. As. Soc. Bengal, v. 69, prt 2, p. 379 (Andamans).
 1905. „ *sulcatus* Lenz. Abhandl. Senckenb. Gesellsch., Bnd. 27 p. 366 (no new record).

This species seems to have been often confounded with *M. grandidieri*, *M. brevis* and *M. carinimanus* and the synonymy appears the more intricate as under two of the latter names various authors have referred to different species.

Recently Lenz, who had the opportunity of studying the type-specimens of *M. sulcatus* and *M. grandidieri* in the Paris Museum, has clearly given the differences between these species. In *M. sulcatus* the ocular peduncles are much elongated, reaching (according to Alcock) beyond the antero-lateral angle of the carapace. The outer orbital angle is small and directed somewhat backward; it is crossed nearly at a right angle by the much larger anterior lateral tooth, which projects straightly outward. Upper orbital border less curved than in *M. grandidieri*. Male cheliped with a high palm, which shows a strong ridge at the outer surface, close to and parallel with the under margin, and at the inner surface there is in the median line a longitudinal row of denticles (according to Alcock), the first one of which, near the carpal joint, is considerably enlarged. Of the fingers the immovable finger only has a strong molariform tooth near the base.

Alcock says that the carapace of the males is very broad, the breadth being twice and two-thirds the length, in the females the carapace is somewhat narrower. On each branchial region there are three granular tubercles in a longitudinal row.

I shall have occasion to note various differences between this species and the following which is very nearly related to it, though, according to Lenz, evidently distinct.

The Leiden Museum does not possess this apparently rare species, the range of which seems to embrace the shores of the Indian Ocean and not to extend into the Pacific.

M. grandidieri A. Milne-Edwards (Pl. VI, Fig. 3).

1867. *M. grandidieri* A. Milne-Edwards. Ann. Soc. entom. France, sér. 4, t. 7 p. 285 (Zanzibar).
 1868. " *grandidieri* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 4 p. 84, pl. 20 f. 8—11 (Zanzibar).
 1881. " *grandidieri* Lenz et Richters. Beitr. Crust. Fauna Madagascar, p. 3 (Madagascar, Nossi-Bé).
 1894. " *grandidieri* Ortmann. Jenaische Denkschr. Bnd. 8, p. 58 (Dar-es-Salaam, Kilwa).
 1897. " *grandidieri* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10, p. 345 (no new record).
 1905. " *grandidieri* Lenz. Abhandl. Senckenb. Gesellsch., Bnd. 27 p. 365 (Zanzibar).

The following are the principal differences between this and the preceding species, as summed up by Lenz.

	<i>M. sulcatus</i>	<i>M. grandidieri</i>
external orbital angle.	directed slightly backward	directed outward
antero-lateral tooth of carapace	directed outward	" obliquely forward
inferior orbital border.	regularly crenulated, without intervals	denticles of unequal size, leaving a space between them which is as large as the base of the denticle itself
superior orbital border.	faintly curved	strongly curved
ocular peduncles.	reaching beyond the sides of the carapace	reaching to the tip of the first lateral tooth (apparent orbital angle)
second transverse groove of the carapace	distinct	less pronounced
branchial regions	with three or four denticulated tubercles in a longitudinal row	with faintly pronounced tubercles, which are often entirely absent

The carapace of *M. grandidieri* is minutely granulated, especially on the branchial and cardiac regions. A second (posterior) lateral tooth is not developed in my specimens but may be concealed under the long hairy covering of the lateral margins. The external orbital angle and the anterior lateral tooth, which latter is very bulky, are placed in a most characteristic fashion (as seen in the figure). Ocular peduncles long; according to Lenz they are somewhat shorter than in *M. sulcatus*, in which species they project slightly beyond the tip of the lateral tooth. Upper orbital margin very convex, minutely beaded. The species is remarkable for the long, slender ambulatory legs, and for the bulky size of the male cheliped. In the latter the palm is very high, higher than in any other species I have seen (see the figure); but I must state, that in other specimens the palm is somewhat more slender. On the outer surface there is a distinct ridge, as in many other species of *Macrophthalmus*, which is proximally finely denticulated but simple on the immovable finger. The fingers are very widely gaping at the base; the immobile finger has a larger tooth in about the middle of its length, this tooth however is not very much pronounced in my specimens. Milne-Edwards (1868) has also given a figure of the cheliped, in which the fingers are less gaping and each bearing a larger denticulated tooth, that of the movable finger being found near the base and of a quadrangular shape. I have not succeeded in detecting this latter tooth, but my specimens were preserved in a dry state and the thick hairy coating of the fingers and of the inner surface of the palm has prevented me from getting a distinct view of these parts. The spine at the inner surface of the hand is very conspicuous. The upper margin of the palm is bordered by a regular row of large granules, gradually diminishing in size towards the distal end. Both fingers are very strongly bent inward.

M. grandidieri is also very nearly related to *M. brevis*, but in the latter the upper orbital border is not so strongly curved, the outer orbital angle and the anterior lateral tooth keep the same direction and are not placed crosswise, and the palm of the male cheliped is much less high. The ambulatory legs are also shorter in *M. brevis*.

The Museum contains four specimens (♂) of *M. grandidieri*, all in a dry state, from the Red Sea. They had hitherto been undetermined.

The species has only been found at the coast of East-Africa and Madagascar.

The following is a list of some dimensions of the species in mm.

	1	2	3	4
	♂	♂	♂	sex unknown
Distance between tips of outer orbital angles	23.5	27.5	33.—	30.—
Length of carapace	11.5	13.—	16.—	14.—
Fronts in its narrowest place	3.5	4.—	—	—
Length of palm (immobile finger included)	18.—	21.5	—	—
Height of palm at insertion of mobile finger	8.5	12.—	—	—

1—2 are specimens of the Museum, 3 is a specimen of Milne-Edwards, 4 a specimen (the sex of which is not stated) of Lenz (1905).

M. dilatatus de Haan (Pl. VI, Fig. 4).

1835. *Ocypode (Macrophthalmus) abbreviata* de Haan. Fauna Japonica, Crust., p. 26 (*nomen nudum*).
1835. *Ocypode (Macrophthalmus) dilatata* de Haan. Fauna Japonica, Crust., p. 55, pl. 15 f. 3¹⁾ (Japan).
1852. *M. dilatatus* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 157 („Mers du Japon et de l'Inde”).
1890. „*dilatatus* de Man. Notes Leyden Museum, v. 12. p. 76, pl. 4 f. 9 (no new record).
1894. „*dilatatus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 744 (Tokio Bay).
1897. „*dilatatus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 345 (south-east coast of Japan).
1904. „*dilatatus*? Doffein. Wiss. Ergebn. „Valdivia” Exp., Bnd. 6, Bra-chyura, p. 29 (Padang).

This species closely resembles *M. carinimanus* and in the case of female specimens the discrimination of both species may be often impossible; in *M. dilatatus* however the carapace is somewhat less broad, the outer orbital angle is smaller than the anterior lateral tooth of the carapace (in *M. carinimanus* both teeth are of nearly equal size), the incision between them is narrow and deep and the upper orbital border is not so strongly curved as in the species of Milne-Edwards. The granulation on the carapace is much more conspicuous than in the preceding species. The chief difference is to be found in the palm of the male cheliped, which is already well figured by de Haan and again by de Man; the latter author has clearly shown its principal features. Along the upper border there is a row of rather large, spiniform tubercles, widely sepa-

1) Not f. 2 as is mentioned in the text and copied by H. Milne-Edwards.

rated and diminishing in size towards the distal end of the palm; the outer surface is not smooth, but the upper part is strongly tuberculated and in the middle line, parallel with the margins, 5—6 larger tubercles are arranged in a longitudinal row; between this and the strong ridge near the under border the palm is nearly smooth; the ridge is strongly granulated on the palm, more so than in *M. carinimanus*, but simple on the immobile finger. The fingers are bent downward, a character, already observed by de Haan („digitis inferioribus sigmoideis”); the immobile finger has a rather small, very low tooth in the middle of its length; according to de Man the dactylus has no larger tooth, but in reality there does exist a very low one near the base.

Comparing de Man's figures of the male cheliped of *M. carinimanus* (Notes Leyden Museum, v. 12, 1890, pl. 4 f. 8) and that of *M. dilatatus* (ibidem, pl. 4 f. 9) the differences between the two species are at once obvious.

The Museum possesses eight specimens of the species under discussion (four specimens preserved in alcohol), all males except one, from Japan. This locality is the only sure record, for Doffein's specimen (a young female) has by the author himself only with much reservation been referred to *M. dilatatus*.

Five of the Museum specimens present the following dimensions (the first seems to have been measured by de Man, 1890, p. 79).

	1	2	3	4	5
	♂	♂	♂	♂	♂
Distance between external orbital angle	26.5	25.5	25.—	24.75	20.75
Length of carapace.	12.75	12.25	12.—	11.75	9.5

M. brevis ¹⁾ (Herbst). (Pl. VI, Fig. 5).

1804. *Cancer brevis* Herbst (*nec* Hilgendorf, de Man). Naturgesch. Krabben u. Krebse, Bnd. 3 Heft 4. p. 9. pl. 60 f. 4 (East-India).
1837. *M. carinimanus* H. Milne-Edwards. (*nec* Hilgendorf) Hist. nat. d. Crust., t. 2 p. 65 (no record).

1) Besides the synonyms here named yet two names should perhaps be included in the list, though very little is known about the specimens referred to them. The first, *M. laevimanus* (H. Milne-Edwards, Ann. Sc. nat. sér. 3, Zool., t. 18, 1852, p. 157) is only distinguished from *M. carinimanus* by the lack of the elevated ridge near the inferior border of the palm of the male cheliped. The second, *M. parvimanus* (H. Milne-Edwards, Hist. nat. d. Crustacés, t. 2, 1837, p. 65 and Ann. Sc. nat. sér. 3, Zool., t. 18, 1852, p. 157) has very short and compressed chelipeds, even in the male, and whereas the author in 1837 remarked that the ocular peduncles are much elongated, this character is not mentioned in the Ann. Sc. nat., where the species is classed among the species with short eye-stalks. Perhaps this species, as well as the „*Ocypode microcheles*”, of Boec (Hist. nat. Crust. t. 1 p. 199, 1802) and the *Macrophthalmus parvimanus* of Guérin (Iconogr. Règne animal, Crust. pl. 4 f. 1) have been founded on females of *Uca (Gelasimus)*.

1847. *M. carinimanus* Gray. Cat. Crust. British Museum, p. 37 (Singapore).
 1852. " *carinimanus* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 156 (Pondichéry and Mauritius).
 1880. " *carinimanus* de Man. Notes Leyden Museum, v. 2 p. 69 (Celebes).
 1890. " *carinimanus* de Man. Notes Leyden Museum, v. 12 p. 78, pl. 4 f. 8 (no new record).
 1897. " *carinimanus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd 10 p. 344 (no new record).
 1902. " *carinimanus* de Man. Abhandl. Senckenb. Gesellsch., Bnd 25 p. 492 (Halmheira).

There has been some confusion about the original *Cancer brevis* of Herbst and the *Macrophthalmus carinimanus* of Milne-Edwards, owing to the insufficient description of these authors. Indeed it is only after the minute diagnosis of de Man, that the latter species became better known.

Hilgendorf (Baron v. d. Decken's Reisen in Ost-Afrika, Bnd. 3, 1869, Crustacea, p. 86, pl. 3 f. 4) described and figured a specimen of *Macrophthalmus* under the name *M. brevis* and declared that this specimen exactly agreed with Herbst's original specimen; he further united with it *M. carinimanus*, as Milne-Edwards himself, though with some hesitation, had suggested already in 1852. Later, however, Hilgendorf changed his opinion as to the identity of the two species (Monatsber. Ak. Wiss. Berlin, 1878, p. 806), as he had acknowledged that the original specimen of Herbst was different from his own specimens from East-Africa; the latter were now designated under the name *M. carinimanus*.

To decide this question I wrote to Prof. Vanhöffen of the Berlin Zoological Museum to compare Herbst's specimen with the descriptions of Hilgendorf and de Man, adding a drawing of the habitus of *M. carinimanus* to my letter. Prof. Vanhöffen most obligingly informed me, that the *Cancer brevis* indeed, except for some small differences, seemed to be identical with *M. carinimanus*, so that the first name must have the priority. The drawings of the lateral teeth of the carapace and of cheliped of Herbst's original specimen, made by Prof. Vanhöffen with the aid of the camera lucida and kindly placed at my disposal, have fully convinced me of the correctness of Milne-Edwards's surmise. Hilgendorf's specimens on the contrary belong to another species, which I have named *M. hilgendorfi*.

De Man (1880, p. 69) rightly remarked, that the species now under discussion very much resembles *M. dilatatus*; indeed, the conspicuous granulation on the carapace and the verrucous tubercles on the brachial regions occur in both species. In *M. brevis* (= *M. carinimanus*) however, the carapace is yet more transversely broadened; the external

orbital angle and the first lateral tooth are somewhat differently shaped and the transverse furrows on the lateral regions of the carapace are much more pronounced than in the Japanese species.

The external orbital angle is directed obliquely forward and may project as far as the upper orbital margin; in some cases however the direction is less oblique and the tip remains a little way behind the level of the upper orbital margin (see de Man 1902). The first lateral tooth is of nearly the same size (in the original *Cancer brevis* it appears to be slightly larger), the incision between the teeth is sometimes triangular and wide, in other cases very narrow and de Man (1880 p. 76) has described a specimen, in which the teeth are placed closely together and only separated at the tip. Behind the second lateral tooth there is a row of indentations at the lateral borders of the carapace, varying both in number and in size (see de Man 1902).

