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BIOLOGICAL RESULTS OF THE SNELLIUS EXPEDITION

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(CRUSTACEA BRACHYURA)

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# BIOLOGICAL RESULTS OF THE SNELLIUS EXPEDITION

## XVIII. THE GENERA *GRAPSUS*, *GEOGRAPSUS*, AND *METOPOGRAPSUS* (CRUSTACEA BRACHYURA)

by

**SANTOSH KUMAR BANERJEE**

Entomology Department, McGill University Macdonald College, Quebec, Canada

The present paper deals with the Indo-West Pacific species of the genera *Grapsus*, *Geograpsus*, and *Metopograpsus*. It is based in the first place on the collections brought together by the Snellius Expedition during its 1929-1930 exploration of the eastern part of the Malay Archipelago. Furthermore the Indo-West Pacific material of those genera present in the collections of the Rijksmuseum van Natuurlijke Historie at Leiden and the Zoological Museum at Amsterdam also is included in the present report. A short visit to the British Museum (Natural History) enabled me to examine part of the material of *Grapsus*, *Geograpsus*, and *Metopograpsus* in the collections of this institution, including the specimens collected by the 'Challenger' and 'Alert' expeditions. I wish to tender my best thanks to the authorities of these three musea for their kindness in allowing me to study this material and for their permission to publish the results in this paper.

Since all known Indo-West Pacific species of the genera dealt with here could be studied, the present report is more or less in the form of a revision: of every species a description and figures are given, while furthermore the habitat, geographical distribution, and synonymy are dealt with. Where possible, identifications of previous authors are checked. Since a large number of important specimens (among which types of allegedly new species) were not available to me the present paper can not be considered a complete revision, but is just an attempt to continue the work that other authors (e.g., Tweedie in the genus *Metopograpsus*) did to bring some order in the confused state of our knowledge of this group.

The abbreviations cl and cb are used here to indicate the carapace length and carapace breadth respectively, the term male pleopod is used for the first pleopod of the male specimens.

An account of the localities visited by the Snellius Expedition, where zoological collecting was done, was given by Boschma (1936).

I am most grateful to Dr. H. Boschma, Director of the Rijksmuseum van

Natuurlijke Historie, for the permission to undertake the present study in his museum, and to Dr. L. B. Holthuis, Curator of Crustacea of the said museum for the supervision of my work. Furthermore I wish to thank Dr. J. L. Bhaduri, Sir Nilratan Sarkar Professor of Zoology and Comparative Anatomy, Calcutta University, and Dr. K. K. Tiwari, Zoological Survey of India, who initiated my carcinological studies. Also I am thankful to Dr. Isabella Gordon and Mr. R. W. Ingle, both of the Crustacea section, British Museum (Natural History), London, to Dr. John S. Garth, Allan Hancock Foundation, Los Angeles, and to Dr. J. H. Stock, Zoological Museum, Amsterdam, for information and help received.

### **Grapsus** Lamarck, 1801

*Grapsus* Lamarck, 1801, p. 150.

Description. The carapace is slightly broader than long and much depressed. Its regions are fairly well defined. The cervical groove is particularly distinct. The external orbital angle is acute. There is only one tooth placed immediately behind the external orbital angle. The branchial region bears regular obliquely transverse ridges. The gastric region is provided with a squamiform sculpture. There are four post-frontal lobes along the line of flexion of the front. The urogastric groove is distinct.

The front is about half as broad as the anterior border of the carapace. Its margin is crenulated and the surface is rugose.

The orbit is placed at the antero-lateral corner of the carapace.

The inter-antennular septum is very broad and the antennule folds transversely in the fossa. The antennal flagellum is short and is placed in the orbital hiatus, the excretory tubercle of its basal joint is very prominent. The sub-orbital border is deeply notched near the external orbital angle; the inner orbital hiatus is partly filled by the antennal peduncle and partly by a strong isolated tooth in the inner fossa.

The epistome is well defined and of good length and breadth. It possesses a distinct ridge on either side.

The buccal cavern is squarely cut with its antero-lateral corners rounded. Its upper border is distinctly serrated. A large rhomboidal gap exists between the external maxillipeds in which the jaws of the mandibles are exposed. The ischium is longer than broad, the merus is shorter than the ischium, the palp articulates near the antero-external angle of the merus. The exopodite of the external maxilliped possesses a long flagellum.

The pterygostomial region and the sub-hepatic region are provided with hairs.

In both sexes the chelipeds are sub-equal, being much shorter than the legs. In the male they are very stout.

The merus is ridged and its lower surface is smooth. The carpus bears a strong tooth at its inner angle. The palm and the fingers are short and stout. The finger tips are broad and spoon-like.

Key to the Indo-West Pacific species.

1. Branchio-cardiac groove distinct. Antero-lateral portion of epistome with two short or one interrupted straight ridge, which does not touch upper border of buccal cavern. Finger tips of cheliped white, not coloured. Inferior distal extremity of merus of last pair of walking legs as a rule not serrated, only obscurely so in large specimens. Sixth male abdominal segment much longer than fifth . . . . . *Grapsus tenuicrustatus* (Herbst).
- Branchio-cardiac groove indistinct. Antero-lateral portion of epistome with one entire highly arched ridge, which touches upper border of buccal cavern. Finger tips of cheliped coloured dark tan or brown. Inferior distal extremity of merus of last pair of walking legs serrated. Sixth male abdominal segment equal to or shorter than fifth . . . . . 2
2. Carapace rough, not naked. Inter-antennular septum rugose. Epistome rugose, sometimes with hairs on its surface, not sunken transversely. Upper border of buccal cavern *cus*-shaped, not vertically raised. Antero-internal angle of merus of external maxilliped not produced transversely. External surface of palm of cheliped rough with two distinct ridges. Sternite belonging to the chelipeds not coloured dark tan; but rather white or greyish white. Male pleopod curved, not very stout . . . . . 3
- Carapace naked, smooth between the ridges. Inter-antennular septum smooth. Epistome not rugose but smooth in the middle and transversely sunken. Upper border of buccal cavern straight and vertically raised. Antero-internal angle of merus of external maxilliped produced in a transverse direction. External surface of palm of cheliped smooth and with two indistinct ridges. Sternite belonging to the chelipeds coloured dark tan. Male pleopod straight and very stout . . . . . *Grapsus longitarsis* Dana.
3. Lateral margins of carapace arched or sub-parallel. Carapace depressed. No strong vertical tubercle on hepatic region. No straight interrupted ridge on extreme anterior portion of branchial region just below cervical groove. Front not wide. Epistomal ridge entire, not tuberculate. Walking legs in small specimens slender . . . . . *Grapsus albolineatus* Lamarck.
- Lateral margins not arched but rather parallel. Carapace swollen. Strong vertical tubercles on hepatic region. A straight repeatedly interrupted long ridge on extreme anterior portion of branchial region just below cervical groove. Front wide. Epistomal ridge slightly tuberculate. Walking legs even in small specimens stout . . . . . *Grapsus intermedius* De Man.

### ***Grapsus tenuicrustatus* (Herbst) (Figs. 1 a, 2 a, c-g)**

*Cancer tenuicrustatus* Herbst, 1783, p. 113, pl. 3 figs. 33, 34.

*Grapsus hirtus* Randall, 1840, p. 124.

*Grapsus rudis* H. Milne Edwards, 1853, p. 168.

*Grapsus Pharaonis* H. Milne Edwards, 1853, p. 168.

*Grapsus gracilipes* H. Milne Edwards, 1853, p. 168.

*Grapsus maculatus pharaonis* A. Milne Edwards, 1873, p. 285.

*Grapsus maculatus tenuicrustatus* Kingsley, 1880, p. 103.



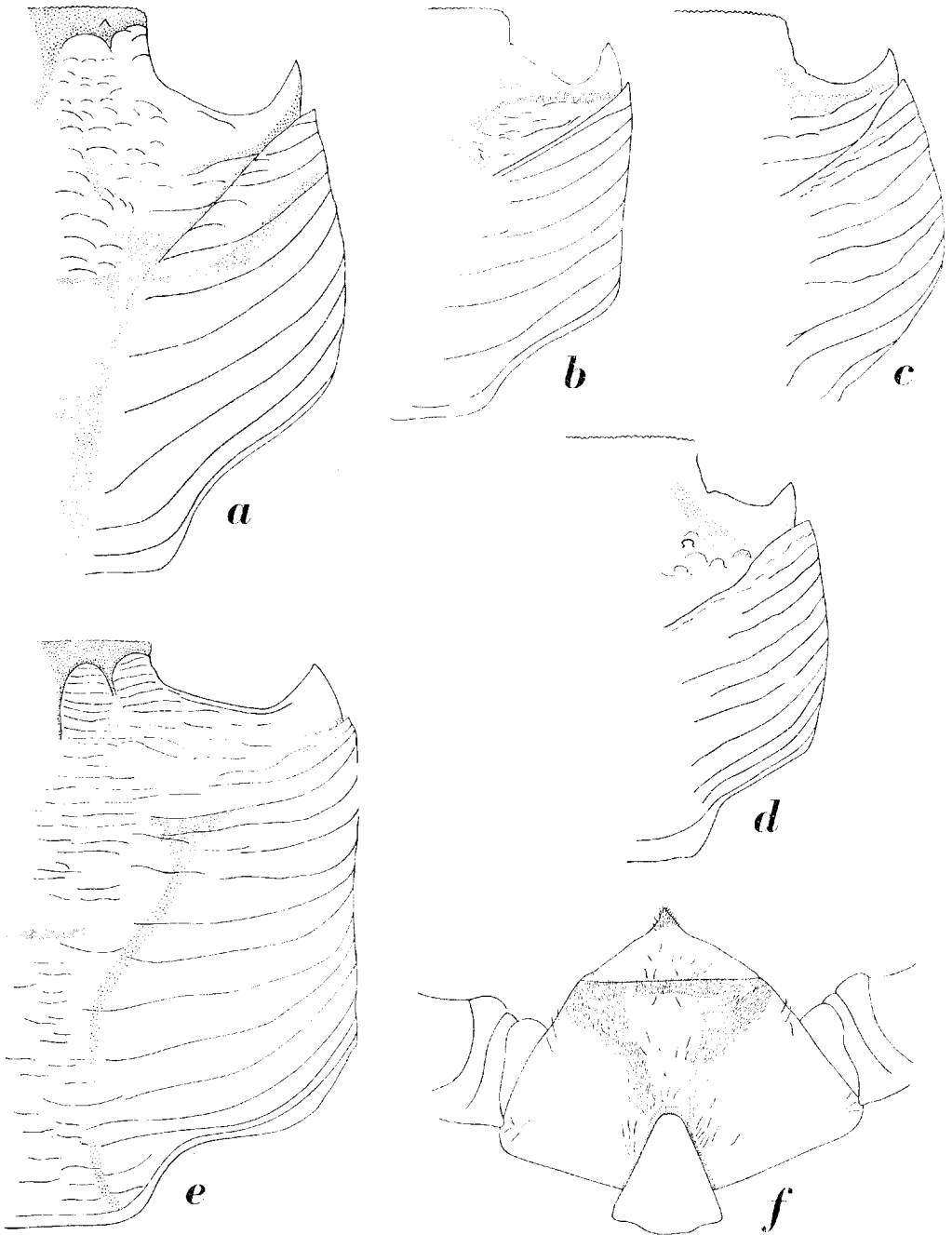


Fig. 1. *a-e*, right half of carapaces in dorsal view, showing the branchial and the hepatic regions; *a*, *Grapsus tenuicrustatus* (Herbst); *b*, *Grapsus longitarsis* Dana; *c*, *Grapsus albolineatus* Lamarck; *d*, *Grapsus intermedius* De Man; *e*, *Geograpsus crinipes* (Dana); *f*, *Geograpsus grayi* (H. Milne Edwards), sternite of the chelipeds.  $\times 3$ .

- Grapsus grapsus tenuicrustatus* Safford, 1905, p. 90.  
*Grapsus maculatus gracilipes* Tesch, 1918, p. 72, pl. 2 fig. 3.  
*Grapsus gracillimus* Sessler, 1923, p. 32, pl. 6 fig. 5.  
*Grapsus tenuicrustatus* De Man, 1920, p. 17.  
*Grapsus maculatus tenuicrustatus* Stephensen, 1945, p. 194, fig. 59A-D.

### Snellius Expedition

- Maratua, reef, August 14-18, 1929; 1 female, cl 43.5 mm, cb 44.5 mm.  
 Ternate, shore, September 25-27, 1929; 1 female, cl 11 mm, cb 12.5 mm.  
 Sissie near Misool, shore or reef, October 6, 1929; 1 male, cl 14.4 mm, cb 16.2 mm.  
 Wotap, Tenimber Islands, October 20-23, 1929; 1 male, cl 55.9 mm, cb 57.1 mm.  
 Batu Ata, shore, March 6, 1930; 1 male, cl 15 mm, cb 17 mm; 4 females, cl 11.4-27.4 mm, cb 13-29.8 mm.  
 Taliabu, Sula Islands, March 18, 1930; 1 male, cl 21 mm, cb 23.9 mm.  
 Letti, October 31, 1930; 1 male, cl 23 mm, cb 25 mm; 1 female, cl 26.9 mm, cb 29.1 mm.  
 Kisar, November 2, 1930; 1 male, cl 32 mm, cb 35 mm.  
 Locality unknown; 1 male, cl 34.7 mm, cb 37 mm; 1 female, cl 28.5 mm, cb 30.5 mm.

### Leiden Museum

- Red Sea, L. W. Ruysenaers; 1 female, cl 48 mm, cb 58 mm (dry preserved specimen).  
 Jidda, Red Sea, J. A. Krøyer; 3 males, cl 42.4-62 mm, cb 45.3-64.4 mm; 3 females, cl 34-50.5 mm, cb 36.2-53 mm.  
 Réunion, F. P. L. Pollen and D. C. van Dam; 2 males, cl 25.8 and 28.5 mm, cb 28.5 and 31.4 mm; 1 female, cl 33 mm, cb 36.5 mm.  
 Pulu Weh, North point of Sumatra, June 25, 1923; 1 male, cl 51 mm, cb 52 mm; 1 female, cl 22.5 mm, cb 25 mm.  
 Pulu Weh, North point of Sumatra, October, 1926, P. Buitendijk; 1 male, cl 11 mm, cb 13 mm (dry preserved specimen).  
 Lasikin, Simatur near Sumatra, April 1913, E. Jacobson; 1 male, cl 27 mm, cb 30 mm; 1 female, cl 35 mm, cb 39 mm (dry preserved specimens).  
 Amboina, E. W. A. Ludeking, 1853; 1 male, cl 35 mm, cb 36.5 mm.  
 Ngarumaoa Island, Raroia Atoll, Tuamotu Islands, August 23, 1952, J. P. E. Morrison; 1 male, cl 24.8 mm, cb 27 mm.  
 South Seas, Museum Godeffroy; 2 females, cl 27 and 44.5 mm, cb 28.5 and 45.7 mm.  
 Locality unknown; 1 male, cl 63.5 mm, cb 65 mm; 1 female, cl 50 mm, cb 53 mm (dry preserved specimens).

### Amsterdam Museum

- Sabang, N. Sumatra, May, 1908; 1 male, cl 29 mm, cb 31 mm.  
 Pulu Berhala, off E. coast of Sumatra; 2 males, cl 40.8 and 58 mm, cb 42 and 60.4 mm.  
 Nusa Kambangan, near S. coast of Java, May 21, 1906; 1 male, cl 21 mm, cb 24 mm.  
 Pontianak, W. coast of Borneo; 1 male, cl 45 mm, cb 47 mm; 1 female, cl 39 mm, cb 41 mm.  
 Aru Islands, W. J. Tissot van Patot; 1 female, cl 40 mm, cb 42 mm.

### British Museum (Natural History)

- Christmas Island, 1908, C. W. Andrews; 1 male, cl 9.5 mm, cb 11.5 mm.

Description. In the adults the carapace is discoidal in shape and slightly depressed. In very young specimens its lateral margins are more or less straight and give it a squarish appearance. The regions of the carapace are more distinctly defined than in the other three Indo-West Pacific species of the genus. The cervical groove is very prominent. The transverse ridges on the branchial region are quite salient and there are no small inter-ridges near the lateral margin. Between the second, the third, and the fourth ridges there are one or two small inter-ridges which originate from the cervical groove. The hepatic region shows no tubercles but possesses some distinct longer and shorter ridges. The post-frontal lobes are rather broad, and are not placed behind the outer two. All these lobes are tuberculate over their surface. The mesogastric region shows several transverse ridges and is well defined. There are also some transverse ridges on the proto-gastric region. The urogastric region is traversed by a deep uninterrupted groove. There is an indistinct demarcation between the cardiac and the intestinal regions. The branchio-cardiac groove is distinct and rather deeply sunken. The intestinal region is longitudinally swollen.

The front is broad, deep, and strongly deflexed. Its surface is rugose and shows two prominent tubercles; in a few specimens these tubercles are lacking or a circle of small tubercles surrounds the prominent one.

The antennular fossa is smaller in comparison to the other three species. The sub-orbital tooth is obtuse, and generally is not keeled.

The epistome is broad and of good length. It bears one interrupted ridge or two short ridges on either side, which are straight and do not touch the upper border of the buccal cavern.

The upper border of the buccal cavern is straight. The palate bears no median prominent ridge, but is provided with a deep and prominent pit in its posterior part.

The lateral margin of the merus of the external maxilliped is rather straight and its antero-external angle is narrowly conical.

The slanting ridge in the pterygostomian region bears black hairs.

In the cheliped the inner border of the ischium and the merus bear strong spines and there are a few spines at the distal end of the outer border of the merus. The external surface of the carpus bears some scattered tubercles and shows some small ridges near its articulation with the merus; the distinctness of these ridges varies in specimens of different size. The inner angle of the carpus possesses a large talon-shaped tooth. The palm is generally provided with two ridges on its external surface. A row of tubercles runs parallel with the median ridge, distally it curves downwards and touches the ridge. In a few specimens some inter-ridges are visible between this

row and the ridge. The lower ridge is prominent, it is longer and extends to the tip of the fixed finger. The finger tip is broad and rounded and of a white colour.

The length of the walking legs is variable. Generally the first pair is shortest and the third longest, but this arrangement is not constant. The upper portion of the coxa of the third walking leg bears an erect pyramid-like tooth. The transverse ridges on the posterior surface of the merus are more marked than those of *Grapsus albolineatus*. There is no serration at the inferior distal angle of the merus of the last pair of walking legs, though in very large specimens an indication of a serration may be present. The upper distal angle of the merus of the four walking legs terminates in a triangle, which is rather more prominent than in the other three species. There are two diverging ridges on the external surface of the carpus. The upper half of the lower surface of this joint possesses some marked transverse ridges. The propodus and the dactylus of each walking leg bear several rows of strong spines, generally one row at the inner side of the upper margin, one row at the lower margin, and one or two rows on its anterior surface; but the numbers are variable in specimens of different size. Especially in large specimens there are some long hairs in the spaces between the spines. The upper portion of the propodus of each walking leg shows a hairy ridge, which extends over the entire length of the joint; in some specimens this ridge is lacking. The tip of the dactylus is spiny.

In the male the sixth abdominal segment is about twice as long as the fifth. The male pleopod is slender and straight with the base narrower than in *G. albolineatus*.

Colour. In spirit specimens some have the carapace and the legs brownish white with brick red patches. The under side of the body is white or pinkish white with a slight reddish tinge in the area of the mouth parts. In others the carapace and the legs are dark olive with white patches and dots, the under side is white. The carpus and palm of the cheliped in all specimens are of a reddish colour, the finger tips are white. In life the carapace is red or dark olive with scattered patches of white dots, the legs are reddish above, and greenish white below; the under side is bluish white with a reddish tinge in the area of the mouth parts, and the palm of the cheliped externally is of a deep blood colour with white finger tips (Stimpson, 1907; Holthuis, 1953).

Habitat. This species is found on rocks between the tide marks along the seaward reef and on stony or pebbly beaches (Whitelegge, 1897; Stimpson, 1907; Sewell, 1913; Tweedie, 1950; Holthuis, 1953).

Distribution. *G. tenuicrustatus* is widely distributed throughout the Indo-

West Pacific region from the Red Sea and the east coast of Africa to Japan, Australia, the Polynesian Islands and Hawaii. Stephensen (1945) remarks that this species is not known from the Persian Gulf.

There is some doubt whether this species actually occurs in New-Zealand (Chilton and Bennett, 1928).

Remarks. Most of the previous authors were of the opinion that *Grapsus grapsus* (L.) is a widely distributed species, occurring both in the Indo-West Pacific, the East Pacific, and the Atlantic regions. Then Kingsley (1880) and Rathbun (1906) first regarded the Indo-West Pacific form as a subspecies of the West American and the Atlantic form. After having examined a large number of specimens from the three regions I agree with Kingsley (1880) and Rathbun (1906) that the Indo-West Pacific form possesses some constant differences from the specimens of the other two regions. The differences between the two forms are such that in my opinion they should be treated as distinct species, as has already been done by De Man (1929), Ward (1942), and Holthuis (1953). The correct name for the Indo-West Pacific species is *Grapsus tenuicrustatus* (Herbst, 1783). The name *Grapsus grapsus* (Linnaeus, 1758) must be used for the Atlantic and the West American form. The following differences as observed by Dr. L. B. Holthuis (in litt.) are given below:

1. The front in *Grapsus tenuicrustatus* is deeper, being generally less than twice as wide as long, only in juveniles it is sometimes more than twice as wide as long. In *Grapsus grapsus* the front is shallower, being more than twice as wide as deep, in very large specimens it sometimes is twice as wide as deep.

2. In *Grapsus tenuicrustatus* there are always one to three short additional ridges near the lateral margin between the posterior transverse ridge, which is partly confluent with the lateral margin of the carapace and the transverse ridge, which lies just before it. In *Grapsus grapsus* there is no ridge there or very seldom a single very short ridge.

3. The upper surface of the postero-lateral part of the carapace in *G. grapsus* is much smoother than in *G. tenuicrustatus*. The postero-lateral part of the surface in *G. grapsus* shows a large number of longitudinal ridges, which are broad and separated by shallow grooves. In *G. tenuicrustatus* the ridges are higher and the grooves are deeper, whereby the carapace acquires a distinctly wrinkled appearance.

4. In *G. grapsus* the antero-lateral part of the epistome bears a single uninterrupted ridge, which runs parallel to the anterior margin of the epistome or even converges with it towards the median line (fig. 2 b). In *G. tenuicrustatus* there are two short (or one interrupted) ridges there, the

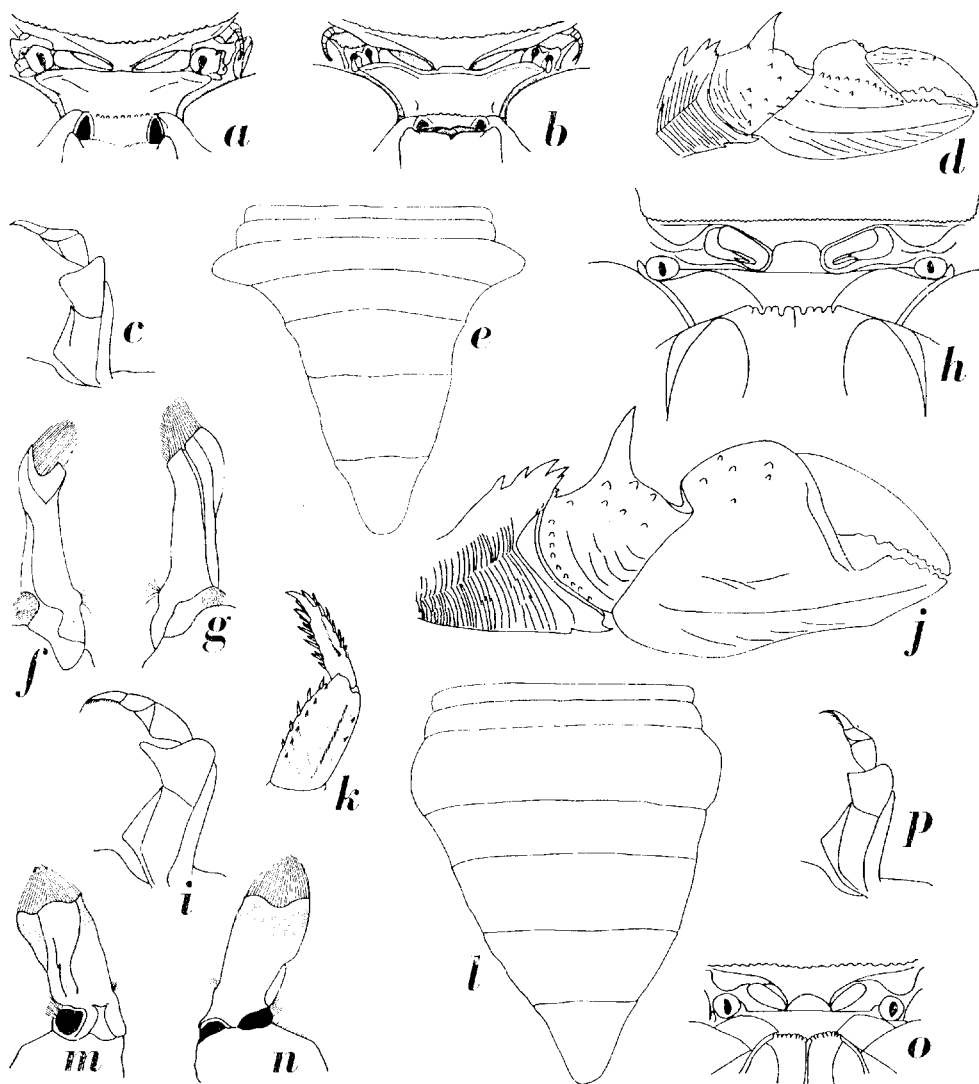


Fig. 2. *a, c-g, Grapsus tenuicrustatus* (Herbst); *a*, epistome; *c*, external maxilliped; *d*, cheliped; *e*, male abdomen; *f*, left male pleopod, dorsal view; *g*, the same, ventral view. *b, Grapsus grapsus* (Linnaeus), epistome. *h-n, Grapsus longitarsis* Dana; *h*, epistome and palate; *i*, external maxilliped; *j*, cheliped; *k*, dactylus of the first walking leg; *l*, male abdomen; *m*, left male pleopod, dorsal view; *n*, the same, ventral view. *o, p, Grapsus albolineatus* Lamarek; *o*, epistome and palate; *p*, external maxilliped. *a, b*,  $\times 2$ ; *c-j, l-p*,  $\times 3$ ; *k*,  $\times 2\frac{1}{3}$ .

inner of which diverges from the anterior margin of the epistome towards the middle (fig. 2a). This inner ridge sometimes is more or less parallel to the anterior margin, but then it is separated from this margin by a distance, which is much larger than in *G. grapsus*. This character proves to be valuable and constant to distinguish the two species.

5. Rathbun (1906) mentions a difference in the spine of the carpus of the cheliped. In *G. grapsus* this spine is broad and ends in a sharp point, in *G. tenuicrustatus* the spine is narrow, ending in a long spine. This character is somewhat variable, but on the whole the spine is distinctly more slender in *G. tenuicrustatus* than in *G. grapsus*.

6. Sakai (1939) states that the merus of the ambulatory legs is much narrower and longer in *G. tenuicrustatus* than in *G. grapsus*, and that in *G. tenuicrustatus* the last pair of legs is distinctly longer than the first, while these two pairs are sub-equal in *G. grapsus*. I can not confirm Sakai's observation. I did not find that specimens of *G. tenuicrustatus* have the legs slenderer than those of *G. grapsus*, while on the whole in my *tenuicrustatus* material the last walking leg is shorter compared to the first than in my *Grapsus grapsus* material.

Several authors regard *Grapsus gracilipes* H. Milne Edwards as a separate species, but after very detailed examination of my specimens of *G. gracilipes* and comparison with *Grapsus tenuicrustatus* I can not accept their views. According to H. Milne Edwards (1853), De Man (1883; 1902; 1929) and Tesch (1918) *G. gracilipes* differs from *G. tenuicrustatus* by having the walking legs more slender. De Man (1929) moreover mentioned that in *G. gracilipes* the protogastric lobules of the carapace are little prominent, which renders the frontal margin oblique instead of vertical.

I have measured the length and breadth of the propodus of all my material of *G. tenuicrustatus* and of my three specimens of *G. gracilipes*. In the one from Amboina, the carapace length is 35 mm, the length of the propodus of the last pair of walking legs is 19 mm and its breadth is 4.2 mm. A specimen of *G. tenuicrustatus* in the Snellius material, of about the same size (carapace length 34.7 mm) has the legs far less slender (length of propodus 14 mm, breadth 4.2 mm).

The ratio between the length and breadth of the propodus in the Amboina specimen of *G. gracilipes* thus is 4.5, while in the specimen of *G. tenuicrustatus* it is 3.3. But in my material of *G. tenuicrustatus* this ratio appears to be strongly variable. As shown in the table below the variability of the ratio is correlated in a larger or smaller degree with the size of the specimens, in the smaller specimens the walking legs being more slender.

Tesch (1918) also concludes that the length of the propodus of the last pair of walking legs varies individually in *G. gracilipes*.

Table showing the ratio of the length and breadth of the propodus of the last pair of walking legs of *G. tenuicrustatus* and *G. gracilipes* along with their localities and sex.

Locality	Sex	Carapace length in mm	Ratio = Length/breadth of the propodus of the last pair of walking legs.
<i>G. tenuicrustatus</i>			
Ternate	female	11.0	5.75
Batu Ata	female	11.4	5.00
Batu Ata	female	12.0	4.93
Batu Ata	female	13.5	4.55
Sissie	male	13.5	4.55
Batu Ata	male	15.0	4.70
Letti	male	23.0	3.68
Batu Ata	female	24.4	4.18
Ngarumaoa Atoll	male	24.8	4.31
Letti	female	26.0	3.68
South Seas	female	27.0	4.31
Locality unknown	male	28.5	3.33
Réunion	male	28.5	3.75
Kisser	male	32.7	3.94
Réunion	female	33.0	3.26
Jidda	female	34.0	3.50
Locality unknown	female	34.7	3.56
Jidda	male	42.4	3.41
Maratua	female	43.5	3.81
Jidda	female	43.9	3.33
South Sea	female	44.5	3.35
Jidda	female	50.5	3.60
Jidda	male	56.4	3.38
<i>G. gracilipes</i>			
Pulu Berhale	male	40.8	4.0
Pulu Berhala	male	58.0	3.5
Amboina	male	35.0	4.5

Apart from the slenderness of the walking legs the general appearance of *G. gracilipes* is exactly similar to that of *G. tenuicrustatus*. Both show all the essential features mentioned in the description of *G. tenuicrustatus* given above.

H. Milne Edwards (1853) noted that in *G. gracilipes* the frontal region is oblique, but in my specimens it is vertical. I have observed that in small



juvenile specimens of *G. tenuicrustatus* the front remains oblique and less deep but as the specimens grow in size, the front becomes more deep and simultaneously more vertical.

Sendler (1923) in his description of *G. gracilipes* mentioned that the eye stalks are longer than the orbits. In my material I do not find any noticeable difference in the length of the eye stalk, and I can not consider this a good character to distinguish *G. gracilipes* from *G. tenuicrustatus*.

De Man (1929) furthermore stated that small teeth on the merus of the last walking leg in *G. gracilipes* appear at an earlier age than in *G. tenuicrustatus*, but some very small specimens of my material of *G. tenuicrustatus* already possess these small teeth. Furthermore I do not agree with De Man's statement that the length of the penultimate segment of the male abdomen of *G. gracilipes* is slightly broader than that of *G. tenuicrustatus*. In my material of *G. gracilipes* this length is exactly similar to that of the specimens of *G. tenuicrustatus* of the same size.

A thorough examination of all material of *G. tenuicrustatus* and *G. gracilipes* led me to the conclusion that it is necessary to consider *G. gracilipes* and *G. tenuicrustatus* one single species.

II. Milne Edwards (1853) considered *Grapsus hirtus* Randall a synonym of *Grapsus rudis* H. Milne Edwards. Later on Kingsley (1880) and Rathbun (1906) examined Randall's type specimen of *G. hirtus*, and remarked that this species belongs to *G. tenuicrustatus*.

II. Milne Edwards (1853) in his short description of *G. rudis* mentioned the characters (the front broader and more arched, the gastric region more rugose, and the oblique ridge in the branchial region furnished with short stiff hairs, sub-denticulate inferior external angle of the merus of the last pair of walking legs) which are characteristic of *G. tenuicrustatus*. Since his specimen is from Hawaii there can be little doubt about its conspecificity with *G. tenuicrustatus* as stated by Rathbun (1906).

Regarding *Grapsus pharaonis* the few characters mentioned by II. Milne Edwards (1853) (the meri of the last legs have rounded inferior external angles, the propodus is very much elongated, and the external protogastric lobule is less elevated) occur in *G. tenuicrustatus*. Furthermore he also mentioned that the species *pharaonis* is very near to *G. rudis*. The fact that the propodus of *G. pharaonis* is very much elongated can not be considered an important character since, as stated above, the length of the propodus of the walking legs of *G. tenuicrustatus* does not remain constant, and especially in the small specimens the walking legs are slender. Therefore *G. pharaonis* and *G. tenuicrustatus* are considered the same species.

Stephensen (1945) showed in his figure 59 A that the male pleopod of *G.*

*tenuicrustatus* is curved in the middle. In my material this pleopod is straight and not curved. It is interesting to note that the pleopod figured by Stephensen rather closely resembles that of *Grapsus albolineatus* of my material.

### **Grapsus longitarsis** Dana (Figs. 1 b, 2 h-i)

*Grapsus longitarsis* Dana, 1851, p. 249.

*Grapsus subquadratus* Stimpson, 1858, p. 103.