The chelipeds of the male, remarkable for their elongated palm, the length of which is not less than four times its height, have been made so well-known by de Man (1880 and 1890) that it is needless to re-describe them. The drawing, made by Prof. Vanhöffen, of the cheliped of *Cancer brevis* agrees exactly with de Man's figure (1890). The outer surface is nearly smooth, somewhat granulated at the upper border¹⁾, a strong ridge runs at the under margin, parallel with it, and is continued on the immobile finger; the inner surface of palm and fingers are much hairy and there is a distinct spine not far from the carpal end on the palm.

The Museum contains six specimens (4 ♂, 2 ♀) of this species, collected at the coasts of Celebes, and already spoken of by de Man (1880). These specimens seem first to have been preserved in a dry state and afterwards put in alcohol, as may be inferred from the extreme liability of the legs to detach themselves; it is for this reason that I have abstained from measuring the chelipeds.

Dimensions of some specimens	1	2	3	4	5
	♂	♂	♀	♀	♂
Distance between external orbital angles	21.75	21.5	21.—	17.25	21.65
Length of carapace	9.75	9.5	9.5	8.25	9.75

1—4 are Museum specimens, 5 is the ♂ from Halmheira (de Man, 1902, p. 493).

1) From the few notes provided by Hilgendorf about the original specimen of Herbst's *Cancer brevis* (Monatsber. Ak. Wiss. Berlin, 1878, p. 807) we may infer already with confidence, that this specimen really does belong to *M. carinimanus*, as it is described as having a long palm, scarcely increasing in height towards the end, and without a granulated ridge along the upper border, as in the next species, which is founded on Hilgendorf's specimen.

The length of the carapace is to its breadth as 1 : 2.20, except in the smaller female, where the proportions are as 1 : 2.09; whereas in *M. dilatatus* these proportions are as 1 : 2.10.

Some dimensions of the original specimen of *Cancer brevis*, kindly delivered by Prof. Vanhöffen, may be inserted here:

Distance between external orbital angles	18.—
Length of carapace.	8.5
Length of palm (index excluded).	11.—
Length of dactylus.	5.6
Least breadth of front	3.—

M. brevis has been found at Mauritius, at Pondichéry and at Celebes and Halmahera.

M. hilgendorfi n. n. (Pl. VII, Fig. 6).

1851. *M. carinimanus* Bianconi. Spec. zool. mossamb., Fasc. 5 p. 85 (Mozambique).
 1869. " *brevis* Hilgendorf (*nec* Herbst). Baron v. d. Decken's Reisen in Ost-Afrika, Bnd. 3, Crust., p. 86, pl. 3 f. 4 (Zanzibar and Red Sea).
 1878. " *carinimanus* Hilgendorf (*nec* Milne-Edwards). Monatsber. Ak. Wiss. Berlin 1878, p. 806 (Mozambique).
 1880. " *brevis* de Man. Notes Leyden Museum, v. 2 p. 70 (Bay of Pasandawa, Madagascar).
 1906 " *brevis*? Nobili. Ann. Sc. nat. sér. 9, Zool., t. 4 p. 318 (Red Sea and Perim).

I have already explained how Hilgendorf in 1869 referred a specimen from Zanzibar to *Cancer brevis* of Herbst and afterwards, recognizing the difference, regarded this specimen and another from Mozambique as *M. carinimanus*. As the species of Herbst and of Milne-Edwards have turned out to be identical, but do not agree with that of Hilgendorf I am obliged to create a new name for Hilgendorf's species.

Nobili synonymises the *M. brevis* of Hilgendorf with *M. grandidieri* M. Edw., as his specimens agreed very well with description and figure of the first-named species and also with an original specimen of the species of Milne-Edwards. I am unable to explain this discordance, unless it be presumed that Nobili's specimens are referable to a transitional subspecies. The author states, however, that the dactylus of the male cheliped has no large tooth, which character is not referable to any of the species here named. I am inclined to believe that Nobili's specimens are to be regarded as the present species.

The differences between this and the preceding species are many. The carapace is less widened, finely granulated (not provided with the large granules of *M. brevis* and *M. dilatatus*) and destitute of the longitudinal

row of verrucous tubercles on the branchial regions. The transverse furrows on the carapace are much less pronounced. The general form of the carapace is much like that of *M. dilatatus*, but the external orbital angle projects less outward than the anterior lateral tooth which is larger and directed obliquely forward, as shown in the figure.

The specimen of the Museum agrees exactly with Hilgendorf's figure, but the front is somewhat broader. The ocular peduncles reach to the tip of the external orbital angle; according to Hilgendorf they are twice as long as the front between the eye-stalks (though it does not appear so in his figure, in which the latter are three times as long as the front); in my specimen the length of the eye-stalks keeps an intermediate place between Hilgendorf's description and figure.

The main character of the species is again to be found in the male cheliped. The arm bears a thick fur of hairs on the inner side; the wrist has only one spine, at the under side, near the articulation with the palm, but none at the inner border; the palm is much less elongated than in the preceding species, its length being scarcely twice the height, the outer surface has a very distinct ridge near the under margin and is slightly granular towards the upper margin, which shows a regular row of spiniform tubercles; the inner surface of palm and fingers is much hairy and there is a spine near the carpal end. The cutting margin of the movable finger is, as has been rightly observed by Hilgendorf, concealed by a closely set hairy covering, on close inspection we may see a distinct rectangular tooth near the base of the finger, which tooth does not seem to have been detected either by Hilgendorf or by de Man. The cutting margin of the index is free from hairs and the proximal half is occupied by a large tooth, crenulated on the free margin, except for the abruptly sloping fore side. In the preceding species this tooth on the index has a much smaller base and is more distinctly sloping towards the base of the finger.

This East-African species is represented in the Leiden Museum by a single specimen (♂) from the Bay of Pasandava (Madagascar); it has been already spoken of by de Man.

Its dimensions and those of Hilgendorf's specimen from Zanzibar are the following:

Distance between external orbital angles	22.5	32.—
Length of carapace.	11.5	15.—
Breadth of front between the eye-stalks.	3.5	—
Length of the palm with index	14.— ¹⁾	23.—
Height of the palm	6.—	—

¹⁾ de Man gives a length of 15.5 mm. to the hand, but I cannot explain this, unless it be presumed that the author has measured to the tip of the opened dactylus.

M. crassipes H. Milne-Edwards (Pl. VII, Fig. 7).

1852. *M. crassipes* H. Milne-Edwards. Ann. Sc. nat. sér. 3, Zool., t. 18 p. 157 (Australia).
 1865. " *crassipes* Hess. Arch. Naturgesch., Jahrg. 31. 1. p. 142 (East-Australia).
 1882. " *crassipes* Haswell. Cat. Austral. Crust., p. 89 (no new record).
 1890. " *crassipes* de Man. Notes Leyden Museum, v. 12 p. 76, pl. 4 f. 7 (Carolines).
 1894. " *crassipes* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 744 (Carolines).
 1897. " *crassipes* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 345 (Australia and China).
 1910. " *crassipes* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4 p. 323 (Gulf of Siam).

As has been stated by de Man, this species shows the greatest resemblance with *M. dilatatus*; this author notes, however, the following differences:

1. the incision between the external orbital angle and the antero-lateral tooth is narrower in *M. crassipes*;
2. the ocular peduncles reach to the tip of the external orbital angle, or even a little way beyond it, in *M. crassipes*, but are shorter in *M. dilatatus*.

Judging after my only specimen I can add, that the crenulation of the upper orbital border is coarser and stronger in *M. crassipes*, that the front is comparatively narrower (compare the figures 4 and 7) and that the granulation of the carapace is much more pronounced in the species now under discussion, extending to the cardiac area and to the hinder part of the mesogastric area, which parts are nearly smooth in *M. dilatatus*; close to the margins there may be observed in *M. crassipes* some conspicuous granules on the branchial regions, larger than the other. The meropodites of the ambulatory legs are somewhat more slender than in *M. dilatatus* and, contrary to all other species of the genus, there is no spine at the anterior border of the meropodite near its distal end.

The male chelipeds of the two species are widely different, as has been described by de Man (p. 77). In comparison with the bulky shape of the chelipeds of *M. crassipes* those of *M. dilatatus* are weak and small. The arm of the first species shows a thick patch of hairs on the fore side; the outer surface is provided with some small granules, already observed by Milne-Edwards. The wrist is large and, as in *M. dilatatus*, it bears two spines, one in the middle of the inner border, and another at the under side near the distal end. The palm is very large, the outer

surface is slightly granular towards the upper margin, which itself has no row of spiniform tubercles but only a dense crowding of somewhat larger granules; a large and distinct crest runs close to and parallel with the under margin and is continued on the index. Inner surface of palm and fingers much hairy, a spine at the inner surface of the palm near the carpal joint. Fingers hairy along the cutting margin; the dactylus has an extremely small quadrangular tooth close to the base, the index is provided with a much larger tooth, the base of which is about as large as the height, the free margin of the tooth is coarsely granulated, except for the abruptly sloping fore side.

The differences between the species here named and *M. carinimanus* (= *M. brevis*) are also clearly indicated by de Man. I need not enlarge upon these differences here as I have nothing but to repeat de Man's statements.

M. crassipes is represented in the collection only by a single specimen (♂), this very specimen has been already described by de Man, who gave also the dimensions of the carapace (distance between external orbital angles 22.5 mm., length of carapace 10.25 mm.); it originates from the Carolines.

The range of this species has recently been extended to the Gulf of Siam; as it occurs also at the shores of China, of Australia and of the Carolines, it is remarkable that it has never been recorded from our East-Indian Archipelago.

M. convexus Stimpson (Pl. VII, Fig. 8).

1858. *M. convexus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Loo-Choo-isles).
 1867. " *inermis* A. Milne-Edwards. Ann. Soc. ent. France, sér. 4, t. 7 p. 286 (Sandwich-isles).
 1873. " *inermis* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9 p. 277, pl. 12 f. 5 (New Caledonia).
 1873. " *graeffei* A. Milne-Edwards. Journ. d. Museums Godeffroy, Heft 4 p. 81, pl. 13 f. 5 (Upolu, Samoa).
 1880. " *convexus* Miers. Ann. Mag. Nat. Hist. ser. 5, v. 5 p. 307 (Mauritius, Penang, Singapore and Australia).
 1882. " *convexus* Haswell. Cat. Austral. Crust., p. 89 (Australia).
 1888. " *convexus* de Man. Arch. Naturgesch., Jahrg. 53. 1.p. 354, pl. 15 f. 4 (Amboina).
 1894. " *convexus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 745 (Carolines, Fidji-isles, Tahiti and German New Guinea).
 1897. " *convexus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 344 (no new record).

1897. *M. graeffei* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 343 (no new record).
 1900. „ *convexus* Alcock. Journ. As. Soc. Bengal, v. 69 prt. 2. p. 378 (Andamans).
 1902. „ *convexus* de Man. Abhandl. Senckenb. Gesellsch., Bnd. 25 p. 493, pl. 19 f. 6—6a (Ternate and Halmaheira).
 1906. „ *inermis* Rathbun. Bull. U. S. Fish Comm. v. 23, prt. 3, p. 834, (Hawaiian Islands).
 1907. „ *convexus* Stimpson. Smithson. Inst., Miscell. Coll., v. 49 p. 97 pl. 13 f. 2 (Loo-Choo-isles).
 1910. „ *convexus* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4 p. 323, pl. 2 f. 3 (Gulf of Siam).

Miers already advanced that *M. inermis* of Milne-Edwards might be identical with Stimpson's *M. convexus*, and this has been confirmed by de Man (1888), who could study the type-specimens of *M. inermis*.

I think that the *M. graeffei* is founded on a very young male specimen¹⁾ of the species now under discussion. Indeed *M. graeffei* shows exactly the same shape of the lateral teeth and notably the external orbital angle is sharp and pointed, directed obliquely forward and much larger than the lateral teeth, the curve of the upper orbital border is also alike and the ocular peduncles project slightly beyond the sides of the carapace; the latter is stated by Milne-Edwards to be „dépourvue de granulations ou de tubercules, à peine piquetée sur les régions branchiales”. In this young specimen I presume that the verrucous tubercles on the branchial regions are not yet fully developed. Moreover the chela of *M. graeffei* is covered with hairs only at the inner side of the fingers, whereas the inner surface of the palm is naked, quite as in Milne-Edwards' figure of the adult chela of „*M. inermis*” in the Nouv. Arch. t. 9, pl. 12 f. 5^a.

In all the species as yet treated of, the external orbital angle is either smaller than the anterior lateral tooth of the carapace or these teeth are alike in size. The only exception is formed by *M. telescopicus* with its long ocular peduncles. In *M. convexus* the external orbital angle on the contrary is much larger than the anterior lateral tooth, it is directed obliquely forward in such a way, that the tip (in adult specimens at least) may be on the same level with the upper orbital border²⁾. By

1) According to Milne-Edwards the breadth of the carapace is 14 mm., the length 7 mm.; in his figure 5^a, where the dimensions of the carapace are given in natural size, these dimensions are much less (breadth 8 mm., length 5.5 mm.). There must be an error either in the text or in the figure.

2) In Stimpson's figure (1907) however the upper orbital border projects much farther forward than the outer orbital angle.

this character the species at first sight resembles somewhat a small *Uca* (= *Gelasimus*) and this resemblance is increased by the narrow front¹⁾ being much constricted between the eye-stalks, and by the dark green colour of the carapace of nearly all my specimens in spirit-preservation. The carapace is nearly wholly smooth and glossy, only towards the sides there are some minute granules. The anterior lateral tooth is much smaller than the external orbital angle and the posterior one is nothing but a faint knob. On the branchial regions there is the same row of verrucous tubercles, three on each side, as we have met with in most of the preceding species. The furrows on the carapace are very faintly marked. The meropodites of the ambulatory legs are robust and armed with a small spine near the distal end of the fore margin, as de Man (1902, p. 494) rightly remarked, except in the case of the hindmost legs, though Stimpson (1907) has here figured a similar spine.

The chelipeds of the male have been described and figured by de Man in 1888 and again, yet more minutely, by the same author in 1902. There is no need to repeat his statements here; we may however remind to the fact that, contrary to all the species with short eye-stalks and with a carapace twice as broad as long, *M. convexus* has no spine on the inner surface of the palm, which is almost wholly naked, only the inner side of the fingers and the neighbouring parts of the palm are fringed with hairs, as has been already stated by Milne-Edwards for his *M. inermis*. In some cases however the inner surface of the palm seems to be covered with hairs, as both Stimpson, in his final description of the type-specimen, and Alcock state that the hand is hairy within. The outer surface of the palm is very finely granular and bears a faint ridge close to the under margin. Both fingers are armed with a larger tooth at the cutting margin, that of the dactylus being small and quadrangular, the tooth of the index is angular and sloping backward: In young specimens these teeth are much less developed than in the adults²⁾ as may be inferred on comparing the chela of *M. graeffei* (Milne-Edwards, 1873, pl. 13 f. 5^b—5^c) and of a young specimen of *M. convexus* with a breadth of carapace of 16,6 mm. (de Man, 1888, pl. 15 f. 4) with that of a full-grown specimen (de Man, 1902, pl. 19 f. 6), whose breadth of carapace measured 27,5 mm. The fingers are also bent much more downward in the adult.

The Leiden Museum possesses several specimens, viz.: three specimens

1) According to de Man (1902, p. 494) the breadth of the front at the fore margin is only $\frac{1}{4}$ of the entire breadth of the carapace.

2) de Man (1902, p. 494) states that in young males, whose breadth of carapace is about 14 mm., the teeth on both fingers are already present.

(1 ♂, 2 ♀) from the Pacific, without further indication, two (1 ♂, 1 ♀) from Ternate (already mentioned by de Man, 1902), and one young female from Sekroë (Dutch New Guinea).

The species seems to be widely distributed through the Pacific region, but it has been found also in the East-Indian archipelago, in the Gulf of Siam, at Singapore, at Penang and even at Mauritius and in the Red Sea.

I give here the dimensions of some specimens in mm.; from these measurements we may conclude, that in adult specimens the breadth of the carapace is nearly twice its length, but in the young stages considerably less (proportion about 1.70:1).

	1	2	3	4	5	6	7
Distance between external orbital angles	♂ 20.5	♂ 24.5	♀ 13.—	♂ 16.6	♂ 27.5	♀ 24.5	sex not stated 25.—
Length of carapace.	10.5	12.5	8.—	9.2	14.—	13.—	13.—

1—3 are specimens of the Museum, 4 is a specimen of de Man (1888), 5—6 also specimens of de Man (1902), 7 is a specimen mentioned by Milne-Edwards.

M. consobrinus Nobili.

1906. *M. consobrinus* Nobili. Bull. Mus. d'Hist. nat. Paris t. 12 p. 265 (Rikitea, Tuamotu archipelago).
 1907. „ *consobrinus* Nobili. Mem. Acc. Torino ser. 2, t. 57 p. 408 (no new record).

The description of the type-specimen in the Bull. runs as follows: „♂. Voisin de *M. convexus*. Carapacé deux fois aussi large que longue. Régions gastrique et cardiale lisses, régions hépatiques et branchiales finement granuleuses, les granules formant un amas longitudinal sur chaque région branchiale. Dent orbitaire externe très aiguë, dirigée en avant et en dehors; une seule dent après, aiguë, dirigée en dehors; aucune trace de 3^e dent. Pédoncules oculaires atteignant l'extrémité de l'orbite. Chélicèdes égaux; bords du mérus finement granulés, pourvus de long poils clairs. Bord interne du carp marginé par une ligne granuleuse, quelques granules aigus à l'angle interne. La moitié supérieure de la face externe de la main granulée, l'inférieure lisse; bord supérieur occupé par deux petites crêtes granuleuses, bord inférieur avec une forte crête lisse s'étendant jusqu'à l'extrémité du doigt fixe. Doigt mobile avec une faible crête dentelée, sans dent molariforme au bord préhensile; doigt fixe avec une grosse dent molariforme. Face interne de la main feutrée, sans épines. Mérus des 3 premières paires de pattes ambulatoires avec une épine

apicale, bords du mérus, du carp et du propodite finement dentelés, les denticules disposés en 2—3 séries sur le mérus. Longueur 16.5 mm.; largeur 34 mm. — Rikitea”.

Death has prevented this distinguished Italian carcinologist from completing the preliminary diagnosis of his species in the Bull. by drawings and figures. From the quoted description we may infer that *M. consobrinus*, which is nearly related to *M. convexus*, differs from this species by the direction of the anterior lateral tooth which points straightly outward, by the strong ridge near the under margin of the palm of the male cheliped (this ridge is only faintly marked in the preceding species) and by the dactylus bearing no larger tooth near the base. The species seems to attain a larger size than *M. convexus* and in the adult the carapace is fully twice as broad as long (not nearly so, as in the preceding species).

M. erato de Man (Pl. VIII, Fig. 9).

1888. *M. erato* de Man. Journ. Linn. Soc. London, v. 22 p. 125, pl. 8 f. 12—14 (Mergui archipelago).
 1895. „ *erato* de Man. Zool. Jahrb. Abt. Syst., Bnd. 8 p. 579 (Malakka).
 1900. „ *erato* Alcock. Journ. As. Soc. Bengal, v. 69 prt. 2 p. 381 (Mergui archipelago and Akyab).
 1910. „ *erato* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4 p. 323 (Gulf of Siam).

This small species, which is fully described by de Man (1888), is subquadrangular in outline, the length of the carapace being two-thirds of its greatest breadth, and the latter is to be found between the tips of the anterior lateral teeth; the external orbital angles are less prominent. Both teeth are directed obliquely outward. Upper orbital border nearly straight, faintly curved, eyes not reaching end of orbits, ocular peduncles thick, nearly straight. The sides of the carapacé are nearly parallel.

The grooves are well marked, as de Man observed and there is a faint ridge at the postero-lateral side of the carapace, just above the insertion of the last legs. The middle regions of the carapace are free from granules, only finely punctate, the other parts, especially the lateral parts, are provided with large granules, scattered under a rather thick hairy covering, which is also found in the grooves, separating the various regions, but I have seen no hairs in the grooves separating the branchial region from the cardiac area. Front broad, not constricted between the eye-stalks, and occupying one-fifth (de Man) to two-ninths (Alcock)

the breadth of the carapace. ¹⁾ For further particulars I may refer to de Man's accurate and elaborate description.

This author has also given a full account of the inferior orbital margin, which, owing to the presence of a „musical ridge” in the male, is peculiarly modified. De Man says (1888, p. 127): „the inferior orbital margin presents in its middle a broad, though little prominent, slightly triangular lobe, which is directed somewhat downward, its obtuse tip being found at the internal or median side; the upper surface of this lobe is slightly concave. Behind this lobe, the inferior margin of the orbits presents a second, also obtuse, much smaller lobule, which is found at the external end of the under margin; whereas the internal or median part of the under margin, lying between the larger middle lobe and the epistome, is armed with a row of seven or eight minute rounded granules, the external one of which is the largest, whereas the others successively decrease in size towards the epistome, *i. e.* towards the inner end of the orbital margin”. De Man rightly remarks, that this structure of the inferior orbital margin distinguishes this species very well from the nearly allied *M. quadratus*.

The chelipeds of my only male specimen were equal (according to de Man they are sometimes unequal in size). The musical crest at the middle of the inner margin of the short, triquetrous arm is obliquely parallel with this border ²⁾. The palm is much compressed, smooth, hairy at the inner surface, crenulated at the upper margin, and without crest externally; there is a faint crest however running from the tip of the index to the palm, where it soon disappears. According to de Man the length of the palm (index not included) is in proportion to its greatest height, at the articulation with the dactylus, as 15:11, and I found the same proportion, though in my specimen the palm was comparatively much smaller (see the dimensions below). De Man also states the spine at the inner surface of the palm near the carpal end, which is characteristic in this species. The fingers are short, with a rather wide gap between their bases, and with horny, excavated, hairy tips; the dactylus has a small rectangular tooth at the base and the index a much larger one, rising slightly above the general level of the cutting margin and occupying nearly the whole distal half of the latter.

The middle pairs of the ambulatory legs have very massively built meropodites with an extremely small spine near the distal end of the

1) De Man wishes it to be understood, that he takes here the distance between the external orbital angles.

2) Alcock states the same, whereas the musical ridge of de Man's specimens seems to be exactly parallel with it.

anterior margin. The legs are remarkable for their hairiness, indeed they are thickly covered with a brownish fur, with only a few longer hairs. In my specimens this coating is most conspicuous on the carpo- and propodite of the penultimate pair of legs, so as to conceal the underlying joints in dorsal view, at the under side these joints, like all the legs, are wholly naked. De Man says nothing about this hairy covering, but Alcock states that „the upper surface of the legs, especially in the case of the third pair, is hairy”. The first named author rightly remarked, that the distal half of the under margin of the meropodites, especially those of the middle pairs, are minutely denticulate.

The Museum is in the possession of 4 specimens (1 ♂, 3 ♀) collected at the south coast of Madoera a few years ago by Mr. Buitendijk.

The range of this small species is now known to extend from the Mergui archipelago to the Gulf of Siam, Malakka and Madoera.

Finally I give here the dimensions of some specimens in mm.:

	1 ♂ ¹⁾	2 ♀	3 ♂	4 ♀
Distance between external orbital angles	11.25	14.75	9.5	11.—
Distance between the antero-lateral teeth	11.5	15.—	9.8	11.4
Length of carapace	8.25	10.75	6.5	7.6
Breadth of the front between the ocular peduncles	2.5	2.75	2.—	2.15
Length of the palm (index included)	7.25	6.25	8.—	4.75
Greatest height of palm at insertion of dactylus	3.75	2.—	—	—
Length of carpo- and propodite of the penultimate pair of legs	7.5	10.—	—	—

1—2 are specimens of the Museum, 3—4 are those measured by de Man (1888, p. 129).

M. latreillei (Desmarest).

1822. *Gonoplax Latreillii* Desmarest. Hist. d. Crust. foss. p. 99, pl. 9 f. 1, 4 (East-India and Luzon).
 1837. *M. Latreillii* H. Milne-Edwards. Hist. nat. d. Crust., t. 2 p. 66 (record?).
 1839. „ *Desmaresti* Lucas. Ann. Soc. entom. France, t. 8 p. 567, pl. 20 (Malakka).
 1847. „ *serratus* Gray. Cat. Crust. British Museum, p. 37 (Philippines).

1) This specimen bears a *Sacculina* at the abdomen, which may have influenced the development of the chelipeds; indeed, though the specimen is larger than that of de Man (n° 3), the length of the palm is less.

1848. „ *serratus* Adams & White. Zool. Voy. „Samarang”, p. 51 (Philippines).
 1852. „ *serratus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159 (no new record).
 1858. „ *serratus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Hongkong).
 1865. „ *Latreillei* A. Milne-Edwards. Ann. Sc. nat., sér. 5, Zool., t. 3 p. 193 (record?).
 1873. „ *Latreillei* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9, p. 278, pl. 13 f. 3 (New Caledonia).
 1874. „ *Polleni* Hoffmann. Crust. et Echinod. Madagascar, p. 19, pl. 4 f. 27—30 (Sakatia, Madagascar).
 1879. „ *Polleni* de Man. Notes Leyden Museum, v. 1 p. 66 (no new record).
 1881. „ *Polleni* Lenz & Richters. Beitr. Crustaceenfauna Madagascar, p. 4 f. 24—27 (Nossi Bé).
 1886. „ *serratus* Miers. Rep. Brachyura „Challenger”, p. 250 pl. 20 f. 1 (*partim*) (Philippines).
 1894. „ *latreillei* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7. p. 747 (Philippines, Luzon).
 1894. „ *laniger* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 746, pl. 23 f. 15 (Bay of Tokio, Kochi, Japan).
 1906. „ *latreillei* Laurie. Rep. Pearl-Oyster Fish. Ceylon, t. 5, Brachyura, p. 427, pl. 2, f. 3 textfig. 12 (Gulf of Manaar, Philippines, Singapore).
 1907. „ *serratus* Stimpson. Smithsonian. Inst., Miscell. Coll., v. 49, p. 96, pl. 13 f. 3 (Hongkong).
 1910. „ *serratus* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v 4 p. 323 (Gulf of Siam).
 1910. „ *latreillei* Rathbun. Bull. Mus. comp. Zool. Harvard Coll. Cambridge, Mass., v. 52 p. 306 (Makassar).

This species has been long known in a fossil state only, until A. Milne-Edwards in 1865 supposed that it might also be found living in the Indian Ocean; his surmise was corroborated by the discovery of living specimens at New Caledonia (1873). Afterwards Ortmann established the identity of *M. serratus* with *M. latreillei*.