*Orthograpsus longitarsis* Kingsley, 1880, p. 195.

*Grapsus strigosus longitarsis* Rathbun, 1906, p. 838, fig. 4.

*Grapsus longitarsis somalicus* Maccagno, 1930, p. 1.

#### Leiden Museum

Onotao Atoll, Gilbert Islands, July-August, 1951, A. H. Banner; 1 female, cl 19 mm, cb 21.5 mm.

Ngarumaoa Island, Raroia Atoll, Tuamotu Islands, August 23, 1952, P. E. Morrison; 2 males, cl 26 and 27.1 mm, cb 28.5 and 30.7 mm; 1 female, cl 19 mm, cb 21.5 mm.

#### British Museum (Natural History)

Society Islands, B. Grey; 1 male, cl 25 mm, cb 28 mm.

Description. The carapace is sub-quadrate in shape with its lateral margins not arched but rather straight. Its surface is naked and has the regions moderately marked. The protogastric region is clearly distinguishable. The cervical groove is prominent up to the mesogastric region but fades out later. The branchio-cardiac groove is ill-defined. The branchial ridges are prominent and rather strongly curved near the margin of the carapace. There are no small ridges in the anteriormost portion of the branchial region. The first ridge next to the cervical groove is of the same length as that of this groove and runs parallel to it. There are no interridges and the space between the ridges is smooth. The transverse sunken portion in the branchial region is not very prominent. A distinct groove runs from below the external orbital angle to the outer border of the mesogastric region, it is placed before the cervical groove. The whole epigastric and the upper half of the mesogastric region are provided with small transverse ridges. The four post-frontal lobes are placed in a straight line and are tuberculate; the tubercles are smaller than in *Grapsus albolineatus*. There is a row of small tubercles in the sunken groove between the two median post-frontal lobes.

The front is broader than in *Grapsus tenuicrustatus* and *G. albolineatus*; its sides are less arcuate. It is narrow and has its surface homogeneously tuberculate. In the two male specimens of Ngarumaoa Island it shows a pair

of prominent tubercles, in one specimen each tubercle is surrounded by a circle of tubercles.

The inter-antennular septum is smooth. The antennular fossa is wider than in *G. albolineatus*. The sub-orbital tooth is acute or sub-acute. The small conical portion of the suborbital border near the notch next to the external orbital angle is slightly greater than in *G. albolineatus*.

The epistome is smooth in the middle portion. It shows a transverse depression in the middle. The two elevated ridges placed on either side of the epistome are strongly curved and touch the upper border of the buccal cavern.

The upper border of the buccal cavern is straight and vertically projecting; the shape of its teeth differs from that found in *G. albolineatus*, being more or less molar-like. The antero-lateral corner of the buccal cavern is rounded and slightly produced inwards. The palate is slightly broader than in *G. albolineatus* and its anterior portion near the median ridge is elevated whereas in that species it is deeply concave.

The antero-external angle of the merus of the external maxiliped is broadly rounded while its antero-internal angle is greatly produced. The ridge on the ischium next to the rhomboidal gap remains prominent to its end.

In the cheliped the inner angle of the merus is strongly produced to a distinctly serrated flattened process. The external surface of the carpus possesses a few scattered tubercles of equal size. Its inner tooth is strongly spiniform, long and slender. The external surface of the palm is smooth though it has ridges of which the lower is rather prominent and longer than the upper, which is short, ill-defined and interrupted in some specimens. The lower longer ridge reaches to the fixed finger. The fingers are less distinctly spoon-tipped than in *G. tenuicrustatus* and *G. albolineatus*. The tips are coloured. There is a deep sunken portion at the base of the fixed finger near the articulation of the dactylus.

The four pairs of walking legs are more slender than in *G. albolineatus*. In between the coxae of the second and third walking legs there is a fringe of closely placed hairs; this is less distinct than in *G. intermedius*. The merus of the first three pairs of walking legs has its lower distal extremity strongly serrated while in the last pair the serration of that region is indistinct; in some specimens it is absent. In the posterior part of the distal margin of the propodus of the first walking leg there is no or only one strongly reduced ventral tooth. The dactyli of all the walking legs as a whole are longer than in *G. albolineatus*.

The shape of the male abdomen differs from that of *G. albolineatus*. It is rather more equilaterally triangular than that of the other three species.

The sixth abdominal segment is equal to or slightly shorter than the fifth. The abdomen of the adult female is much broader than long and covers the base of the coxae of the walking legs. The male pleopod is straight and very stout in comparison with the other three species. It is provided with a large hairy tip.

Colour. In spirit specimens the carapace and the walking legs are mottled with numerous sharply defined reddish brown or chestnut brown spots and patches, the patches are arranged symmetrically along the branchial ridges. They are much broader and deeply coloured in the pterygostomian and sub-orbital regions, in the elevated portion of the epistome, and in the first three sternites behind the buccal cavern. The rest of the under surface of the body is white. The finger tips of the chelipeds are dark brown. There is a bluish band round the anterior portion of the male pleopod.

Habitat. This crab occurs under stones below tide marks and in the reef flats near the shore. It is very active at night (Stimpson, 1907; Holthuis, 1953).

Distribution. This species is distributed in the Indo-West Pacific region from the East coast of Africa to the Tuamotu and the Hawaiian Islands.

Remarks. Stimpson's figure (1907, pl. 16 fig. 4) of *Grapsus subquadratus* very closely agrees with my specimen of *G. longitarsis*. Rathbun considered this species a synonym of *G. longitarsis* and I fully agree with her in this respect.

The *Grapsus* sp. of Pesta (1911) probably belongs to *G. longitarsis* as already suggested by himself. The mouth parts as figured by Pesta closely resemble those of *G. longitarsis*. Especially the shape of the inner angle of the merus of the external maxilliped, which is greatly produced, and the outer angle of the merus, which is broadly rounded, characters which are typical of *G. longitarsis*, show Pesta's animal to belong to that species. Pesta states that his *Grapsus* sp. agrees with Stimpson's (1907) description of *G. subquadratus* but the inner edge spine of the carpus of the cheliped is not so long as in Stimpson's figure. In my opinion this difference falls within the range of variability of the species and it is not sufficient to distinguish two forms.

Maccagno (1930) described *G. longitarsis somalicus*, as a new variety of *G. longitarsis*, but her description agrees closely to my *G. longitarsis* specimens. The differences between the typical *G. longitarsis* and the var. *somalicus* as pointed out by Maccagno are not very clear. The lateral margins of the carapace in my specimens of *G. longitarsis* are distinctly straight and the width of the front, measured at the base near the beginning of the supra-orbital margin, is as great as the length of the posterior margin

of the carapace; the fingers in general are more pointed than in *Grapsus tenuicrustatus* and *Grapsus albolineatus*. Furthermore Maccagno remarked that the fingers of *G. longitarsis somalicus* are longer than those of *G. longitarsis* but in my opinion this is not a good character since the length of the fingers proves to be quite variable within the species. The colour described by Maccagno as a differentiating character is similar to the colour of my specimens. Therefore I can not but consider the variety a synonym of *G. longitarsis* Dana.

**Grapsus albolineatus** Lamarck (Figs. 1 c, 2 o, p, 3 a, f)

- Cancer strigosus* Herbst, 1799, p. 55, pl. 47 fig. 1 (not *Cancer strigosus* Linnaeus, 1761).  
*Grapsus albo-lineatus* Lamarck, 1818, p. 249.  
*Grapsus strigosus* Bosc, 1801-1802, p. 203.  
*Grapsus* (*Goniopsis*) *strigosa* De Haan, 1833, p. 33, pl. D.  
*Grapsus* (*Goniopsis*) *flavipes* McLeay, 1838, p. 66.  
*Grapsus granulatus* H. Milne Edwards, 1853, p. 169.  
*Grapsus Peroni* H. Milne Edwards, 1853, p. 169.  
*Grapsus longipes* Stimpson, 1858, p. 102.

Snellius Expedition

- Pulu Pisang Ketjil near Padang, shore, May, 1929; 1 male, cl 15.8 mm, cb 17.2 mm.  
Mamudju, Celebes, shore or reef, August 4-5, 1929; 1 female, cl 35 mm, cb 38.5 mm.  
Maratua, reef, August 14-18, 1929; 1 male, cl 21.9 mm, cb 27 mm; 1 female, cl 28.5 mm, cb 31.2 mm.  
Paleleh, Celebes, shore, August 21-22, 1929; 1 male, cl 19.5 mm, cb 21.8 mm; 3 females, cl 17.5-30 mm, cb 19.1-32 mm.  
Sipankot near Sibutu, Sulu Islands, shore, September 10-14, 1929; 1 female, cl 20 mm, cb 23 mm.  
Kafal near Misool, shore or reef, October 3-5, 1929, 4 males, cl 15.5-23.5 mm, cb 17.9-25.4 mm; 4 females, cl 8-24 mm, cb 9.1-27 mm.  
Pelee near Misool, shore, October 4, 1929; 2 females, cl 16.8 and 24 mm, cb 18.8 and 26.9 mm.  
Waaf near Misool, shore, October 5, 1929; 2 males, cl 33 and 34.9 mm, cb 36 and 36 mm; 2 females, cl 35 and 39.5 mm, cb 39 and 42.2 mm.  
Sissie near Misool, shore or reef, October 6, 1929; 3 males, cl 9-27.8 mm, cb 10.2-31.2 mm.  
Manumbai, Aru Islands, shore, October 11-14, 1929; 3 males, 14.1-38 mm, cb 16-41 mm.  
Kambang near Timor, reef or shore, November 26-28, 1929; 10 males, cl 13-30 mm, cb 15-32 mm; 7 females, cl 15-20.2 mm, cb 17.2-23 mm.  
Semau near Timor, shore, November 27, 1929; 1 female, cl 33 mm, cb 36 mm.  
Near Kupang, Timor, reef, December 8, 1929; 1 male, cl 33.8 mm, cb 38.2 mm.  
Peiokan, Postiljon Islands, shore or reef, December 20, 1929; 1 female, cl 40 mm, cb 45 mm.  
Sambardjaga, Postiljon Islands, shore or reef, December 21, 1929; 1 female, cl 21 mm, cb 25 mm.  
Samaloua near Makassar, shore, February 3, 1930; 1 female, cl 36 mm, cb 38 mm.  
Kudingareng Lompo ("Groot Herteebest") near Makassar, February 3, 1930; 3 males, cl 10-29 mm, cb 11-31 mm; 4 females, cl 11-23 mm, cb 12.5-21 mm.

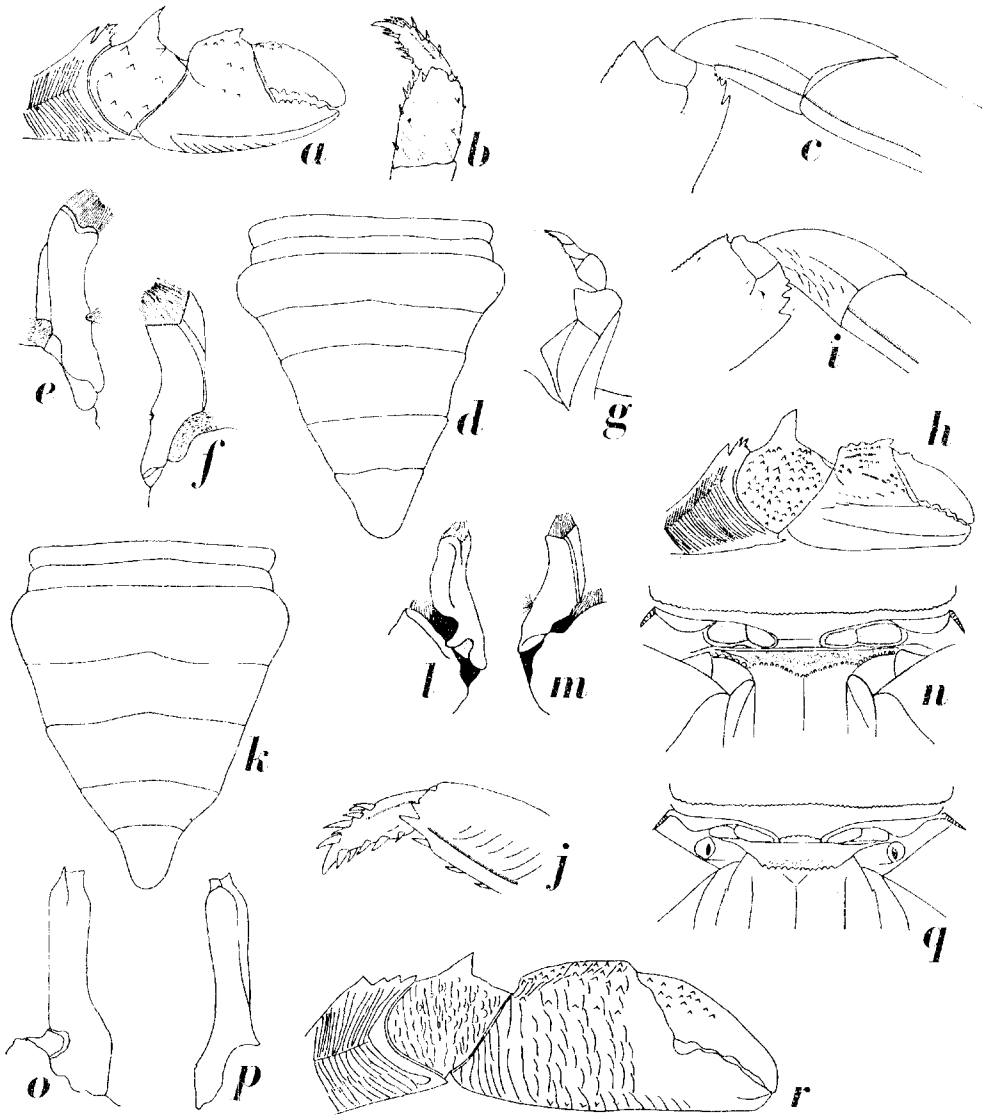


Fig. 3. *a-f*, *Grapsus albolineatus* Lamarek; *a*, cheliped; *b*, dactylus of the first walking leg; *c*, merus joint and carpus of the first walking leg; *d*, male abdomen; *e*, left male pleopod, dorsal view; *f*, the same, ventral view. *g-m*, *Grapsus intermedius* De Man; *g*, external maxilliped; *h*, cheliped; *i*, merus joint and carpus of the last walking leg; *j*, dactylus of the last walking leg; *k*, male abdomen; *l*, left male pleopod, dorsal view; *m*, the same, ventral view. *n-f*, *Geograpsus grayi* (H. Milne Edwards); *n*, epistome and palate; *o*, left male pleopod, hairs removed, dorsal view; *p*, the same, ventral view. *q, r*, *Geograpsus crinipes* (Dana); *q*, epistome and palate; *r*, cheliped. *a, c-r*  $\times 3$ ; *b*,  $\times 2\frac{1}{2}$ .

Aloang, Paternoster Islands, February 8, 1930; 6 males, cl 17-45 mm, cb 19.1-49.0 mm; 9 females, cl 17.5-40 mm, cb 19.1-43 mm.

Tanah Djampca, shore or reef, February 21-22, 1930; 1 male, cl 31 mm, cb 34 mm; 1 female, cl 18.5 mm, cb 21 mm.

Gonto Sua near Makassar, shore, March 1, 1930; 2 males, cl 17-23 mm, cb 18.5-26 mm; 2 females, cl 32.2 and 32.5 mm, cb 34.4 and 34.8 mm.

Taliabu, Sula Islands, shore, March 18, 1930; 3 females, cl 15-36 mm, cb 17-38 mm.

Obi Latu, shore or reef, April 23-27, 1930; 1 female, cl 23.4 mm, cb 25.5 mm (damaged).

Haruku, shore or reef, May 3-7, 1930; 1 male, cl 33 mm, cb 35.5 mm; 6 females, cl 14.5-43 mm, cb 17-46.8 mm; 2 hermaphrodites, cl 14.8 and 16 mm, cb 16.5 and 18 mm.

Ake Selaka, Kau Bay, Halmahera, shore or reef, May 28, 1930; 2 males, cl 26.5 and 27 mm, cb 29 and 31 mm; 1 female, cl 40 mm, cb 43 mm.

Morotai, June 3-10, 1930; 5 males, cl 23.5-44 mm, cb 26.1-47 mm; 5 females, cl 17-30 mm, cb 19.5-37.4 mm; 2 damaged specimens, cl 18 and 31.2 mm, cb 20.2 and 34 mm.

Flores, August 18-19, 1930; 1 male, cl 21 mm, cb 24 mm.

Kaledupa, August 27, 1930; 3 males, cl 12-15 mm, cb 14-17 mm; 2 females, cl 11 and 14 mm, cb 13.5 and 16 mm.

Island near Menado, September 25, 1930; 1 male, cl 29 mm, cb 32 mm.

Morotai, October 1, 1930; 14 males, cl 19-35 mm, cb 21.5-37.2 mm; 16 females, cl 12.8-32.1 mm, cb 14.2-36.1 mm.