The various names attributed to this species are due not only to the different designation of geologists and zoologists (who first called this species *M. serratus*) but also to the variability this species evidently displays in the succeeding stages of age. Indeed, if we compare Stimpson's figure of a young specimen of *M. serratus* and its cheliped (1907) with

Ortmann's figure of *M. laniger*, it is impossible to find any difference, except for the woolly hairy covering of the carapace in the latter case. Laurie however has shown, that a hairy carapace is found in young specimens and that it is „associated indifferently either with „flat, not thorn-like” carapace-teeth¹⁾, or with acute, upturned carapace-teeth, or with a somewhat intermediate form”.

De Man has already spoken of the probability that the *M. Polleni* of Hoffmann is identical with *M. latreillei*; Ortmann and Laurie agree with him. I cannot but confirm de Man's supposition; though Hoffmann has made no mention of the fourth lateral tooth (including in the number of teeth the external orbital angle) it is indeed present, as I could convince myself in examining Hoffmann's specimen, still preserved in the Museum.

There is no need to give new figures of this easily recognizable species, as it is well figured by A. Milne-Edwards (1873) and by Miers; drawings of young specimens are given by the latter author, by Ortmann (*M. laniger*) and by Stimpson (1907).

Finally Laurie gave photographic reproductions of four specimens; we conclude from this series that the shape of the carapace may vary considerably, in some cases being nearly equilateral, in other much more elongated transversely. The whole surface is closely covered with large granules and, in young specimens, with hairs, which gradually disappear in older stages. On each branchial region there may be seen two longitudinal rows of small granules. The grooves on the carapace are not very conspicuous, only those circumscribing the mesogastric and cardiac area being usually distinct; it is in these latter grooves, that slight traces of the original hairy covering of the carapace may remain in adult specimens.

The external orbital angle is large and directed obliquely forward or straightly outward, dentated at the margins; the three following lateral teeth gradually diminish in size distally. All the carapace-teeth may be either spiniform or flat (Laurie); the first type seems to be the usual one in young specimens. The upper orbital border is nearly straight and has slightly any curve in adult specimens; in young specimens there may be a more pronounced curve, though the orbital border does not project farther forward than the external orbital angle. The front is very narrow, occupying about one-tenth of the breadth of the carapace between the external orbital angles.

The male chelipeds are remarkably small; they may attain a large size only in the largest specimens known. The palm is granulated on

1) Ortmann has given this character of the carapace-teeth as another feature to distinguish his species from *M. latreillei*.

both surfaces, but naked and without spine near the carpal end at the inner surface. Inner surface of the fingers hairy. Dactylus with a large tooth near the base; index regularly denticulate at the cutting margin, without larger tooth. In the adult the immobile finger is curved downward, in young specimens, however, this finger is in a line with the inferior margin of the palm. Unlike nearly all other species of the genus, *M. latreillei* is characterized by having a spine at the distal end of the meropodites of the last legs, as in the preceding ambulatory legs.

This species, which is distributed throughout nearly the whole Indo-pacific region, is represented in the collection of the Museum only by Hoffmann's type-specimen of *M. Polleni*, from the Bay of Sakatia, Madagascar. Its carapace is nearly wholly equilateral, the breadth between the outer orbital angles being 32 mm., the length 30 mm. Though it is naked, except for some hairs in the grooves, Ortmann's specimen of *M. laniger* with a carapace-breadth of 41 mm. and a length of 28 mm. is wholly covered by hairs. The carapace may be much more elongated transversely, though not so as in the next species. Milne-Edwards mentions a specimen, the carapace of which attains a breadth of 50 mm., a length of 35 mm.

M. dentatus Stimpson.

1858. *M. dentatus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Hongkong).
 1907. „ *dentatus* Stimpson. Smithsonian Inst., Miscell. Coll., v. 49 p. 96, pl. 15 f. 1 (Hongkong).
 1910. „ *dentatus* Rathbun. K. Dansk. Vid. Selsk. Skr., 7. Raekke, v. 4 p. 322 (Gulf of Siam).

The present species is placed next to *M. latreillei* on account of its having also four lateral carapace-teeth in all, but in other respects the general form of the carapace is much more like that of *M. convexus*, though the transverse diameter of the carapace is less (length to breadth as 1:1.67 according to Stimpson). This carapace is naked, without hairs, smooth, „except towards the postero-lateral angle, where there are two slightly raised, plicated longitudinal ridges” (Stimpson, 1907). In the figure there appear indeed on each branchial region two parallel rows

1) The figure 3c of Laurie (see the list of synonyms of the preceding species) very much recalls the present species in general form; yet the chief difference between such transversely elongated specimens of *M. latreillei* and *M. dentatus* is to be found in the surface of the carapace being distinctly granular in the first species and smooth in the latter. Besides, in *M. dentatus* the fingers of the chela are comparatively shorter, and both fingers have a larger tooth, whereas such a tooth is wanting at the index of *M. latreillei*.

of obtuse tubercles, parallel with the distinctly converging sides of the carapace. The upper orbital border is elegantly curved and ends in a sharp, obliquely pointing tooth, which reaches as far forward as the upper orbital margin. The following lateral teeth of the carapace are much smaller, all directed obliquely forward. The eyes do not at all reach the external orbital angle. Front narrow, bilobed at the free margin. Grooves on the carapace all distinct.

The chelipeds of the male are rather long and are everywhere smooth, also on the palm. The fingers are very short, their length being about one half of the length of the palm (without index), clothed with hairs at the inside. The immobile finger has a large tooth at about the middle of its length, the dactylus bears a smaller, but well-defined tooth near the base. As in the preceding species there seems to be a spine at the anterior margin of the meropodites of the last pair of legs, near the distal end, though Stimpson does not particularly make mention of it.

This small species, with a carapace-breadth of 13 mm. (measured between the tips of the outer orbital angles) and a length of about 8 mm., has been found originally at Hongkong; it appears to be not uncommon in the Gulf of Siam. The Museum does not possess it.

M. quadratus A. Milne-Edwards (Pl. VIII, Fig. 10).

1873. *M. quadratus* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9, p. 280, pl. 12 f. 6 (New Caledonia).

The species at first sight is very much like *M. erato*, but, except for the differently shaped inferior orbital margin in the male, it is distinguished by the much stronger curve of the superior orbital border, by the outer orbital angle being more strongly pronounced and reaching farther outward than the next lateral tooth of the carapace, and finally by the lesser hairiness of the walking legs and the slenderness of their meropodites.

Nearly the whole surface of the carapace is granulated; the granules are most crowded on the branchial regions, on the hepatic regions they are more scattered and extend towards the mesogastric area. The ridge in the broad, not constricted, nearly vertically deflexed front is rather deep, especially between the transverse epigastric ridges, immediately behind which it bifurcates. As Milne-Edwards remarked, the carapace is covered by short hairs, somewhat more crowded on the lateral regions. The outer orbital angle projects obliquely forward, its tip is pointed and its hinder margin presents some small dentations. The first antero-lateral tooth is slightly shorter, its anterior margin is directed less forward than

the same margin of the outer orbital angle, and the curved side margin presents three or four distinct indentations. The second lateral tooth is very small, separated from the preceding by a distinct incision and presenting at the side margin likewise some four indentations. Behind the teeth the sides of the carapace are distinctly convergent. On the branchial regions there is no trace of longitudinal granulated rows. The upper border of the orbital groove is finely crenulated, the crenulations being more conspicuous in the outer half of the border and continued upon the fore margin of the external angle. The inferior orbital margin is regularly crenulated in the female, but in the male it presents three large, obtuse lobules in its outer half, with the tips directed inward; between the inner tubercle and the epistome there is a short row of 7—8 extremely minute denticles.

Like *M. erato* the three-faced arm of the cheliped bears a „musical crest”, about at the same place, viz. in the middle of the inner margin, and parallel to this margin ¹⁾. The carpus presents some sharp granules at the inner angle of the anterior side. The palm is inflated and very short, its height at the insertion of the dactylus being not much less than the length (index excluded); inner surface densely hairy, but there is no spine near the carpal end, as in *M. erato*. Parallel with the superior border of the palm and close to it runs an inconspicuous ridge, which, like the border itself, is minutely granular; the whole outer surface proves to be somewhat granulated, when examined with rather strong magnifying power, but appears smooth to the naked eye. The fingers are short, much more so than the palm, and there is a wide space between their bases, the fingers meeting only at the tips, which are horny, excavated, spoon-like as in *M. erato*, and show a few short, yellow hairs at the inner border. The immobile finger has a faint longitudinal ridge at its outside, this ridge is not so easily visible as in *M. erato*; the cutting margin is occupied in its whole second half by a very long crenulated tooth, continued to the tip of the finger, the first half of the index being unarmed. The dactylus bears a distinct, rectangular tooth not far from the base; between this tooth and the tip of the finger the cutting margin shows several indentations. In the shape of the palm there is very much resemblance with *M. erato* (see de Man, Journ. Linn. Soc. London, v. 22, 1868, pl. 8 f. 14); but as this author pointed out, the palm is somewhat higher and comparatively shorter in *M. quadratus*. The ambulatory legs again agree with those of *M. erato* in having

1) In my only ♂ of *M. erato* the crest forms a certain angle with the margin and the same has been observed by Alcock (see p. 180).

an extremely minute spine at the fore margin of the meropodites in the middle pairs of legs, near the distal end of the meropodite, but this spine is wanting in the anterior and posterior legs (though Milne-Edwards figures a spine in the hinder pair), and further in the granulation of the hinder margin of these meropodites. The legs differ however in several particulars: firstly the meropodites are much more slender and cylindrical in dorsal view (though three-faced in transverse section as in all other species); secondly the legs are much less hairy and nowhere show thick patches of hair; and finally the carpo- and propodite of the middle pairs of walking legs are much shorter than in *M. erato*, as is shown in the figures and in the dimensions given below of *M. quadratus* and those of *M. erato* on p. 181.

This rare species, which has been found nowhere else than at New Caledonia, is represented in the Museum by a single male specimen, received from Milne-Edwards himself, and likewise originating from the said locality.

Its presents the following dimensions:

Distance between external orbital angles	11.—
Length of carapace	8.—
Breadth of front	2.25
Length of palm (index included)	8.—
Greatest height of palm at insertion of dactylus	4.75
Length of carpo- and propodite of the penultimate pair of legs	5.25

M. punctulatus Miers.

1884. *M. punctulatus* Miers. Zool. Voy. „Alert” 1881—82, p. 237, pl. 25 f. a. (Port Jackson).

The species is most closely related to *M. quadratus* as may be inferred from the following description of Miers ¹⁾: „the carapace is nearly quadrate and relatively narrow, being but little broader than long; the cervical suture is in its posterior part very distinctly defined; the surface is uneven, punctulated, without spines or tubercles, but clothed with a few scattered hairs, which are more numerous, though not dense, on the postero-lateral parts of the branchial regions; the front is about one-third of the total width of the anterior part of the carapace, with its anterior margin nearly straight; the antero-lateral margins are nearly straight and 3-toothed (the tooth at the external orbital angle included); the posterior

1) I am much indebted to Dr. de Man for a full transcription of Miers' diagnosis, together with a calque of the original figure, as I myself had no opportunity to consult the paper quoted.

lateral tooth is very small. The male postabdominal segments are all of them distinct. The first two joints of the slender antennal peduncle are contained within the large inner orbital hiatus; the epistome is transverse and very short, almost linear; the merus-joint of the outer maxillipedes is truncated at its distal end and nearly as large as the preceding joint. The chelipedes (for so small a specimen) are well developed and are sub-equal; merus and carpus are smooth, without spines or tubercles, merus more or less hairy on its inner surface and upper margin; the palm is but little longer than its greatest vertical depth, which is at the articulation with the mobile finger, smooth and polished externally, its upper margin not carinated, its inner surface with a dense patch of hair; the lower margin of the immobile finger is in a straight line with the lower margin of the palm, its upper or inner margin is denticulated and has a strong tooth or lobe in the middle; the inner margin of the mobile finger has a smaller tooth near its base; the fingers, when closed, meet only toward their apices, having a hiatus between them, which is hollowed out into a deep, nearly semicircular cavity at the base of the immobile finger; this cavity is margined with hairs. The ambulatory legs are slender, somewhat compressed and the margins somewhat thinly clothed with hair. Colour, in spirit, brownish. Length of carapace nearly 3 lines (6 mm.), breadth $3\frac{1}{2}$ lines (somewhat over 7 mm.); length of chelipede about $5\frac{1}{2}$ lines (over 11 mm.).

In the figure the external orbital angle has a convex outer margin and does not project farther outward than the antero-lateral tooth of the carapace, both teeth are of nearly the same shape and size. Besides by this marked character the species is moreover distinguished from the preceding by a much more quadrate carapace, by comparatively longer chelipeds, by the front being one-third of the total breadth of the carapace (one-fourth in *M. quadratus*) and by the short eye-stalks, the length of which does not exceed the breadth of the front¹⁾. The last feature, together with the shortness of the ischiopodite of the last maxillipeds, which joint nearly equals in length the meropodite of these extremities, very nearly approaches *M. punctulatus* to *Euplax boscii* (Audouin). The species of Miers is however more quadrate in outline and in *Euplax* the sides of the carapace are armed with only 2 teeth in all.

1) Miers himself gives as differences between his species and *M. quadratus*, that in the latter species only two lateral teeth in all are present at each side of the carapace, and that there is no tooth on the inner margin of the immobile finger. In reality however there are two lateral teeth (besides the external orbital angle) at each side of the carapace in *M. quadratus* and the cutting margin of the index is occupied by a very broad, crenulated tooth in the distal half of the finger; this tooth seems only to be better defined towards the tip of the finger in the species of Miers.

M. latifrons Haswell.

1882. *M. latifrons* Haswell. Proc. Linn. Soc. N. S. W., v. 6 p. 549 (Port Philip).
1882. „ *latifrons* Haswell. Cat. Austral. Crust., p. 90 (no new record).

„Carapace about once and a half as broad as long; surface very finely granulate. Front broad, about one-fourth of the total breadth. Orbits nearly transverse. Lateral borders arched, with three teeth separated by deep fissures, the first two broad, the third small. Anterior limbs in the male very large, finely granular like the carapace; hands unarmed, with a granular raised line on the outer surface near the lower border. Immobile finger much bent downwards, regularly denticulated on its inner edge; inner edge of mobile finger with a denticulated elevation near the base. Inner surface of the arm, edge of carapace, and basal joints of legs, with scattered slender hairs; a thicker coating on the fourth and fifth joints of the ambulatory legs. Length of carapace $\frac{3}{4}$ ths inch; greatest breadth $1\frac{1}{8}$ th inch” (Haswell, Cat. Austr. Crust.).

Haswell's species seems to be nearly related to *M. erato*, especially by the breadth of the front and the hairy coating of the legs, which, as in my specimens of *M. erato*, show a thick coating of hair on the carpo- and propodite. The chelipeds of the male appear however to be larger in *M. latifrons*, there is a granular line near the lower border of the palm, the inner surface of the latter is unarmed, and the „musical crest” on the arm of *M. erato* seems to be absent. The index is much bent downward in *M. latifrons*, but is in the same line with the lower border of the palm in *M. erato*. The species of Haswell also seems to attain a larger size (about 28 mm. broad and 18.75 mm. long).

This species, like the preceding, is not represented in the Leiden Museum, and I am unable to give further information.

M. setosus H. Milne-Edwards.

1852. *M. setosus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159 (Australia).
1882. „ *setosus* Haswell. Cat. Austral. Crust., p. 89 (Port Jackson, Australia).
1888. „ *setosus* de Man. Arch. Naturgesch., Jahrg. 53. 1, p. 356, pl. 9 f. 2—2^a (no new record).
1897. „ *setosus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 343 (Moreton Bay).

De Man, who has had occasion to examine an original specimen of this species from the Paris Museum, revealed its main characters. In

general form it resembles somewhat *M. convexus*, but the carapace is narrower, and the whole surface is granulated, with the exception of the middle parts; there are no denticulated tubercles on the branchial regions and the carapace is regularly rounded transversely. The upper orbital border is much sloping backward, so that the outer orbital angle is lying behind the level of the convex curve of this upper border; the outer orbital angle itself is rounded, not at all sharp, and somewhat like that of *M. pacificus* and *M. japonicus*. The antero-lateral tooth of the carapace seems scarcely at all defined, anteriorly it is separated from the preceding orbital angle by a distinct incision, but distally there is scarcely an indication of an incision to separate it from a second lateral tooth. Sides of the carapace distinctly convergent posteriorly.

The palm of the male cheliped is, according to de Man's figure, twice as long as high, slightly granulated, and provided at the outer surface, close to the under margin, with a row of granules that is continued upon the immobile finger. Inner surface of palm and fingers densely hairy. Immobile finger much bent downward, so that the under margin of the palm and that of the said finger form a concave line; the finger is crenulated throughout at the cutting margin, but has no larger tooth. Such a tooth is well represented upon the dactylus, and between the tooth and the tip of the finger there are larger or smaller indentations.

There are, as far as I am aware, no dimensions published of this species, but according to de Man's figure, *M. setosus* seems to belong to the middle-sized species, the breadth of the carapace between the outer orbital angles being about 31 mm., the length about 17 mm. The Leiden Museum has no specimen.

M. pacificus Dana. (Pl. VIII, Fig. 11)

1851. *M. pacificus* Dana. Proc. Ac. Nat. Sc. Philadelphia, 1851, p. 248 (Upolu, Samoa).
 1852. „ *pacificus* Dana. U. S. Expl. Exp., Crust., prt. i p. 314, pl. 19 f. 4 (same record).
 1858. „ *pacificus* Stimpson. Proc. Ac. Nat. Sc. Philadelphia, v. 10 p. 97 (Loo-Choo-isles).
 1868. „ *bicarinatus*? Heller. Crust. „Novara” Reise, p. 36, pl. 4 f. 2 (Nicobars).
 1890. „ *pacificus* de Man. Notes Leyden Museum, v. 12, p. 79, pl. 4 fig. 10 (locality unknown).
 1895. „ *pacificus* de Man. Zool. Jahrb. Abt. Syst., Bnd. 8 p. 579 (Penang and Pontianak).

1897. *M. pacificus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10 p. 342 (no new record).
 1902. „ *bicarinatus* de Man. Abhandl. Senckenb. Gesellsch., Bnd. 25, p. 496 (no new record).
 nec 1910. *M. pacificus* Rathbun. Bull. Mus. comp. Zool. Harvard Coll., Cambridge, Mass., v. 52 p. 307, pl. 1 f. 3 (= *M. crinitus* Rathbun).

Unfortunately there is some confusion in the right interpretation of Dana's species, owing to the fact that the figure of this author seems to be incomplete, and that Heller's *M. bicarinatus* is not wholly reliable with respect to the form of the lateral teeth of the carapace.

De Man in 1890 first determined the very specimens of the Leiden Museum as *M. pacificus*; later, in 1902, however, he changed his opinion, and regarded these specimens as the true *M. bicarinatus*, whereas another specimen collected by Prof. Kükenthal at Halmheira, was referred by de Man to *M. pacificus*.

Miss Rathbun recently (1913) supposed, that this latter specimen of de Man belonged to a new species created by her, *M. crinitus*, that the Leiden Museum specimens ought to be referred to *M. pacificus*, as de Man had formerly done (1890), and that *M. bicarinatus* is too unlike the species under consideration to be united with either" (Proc. U. S. Nat. Mus., v. 44, p. 619).

Unless the type-specimen of Heller be examined again, this question must remain undecided, but I think it the safest way to suppose that *M. pacificus* and *M. bicarinatus* are really identical and for the rest to agree with Miss Rathbun's opinion in referring de Man's Halmheira specimen to *M. crinitus*.

The Leiden Museum specimens have been so amply described by de Man in 1890, that it is useless to give a fresh description here. The carapace, smooth and glossy to the naked eye, is nearly equilateral, its greatest breadth (which is lying between the postero-lateral teeth, so that the carapace is narrowed anteriorly), being to the length as 7:5. The external orbital angle is not at all pointed, but rectangular, and separated from the next lateral tooth by a distinct incision. On the branchial regions there are two longitudinal, slightly pubescent lines on each side, a third row is lying before them and running in a transverse direction, and finally there is a similar, but very short and concave line just above the insertion of the posterior legs. This arrangement recalls one strongly to that found in species as *M. japonicus* and *M. tomentosus*; and it is chiefly on account of the fact, that these lines are not represented in Dana's figure of *M. pacificus*, that the confusion above alluded

to has been created; the lines are on the contrary partly represented in Heller's figure of *M. bicarinatus*.¹⁾

The palm of the male cheliped is peculiar in having no ridge whatever close to the under margin, in being smooth to the naked eye, and in the inner surface being unarmed and naked; there are only hairs near the insertion of the fingers and at the inner surface of the latter. Both fingers have horny, excavated, spoon-like tips; the dactylus has a large, quadrangular tooth somewhat before the middle, the immobile finger on the contrary has no larger tooth, but is crenulated throughout, is in a line with the under margin of the palm and shows a faint ridge at the outside. Contrary to the usual case in the genus, the ambulatory legs are only slightly hairy, even the posterior legs have only few, short hairs along the margin. It seems to have been overlooked by de Man, that (in my specimens at least) the hinder legs have a small spine at the anterior margin of the meropodite, near its distal end, quite as occurs in the preceding legs, and this character the species shares, as far as I know, only with very few of its congeners (*M. latreillei*, *M. dentatus* (?)).

The dimensions of two of the Museum specimens (1 ♂, 3 ♀) have been given by de Man (1890, p. 82—83); one of these, the largest female, was again and more fully measured by the same author on another occasion (1902, p. 498).

M. crinitus Rathbun.

1902. *M. sp.* de Man. Abhandl. Senckenb. Gesellsch., Bnd 25 p. 495 (Halmahera).
 1910. „ *pacificus* Rathbun (nec Dana). Bull. Mus. comp. Zool. Harvard Coll., Cambridge, Mass., v. 52 p. 307, pl. 1 f. 3 (Amboyna).
 1913. „ *crinitus* Rathbun. Proc. U. S. Nat. Mus., v. 44 p. 619, pl. 75 f. 3 (same record).

This species is most closely allied to the preceding one, so that at first sight it was confounded with the latter by Miss Rathbun, but it cannot be denied that it bears even a greater resemblance to *Euplax boscii* (Audouin).

The carapace is nearly wholly subquadrate, its breadth only slightly exceeding the length; it is convex, evenly rounded above, smooth in the middle parts and irregularly granulate towards the sides, but here the

¹⁾ This figure, as de Man observes, is probably wrong in presenting the carapace much narrower than it really is, and there is a remarkable contradiction between Heller's figure and text, as regards the dimensions of his species (see also de Man, 1902, p. 495).

surface is everywhere covered by hairs. Like the preceding species the carapace is narrowed anteriorly and attains its greatest breadth at the postero-lateral teeth. The external orbital angle and the lateral teeth seem to offer no marked difference with those of *M. pacificus*¹⁾. The upper orbital border appears to be slightly more sinuous. There is no trace of longitudinal pubescent lines on the postero-lateral sides of the carapace, but above the insertion of the posterior legs there is a similar short, curved line as in the preceding species.

The cheliped of the male, except for its being densely clothed with hairs along nearly the whole inner face, is again very much like that of *M. pacificus*, but the granulation on the wrist and on the outer surface of the palm seems to be somewhat coarser. The dactylus has the same, large, conspicuous, quadrangular tooth at the middle of its length.

The ambulatory legs of *M. crinitus* are, like the carapace, densely covered with hairs; mero-, carpo- and propodite of the penultimate pair of legs are comparatively longer than in *M. pacificus* (see de Man, p. 498); the first to third pair of walking legs bear a small spine at the anterior margin of their meropodites, near the carpal end, but the spine is concealed by the thick hairy covering of these joints.

M. crinitus, as has been remarked above, is nearly related to *Euplax boscii* (Audouin), but in *Euplax* the sides of the carapace are armed with only two teeth in all, the meropodite of the third pair of maxillipeds is nearly as long as the preceding joint, these maxillipeds themselves leave a wide gap between them, and the outer margins of the external orbital angles are convergent posteriorly, whereas in the present species of *Macrophthalmus* there are three teeth in all at the sides of the carapace (external orbital angle included), the meropodite of the third pair of maxillipeds is shorter than the preceding joint, the maxillipeds have only a narrow gap between them, and the outer margins of the external orbital angles are divergent posteriorly or parallel.

The species is not represented in the collection of the Leiden Museum.

The length of the carapace of a type male specimen, measured by Miss Rathbun, is 11.2 mm., the breadth 15.3 mm., the width of the front below 2.5 mm.

M. tomentosus Souleyet. (Pl. IX, Fig. 12).

1841. *M. tomentosus* Souleyet. Voy. „Bonite”, Zool., t. 1 p. 243, Crust., pl. 3 f. 8. (Manilla, Philippines).

¹⁾ According to de Man (p. 497) the outer orbital angle is distinctly sharper in the present species.

1852. *M. tomentosus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159 (no new record).
 1873. „ *tomentosus* A. Milne-Edwards. Nouv. Arch. Mus. d'Hist. nat. Paris, t. 9 p. 279 (New Caledonia and Aroe-isles).
 1888. „ *tomentosus* de Man. Journ. Linn. Soc. London, v. 22 p. 122 (Mergui Archipelago).
 1900. „ *tomentosus* Alcock, Journ. As. Soc. Bengal, v. 69, prt. 2, p. 382 (same record as that of de Man).

Though at first sight this species is much like *M. japonicus* and *M. depressus*, as de Man observed, it may be easily distinguished by the carapace being considerably narrowed anteriorly (so that the external orbital angle, which is very much rounded off, projects less outward than the first lateral tooth), by the finer granulation of the carapace and the hairiness of the meropodites of the walking legs.

De Man has furnished us with a full description of this species. The greatest breadth of the carapace is found between the tips of the postero-lateral teeth, behind which the sides are parallel or even slightly bulging.¹⁾ The outer orbital angle is rectangular and very large; the side margins of the angles diverging towards the incision which separates the first lateral tooth anteriorly. This latter tooth projects farther outward and has a convex lateral margin, which passes nearly without incision into the very small second lateral tooth, situated (in my specimen at least) a little way before the middle of the lateral margin of the carapace.²⁾ The granulation of the carapace, though very distinct, is represented perhaps somewhat too coarse in my figure; the granules are especially crowded on the branchial regions, but the middle parts of the carapace (the mesogastric and the median part of the anterior cardiac area) are smooth. Towards the postero-lateral sides we may observe the same arrangement of granulated rows as has been mentioned (in the shape of pubescent lines) in *M. pacificus*. Firstly there are at each side two obliquely-longitudinal hairy rows, composed of closely set granules that are larger than those on the rest of the carapace; in *M. japonicus* the granules composing these rows are fewer in number, more scattered

1) In Souleyet's figure the sides of the carapace in the posterior part are very irregular, presenting some conspicuous prominences. To judge from my specimen the carapace is somewhat broadened behind the small second lateral teeth, with a regular, convex outline, but details are obscured by the rather thick hairy coating of the surface.