Rumoh Tiga, Amboina, October 17, 1930; 1 female, cl 27 mm, cb 28 mm.

Ende, Flores, November 6-8, 1930; 1 male, cl 21.5 mm, cb 23.5 mm.

Locality unknown; 1 male, cl 29 mm, cb 31.7 mm; 4 females, cl 21-34 mm, cb 23-37 mm.

### Leiden Museum

Red Sea, R. Kossmann; 1 female, cl 56 mm, cb 60 mm.

Red Sea, L. W. Ruysenaers; 1 male, cl 59 mm, cb 66 mm (dry preserved specimen).

Red Sea and Java; 2 males, cl 27 and 32 mm, cb 30 and 35 mm; 1 female, cl 51 mm, cb 53 mm (dry preserved specimens).

Durban, November 10-11, 1938; 1 male, cl 17 mm, cb 19 mm; 1 female, cl 11 mm, cb 13 mm.

Reunion Rocks, S.E. coast of South Africa, October 28, 1938, L. D. Brongersma; 1 female, cl 30 mm, cb 35 mm.

Indian Ocean, C. G. C. Reinwardt; 2 females, cl 22.5 and 36 mm, cb 26 and 40 mm.

Indian Ocean; 3 males, cl 34-40 mm, cb 37-44 mm; 6 females, cl 37-44 mm, cb 41-48 mm (dry preserved specimens).

Pulu Weh, N. point of Sumatra, June 25, 1923; 2 males, cl 27 and 51 mm, cb 29 and 52 mm; 1 female, cl 22.5 mm, cb 25 mm.

Pulu Weh, N. point of Sumatra, June, 1929, P. Buitendijk; 1 male, cl 26.2 mm, cb 28 mm.

Lasikin, Simalur near Sumatra, June, 1913, E. Jacobson; 3 females, cl 22-45 mm, cb 25-49 mm (dry preserved specimens).

Simalur near Sumatra, 1913, E. Jacobson; 3 males, cl 36-43 mm, cb 39-47 mm; 1 female, cl 42 mm, cb 47 mm (dry preserved specimens).

Labuan Badjan, Simalur near Sumatra, June, 1913, E. Jacobson; 2 males, cl 17.5 and 22.5 mm, cb 19.5 and 28 mm.

Padang, Sumatra; 3 males, cl 39-48 mm, cb 41-53.5 mm; 4 females, cl 31-44 mm, cb 33-47 mm.

Near Tandjong Priok, N. coast of Java, 1906, P. Buitendijk; 3 males, cl 22-31.5 mm, cb 21-37 mm; 1 female, cl 45.5 mm, cb 48.1 mm.

S. coast of Madura, January, 1917, February, 1921, P. Buitendijk; 1 male, cl 37 mm, cb 39 mm, 2 damaged specimens, one of which is a female, measurements not possible. Java; 3 males, cl 30-57 mm, cb 33-62 mm; 6 females, cl 18-42 mm, cb 20-45 mm (dry preserved specimens).

Pontianak, W. coast of Borneo; 1 male, cl 38 mm, cb 41 mm.

Makassar, Celebes, D. M. Piller; 2 females, cl 29 and 31 mm, cb 31 and 35 mm.

Amboina, J. F. Teysman; 1 female, cl 40 mm, cb 52 mm.

Amboina, 1864, E. W. A. Ludeking; 1 female, cl 30 mm, cb 31.5 mm.

Haruku, 1865, D. J. Hoedt; 2 females, cl 27 and 33.5 mm, cb 31 and 36 mm.

Pacific Ocean, Museum Godeffroy; 2 males, cl 14 and 15 mm, cb 17 and 17.8 mm.

Locality unknown, 1863, E. W. A. Ludeking; 1 female, cl 40 mm, cb 42 mm.

### Amsterdam Museum

Zanzibar, August, 1952; 1 female, cl 15 mm, cb 17 mm (dry preserved specimen).

Sabang, N. Sumatra, May, 1908; 1 female, cl 28 mm, cb 30 mm.

Nias near Sumatra, J. P. Kleiweg de Zwaan; 5 females, cl 10-36 mm, cb 12-39.5 mm.

Sumba or Sundaalwood Island; 1 male, cl 25.5 mm, cb 27.1 mm.

Aru Islands, W. J. Tissot van Patot; 2 males, cl 32 and 38 mm, cb 34 and 40.5 mm; 2 females, cl 34 and 35.5 mm, cb 37 and 39 mm.

Hollandia, Netherlands New Guinea, 1910-11; 1 female, cl 29 mm, cb 31 mm.

Siboga Exp., Sta. 19, Labuan Tring, W. coast of Lombok; 1 male, cl 8 mm, cb 10 mm.

Siboga Exp., Sta. 277, Damar Island, Banda Sea; 1 male, cl 8 mm, cb 10 mm.

### British Museum (Natural History)

Aqaba, Trans Jordan; 2 males, cl 14 and 17 mm, cb 15 and 20 mm; 1 female, cl 13 mm, cb 15 mm.

Gulf of Suez, R. MacAndrew; 1 male, cl 64.9 mm, cb 71 mm; 1 female, cl 52.3 mm, cb 57 mm.

Socotra, I. B. Balfour; 1 male, cl 58 mm, cb 64 mm.

Nairobi, E. Africa, H. Copley; 1 female, cl 16 mm, cb 18 mm.

Kosi Bay, Zanzibar, Natal Govt. Museum; 1 male, cl 28 mm, cb 31 mm.

Mozambique, R. Coppinger, H. M. S. "Alert"; 1 male, cl 21 mm, cb 23 mm.

Karachi, Karachi Museum; 1 male, cl 34.5 mm, cb 36 mm; 1 female, cl 43.5 mm, cb 46.5 mm.

Pamban, S. India, E. Thurston; 2 males, cl 42.1 and 49 mm, cb 45.5 and 53 mm.

Cocos-Keeling Islands, Indian Ocean, J. Grant; 3 males, cl 28-30 mm, cb 31-31.5 mm; 2 females, cl 37 and 39 mm, cb 37 and 41.5 mm.

Singapore, F. P. Bedford and W. F. Lanchester; 2 males, cl 36 and 49.5 mm, cb 38 and 51 mm; 1 female, cl 45 mm, cb 47 mm.

Chungchow, Hongkong, C. J. Shen; 1 female, cl 40 mm, cb 45 mm.

Timor Laut (Tenimber Islands), H. O. Forbes; 1 male, cl 45 mm, cb 47 mm.

Aru Islands, H. M. S. "Challenger"; 1 female, cl 20 mm, cb 22 mm.

Duke of York Island, Bismarck Archipelago, G. Brown; 1 male, cl 46.5 mm, cb 50 mm; 1 female, cl 41 mm, cb 42 mm.

Samoa, S. J. Whitmer; 1 female, cl 27 mm, cb 30 mm.

N. W. Australia, B. Grey; 2 females, cl 40.5 and 41 mm, cb 43 and 47 mm.



Description. The carapace, as in *Grapsus tenuicrustatus*, is discoidal in shape and depressed. Its lateral margins are strongly arched but in very small specimens they are more or less straight. The regions of the carapace are well defined. The cervical groove is rather more prominent than in *Grapsus longitarsis* and *G. intermedius* but less so than in *G. tenuicrustatus*. The branchial region possesses obliquely transverse ridges. In the anterior-most portion of the branchial region there are one to three or four small ridges just next to the cervical groove. There are some inter-ridges between the long ridges. The upper portion of the branchial region shows a transverse sunken region. The protogastric and the mesogastric regions are not clearly marked. In large specimens the demarcation between the cardiac and the intestinal regions is very vague and in small specimens it even is absolutely invisible. The branchio-cardiac groove is indistinct. The cardiac and the intestinal regions are not swollen. The four post-frontal lobes are placed in a single straight line and a little behind these there is a row of tubercles of similar size, which are also placed in a single straight line. These lobes are strongly tuberculate. The ridges on the mesogastric region are less distinctly marked than in *G. tenuicrustatus*. The carapace of a male from Pulu Pisang Ketjil near Padang is naked and not rugose but is smooth between the ridges. Since this specimen in its other characters is a typical *G. albolineatus*, this difference obviously is due to individual variation or presents an abnormality.

The front is less deflexed and less deep than in *G. tenuicrustatus*. Its surface is tuberculate; more marked in large than in small specimens. The two prominent tubercles shown on the front in *G. tenuicrustatus* are lacking here, but in some specimens two, three, or four tubercles are placed in bilaterally symmetrical position.

The inter-antennular septum is rugose. The sub-orbital tooth is acute and keeled. The small conical portion of the suborbital border near the notch next to the external orbital angle is serrated. A male specimen from Ende (Flores) differs from all other specimens in showing no notch in the sub-orbital border next to the external orbital angle but in other characters it is a typical *G. albolineatus*.

The epistome is shorter than in *G. tenuicrustatus*. It is rugose and has two ridges, which are curved and touch the upper border of the buccal cavern.

The upper border of the buccal cavern is *∩*-shaped and is not vertically raised as in *G. longitarsis*. The palate is provided with a prominent median ridge. Its lateral margin is strongly keeled and deeply concave. The portion between the median ridge and the lateral margin of the palate is deeply concave.

The antero-external angle of the merus of the external maxilliped is somewhat rounded, being less conical than in *G. tenuicrustatus*. The antero-internal angle of the merus is not as strongly produced as in *G. longitarsis*.

The upper margin of the sternite belonging to the chelipeds is more curved than in *G. longitarsis*.

In the cheliped the inner angle of the merus is strongly serrated. The inner tooth of the carpus is not so strongly spinous as in *G. longitarsis*. The external surface of the carpus is tuberculate but less strongly than in *G. intermedius*. The external surface of the palm is rugose and bears two prominent ridges. The longest ridge extends to the tip of the fixed finger. In some specimens the second ridge, which lies just before the longest, is interrupted. Below the longest ridge there are some oblique ridges. The finger tips are of a deep brown colour and are narrower than in *G. tenuicrustatus*.

The merus of the four pairs of walking legs is slightly broader than that of *G. tenuicrustatus* but this character is of a variable nature. Its distal lower end is strongly serrated. The carpus of these legs shows a straight hairy ridge on its external surface, especially in the last pair of walking legs it is prominent. The propodus of the first walking leg bears a long and sharp ventral tooth in the posterior part of the distal margin. Both the propodus and the dactylus of all the walking legs possess hairy ridges and spines. The tip of the dactylus is spiny.

The sixth male abdominal segment is far shorter than the fifth, which is the longest segment. The male pleopod is stouter than in *G. tenuicrustatus* but more slender than in *G. longitarsis*. It is slightly bent in the middle with the hairy tops less broad than in *G. longitarsis*.

Colour. In spirit specimens the carapace and the legs are reddish or brownish red mottled with dark brown or reddish patches and spots. The ventral side of the body is rather whitish. The external surface of the palm is white or yellowish white. The carapace of some spirit specimens is rather bluish or greyish. In all specimens the finger tips of the chelipeds are deep brown. In life the carapace is red with white spots, blackish with somewhat slate-hued reflections or reddish, the legs are brown, and the under surface of the body is white (Lamarck, 1818; Stimpson, 1907; Stebbing, 1910).

Habitat. The high tidal zone of rocky beaches is often inhabited by a dense population of *G. albolineatus* (Sakai, 1953).

Distribution. This species is widely distributed throughout the Indo-West Pacific region from the Red Sea and the east coast of Africa to Japan, the Polynesian Islands, and Hawaii. Balss (1935) remarks that it is doubt-

ful whether the species actually occurs in Australia since it has been recorded by Haswell (1882) without mentioning an exact locality.

Remarks. The specific name *strigosus* Herbst, 1799, as published in the combination *Cancer strigosus*, is invalid because it is a junior homonym of *strigosus* Linnaeus, 1761, as published in the same combination *Cancer strigosus*. The latter species at present is known as *Galathca strigosa* (Linnaeus, 1761) (family Galatheidae, sub-order Anomura). The oldest available name for the present species is *Grapsus albolineatus* Lamarck, 1818, which therefore is used here.

Poeppig (1836) first records *Grapsus albolineatus* under the name *Grapsus strigosus* from Chile (Talcahuano Bay) but he remarks that this species is rarely found there. Nicolet's (1849) record is based on that by Poeppig.

White (1847) records this species from Loretto, North America, under the name *Goniopsis strigosa* but Rathbun (1918) states that this record probably is based on *Grapsus grapsus* (L.).

Dana (1852, p. 338, 1855, pl. 21 fig. 2) again describes *Grapsus albolineatus* under the name *Grapsus strigosus* from Chile, basing himself on a male specimen from Valparaiso. Some of the characters mentioned by him show that his specimen is *G. albolineatus*, e.g., "the third joint of the posterior legs (like that of other legs) is three-dentate at its lower apex", "the front is quite different in proportions from the *pictus*", "shorter epistome". But the other characters are rather vague and occur both in *Grapsus grapsus* and *G. albolineatus*. Moreover Dana's figure of the third maxilliped strongly resembles that of *G. albolineatus* in the rather rounded antero-external angle of the merus which in *G. grapsus* is strongly conical.

Regarding the material of Poeppig's *Grapsus albolineatus* I received the following information from Dr. John S. Garth, Allan Hancock Foundation, University of Southern California, Los Angeles, U.S.A., who just finished a revision of the Chilean crabs. According to Dr. Garth Poeppig's animals hardly can be anything but *Grapsus grapsus* (L.), which is a rather common species in Chile while all modern investigations have failed to confirm the presence of *G. albolineatus* there or anywhere else in the eastern Pacific.

As pointed out above, Dana's Chilean *Grapsus albolineatus* is correctly identified, which is confirmed by the fact that Dana recognised both *G. grapsus* (*Grapsus pictus*) and *G. strigosus* in his material. It is possible that a confusion of the labels in Dana's material has occurred. Therefore I fully agree with Dr. Garth that *G. albolineatus* in all probability does not occur in the eastern Pacific.

The characters mentioned in the short original description of *Grapsus granulatus* H. Milne Edwards (1853) all are present in *G. albolineatus*, and

some are characteristic of that species. H. Milne Edwards stated his species to be closely related to *G. albolineatus* and he recorded the species from the Red Sea. *Grapsus peroni* H. Milne Edwards (1853) was described as closely allied to *G. albolineatus*, but with the protogastric lobes only slightly elevated and ornamented with rounded tubercles, with the front less strongly deflexed, and with the marginal teeth of the meropodite short. The type of this species originated from Australia. Then Haswell's (1882) record is based on that of H. Milne Edwards. Ortmann (1894) and Alcock (1900) considered both *G. granulatus* and *G. peroni* synonymous with *G. albolineatus* (under the name *G. strigosus*). I follow them here, since the characters cited by H. Milne Edwards for his two species do not permit to distinguish them from *G. albolineatus*.

The characters of *Grapsus (Goniopsis) flavipes* mentioned by McLeay (1838) in his very short description (carapace very smooth, dark bluish, anteriorly bidentate; epistome very short, at either side with a transverse tuberculate ridge, hands with two carinae; legs yellow and very shiny) do not fully agree with the characters shown by *G. albolineatus*. In general the carapace of *G. albolineatus* is not very smooth but I have one specimen in which it indeed is smooth. Moreover in *G. albolineatus* the epistome is short when compared with that of *G. tenuicrustatus*, but its ridges are not tuberculate. Krauss's (1843) record is based on that of McLeay's *G. flavipes*. Ortmann (1894) and Alcock (1900) consider this species a synonym of *G. strigosus* in which they are followed by Stebbing (1908; 1910) and Barnard (1950).

The characters given by Stimpson (1858; 1907) for his species *Grapsus longipes* are not sufficient to regard it as a separate species distinct from *G. albolineatus*. Stimpson stated that the carapace of *G. longipes* is somewhat narrower anteriorly and a little more depressed across the median region. We know that the lateral margin of the carapace of *G. albolineatus* is narrow anteriorly in comparison with *G. longitarsis* Dana and *G. intermedius* De Man. Another difference put forward by Stimpson is the slenderness of the walking legs of *G. longipes*. I have already mentioned that the length of the walking legs is variable in these species; especially in small specimens of *G. albolineatus* the legs remain slender. Stimpson moreover mentions that *G. longipes* is closely allied to *G. strigosus* and that the carapace except for the above mentioned characters resembles that of the latter species. Therefore I entirely agree with Rathbun and Sakai (1939), who consider *G. longipes* Stimpson a synonym of *G. albolineatus* (under the name *G. strigosus*).

I have examined the two male *Grapsus* specimens collected during the Siboga Expedition at Station 19 (Labuan Tring, West coast of Lombok)

and Station 277 (Damar Island, Banda Sea) which were identified by Tesch (1918) with *Grapsus longitarsis*; they actually prove to belong to *G. albolincatus*.

Hoffmann (1874) in his plate 5 fig. 31 of *G. strigosus* does not show the serration at the inferior distal extremity of the merus of the last pair of walking legs, and also the shape of the cervical groove as shown in his figure differs from all of my specimens of this species. These features are probably due to inaccuracies in the figure.