2) De Man mentions three (not two) incisions; the posterior incision, situated behind the middle of the lateral margin, is very indistinct and may easily be overlooked. I have not found it in my specimen.

and not larger than the surrounding granules on the carapace. Secondly there is a transverse row, apparently proceeding from the second lateral tooth, and finally we may observe an oblique row just above the insertion of the posterior legs. All the borders of the carapace are crenulated or finely beaded. The upper border of the orbit is elegantly curved, straight; the inferior border projects much more forward, is convex and much more conspicuously crenulated than the upper border; in the male the outer fourth of the under orbital border is occupied by three rounded tubercles, with the tips directed inward, which formation, as usual, is associated with the presence of a „musical crest”. Front narrow, deeply grooved in the middle, much constricted between the eye-stalks; the latter are straight, stoutish and do not reach to the external orbital angle.

The chelipeds of the only male specimen in the Museum are, unlike the usual case in this genus, unequal, the right being the larger.¹⁾ Upper and inner border of the arm furnished with long hairs, inner surface of the arm with a short horny „musical crest”, running close to and parallel with the inner margin of the arm, and lying in the beginning of the distal half of the latter. Wrist armed with a row of tubercles along the inner margin and some spines at the anterior border, near the palm. Palm rather low, not increasing much in height towards the distal end, outer surface smooth, without ridge near the under margin, somewhat granular towards the superior border. Fingers about as long as the palm, with horny, excavated, spoon-like tips, densely clothed with hair at these tips, but the inner surface of the fingers as well as that of the palm is nearly naked.²⁾ This last character the species shares with *M. japonicus*. The cutting margin of both fingers are armed with a large tooth, that on the dactylus being narrow, rectangular and placed near the base, that on the index being larger and higher, sloping backward; between the tooth and the tip both fingers are minutely denticulate. The ambulatory legs have strong and thick meropodites, which in the first to third pair are armed with a spine at the fore margin and densely clothed with hairs at the upper surface; these hairs are also visible on the carpus and the proximal half of the propodite in the middle pairs of legs. Nails very much compressed and broad, hairy at the margins.

The only specimen of the Museum (♂) is one of those, described by de Man, from the Mergui archipelago; it has been measured by this author already (p. 124).

1) De Man states that the chelipeds in the adult specimens are „nearly equal to one another”.

2) De Man observed at the inner surface of the palm „a close down of hairs”, but in adult specimens these hairs are, according to the author, „nearly wanting, being probably worn off, so that the inner surface of the palm appears glabrous”.

M. depressus Rüppell. (Pl. IX, Fig. 13).

1830. *M. depressus* Rüppell. 24 kurzschwänz. Krabben d. Rothen Meeres, p. 19, pl. 4 f. 6 (Red Sea).
1837. " *depressus* H. Milne-Edwards. Hist. nat. d. Crust., t. 2 p. 66 (same record).
1839. " *affinis* Guérin. Voy. „Favorite”, t. 5, 2^{me} part., p. 172, pl. 50 f. 2 (Bombay and Pondichéry).
1839. " *affinis* Guérin. Mag. Zool., t. 8, cl. 7, Crust., p. 4, pl. 24 f. 2 (no new record).
1852. " *depressus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 159 (no new record).
1852. " *affinis* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158 (no new record).
1861. " *depressus* Heller. Sitzungsber. K. K. Ak. Wis. Wien, Bd. 43. 1. p. 362 (Red Sea).
1875. " *depressus* Paulson. Rech. Crust. Mer Rouge, p. 66, pl. 6 f. 5—7¹⁾ (Red Sea).
1881. " *depressus* de Man. Notes Leyden Museum, v. 3 p. 235 (Djeddah, Red Sea).
1882. " *affinis?* Haswell. Cat. Austral. Crust., p. 88 (Holborn Island, North Australia).
1888. " *depressus* de Man. Arch. Naturgesch., Jahrg. 53. 1, p. 356, pl. 15 f. 3 (no new record).
1888. " *depressus* de Man. Journ. Linn. Soc. London, v. 22 p. 124 (Mergui archipelago).
1893. " *depressus* Henderson. Transact. Linn. Soc. London, ser. 2, v. 5, p. 389 (Rameswaram, Ceylon).
1895. " *depressus* de Man. Zool. Jahrb. Abt. Syst., Bd. 8, p. 578 (Atjeh).
1897. " *depressus* Ortmann. Zool. Jahrb. Abt. Syst., Bd. 10 p. 342 (no new record).
1900. " *depressus* Alcock. Journ. As. Soc. Bengal, v. 69 prt. 2, p. 380 (Mergui archipelago and Aden).
1906. " *depressus* Nobili. Bull. Sc. France et Belgique, v. 40 p. 155 (Persian Gulf).
1906. " *depressus* Nobili. Ann. Sc. nat. sér. 9, Zool., t. 4 p. 318 (Suez, Massowah).

Several authors (de Man, Henderson, Ortmann) have pointed out, that the *M. affinis* of Guérin most probably is identical with *M. depressus*,

1) Cited after Nobili.

and I think this to be right, also on account of Guérin's statement, that the immobile finger has no larger tooth, the very character by which this species is distinguished from the closely related *M. japonicus*. I agree with de Man (1895) in his doubt about the identity of Haswell's species with that of Guérin (Haswell himself was not quite certain about his determination), for the palm is described as having „a faint longitudinal linear depression close to the lower border”, whereas de Man (1888, in Arch. Naturgesch.) expressly states that a ridge or granular row is absent in *M. depressus*.

It has been again de Man, who on several occasions pointed out the main characters of this species. The form of the carapace is nearly exactly the same as in *M. japonicus*, but *M. depressus* never seems to attain the size of this species. The sides are nearly parallel, not distinctly convergent posteriorly¹⁾; the length of the carapace is about two-thirds its greatest breadth, which latter is found between the tips of the first lateral teeth. The whole surface, with exception of the middle parts, is granular, and on the branchial regions there are at each side two longitudinal hairy rows of granules, the outer of which is somewhat convex, a transverse similar row is observed near the insertion of the posterior legs. The outer orbital angle is rectangular and projects less outward than the obtusely rounded antero-lateral tooth, which has a convex outer margin and is minutely crenulate; the second tooth is extremely small and separated from the preceding by a minute incision. Carapace hairy towards the sides, a row of long hairs along the margins. Front narrow, constricted, about one-eighth the breadth of the carapace. Upper orbital border nearly straight, under border distinctly and regularly crenulate. Eye-stalks slender, reaching nearly to the external orbital angle.

In the chelipeds of the male the differences between *M. depressus* and *M. japonicus* are clearly pronounced (de Man, 1881). In the first named species the arm is shorter, and the whole inner and outer surface are closely covered with hairs, whereas in *M. japonicus* such hairs are much more scarcely distributed and arranged especially along the margins. The upper border of the palm is somewhat crenulate in *M. japonicus*, smooth and slightly granular in *M. depressus*; in the first named species the inner surface of the palm and the fingers are naked, or nearly so, the upper surface of the dactylus is granular, and the index bears a large tooth and is curved downward; in *M. depressus* on the contrary the inner surface of the palm and the fingers are densely hairy, the

1) De Man (1888, in Arch. Naturgesch.) however has figured the carapace with posteriorly convergent sides.

upper surface of the dactylus is smooth, not granular, and the index has no large tooth, but is coarsely denticulated at the cutting margin and not curved downward. In both species here named the mobile finger has a large rectangular tooth near its base.

The ambulatory legs of *M. depressus* are remarkable for their massively-built meropodites in the middle pairs of legs; these meropodites have convex anterior and posterior margins and their thickness is more than one-third the length, in the case of the first to third pair there is a distinct spine at the anterior margin, at the usual place. Mero-, carpo- and propodite of the second and third pair of ambulatory legs are densely clothed with hairs, both at the upper and under surface (only in the second pair the carpo- and propodite are naked at the under surface).

This species which ranges throughout the whole Indian Ocean, though it has not as yet been found at the east coast of Africa, is represented in the Museum by several specimens: four (3 ♂, 1 ♀) from Djeddah at the Red Sea, already spoken of by de Man (1881), one (♂, dried) from an unknown locality (found by me in a lot of *M. japonicus*, but certainly erroneously associated with that species, as both have never been recorded to occur in the same localities) and finally four (all ♀, dried) from the Red Sea and received as co-types from Rüppell himself.

The dimensions of the largest specimens at my disposal are

	1 ♂	2 ♀
Distance between external orbital angles	19.5	.29.—
Greatest breadth of carapace (at the middle of the lateral margin of the antero-lateral teeth)	20.5	30.5
Length of carapace	14.—	20.—
Least breadth of front	2.5 (scarcely constricted)	2.5 (much constricted).

The species may be in some cases more transversely elongated, for Alcock mentions a specimen, the length of which is the same as in my male specimen, but with a carapace-breadth of 22 mm.

M. definitus Adams & White.

1847. *M. definitus* Gray. Cat. Crust. British Museum, p. 37 (Philippines).
 1848. „ *definitus* Adams & White. Zool. Voy. „Samarang”, Crust., p. 51 (Philippines).
 1894. „ *depressus* Ortmann, nec Rüppell. Zool. Jahrb. Abt. Syst., Bnd. 7 p. 745 (locality unknown).

1897. *M. definitus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd. 10, p. 342 (Philippines).
 1910. „ *definitus* Rathbun. Bull. Mus. comp. Zool. Harvard Coll., Cambridge, Mass., v. 52 p. 307, pl. 2 f. 1 (Makassar).

Miss Rathbun recently made known the female and it is her description and figure we take as base for the diagnosis of this species, which is not in the collection of the Leiden Museum.

In general appearance *M. definitus* is again very much related to *M. japonicus*, but the carapace is broader, the length being three-fourths the greatest breadth, which latter is found rather far behind, behind the lateral teeth; the lateral margins of the carapace are nearly parallel and not at all convergent posteriorly. The whole surface is covered with granules; on each epigastric lobe, immediately behind the base of the front, there is a transverse row of granules, concave forward; the mesogastric and cardiac area, besides the neighbouring parts of the hepatic and branchial regions, are smooth, with a polished appearance. There seem to be no longitudinal rows of granules on the branchial regions, but the transverse row at the level of the postero-lateral teeth of the carapace is clearly visible. Front constricted, deeply furrowed, and beaded along the side margins, like the upper orbital border which is straight and elegantly curved. Outer orbital angle rectangular, projecting less outward than the first lateral tooth of the carapace; the latter tooth with a convex outer margin; second lateral tooth scarcely, if at all, defined. Ocular peduncles slender and short, not reaching the outer orbital angle.

Male cheliped with a naked under surface of arm (hairy in *M. japonicus*); upper border of palm coarsely granulate, inner surface densely hairy, as also the inside of the fingers; both fingers with a large tooth at the cutting margin, that on the dactylus however is much smaller than in *M. japonicus* and that on the immobile finger is lower, much more sloping than in the Japanese species and placed nearly in the middle of the finger, whereas in the other species it is situated nearer to the base. Meropodites of the middle pairs of ambulatory legs narrowing towards the distal end, the spine at the anterior border is very small and nearly wholly concealed under the woolly fur with which the meropodites are clothed. There is a transverse ridge on the third abdominal segment in the male (in the female also on the preceding segment) which is absent in *M. japonicus*.

This apparently very local species has been measured by Miss Rathbun and for the sake of completeness I give here the dimensions of the two sexes.

	1	2
	♂	♀
Distance between external orbital angles.	27.8	22.2
Greatest breadth of carapace posteriorly.	30.—	25.—
Length of carapace.	23.2	19.6

The species attains the same size as *M. japonicus*.

M. japonicus de Haan. (Pl. IX, Fig. 14).

1835. *Ocypode (Macrophthalmus) japonica* de Haan. Fauna japonica, Crust., p. 54, pl. 7 f. 1 (♀, sub nomine *O. (M.) depressa*) pl. 15 f. 2¹⁾ (♂) (Japan).
1847. *M. japonicus* Gray. Cat. Crust. British Museum, p. 38 (Japan).
1848. " *japonicus* Adams & White. Zool. Voy. „Samarang“, Crust., p. 51 (Meiacoshima).
1852. " *japonicus* H. Milne-Edwards. Ann. Sc. nat., sér. 3, Zool., t. 18 p. 158 (Japan).
1894. " *japonicus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd 7, p. 746 (Bay of Tokio and Nagasaki).
1897. " *japonicus* Ortmann. Zool. Jahrb. Abt. Syst., Bnd 10, p. 343 (no record of locality).

De Haan has excellently characterized this species. Carapace in its greatest breadth (at the middle of the convex margin of the antero-lateral teeth) about $1\frac{1}{2}$ the length, wholly covered with conspicuous granules, except for the epi- and mesogastric area and the middle of the cardiac area, the granules are largest on the hepatic regions. All the margins are distinctly crenulate, which is most pronounced in the proximal half of the side borders. On the branchial regions we observe at each side the same granular rows as are present in *M. pacificus*, *M. depressus* and *M. tomentosus*, viz. a transverse row at the level of the postero-lateral teeth, two longitudinal rows²⁾, parallel to the side margins and an obliquely transverse row above the base of the posterior legs. The granules composing these rows are not larger, rather smaller than the surrounding ones, contrary to what is the case in *M. tomentosus*. Carapace not much narrowed anteriorly (as in the latter species). Outer orbital angle somewhat more pointed, though scarcely projecting, antero-

1) Not f. 3, as is mentioned by misprint in the text.