### **Grapsus intermedius** De Man (Figs. 1 d, 3 g-m)

*Grapsus intermedius* De Man, 1888, p. 365, pl. 16 fig. 1.

#### Snelliits Expedition

Aloang, Paternoster Islands, February 8, 1930; 4 males, cl 17-21.5 mm, cb 19-23 mm; 8 females, cl 18-23 mm, cb 20-26.2 mm.

Gonto Sua near Makassar, shore, March 1, 1930; 1 female, cl 19.5 mm, cb 22.6 mm.

Karaton, Nenusa Islands, May 20, 1930; 1 female, cl 9 mm, cb 10.5 mm.

Beo, Karakeloug, Talaut Islands, June 14-21, 1930; 1 male, cl 16 mm, cb 18.2 mm; 1 female, cl 12 mm, cb 14 mm.

Obi Latu, shore or reef, April 23-27, 1930; 1 female, cl 18.5 mm, cb 21 mm.

Letti, October 31, 1930; 2 males, cl 11 and 13 mm, cb 12.5 and 15 mm.

#### Leiden Museum

Simalur near Sumatra, 1919, E. Jacobson; 1 female, cl 19 mm, cb 22 mm (dry preserved specimen).

#### Amsterdam Museum

Noordwachter Island; 1 female, cl 14 mm, cb 17 mm (type specimen of *Grapsus intermedius* De Man).

#### British Museum (Natural History)

Aquaba, Trans Jordan; 2 females, cl 19 and 22 mm, cb 21 and 24 mm.

Christmas Island, Indian Ocean, 1908, C. W. Andrews; 1 male, cl 21.5 mm, cb 24 mm.

Description. The carapace is quadrate or sub-quadrate, its lateral margins are parallel or sub-parallel and not arched. Its regions are not well defined. Its surface is more rugose, and slightly swollen in comparison with the other three species. It is provided with some rows of hairs which are very much marked in some specimens. The cervical groove is rather prominent from the lateral margin to the mesogastric region. The branchio-cardiac groove

is indistinct. The branchial region is traversed by transverse ridges. The first ridge on the branchial region just below the cervical groove is of the same length as the latter; it is not entire but divided into small straight pieces which together form an interrupted ridge. There is a transverse slightly sunken portion at the anterior part of the branchial region. The cardiac region is not smooth but provided with small transverse ridges. There is no demarcation between it and the intestinal region. Both these regions are slightly swollen. As in *Grapsus longitarsis* there is a groove before the cervical region but this groove is shorter than in that species. The protogastric and the hepatic regions bear some strong tubercles. The post-frontal lobes are placed in a single straight line and are tuberculate.

The front is broader than that of *Grapsus albolineatus* and of *Grapsus tenuicrustatus* and is not deflexed. It is narrow and has a tuberculate surface. The upper surface of each half bears a single cluster of strong tubercles.

The inter-antennular septum is rugose. The sub-orbital tooth is acute or sub-acute. The small conical tooth of the sub-orbital border near the notch is serrated.

The epistome is short and narrow and slightly rugose. As in *G. albolineatus* it possesses two curved transverse ridges which touch the upper border of the buccal cavern; in the present species these ridges are slightly tuberculate.

The shape of the upper border of the buccal cavern is more or less similar to that in *G. albolineatus*. The palate is provided with a prominent median ridge.

The antero-external angle of the merus of the third maxilliped is broadly rounded.

The groove below the sub-orbital border in the pterygostomian region is prominent and deeply sunken.

In the cheliped the inner angle of the merus is strongly toothed. The external surface of the carpus is markedly tuberculate and provided with a strong spine. The external surface of the palm has two or sometimes three very prominent ridges of which the lowest is the longest and extends to the tip of the fixed finger. The upper surface of the palm is strongly tuberculate.

All the four pairs of walking legs are stout and strong. Even in small specimens they are not slender. The upper outer portion of the coxa of the second walking leg is less conical than in *G. albolineatus*. On the ventral surface, between the coxae of second and third walking legs, there is a fringe of closely placed hairs which is more marked than in the other three species. The merus and propodus of each walking leg are broader and stouter than in *G. albolineatus*. The inferior distal extremity of the merus

of the last pair of walking legs is serrated like the meri of the preceding three pairs. The hairy ridge on the external surface of the carpus of the first three pairs of walking legs are ill-defined while in the last pair it is strongly reduced and there are found some small markings. The dactylus of each walking leg is stout and bears strong spines; the external surface shows a distinct hairy ridge. Its tip is spiny.

Colour. In most of the spirit specimens the body, including the legs, is grey or greyish with some chestnut brown spots; the under surface of the body is greyish white. Some spirit specimens are reddish brown with some red spots. All have the finger tips of the cheliped dark brown.

Distribution. *G. intermedius* has been found in the western Indo-West Pacific region from the Red Sea to the Malay Archipelago. It has been reported from the following localities: Red Sea (Ramadan, 1936; Monod, 1938); East Africa (Lenz, 1910); Madagascar (Lenz, 1910), Christmas Island, Indian Ocean (Ward, 1934; Tweedie, 1936; Calman, 1909); Cocos-Keeling Islands (Tweedie, 1950b); Java Sea (De Man, 1888).

Remarks. One of the type specimens of this species, which forms part of the collection of the Zoological Museum in Amsterdam, could be examined and compared with the other material with which it agrees perfectly. A male specimen of C. W. Andrews (1908)'s collection in the British Museum, reported upon by Calman (1909) as *Grapsus strigosus*, belongs to *Grapsus intermedius* De Man.

Monod (1938) recorded *Grapsus longitarsis* from the Red Sea. But his figure of that species (fig. 28) resembles that of *Grapsus intermedius* more closely than that of *G. longitarsis*. Furthermore it is doubtful whether *G. longitarsis* occurs in the Red Sea or not. Therefore Monod (1938)'s reference of this species is treated here as a synonym of *G. intermedius*.

### **Geograpsus** Stimpson, 1858

*Geograpsus* Stimpson, 1858, p. 101.

This genus closely resembles the preceding genus *Grapsus*, but it differs in many important characters which are given below.

The carapace is more quadrate in shape, the lateral margins are very little arched. The cervical groove is ill-defined. The regions of the carapace are less marked. The post-frontal lobes are less prominent. The lobe at the inner lower angle of the orbit is not so completely isolated. The antennal peduncle is massive. There is a double row of granules on the sub-orbital border. The merus of the external maxilliped is more slender, longer than broad, and possesses some transverse ridges on its outer surface. The flagel-

lum of the exopodite of the external maxilliped is absent or very strongly reduced.

The chelipeds are more massive than the four pairs of walking legs. The inner angle of the merus is strongly produced into a flattened process which is somewhat different in shape from that in *Grapsus*. The spine at the inner angle of the carpus is short and less acute. There is no long prominent ridge on the outer surface of the palm. The finger tips are pointed, acute and not spoon-like.

The spines of the four pairs of walking legs are less crowded and less coarse than in *Grapsus*. Between the coxae of the second and third pairs of walking legs there is a narrow fossa fringed with hairs leading to the branchial cavity. The inferior distal extremity of the merus of all the four pairs of walking legs is less distinctly dentate than in *Grapsus*.

In all the species of the genus the sixth abdominal segment of the male is longer than any of the other segments of the abdomen.

#### Key to the Indo-West Pacific species.

1. Lateral margins of carapace not parallel, distinctly converging backwards behind the epibranchial teeth. Antero-lateral margin sharply keeled and strongly convex. Postero-lateral margin obtuse, not keeled. The transverse ridges or markings on the branchial region fine and curved. Epistome ill-defined. Upper border of buccal cavern confluent with epistome and generally *cc*-shaped. Sub-orbital border, between external orbital angle and notch, not dentate. The sternite belonging to the chelipeds pubescent. Top of male pleopod broadly tipped. . . . . *Geograpsus grayi* (H. Milne Edwards).
- Lateral margins of carapace parallel or slightly diverging backwards. Antero-lateral margin perfectly straight. Lateral margin sharply keeled throughout its length. Transverse ridges of the branchial region of carapace rather straight. Epistome well defined. Upper border of buccal cavern not confluent with epistome. Sub-orbital border between external orbital angle and notch dentate. The sternite belonging to the chelipeds not pubescent . . . . . 2
2. Transverse irregular ridges or lines on cardiac and intestinal regions of carapace. Cervical groove in branchial region deeply cut and long. First few ridges on anteriormost portion of branchial region long. Upper border of buccal cavern straight. Antero-lateral corner of buccal cavern acutely conical. No sharp keel extends from antero-lateral corner of buccal cavern backwards. Lower margin of the merus of the walking legs not at all or very indistinctly dentate at distal extremity. Top of male pleopod narrowly tipped . . . . . *Geograpsus crinipes* (Dana)
- No transverse ridge or line on cardiac and intestinal regions of carapace. Cervical groove in branchial region not deeply cut and not long. First few ridges on anteriormost portion of branchial region short and interrupted. Upper border of the buccal cavern *cc*-shaped. Antero-lateral corner of buccal cavern not acutely conical, but broadly rounded. A strongly curved sharp keel extends from antero-lateral corner of buccal cavern backwards. Lower margin of the merus of the walking legs distinctly dentate at distal extremity. Top of male pleopod broadly tipped . . . . . *Geograpsus stormi* De Man



**Geograpsus grayi** (H. Milne Edwards) (Figs. 1 f, 3 n-p)

*Grapsus grayi* H. Milne Edwards, 1853, p. 170.

*Geograpsus rubidus* Stimpson, 1858, p. 103.

*Geograpsus Grayi* A. Milne Edwards, 1873, p. 288.

*Grapsus rubidus* Hoffmann, 1874, p. 22.

*Geograpsus longitarsis minikoensis* Borradaile, 1901a, p. 692.

*Geograpsus minikoensis* Borradaile, 1907, p. 64.

*Geograpsus viaderi* Ward, 1942, p. 106, pl. 6 fig. 8.

## Leiden Museum

Réunion, March, 1864, F. P. L. Pollen and D. C. van Dam; 2 males, cl 35 and 37 mm, cb 41 and 45 mm.

Pulu Weh, N. Point of Sumatra, 1910, August, 1910, December, 1910, June, 1911, October, 1921, P. Buitendijk; 10 males, cl 10.5-28 mm, cb 12.5-32.5 mm; 8 females, cl 13-27 mm, cb 16-32 mm.

N. Sumatra, P. G. Neeb; 1 male, cl 35 mm, cb 41 mm.

N. coast of Java, 1910, P. Buitendijk; 2 females, cl 15-25.5 mm, cb 17-24.4 mm.

Lae Atoll, Marshall Islands, January 6-10, 1952, F. R. Fosberg; 1 male, cl 25.5 mm, cb 29.8 mm.

Wake Atoll, Wake Islands, April 20, 1952, F. R. Fosberg; 1 male, cl 26 mm, cb 32 mm.

New Caledonia; 2 males, cl 32 and 32 mm, cb 39 and 40 mm (dry preserved specimens).

Tahiti, Museum Codeffroy; 1 male, cl 29 mm, cb 34 mm; 1 female, cl 31 mm, cb 35 mm.

## British Museum (Natural History)

Zanzibar; 1 male, cl 30 mm, cb 36 mm.

Amirantes, M. W. Ridley and R. Percy; 2 males, cl 32.1 and 42.1 mm, cb 38 and 51 mm; 1 female, cl 34 mm, cb 41 mm.

Isle des Roches, Amirantes, and Providence Island, Providence Group, R. Coppinger, H. M. S. "Alert"; 2 males, cl 32 and 36 mm, cb 38 and 42.9 mm; 1 female, cl 25 mm, cb 31 mm.

Seychelles, E. S. Brown; 1 male, cl 34 mm, cb 40 mm.

Tamatave, Madagascar, Rev. Deans Cowans; 1 male, cl 33 mm, cb 40 mm.

Rodriguez, G. Gulliver; 1 male, cl 49 mm, cb 60 mm; 1 female, cl 37 mm, cb 44 mm.

Cocos Island, Indian Ocean, J. Grant; 2 females, cl 25 and 26.5 mm, cb 29 and 32 mm.

Christmas Island, Indian Ocean, 1908, C. W. Andrews; 5 males, cl 14.5-16.5 mm, cb 17.5-56 mm; 4 females, cl 30-38 mm, cb 35-46 mm.

Bonin Island, North Pacific Ocean; 1 male, cl 29 mm, cb 35 mm; 5 females, cl 27-31 mm, cb 31-37 mm.

Lifu, Loyalty Islands, S. J. Whitmer; 1 male, cl 35 mm, cb 41 mm; 1 female, cl 19 mm, cb 23 mm.

Cap des Pins, S. E. Lifu Island, Loyalty Islands, L. E. Cheesman; 2 males, cl 26.5 and 30 mm, cb 31 and 35 mm; 4 females, cl 30-34 mm, cb 35-40 mm.

Maré, Loyalty Islands, W. Perry; 1 female, cl 15 mm, cb 17.5 mm.

Kandavu, Fiji Islands, H. M. S. "Challenger"; 2 males, cl 7.5 and 15 mm, cb 9 and 17 mm.

Society Islands, B. Grey; 1 female, cl 24 mm, cb 27 mm.

Henderson or Elizabeth Island, S. Pacific Ocean, D. R. Tait; 5 males, cl 11.5-17 mm, cb 14-21 mm; 2 females, cl 14 and 18 mm, cb 16 and 20.5 mm.

Henderson or Elizabeth Island, S. Pacific Ocean, D. R. Tait and J. R. Jamieson; 3 males, cl 20-31 mm, cb 33-36 mm.

Description. The carapace is sub-quadrilateral in shape and slightly bulging. Its lateral margins converge posteriorly. The postero-lateral margin is obtuse and not keeled. The antero-lateral margin is keeled to slightly behind the epibranchial tooth and is strongly convex. The cervical groove is not distinct, it runs transversely from the lateral margin of the carapace to the hepatic region and then bends slightly downwards but it does not touch the mesogastric region. The branchial region is traversed by very fine curved oblique ridges. They are oblique near the lateral margin, but closer to the median portion of the carapace they show the tendency to become transverse. The ridges in the anteriormost portion of the branchial region are short and gradually become longer in the posterior portion. There are also some inter-ridges. The protogastric region has some very fine long ridges, in the small specimens they are faded and indistinct. The four post-frontal lobes are not salient and are not placed in a single straight line; the two median lobes are placed somewhat behind the outer two. These four lobes show very fine markings over their surface, sometimes these markings are absent. The mesogastric region is ill-defined. The urogastric groove is very narrow. There is no demarcation between the cardiac and the intestinal regions, both of which show no ridge on the upper surface. The branchio-cardiac groove is as a rule very inconspicuous, though a female specimen from Putu Weh (cl 26 mm, cb 29 mm) has the branchio-cardiac groove distinct near the cardio-intestinal region. The whole carapace is naked.

The front is moderately broad and not deflexed; it is narrow with its margins crenulated, its surface shows some scattered tubercles.

The inter-antennular septum is rather broad, while the antennular fossa is narrow. The antenna is excluded from the orbit. The sub-orbital border is serrated, and has a shallow notch near the external orbital angle.

The epistome is ill-defined. It is short and confluent with the upper border of the buccal cavern. It bears two elevated ridges at both ends. The epistomial region is hairy and rugose.

The upper border of the buccal cavern is not straight but *∞*-shaped. It possesses tubercles of rather equal size. The palate is of good length and is provided with a prominent median ridge, which does not meet its lower border. The palate is not strongly concave and its lateral margins are straight. There is a tuft of hairs at the antero-lateral corner of the buccal cavern. Two male specimens, one from Lae Atoll, Marshall Islands (cl 25.5 mm, cb

29.8 mm) and the other from Wake Island, Wake Atoll (cl 26 mm, cb 32 mm), differ from the other specimens by possessing a well defined epistome and by having the upper border of the buccal cavern straight.

Both the merus and the ischium of the external maxilliped are bristly at their inner margins and sometimes on their surface. The merus is shorter than the ischium and is longer than broad, it possesses transverse ridges. The palp is stout and articulates just at the antero-external angle of the merus. The flagellum of the exopodite is absent or very strongly reduced.

The pterygostomian region is homogeneously pubescent. The sub-hepatic region and the ventral region near the lateral margin of the carapace possess some fine ridges or markings.

The second sternite belonging to the chelipeds is pubescent. Its upper margin is straight. The narrow fossa between the coxae of the second and third walking legs is fringed with hairs.

In the cheliped, the inner angle of the ischium is denticulate, the inner angle of the merus is produced into a process which is strongly serrated at its margin. The dorsal surface of the merus shows transverse ridges. The external surface of the carpus possesses ridges and squamiform markings but no tubercles. Its inner angle bears a stout, strong spine; the outer surface of the palm in some specimens is smooth, in others it has squamiform markings and ridges. The upper surface of the palm possesses a few small tubercles. The external surface of the finger is rather smooth. The female specimen from Tahiti (cl 31 mm, cb 35 mm) is aberrant in that it has the upper surface of the palm of the cheliped strongly tuberculate.

In the walking legs the merus is broader than the carpus and propodus. The lower distal extremity of the merus of the last pair of walking legs is rounded without serration. The meri of the first and the third walking legs, however, show a serration there, while the serration is strongly reduced in the lower distal extremity of the merus of the second walking leg. The carpus, propodus, and the dactylus of the walking legs are bristly. Each propodus bears a faint inconspicuous longitudinal groove. The propodus and the dactylus possess some rows of coloured spines. The tip of the dactylus is pointed.

The male pleopod is very slightly curved. After the removal of the hairs its top appears to be broadly tipped.

*Colour.* Some spirit specimens have the carapace dark purple, the chelae and the legs being yellowish white, or sometimes tinged purple; in others the colour of the carapace is a mahogany colour, the under surface of the body is yellowish white. The finger tips of the cheliped are deep brown. In life the carapace is bluish or purple, dull brownish green, deep red,

mahogany in colour, or grey. The legs are paler than the carapace and are banded with lighter grey. The ventral surface of the body is yellowish or yellow white (Alcock, 1900; Borradaile, 1901b; Stimpson, 1907; Holthuis, 1953).

Habitat. It is a species of land crabs making burrows near the beach or in wooded areas and rotten refuse; it comes out of the burrow only on dull days and at night (Bryan, 1903; Chilton, 1911; Tweedie, 1950b; Holthuis, 1953; Sakai, 1953).

Distribution. This species is distributed throughout the Indo-West Pacific region from the Red Sea and the east coast of Africa to Japan, Polynesia and Australia.

Remarks. Kingsley (1880) noted the identity of *Geograpsus rubidus* Stimpson with *Geograpsus grayi* (H. Milne Edwards). Most of the later authors including Rathbun (in a footnote of Stimpson's 1907 paper) followed Kingsley in considering *G. rubidus* a synonym of *G. grayi*. The characters mentioned by Stimpson in his description of that species agree perfectly with those shown by *G. grayi*. Furthermore Stimpson's figure (1907, pl. 16 figs. 3, 3a) very closely resembles my materials of *G. grayi*. Though Stimpson in his description does not mention that the postero-lateral margin of the carapace is obtuse, his figure 3 shows this very clearly. This figure also shows the posteriorly directed convergence and depression of the lateral margins of the carapace, features, which are characteristic of *G. grayi*. Also the shape of the cervical groove and the strong striation over the lower surface of the palm of the cheliped of *G. grayi* are shown in Stimpson's figure of *G. rubidus*.

De Man (1895) examined Hoffmann's material (2 males from Réunion, Pollen and van Dam's collection) and showed that the specimens identified with *Grapsus rubidus* by Hoffmann belong to *G. grayi*, while Ortmann (1894) and Alcock (1900) incorrectly placed Hoffmann's *G. rubidus* in the synonymy of *Geograpsus crinipes* (Dana). Those specimens have also been examined by me, and it proved that De Man is correct.

Dr. L. B. Holthuis was so kind to examine for me the type specimen of *Geograpsus minikoiensis* Borradaile in the collection of the University Museum of Zoology, Cambridge. From his notes it appears that this species possesses some characters (i.e., lateral margin of the carapace not keeled throughout its length, epistome ill-defined, second sternite of the somite bearing the chelipeds pubescent) which are characteristic of *G. grayi*. Therefore it is considered here a synonym of that species.

Regarding *Geograpsus viaderi* Ward I am of the opinion that this species and *G. grayi* are identical. The figure of *G. viaderi* (Ward, 1942, pl. 6 fig 8)

represents a typical *G. grayi* with all the essential characters mentioned by Ward, e.g., the convergence of the lateral margins of the carapace which is a characteristic feature of *G. grayi*. Another character of that species shown by Ward's figure of *G. viaderi* is the obtuse postero-lateral margin. Therefore, judging by the characters and the figure of *G. viaderi*, there is no justification to consider this species to be distinct from *G. grayi*.

A small male specimen from Pulu Samau reported upon by De Man as *Geograpsus* sp. and according to him possibly belonging to *Geograpsus grayi*, is not to be found in the collection of the Leiden Museum.

The width of the meropodites of the four pairs of walking legs is not a dependable character in this and the following two species. Alcock (1900) and Tesch (1918) put much stress on this character, Rathbun (1907) already pointed to its variability. I entirely agree with the latter author.

### **Geograpsus crinipes** (Dana) (Figs. 1 c, 3 g, r, 4 a-c)

*Grapsus crinipes* Dana, 1851, p. 249.

*Geograpsus crinipes* Stimpson, 1858, p. 101.

*Geograpsus antelmci* Ward, 1942, p. 105, pl. 6 fig. 7.

#### Snellius Expedition

Ternate, September 27, 1929; 1 male, cl 15.5 mm, cb 19 mm.

#### Leiden Museum

Labuan Badjau, Simalur near Sumatra, June 1913, E. Jacobson; 1 female; cl 34 mm, cb 41 mm (dry preserved specimen).

South Sea, Museum Goddefroy; 1 male, cl 40.5 mm, cb 47.1 mm; 1 female, cl 25.5 mm, cb 31 mm.

#### Amsterdam Museum

Atjeh, Sumatra, De Man collection; 2 males, cl 7 and 13 mm, cb 9 and 19 mm.

Nias near Sumatra, J. P. Kleiweg de Zwaan; 1 male, cl 20 mm, cb 23 mm; 1 female, cl 14 mm, cb 18 mm.

Hollandia, N. New Guinea; 1 male, cl 31 mm, cb 36 mm.

#### British Museum (Natural History)

Amirantes, Western Indian Ocean, in rock pools, M. W. Ridley and R. C. Percy; 2 males, cl 44 and 61 mm; 1 female, cl 54 mm, cb 61 mm.

Description. The carapace is quadrilateral in shape. Its surface is naked and flat. Its regions are ill-defined. The lateral margins are keeled and well defined throughout their length, and are slightly divergent posteriorly. The

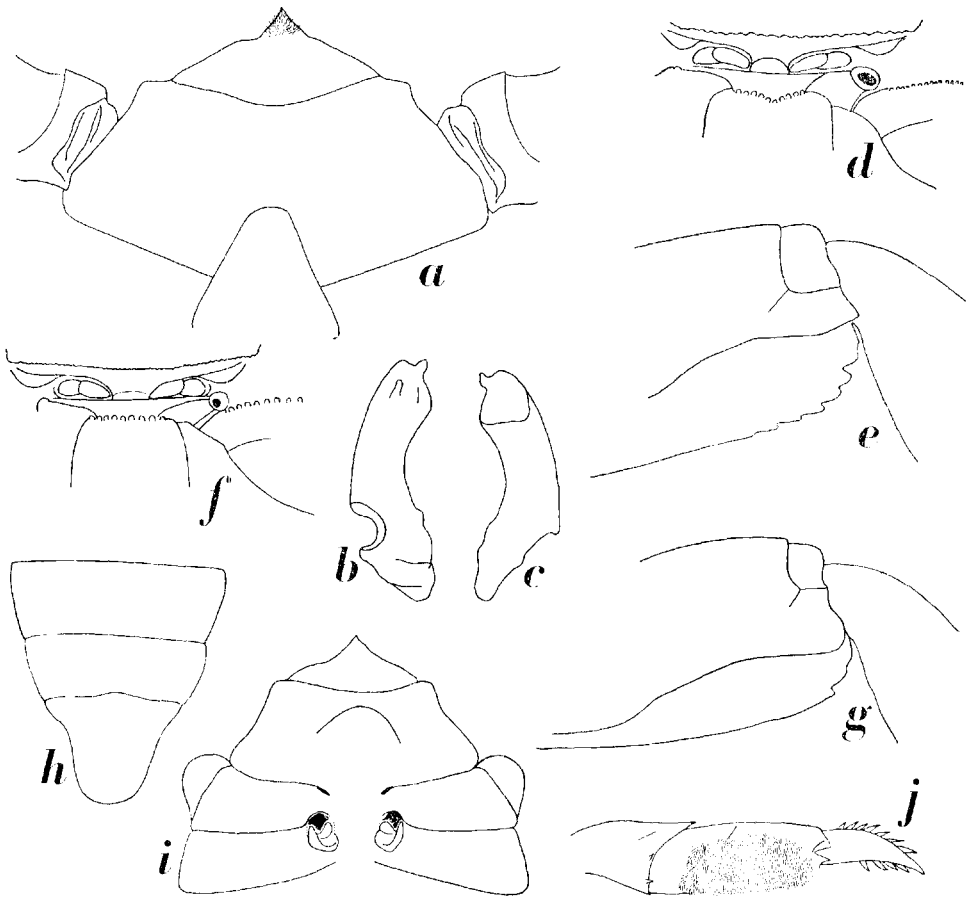


Fig. 4. *a-c*, *Geograpsus crinipes* (Dana); *a*, sternite of the chelipeds; *b*, left male pleopod, hairs removed, dorsal view; *c*, the same, ventral view. *d, e*, *Geograpsus stormi* De Man; *d*, epistome and left strongly curved keel originating from the antero-lateral corner of the buccal cavern; *e*, posterior surface of the merus joint of the seventh walking leg. *f, g*, *Geograpsus lividus* (H. Milne Edwards); *f*, epistome and left straight keel originating from the antero-lateral corner of the buccal cavern; *g*, posterior surface of the merus joint of the second walking leg. *h, i*, *Metopograpsus messor* (Forskål); *h*, fifth, sixth, and last segments of the male abdomen; *i*, sternum of female with oviducal aperture, showing the chitinous projection. *j*, *Metopograpsus latifrons* (White), anterior surface of the propodus of the first walking leg, showing the pubescent area.

× 3.

cervical groove in the branchial region is deeply cut. The branchial region possesses transverse ridges which are entire, distinct and nearly straight. There are no inter-ridges between them. In the extreme anterior portion of the branchial region there is a slightly oblique ridge, and next to it there occurs a pair of long ridges which are transverse and originate very close to the lateral margin of the carapace. The branchio-cardiac groove is totally indistinct. The post-frontal lobes are rather prominent. They bear transverse ridges. The mesogastric region is ill-defined and also bears transverse ridges. The urogastric groove is distinct. The cardiac and intestinal regions are provided with small distinct ridges. There is no demarcation between the cardiac and the intestinal regions.

The front is deflexed and vertical. It is wider than in *Geograpsus grayi* and has its surface homogeneously tuberculate. Its margin is straight and slightly crenulated.

The inter-antennular septum is hairy in the posterior portion.

The sub-orbital border is nearly straight and is strongly toothed. Its portion near the buccal cavern shows many more denticles than that near the notch. The notch of the sub-orbital border is large and the lobule external to the notch is denticulate. The region of the sub-orbital border between the notch and the external orbital angle is slightly serrated. The sub-orbital tooth is obtuse and keeled. The base of the antenna is pubescent.

The epistome is of good length and breadth, and is well defined. It is sunken in the middle of its breadth. On each side of the epistome there is an elevated portion which forms the epistomal ridge and is curved so that it touches the antero-lateral corner of the buccal cavern. There are some short stiff hairs on the surface of the epistome. The antero-lateral corner of the buccal cavern is high and conical. The upper border of the buccal cavern is straight. The palate has a prominent median ridge.

The merus of the external maxilliped shows several transverse ridges which are slightly curved; the exopodite has a strongly reduced flagellum.

The pterygostomial region is pubescent. The sub-hepatic region bears several very prominent ridges. The sternite belonging to the chelipeds is not pubescent.

In the cheliped the inner angle of the ischium is denticulate. The inner angle of the merus is produced into a flattened process which is strongly serrated. The external surface of the carpus is strongly ridged and bears tubercles. There is a strong spine at its inner end. The upper half of the external surface of the palm is markedly tuberculate. The whole external surface of the palm is provided with squamiform markings or ridges, and its lower portion and the lower surface of the palm possess some oblique

ridges. The lower surface of the palm also possesses some tubercles near the tip.

The merus of the walking legs is transversely ridged. Between the coxae of the second and third pairs of legs a narrow fossa, fringed with hairs, is leading into the branchial cavity; the pubescence of this structure is more dense than in *Geograpsus grayi* and *Geograpsus stormi*. The inferior distal extremity of the merus of the last pair of walking legs is rounded, not serrated. Such is the case also with the meri of the other three pairs of walking legs but sometimes a slight serration is observed there. The carpus of the last pair of walking legs generally does not possess any markings, rarely a very indistinct marking or a faint ridge is visible. The carpus, the propodus, and the dactylus of all the walking legs bear rather long bristles, which are not so stiff as in *Geograpsus grayi*. The propodus shows a faint longitudinal groove, which is generally naked or provided with one or two bristles. Both the propodus and the dactylus bear rows of spines on the upper and lower margins; some of these spines are brownish black or deep brown in colour. The tip of the dactylus is more acute than in *G. grayi*.

The male pleopod is stouter than in *G. grayi* and its top is narrow as can be seen after removing the hairs.

Colour. In spirit specimens the carapace, the chelipeds, and all the walking legs are yellow or yellowish brown above, the ventral surface of the body is yellowish white, while the pubescent area of the pterygostomian region is deep brown or brownish black. The finger tips of the cheliped are of a deep brown colour. The carapace of the specimen from Ternate is rather orange in colour. In life the colour of this species is bright red, orange or orange yellow, grey or brown (Alcock, 1900; Borradaile, 1910b; Holthuis, 1953).

Habitat. This land crab inhabits the rocky and sandy shores at or above high tide level and is also found in burrows in the soil or under vegetable refuse, etc., by the side of fresh water pools (Borradaile, 1910b; Edmondson, 1923; Holthuis, 1953). Tweedie (1950b) remarks that the habits of this species and *G. grayi* are similar.

Distribution. *G. crinipes* is widely distributed throughout the Indo-West Pacific region from the Red Sea and the east coast of Africa to Japan, Polynesia and Hawaii.

Remarks. Authors like Ortmann (1894), De Man (1895), and Alcock (1900) considered that Hilgendorf's (1869) *Grapsus* (*Geograpsus*) *rubidus* belongs to *Geograpsus crinipes* (Dana). As shown previously the actual *Geograpsus rubidus* Stimpson is a synonym of *Geograpsus grayi* (H. Milne Edwards), Hilgendorf thus made an incorrect determination. Furthermore Hilgendorf's pl. 5, representing *Grapsus rubidus*, shows a clear picture of



*G. crinipes*. The figure (pl. 5 fig. 1) of the carapace indicates very distinctly the transverse ridges on the cardio-intestinal region and the keeled postero-lateral margin, which are really characteristic of *G. crinipes*. This figure also shows two notches in the frontal margin of the carapace, which are not present in any of my specimens, and which never have been described in the literature; these must be regarded as a deformity of Hilgendorf's specimen. It is obvious that the material identified with *Geograpsus rubidus* by Richters (1880) belongs to *G. crinipes*. Though Richters does not give any description of this species, the fact that he treats *G. rubidus* as being different from *G. grayi*, which he records simultaneously, points in this direction. *Geograpsus grayi* mentioned by Nobili (1906) is based on Hilgendorf's record and thus is *G. crinipes*.

*Geograpsus antelmei* Ward seems to me to be identical with *G. crinipes* (Dana) as far as can be made out from Ward's description and figure (pl. 6 fig. 7). The differentiating characters pointed out by him are very vague and of little importance. The first of these characters, the different shape of the front, falls entirely within the range of variability of this character in my materials of *G. crinipes*. The second character, the long and more slender merus of the external maxilliped, is variable in the three Indo-West Pacific species of *Geograpsus* which I examined. The third differentiating character mentioned by Ward, the longer spine on the wrist of the cheliped in *G. antelmei*, is not good either since in *Geograpsus* as well as in *Grapsus* the length and breadth of this spine is very variable. The shape of the spine of *G. antelmei* falls entirely within the range of variation of that of *G. crinipes*. The fourth character is that the margins of the propodus of the fifth leg are more convergent in *G. crinipes* than in *G. antelmei*. In *G. crinipes* the margins of the propodus of the said leg are converging distally and this convergence may be of different degree in the different specimens of this species. Here, too, the variability of this character in *G. crinipes* is such that the shape of the propodus of *G. antelmei* falls within its range. The last character, the greater concavity at the bases of the chelae in *G. antelmei*, has also been shown by some specimens of *G. crinipes* and must be considered to be due to individual variation. The figure of *G. antelmei* shows all the characteristic features of *G. crinipes*, and Ward's description too gives some typical characters of *G. crinipes*. Therefore I am convinced that *Geograpsus antelmei* Ward and *Geograpsus crinipes* (Dana) are the same.

***Geograpsus stormi* De Man (Figs. 4 d, c, 5 a)**

*Geograpsus lividus* var. *stormi* De Man, 1895, p. 88.