2) The inner one of these is broken up in two rows, one behind the other, which forms a certain very obtuse angle; this arrangement appears also in de Haan's figure of the male.

lateral tooth very high, with obtuse tip, second tooth very small, though distinct. Front narrow, constricted, bilobed at the free margin, very deeply furrowed, a rounded group of granules on each epigastric lobe (where there is a concave series of such granules in *M. definitus*). Upper orbital border with a deep curve, so that the inner curve near the base of the front is at about the same level as the outer orbital angle; the border itself is strongly crenulate, more so than in other species of the genus (except *M. pectinipes*); inferior orbital border nearly straight throughout four-fifths of its length and strongly dentate, the outer fifth part abruptly sloping. Ocular peduncles slender, eyes reaching nearly to the end of the orbit, but not surpassing it. Grooves on the carapace very conspicuous and broad, the grooves circumscribing the gastric area very deep, the lateral transverse ones somewhat sigmoid-shaped, especially the hinder groove, clothed with short hairs.

Chelipeds of the male, as de Haan rightly observed, short or long, according to age; in young specimens scarcely as long as the breadth of the carapace, in the adult twice as long. Arm slender, with a bunch of hairs at the under surface and a row of hairs at the upper border. Palm elongated, slightly granular at the outer surface; inner surface naked, without hairs, but wholly covered with granules, the larger ones being found towards the carpal end and there is a longitudinal row of granules not far from the upper border; the latter finely crenulate and a parallel row of granules immediately behind it, in the proximal half of the palm. Mobile finger much curved, granular, especially at the upper border, cutting margin with a distinct large, quadrangular tooth near the base, between the tooth and the tip of the fingers a series of fine dentations. Index likewise granular, much curved downward, so that it forms a concave line with the inferior border of the palm, some few hairs near the tip at the inner surface, cutting margin provided with a large, sloping tooth and for the rest crenulate towards the tip of the finger.

Meropodites of walking legs broad, though not narrowed towards the distal end (as in *M. depressus*), armed with a spine at the fore margin in the case of the first to third pairs of legs, and hairy along this margin, but not at the upper and under surface, as is so conspicuously pronounced in *M. depressus*. Both margins of the meropodites are strongly serrate. Nails lanceolate, very broad, hairy at the margins.

The Leiden Museum contains a great many specimens, all from Japan and apparently collected by Burger and v. Siebold. Only two (♂ and ♀) were preserved in alcohol, the rest (23 ♂, 11 ♀) were all dried up; among them I recognized the type male of de Haan, figured by him on pl. 15 f. 2.

The specimens were in all stages of age and I can fully confirm Ortmann's observation (1894) that the chelipeds of the young males are of a female character, with only faint development of teeth on the fingers; it is only in full-grown specimens that the chelipeds attain a large size.

M. japonicus seems to have been found only in Japan, where it replaces *M. depressus*. Evidently it is not uncommon there, for Ortmann (1894) mentions a series of no less than 47 ♂ and 24 ♀ collected in the Bay of Tokio by Döderlein.

The dimensions of some of my specimens are the following:

	1	2	3	4
	♂ ¹⁾	♂ ²⁾	♂	♀
Distance between outer orbital angles	31.—	30.5	22.5	24.—
Distance between antero-lateral teeth	33.—	31.75	24.—	25.5
Length of carapace	21.—	20.75	15.5	17.5
Least breadth of front	2.5	2.5	2.—	2.25

Of the 25 species of *Macrophthalmus* here accepted, the following (16) are represented in the collection of the Leiden Museum:

<i>M. pectinipes</i> Guérin.	<i>M. convexus</i> Stimpson.
" <i>transversus</i> (Latreille).	" <i>erato</i> de Man.
" <i>telescopicus</i> (Owen).	" <i>latreillei</i> (Desmarest).
" <i>grandidieri</i> A. Milne-Edwards.	" <i>quadratus</i> A. Milne-Edwards.
" <i>dilatatus</i> de Haan.	" <i>pacificus</i> Dana.
" <i>brevis</i> (Herbst).	" <i>tomentosus</i> Souleyet.
" <i>hilgendorfi</i> n. n.	" <i>depressus</i> Rüppell.
" <i>crassipes</i> H. Milne-Edwards.	" <i>japonicus</i> de Haan.

Nine species therefore are absent:

<i>M. latipes</i> Berradaile.	<i>M. latifrons</i> Haswell.
" <i>sulcatus</i> H. Milne-Edwards.	" <i>setosus</i> H. Milne-Edwards.
" <i>consobrinus</i> Nobili.	" <i>crinitus</i> Rathbun.
" <i>dentatus</i> Stimpson.	" <i>definitus</i> Adams & White.
" <i>punctulatus</i> Miers.	

Leiden Museum, October 1915.

- 1) Type male specimen of de Haan (dried).
2) Specimen here figured (preserved in alcohol).

APPENDIX.

My paper was already finished and under press, when I became acquainted with Laurie's important treatise on the Brachyura of the Suda-nese Red Sea (Journ. Linn. Soc. London, v. 31 n° 209), published in July of this year. In this paper (p. 470), *M. graeffei* A. Milne-Edwards is treated of as a distinct species, different from *M. convexus*. The author states, that in *M. graeffei* the eye-stalks are longer, reaching slightly beyond the tip of the outer orbital angle, whereas in *M. convexus* these eye-stalks are shorter, falling short of the outer orbital angle, but in my figure we may observe, that the pigmented region of the eye touches exactly the tip of this outer angle, so that the difference anyhow seems to be not very great. Further there is some slight difference in the shape and the direction of the external orbital angle and the anterolateral teeth of the carapace, which in *M. graeffei* are more spiniform and more transversely disposed than in *M. convexus*. As to the subterminal spine at the anterior border of the meropodites of the walking legs, such a spine exists in the case of the first to third pairs of these legs in both species; that such a spine really does exist at the hindermost walking legs is indicated in Stimpson's figure (1907) of *M. convexus*, but I am inclined to regard this as an aprioristic presumption. The extremely small spine at the meropodites of the first pair of walking legs may easily escape notice, so that Alcock did not mention it.

Laurie's figures of the cheliped however seem to prove the right of existence of *M. graeffei* as a distinct species, for even in the larger specimens, of about the same dimensions as the adult *M. convexus*, the fingers have no larger teeth.

Moreover Laurie (with Miss Rathbun, 1906) denies the synonymy of *M. convexus* and *M. inermis*, on account of the fact, that both Alcock and Stimpson state that the inner surface of the palm of the cheliped of the male is hairy in *M. convexus*, whereas Milne-Edwards says that this inner surface is naked in *M. inermis*. I regard this as a difference of little importance, perhaps due to age. It is further true, that Milne-Edwards has not figured subterminal spines on the meropodites of the walking legs of *M. inermis*; these spines may have been overlooked, I suppose. For the rest de Man has had occasion to examine typical specimens of *M. inermis* and declared them to be identical with *M. convexus*.

EXPLANATION OF PLATES.

Pl. V.

- Fig. 1. *Macrophthalmus transversus* (Latreille), ♀, magn. 2. — 1^a cheliped of female, magn. 4. — 1^b cheliped of male, magn. 3.
 » 2. *Macrophthalmus telescopicus* (Owen), ♀, magn. 2.

Pl. VI.

- Fig. 3. *Macrophthalmus grandidieri* A. Milne-Edwards, ♂, magn. 2. — 3^a external orbital angle and antero-lateral tooth of the right side of the carapace, magn. 3. — 3^b cheliped of male, magn. 2.
 » 4. *Macrophthalmus dilatatus* de Haan, ♂, magn. 2.
 » 5. *Macrophthalmus brevis* (Herbst), ♂, magn. 2.

Pl. VII.

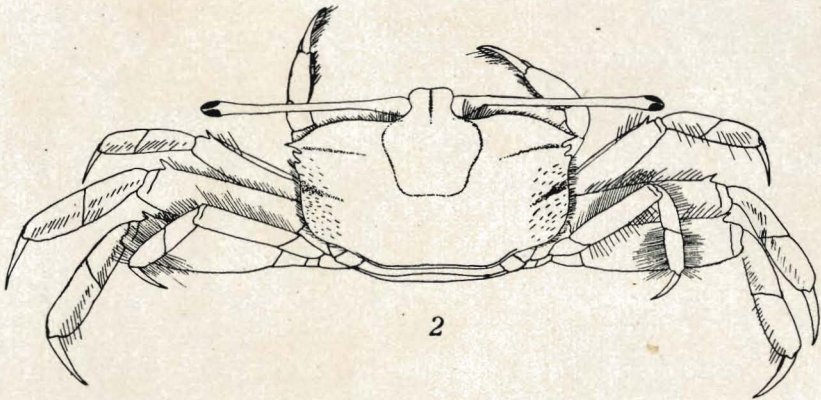
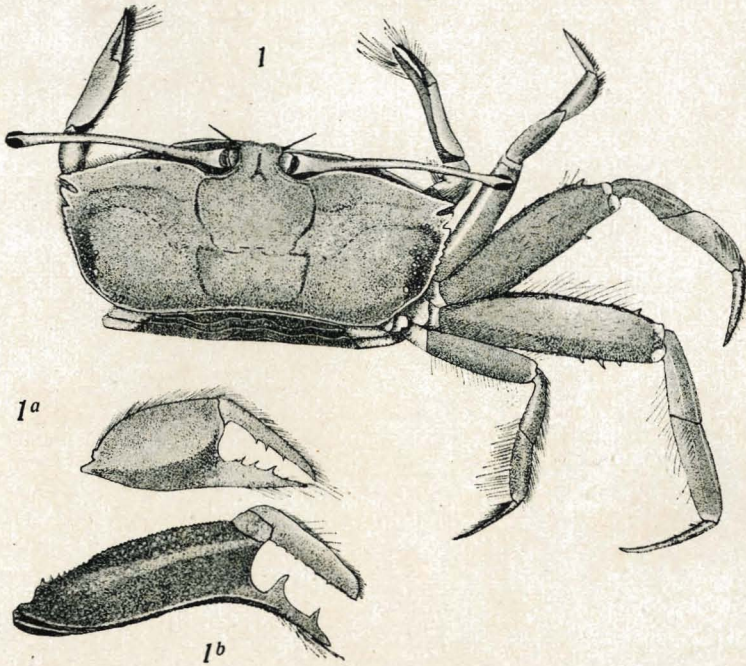
- Fig. 6. *Macrophthalmus hilgendorfi* n. n., ♂, magn. 2. — 6^a external orbital angle and antero-lateral tooth of the right side of the carapace, magn. 4. — 6^b cheliped of male, magn. 2.
 » 7. *Macrophthalmus crassipes* H. Milne-Edwards, ♂, magn. 2.
 » 8. *Macrophthalmus convexus* Stimpson, ♂, magn. 2.

Pl. VIII.

- Fig. 9. *Macrophthalmus erato* de Man, ♂, magn. 3. — 9^a outer orbital angle and antero-lateral tooth of the right side of the carapace, magn. 6. — 9^b under border of the left orbit, magn. 10.
 » 10. *Macrophthalmus quadratus* A. Milne-Edwards, ♂, magn. 3. — 10^a cheliped of male, magn. 4.
 » 11. *Macrophthalmus pacificus* Dana, ♂, magn. 2.

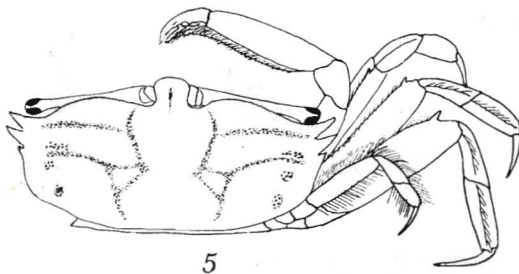
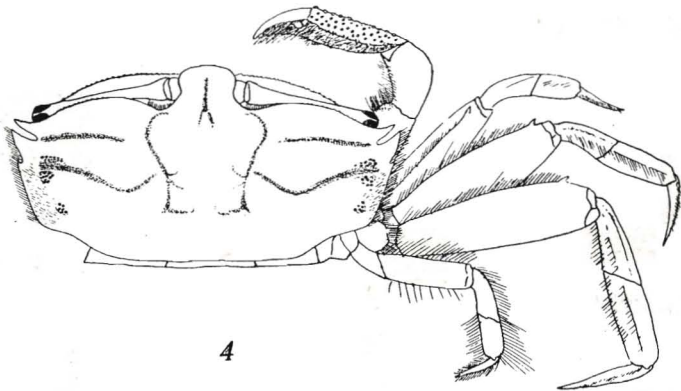
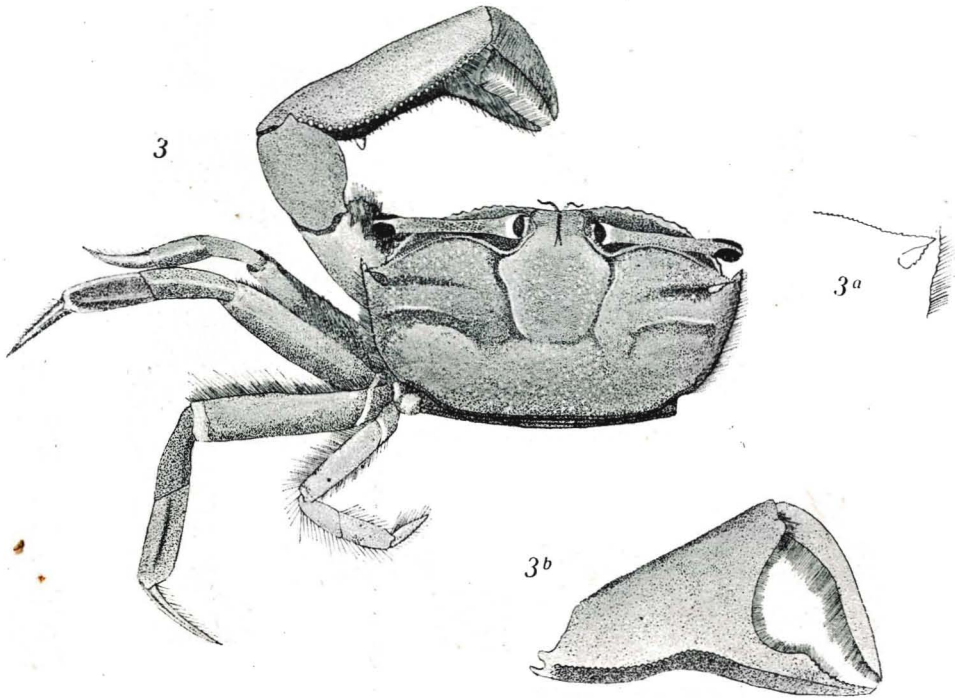
Pl. IX.