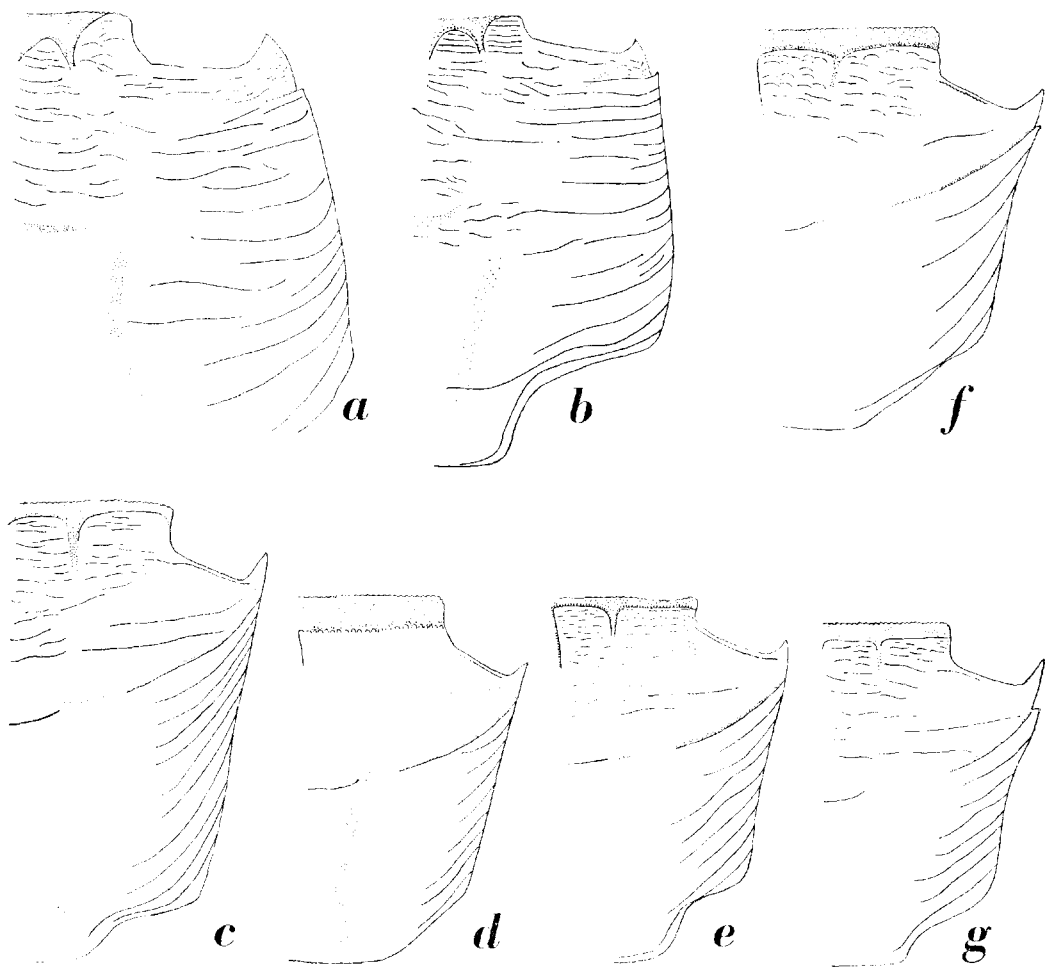


Fig. 5. Right half of carapaces in dorsal view; *a*, *Geograpsus stormi* De Man (posterior part omitted); *b*, *Geograpsus lividus* (H. Milne Edwards); *c*, *Metopograpsus messor* (Forskål); *d*, *Metopograpsus latifrons* (White); *e*, *Metopograpsus frontalis* Miers; *f*, *Metopograpsus occanicus* (Jacquinot); *g*, *Metopograpsus quadridentatus* Stimpson.  
 × 3.

## Snellius Expedition

Wotap, Tenimber Islands, October 20-23, 1929; 1 female, cl 18 mm, cb 22.5 mm.

Serua, shore, April 11, 1930; 1 male, cl 16 mm, cb 20 mm; 1 female, cl 16 mm, cb 20 mm.

Kisar, October 2, 1930; 1 male, cl 22.5 mm, cb 27 mm; 2 females, cl 13 and 14 mm, cb 17 and 18.5 mm (damaged).

Leti, October 31, 1930; 1 male, cl 17 mm, cb 21 mm.

## Amsterdam Museum

Siboga Exp., Sta. 64, Tanah Djampea, Flores Sea; 1 male, cl 20 mm, cb 43 mm.

## British Museum (Natural History)

Aden, Arabian Sea; 1 male, cl 28.5 mm, cb 34.5 mm.

Durban, H. W. Bell Morley, Stebbing collection; 1 female, cl 34 mm, cb 40 mm.

Galle, Ceylon, W. Ondaatje; 1 female, cl 33 mm, cb 38 mm.

Cocos-Keeling Islands, Indian Ocean, J. Grant; 1 male, cl 14 mm, cb 16.5 mm; 1 female, cl 20.5 mm, cb 26 mm.

Christmas Island, Indian Ocean, 1908, C. W. Andrews; 1 male, cl 30 mm, cb 36 mm.

Description. The carapace is quadrilateral in shape. Its lateral margins are sharply keeled, and are parallel or slightly divergent posteriorly. The epibranchial tooth is small. The extreme anterior portion of the branchial region possesses some small interrupted oblique ridges. The cervical groove is very poorly defined. The whole gastric region is slightly convex. The four post-frontal lobes are not placed in a single straight line. The median of these two lobes are placed slightly behind the outer two. These lobes, like those of the mesogastric and hepatic regions, bear transverse ridges. The urogastric groove is distinct. The cardio-intestinal region is depressed and flat, and does not possess any lines or ridges. The branchio-cardiac groove is indistinct. There is no demarcation between the cardiac and the intestinal regions.

The front is almost vertical. Its margin is crenulated. Its surface is not smooth but is covered with small ridges and markings.

The inter-antennular septum is rugose. The sub-orbital tooth is acute or sub-acute and keeled. The sub-orbital border is serrated. A small portion is produced off from the sub-orbital border near the notch, and is also strongly serrated. A small tridentate process protrudes from the portion between the notch and the external orbital angle.

The epistome is well defined and of good length and breadth. Its middle portion is transversely sunken. There are two strong ridges, one on each side of the epistome; these ridges are not straight but are curved and

touch the upper border of the buccal cavern. The epistomial surface is rugose.

The upper border of the buccal cavern is *cus*-shaped and not straight, it is denticulate. The antero-lateral corner of the buccal cavern is broadly rounded. The palate bears a prominent median ridge, while there is a pit at its posterior end. A sharp keel originates from the antero-lateral corner of the buccal cavern, it is strongly curved and finely serrated (the serration is not shown in my figure).

The external maxilliped closely resembles that of *G. crinipes*, but has the ridges on the merus less prominent. The palp does not possess soft hairs. The ischium is smooth. The exopodite possesses a very poorly developed flagellum, which is longer than that of *Geograpsus grayi* and of *Geograpsus crinipes*.

The sternite of the somite belonging to the chelipeds is not pubescent but bears a few scattered stiff hairs.

In the male the chelipeds are unequal, generally the right chela is small and the left large. The ischium has its inner angle denticulate. The inner angle of the merus is strongly produced and is strongly serrated. The upper surface of the merus is distinctly ridged as in the other two species of this genus. The external surface of the carpus possesses some tubercles and a few ridges; in very small specimens the ridges are faint and resemble mere markings. The inner angle of the carpus bears a very short blunt spine. The external surface of the palm shows rather faint squamiform markings while its upper portion is provided with strong tubercles. In the left cheliped there is a sunken groove at the base of the fixed finger.

The carpus, the propodus, and the dactylus of the four pairs of walking legs are thorny and possess some hairs. Between the coxae of the second and the third walking legs there is a narrow fossa fringed with hairs leading to the branchial cavity. This fringed structure is less dense than in *G. crinipes*. The inferior distal extremity of the merus of the last walking leg shows a very indistinct serration whereas in the preceding legs the serration of that region is prominent. The upper margins of the meri of the second and third walking legs bear a row of strong spines. The distal angle of the posterior side of the merus of the second walking leg, which is placed near the groove at the articulation of the carpus, is conical. The propodus of each walking leg has a median row of hairs on its external surface. The dactylus is slender and spiny.

The male pleopod is rather straight and does not possess dense hairs at its top. After removing the hairs the tip of the pleopod appears broad.


Colour. In spirit specimens the carapace is reddish violet or reddish, particularly intense in the anterior region and near the cervical groove;

this colour is variegated. The colour of the rest of the body is reddish testaceous. The two specimens from Serua have their carapace reddish brown, this colour is likewise not variegated.

Distribution. *G. stormi* is distributed in the Indo-West Pacific region from the Arabian Sea and the east coast of Africa to Japan, the Polynesian Islands and Hawaii. According to Edmondson (1946) the Hawaiian distribution of this species is doubtful.

Remark. A thorough examination and an accurate comparison of Indo-Pacific specimens of this species with a large number of typical West Indian *Geograpsus lividus* (H. Milne Edwards) present in the collection of the Leiden Museum made it possible to find some differentiating characters which are not mentioned by De Man (1895) and Maccagno (1930, p. 3), and which seem to be of particular importance to show that the Indo-West Pacific form, which was previously considered a variety or subspecies of the West Indian species, should be treated as a separate species. The differences between *Geograpsus stormi* and *Geograpsus lividus* are given below:

*Geograpsus stormi*

1. There are a few small, interrupted and slightly oblique ridges in the extreme anterior portion of the branchial region of the carapace (fig. 5 *a*).
2. The upper border of the buccal cavern is -shaped. The sharp keel originating from the antero-lateral corner of the buccal cavern is strongly curved, which has already been noted by De Man (1895) and Tesch (1918) (fig. 4 *d*).
3. The palp of the external maxilliped is less pubescent than in *G. lividus*.
4. The distal angle of the anterior side of the merus of the second walking leg, which is placed near the groove at the articulation of the carpus, is conical (fig. 4 *e*).

*Geograpsus lividus*

1. These ridges (generally 2 or 3 in number) are entire, long and transverse (fig. 5 *b*).
2. The upper border of the buccal cavern is most often straight. The sharp keel originating from the antero-lateral corner of the buccal cavern is straight or very slightly sigmoid (fig. 4 *f*).
3. The palp of the external maxilliped is strongly pubescent.
4. This distal angle is broadly rounded (fig. 4 *g*).

- |  |   |
|--|---|
| <p>5. The dactyli of the walking legs are slender and longer than in <i>G. lividus</i>.</p> <p>6. The carapace is reddish violet in colour and the colour is not variegated.</p> | <p>5. The dactyli of the walking legs are stouter and shorter than in <i>G. stormi</i>.</p> <p>6. The colour is not reddish violet and is variegated with brownish or dark tan patches.</p> |
|--|---|

N.B. Though the colour of spirit material as a rule is not reliable as a specific character, the difference in the colour pattern of our specimens of the two species (viz., variegated or plain, not variegated) shows to be constant.

In the British Museum I could examine the Ceylon material collected by W. Ondaatje reported upon by Miers (1884) as *Geograpsus grayi*, and also the material from Christmas Island collected by C. W. Andrews in 1908, dealt with by Calman (1909) as *Geograpsus crinipes*. All these specimens are *Geograpsus stormi* De Man.

### **Metopograpsus** H. Milne Edwards, 1853

*Metopograpsus* H. Milne Edwards, 1853, p. 164.

Description. The carapace is naked, quadrate in shape, slightly broader than long, and a little depressed. Its regions are not well defined. The cervical groove is distinct. The external orbital angle is acute. The branchial region bears distinct oblique ridges. There are four post-frontal lobes along the line of flexion of the front. These lobes are more depressed than in the genus *Grapsus*. The urogastric groove is distinct. The cardiac and the intestinal regions are smooth, and bear no ridges or tubercles.

The front is very broad, being more than half the maximum breadth of the carapace. It is deflexed with a rugose surface and a crenulated free margin.

The orbit is placed at the anterolateral corner of the carapace.

The inter-antennular septum is broad. The antennules fold transversely in the fossa. The antenna is excluded from the orbit by the inner sub-orbital tooth, which mostly is in contact with the front but sometimes does not touch the front. The sub-orbital border bears a notch near its outer end, it is serrated but for a small portion near the notch.

The epistome is well defined, and not very deeply excavated. It is rather short and broad. It bears two curved, elevated, slightly crenulated ridges, one on either side.

The buccal cavern is square with its antero-lateral corner rounded. Its upper border is distinctly serrated. There is a large rhomboidal gap between the two external maxillipeds in which the mandibles are exposed. The merus of the external maxilliped is broader than long, and is shorter than the ischium. It has the palp articulated at or near its antero-external angle. The outer lateral margin of the merus is convex. The exposed surface of the merus is smooth and bears no ridge. The surface of the ischium is also rather smooth. The outer lateral margin of the ischium is straight and bears a linear fringe of soft hairs. The inner lateral margin of the merus and the ischium possesses a linear fringe of rather stiff hairs. The exopodite of the external maxilliped is provided with a long flagellum and bears a hairy fringe on its lateral margin. The base of the external maxilliped is pubescent.

The antero-lateral corner of the buccal cavern possesses a strong keel. This keel is slightly sigmoid and becomes indistinct in the pterygostomial region. Both the pterygostomial region and the subhepatic region are provided with hairs.

There is a curved hairy fringe at the junction of the first and second sternites. A pair of tubercles is visible inside the male abdominal fossa placed on the third sternite.

The chelipeds are subequal or unequal. The merus is ridged and its lower surface is smooth. The inner distal angle of the merus is produced into a process which is strongly serrated. The carpus bears one or two teeth on its inner angle, sometimes these teeth are fused together and are compressed to represent one flattened lobe. The finger tips are broad and hollowed, being spoon-shaped.

The walking legs are compressed. The merus possesses ridges and its upper margin ends in a spine. Its lower distal extremity is serrated. There are some ridges on the carpus. The carpus, the propodus, and the dactylus bear bristles and spines.

The abdomen in both sexes consists of seven separate segments. In the male the abdomen is triangular in shape and its base is as broad as the sternum between the last pair of walking legs. The top of the male pleopod is not densely covered with hairs.

Remark. Tweedie (1949) was the first to make a clear distinction between the species of this genus. Before that time the exact status of several of the species was not correctly understood, and to many of the specimens of *Metopograpsus* dealt with in the literature before 1949 incorrect names have been applied.

## Key to the species:

1. Lateral margin of the carapace entire . . . . . 2
- Lateral margin of the carapace with a tooth behind the external orbital angle . . . 5
2. Free edges of the post-frontal lobes sharp. Post-frontal region smooth, without ridges or markings. A narrow pubescent area along the anterior side near the lower margin of the propodus of the second and third walking legs. Chitinous projection of the male pleopod obliquely T-shaped, its distal margin curved and serrated . . . . . *Metopograpsus latifrons* (White).
- Free edges of the post-frontal lobes rounded and blunt. Post-frontal region not smooth, with distinct ridges or markings. No narrow pubescent area along the anterior side near the lower margin of the propodus of the second and third walking legs. Chitinous projection of the male pleopod, if present, not obliquely T-shaped, its distal margin not curved and not serrated . . . . . 3
3. A narrow pubescent area on the anterior side near the lower margin of the propodus of the first walking leg. A linear fringe of hairs on the upper margin of the propodus of the last walking leg. A concavity at the top of the chitinous projection of the male pleopod. The slit of the oviducal aperture of the female bent in the middle like an angle . . . . . *Metopograpsus frontalis* Miers.
- No or a very short narrow pubescent area on the anterior side of the lower margin of the propodus of the first walking leg. No linear fringe of hairs on the upper margin of the propodus of the last walking leg. The chitinous projection of the male pleopod, if present, without a concavity at its top. The slit of the oviducal aperture in the female rounded but not bent in the middle like an angle . . . . . 4
4. Lateral margins of the carapace distinctly convergent backwards. The exposed surface of the base of the antenna not densely pubescent. Sub-orbital tooth acute and strongly keeled from tip to base. Sixth segment of the male abdomen shorter in length than the fifth segment. No obvious chitinous projection present at the top of the male pleopod. A chitinous projection visible in the oviducal aperture of the female . . . . . *Metopograpsus messor* (Forskål).
- Lateral margins of the carapace scarcely convergent backwards. The upper surface of the base of the antenna densely pubescent. Sub-orbital tooth blunt, not keeled from tip to base. Sixth segment of the male abdomen equal to or slightly longer than fifth. A compressed finger-shaped chitinous projection present at the top of the male pleopod. No chitinous projection visible in the oviducal aperture of the female . . . . . *Metopograpsus thukuhar* (Owen).
5. Cervical groove deep. One transverse, entire or interrupted, ridge on the hepatic region of the carapace before the cervical groove. Sub-orbital tooth acute and keeled. The propodites of the first three walking legs with a linear row of fine hairs on the posterior surface. The chitinous projection of the male pleopod with a concavity at its top, a portion of its distal margin strongly curved . . . . . *Metopograpsus oceanicus* (Jacquinot).
- Cervical groove shallow. Two distinct parallel transverse ridges on the hepatic region of the carapace before the cervical groove. Sub-orbital tooth obtuse and not keeled. The propodites of the first three walking legs without a row of fine hairs on the posterior surface. The chitinous projection of the male pleopod usually without or seldom with a very shallow concavity at its top, its distal margin not curved . . . . . *Metopograpsus quadridentatus* Stimpson.