- Fig. 12. *Macrophthalmus tomentosus* Souleyet, ♂, magn. 2. — 12^a cheliped of male, magn. 2.
 » 13. *Macrophthalmus depressus* Rüppell, ♂, magn. 2.
 » 14. *Macrophthalmus japonicus* de Haan, ♂, magn. 2.



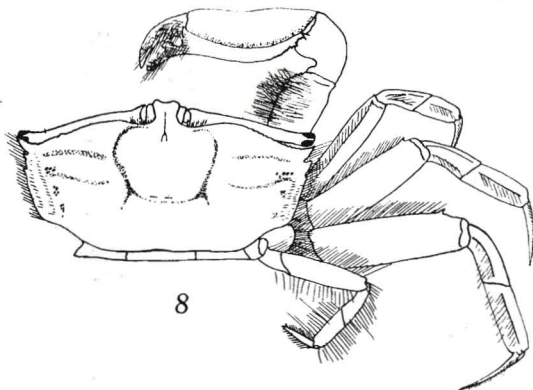
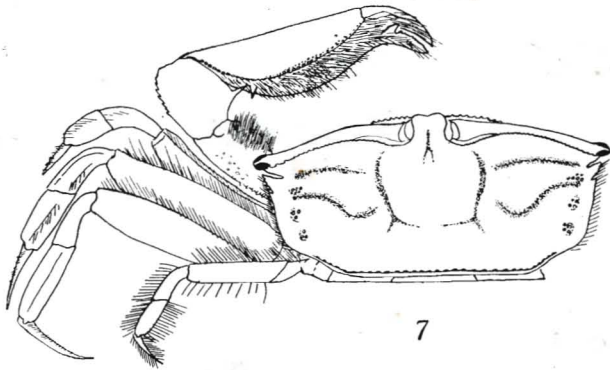
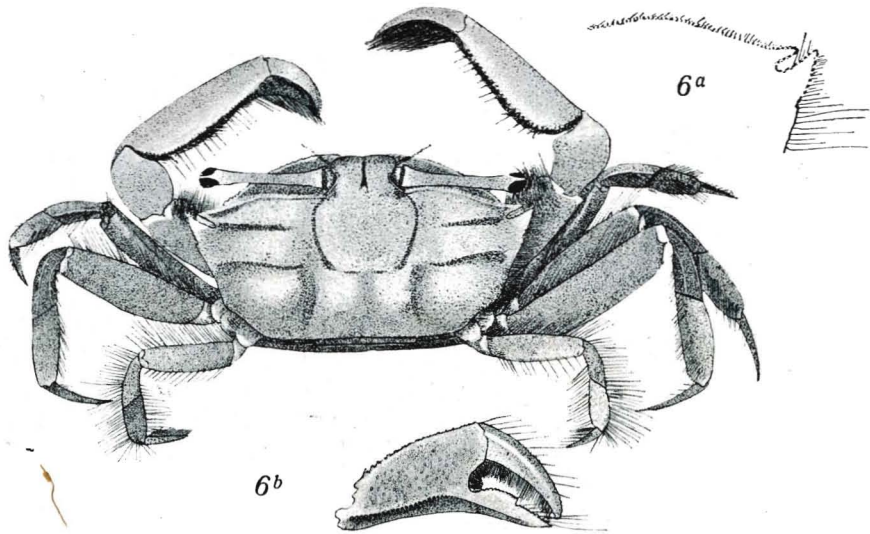
Tesch del.

1. *Macrophthalmus transversus*. 1^a female cheliped. 1^b male cheliped.
2. *M. telescopicus*.



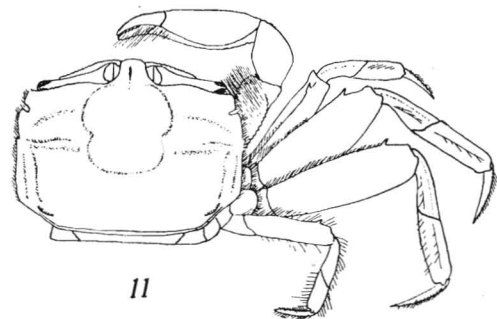
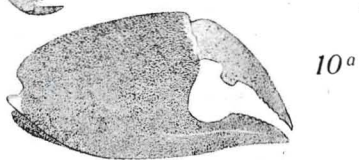
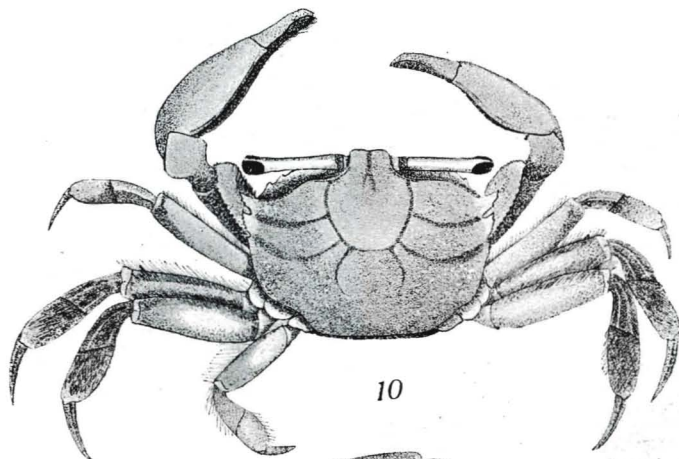
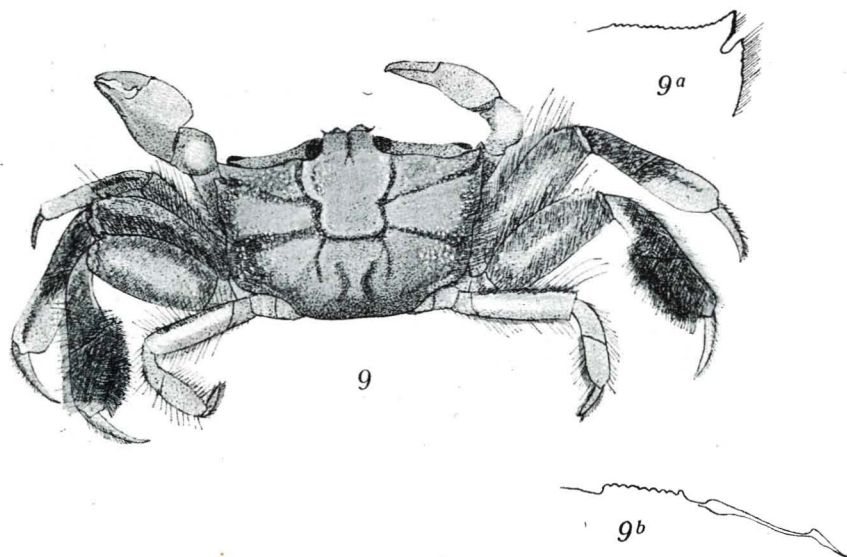
Tesch del.

3. *M. grandidieri*. 3^a External orbital angle and anterior lateral tooth
4. *M. dilatatus*. of the carapace. 3^b male cheliped.
5. *M. brevis*.



Tesch del.

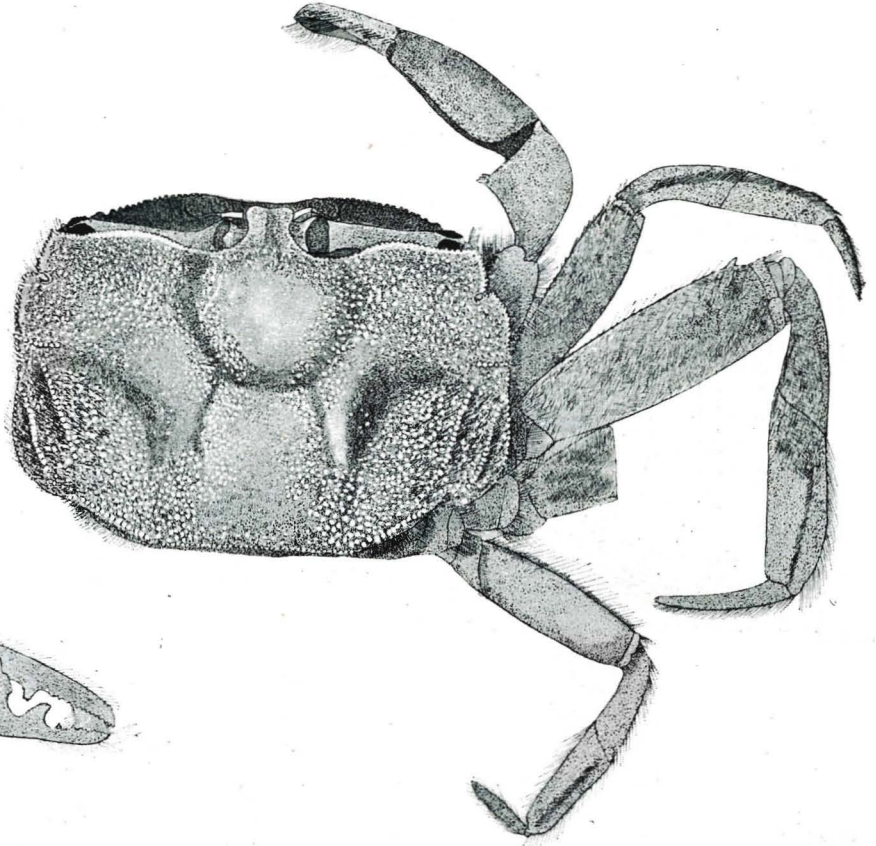
6. *M. hilgendorfi*. 6^a External orbital angle and anterior lateral tooth of the carapace. 6^b male cheliped.
7. *M. crassipes*.
8. *M. convexus*.



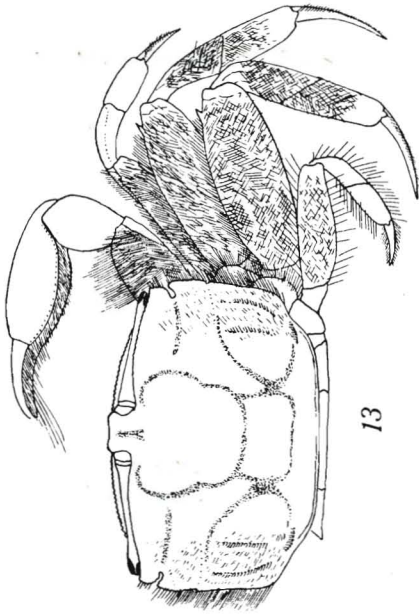
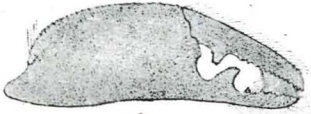
Tesch del.

9. *M. erato*. 9^a External orbital angle and anterior lateral tooth of the carapace. 9^b under border of the left orbit.
10. *M. quadratus*. 10^a male cheliped.
11. *M. pacificus*.

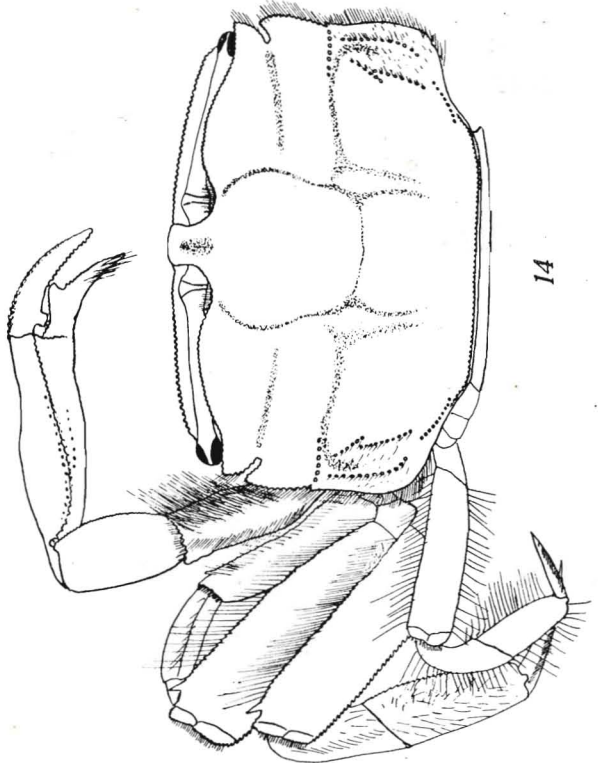
12



12^a



13



14

Tesch del.

12. *M. tomentosus*. 12^a male cheliped. 13. *M. depressus*. 14. *M. japonicus*.