**Metopograpsus messor** (Forskål) (Figs. 4 h, i, 5 c)

*Cancer messor* Forskål, 1775, p. 88.

*Grapsus Gaimardi* Audouin, 1826, p. 82.



*Grapsus (Pachygrapsus) aethiopicus* Hilgendorf, 1869, p. 88, pl. 4 fig. 2.

*Grapsus messor* Hoffmann, 1874, p. 23.

*Metopograpsus messor* Kossmann, 1877, p. 57.

#### Leiden Museum

Red Sea, 1880, R. Kossmann; 1 male, cl 18 mm, cb 23.5 mm; 1 female, cl 19 mm, cb 24 mm.

Jidda, Red Sea, 1880, J. A. Krøyt; 4 males, cl 12.9-20.5 mm, cb 16-26.8 mm; 2 females, cl 7 and 17.5 mm, cb 9 and 22.5 mm.

Nossi Fali, N. W. Madagascar, F. P. L. Pollen and D. C. van Dam; 2 males, cl 15.5 and 20 mm, cb 20.5 and 22 mm.

#### British Museum (Natural History)

Suez Canal Exp., Suez Canal; 3 males, cl 16-17 mm, cb 9-22 mm; 7 females, cl 8-19 mm, cb 10-25 mm.

Suez Canal Exp., Sta. Km 119, Kubri; 1 female, cl 22.5 mm, cb 27 mm.

Suez Canal Exp., Sta. Km 157, El Shatt; 1 male, cl 28 mm, cb 35 mm.

Suez Canal Exp., Sta. R 5, Gulf of Suez; 1 male, cl 30 mm, cb 37.9 mm; 1 female, cl 26 mm, cb 34 mm.

Gulf of Suez, R. MacAndrew don.; 2 males, cl 13 and 23 mm, cb 16.1 and 29 mm; 2 females, cl 13 and 13.5 mm, cb 17 and 18 mm.

Aden; 2 females, cl 7 and 12 mm, cb 10 and 16 mm.

Aquaba, St. Dalab, Trans Jordan; 1 male, cl 20 mm, cb 25 mm; 1 female, cl 12 mm, cb 15 mm.

Sudanese Red Sea, Sta. 1A, 1B, 1E, W. A. Herdman; 5 males, cl 10-27 mm, cb 13-34.5 mm; 8 females, cl 11.5-21.5 mm, cb 17-27 mm.

Tanga, Tanganyika, E. Africa, L. F. Brown; 1 male, cl 22 mm, cb 26 mm.

New Zealand?; 3 males, cl 15-25 mm, cb 10-31 mm; 2 females, cl 16 and 25 mm, cb 21 and 31.5 mm (probably this locality is incorrect).

Description. The lateral margins of the carapace are distinctly convergent posteriorly. There is no tooth on the lateral margin just behind the external orbital angle. The regions are ill-defined. The cervical groove is prominent and straight or sometimes slightly curved. There are two strong transverse ridges just before the cervical groove. These ridges extend across the hepatic region to the mesogastric region, the posterior extends to very near the lateral margin of the carapace. The ridges are parallel to each other. In one of the female specimens from Jidda (cl 17.5 mm, cb 22.5 mm) a third small ridge is visible; on the right side of the animal this additional ridge is placed between the posterior and the cervical grooves, on the left side it lies between the two other ridges. The four post-frontal lobes are placed in a single straight line; the outer two are larger than the two median. The free edges of these lobes are provided with transverse lines of small tubercles, but are not sharp. The supra-orbital border bears a ridge, which extends to the middle of the supra-orbital lobe. Also on the mesogastric region some ridges are visible. The branchio-cardiac groove is ill-defined. The urogastric groove is distinct. There is no demarcation between the cardiac and the intestinal regions.

The front is wide and possesses transverse ridges near the orbital region. Its free margin is slightly sinuous in the middle. The median portion of the front is smooth.

The orbit is transverse or very slightly oblique.

The inter-antennular septum is broad, naked, and smooth. The antennular fossa is moderately large. The exposed surface of the basal segment of the antenna is not densely pubescent but only possesses a few scattered hairs. The antennal peduncle bears at its base a very small flagellum like an exopod.

The inner part of the sub-orbital border is crenulated or very mildly serrated; its middle part (slightly medially to distinctly laterally of the sub-orbital tooth) is strongly serrated; while the external part (up to the notch) is practically entire. The portion of the suborbital border between the notch and the external orbital angle is not serrated. The bottom of the notch is rounded.

The sub-orbital tooth is acute and strongly keeled from its tip to the base. For the larger part of its length it is in contact with the front.

The surface of the epistome is rather smooth.

The upper border of the buccal cavern is generally  $\infty$ -shaped but in some specimens it is straight. It is cut into teeth.

A strong keel originates from the antero-lateral corner of the buccal cavern and passes slantingly across the pterygostomial region, becoming less prominent there. This keel is curved and finely serrated.

The palate has no median ridge.

The upper margin of the sternite belonging with the chelipeds is strongly curved.

The chelipeds are unequal. The inner angle of the ischium is bidentate or tridentate. The merus is strongly ridged on the upper surface, the lower surface is smooth; the inner angle of the merus is produced into a flattened process near its articulation with the carpus. This process is dentate distally while its lateral margin is crenulated. The outer margin of the merus is dentate. The external surface of the carpus bears scattered ridges and tubercles. The external surface of the palm is smooth for its larger part, and rarely possesses a long ridge near its lower margin extending over its whole length. Its upper portion is strongly tuberculate. The lower surface of the palm is provided with oblique ridges. The finger tips are blunt and their edges are slightly sharp but in some specimens they are not sharp. The upper portion of the dactylus possesses some prominent tubercles. The proximal half of the lower surface of the fixed finger bears strong tubercles.

In the four walking legs the inferior distal extremity of the merus is bluntly serrated. The teeth of this serration are not spiny. Between the

coxae of the second and the third pair of walking legs there is a conspicuous tuft of hairs. The carpus of each of the first three pairs of walking legs possesses two ridges of which the upper is very salient while the carpus of the last walking leg bears two distinct ridges on its external surface. There is no distinct linear fringe of hairs either on the upper or on the lower margin and no row of hairs on the posterior surface of the propodus of the last walking leg. The dactylus is strongly spiny.

In the male the sixth abdominal segment is shorter than the fifth. The male pleopod is very important for the identification of this species. It is stout and short and has no obvious chitinous projection on its tip.

Colour. In spirit preservation the carapace and the legs are brownish yellow above, sometimes variegated with dark brown patches; the lower surface of the body is yellowish white. The chelae of the majority of the specimens are of a deep chestnut brown colour, the finger tips of the chelae are brown. In life the colour is dark grey (obscure-cinereus, nigro-nebulosus, Forskål, 1775).

Habitat. The species is frequently found between the stones or rocks near the sea shore (Forskål, 1775).

Distribution. This species inhabits the western part of the Indo-West Pacific region. It seems to be confined to the Red Sea, the Arabian and the East African areas. As this species often has been confused with *M. thukuhar* and *M. frontalis*, many of the records in the literature of *M. messor* can not be trusted. All the records of the species from the east of the region indicated above that could be checked proved to be based on incorrectly identified material.

Remarks. As distinctly shown by Savigny's (1817) excellent figures of the type specimen of Audouin (1826)'s *Grapsus Gaimardi*, this species is a synonym of *Metopograpsus messor* (Forskål), as has already been shown by H. Milne Edwards (1853) and later authors.

Also Hilgendorf's *Grapsus (Pachygrapsus) aethiopicus* is a synonym of *M. messor* as is shown by his figures and description. Kossmann (1877) was the first to point out this synonymy, and is followed by later authors including Hilgendorf himself. Kingsley (1880) on the other hand incorrectly considered *Grapsus aethiopicus* a distinct species of the genus *Pachygrapsus*.

#### **Metopograpsus latifrons** (White) (Figs. 4 j, 5 d, 6 a)

*Grapsus latifrons* White, 1874b, p. 337, pl. 2 fig. 2.

*Metopograpsus maculatus* H. Milne Edwards, 1853, p. 165.

*Metopograpsus latifrons* H. Milne Edwards, 1853, p. 166.

*Grapsus (Grapsus) dilatatus* (De Haan MS.) Herklots, 1861, p. 129 (nom. nud.); De Man, 1879, p. 68.

*Metopograpsus pictus* A. Milne Edwards, 1867, p. 283.

## Snellius Expedition

Tanah Djampea, shore or reef, February 21-23, 1930; 2 females, cl 19 and 20 mm, cb 22.5 and 22.9 mm.

Taliabu, Sula Islands, shore, March 18, 1930; 1 female, cl 15 mm, cb 17 mm.

## Leiden Museum

Java; 3 males, cl 29-31 mm, cb 32-33 mm.

Java; 19 males, cl 24-31 mm, cb 28-38 mm; 8 females, cl 24-28 mm, cb 27-31 mm, one of which is a syntype of *Grapsus (Grapsus) dilatatus* (De Haan MS.) Herklots (nom. nud.) (dry preserved specimens).

North coast of W. Java, 1906, P. Buitendijk; 1 female, cl 28.5 mm, cb 30 mm.

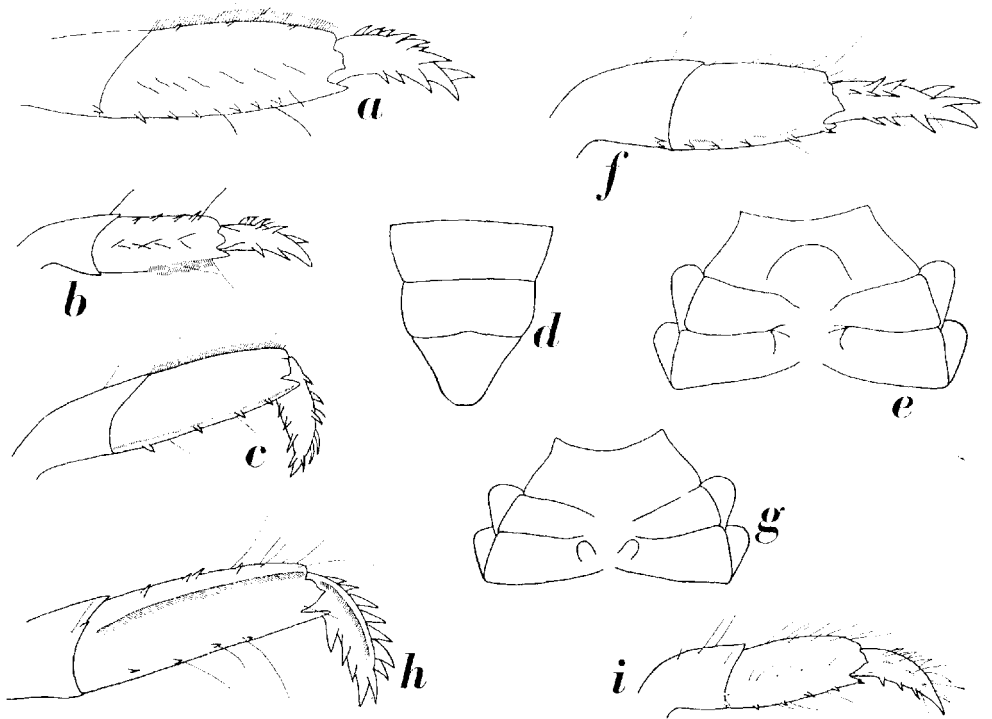


Fig. 6. *a*, *Metopograpsus latifrons* (White), propodus of the last walking leg, showing the hairy fringe on the upper margin. *b-c*, *Metopograpsus frontalis* Miers; *b*, anterior surface of the propodus of the first walking leg, showing the pubescent area; *c*, propodus of the last walking leg, showing the hairy fringe on the upper margin; *d*, fifth, sixth, and last segments of the male abdomen; *e*, sternum of female with oviducal aperture. *f, g*, *Metopograpsus thukuhar* (Owen); *f*, propodus of the last walking leg; *g*, sternum of female with oviducal aperture. *h*, *Metopograpsus oceanicus* (Jacquinot), posterior surface of the propodus and the dactylus of the third walking leg, showing the row of hairs. *i*, *Metopograpsus quadridentatus* Stimpson, posterior surface of the propodus of the third walking leg.  $\times 3$ .

River near Surabaya, E. Java, brackish water, January, 1917, P. Buitendijk; 1 male, cl 22 mm, cb 26 mm.

Besuki, E. Java, 1865, J. Semmelink; 1 male, cl 29 mm, cb 32 mm.

Timor, H. C. Macklot; 1 female, cl 22.5 mm, cb 26 mm (lectotype of *Grapsus (Grapsus) dilatatus* (De Haan MS.) Herklots (nom. nud.) De Man, 1879).

Kisar, N. of Timor, 1868, K. Schädler; 1 female, cl 26.1 mm, cb 30 mm.

Amboina, 1863, E. W. A. Ludeking; 1 male, cl 28.5 mm, cb 30 mm; 2 females, cl 23 and 25.9 mm, cb 25 and 27 mm.

New Guinea, H. C. Macklot; 1 female, cl 19 mm, cb 25 mm (dry preserved specimen).

Old mangrove forest near Hollandia, N. E. Netherlands New Guinea, January 6, 1954, L. van der Hammen; 1 specimen heavily damaged, measurements and sex determination not possible.

#### Amsterdam Museum

Mergui Archipelago, De Man collection; 1 female, cl 22 mm, cb 26 mm.

Java, February 28, 1928, J. Verwey; 1 male, cl 26 mm, cb 28 mm; 1 female, cl 28 mm, cb 32 mm.

Balikpapan, Borneo, W. J. Tissot van Patot; 1 female, cl 22 mm, cb 26 mm.

Samarinda, E. Borneo, D. MacGillavry; 1 male, cl 16 mm, cb 22 mm.

Tello near Makassar, Celebes, 1888, M. Weber; 2 males, cl 23.5 and 25 mm, cb 26 and 28 mm; 2 females, cl 23 and 25 mm, cb 26 and 28 mm.

Kairatu, W. Ceram, brackish water, L. F. de Beaufort; 1 female, cl 25 mm, cb 27 mm.

Siboga Exp., Sta. 47, Bay of Bima, Sumbawa; 2 males, cl 22 and 24 mm, cb 24 and 27 mm; 4 females, cl 15-28.5 mm, cb 18-31 mm.

Siboga Exp., Sta. 86, Dongala, W. coast of Celebes; 1 female, cl 23 mm, cb 26 mm.

Siboga Exp., Sta. 200, Bay of Bara, Buru, Moluccas; 1 male, heavily damaged, measurements not possible.

#### British Museum (Natural History)

Travancore, S. India; 2 males, cl 19 and 20 mm, cb 22.4 and 24 mm.

Singapore, 1934, M. W. F. Tweedie; 1 male, cl 26 mm, cb 28.5 mm.

Labuan, Borneo, 1940, M. W. F. Tweedie; 1 male, cl 21 mm, cb 24.5 mm.

Description. The carapace is much more elongate than in *Metopograpsus frontalis*, its lateral margins are very markedly convergent backwards. There is no tooth on the lateral margin behind the external orbital angle. The cervical groove is distinct. The hepatic region is smooth and bears no ridge. The post-frontal lobes are not of equal size, the outer two are larger than the median two. Their free edges are sharply defined and strongly tuberculate, but without transverse ridge or marking. There is no ridge on the mesogastric region. On the whole the entire post-frontal region is smooth. This character proves to be quite constant and distinguishes the species readily from the related forms. The oblique ridges on the branchial region are short in comparison with those of *M. messor*, *M. frontalis*, and *M. thukuhar*. The branchio-cardiac groove is distinct. The intestinal region is bulging, and there is a faint demarcation between the cardiac and the intestinal regions.

The front is broader and longer than in *M. messor* and is vertically deflexed. Its margin is straight and strongly crenulated.

The orbit is markedly oblique.

The inter-antennular septum is narrower than in *M. messor* and is pubescent. The basal segment of the antennule possesses soft hairs. The entire surface of the basal segment of the antennal peduncle is densely pubescent.

The sub-orbital tooth is obtuse and very weakly keeled, it bears a row of hairs on its margin. The inner part of the sub-orbital border, i.e., the portion near the epistome, is not serrated, in a few specimens it is very faintly crenulated. The sub-orbital notch is not deep. The portion of the sub-orbital border between the notch and the external orbital angle bears a tuft of long hairs on the inner side.

The epistome, like in *M. messor*, has two curved elevated ridges, one on each side. The entire surface of the epistome is pubescent. The space between the ridge of the epistome and the sub-orbital tooth is densely pubescent.

The upper border of the buccal cavern is nearly straight. The palp of the external maxilliped is more densely tufted with hairs than in *M. messor*; the merus is slightly broader than long, in some specimens, however, its breadth is nearly equal to its length.

The palate is of about the same shape as that of *M. messor*.

The antero-lateral corner of the buccal cavern bears a strong curved keel.

In the male only the median area of the anterior portion of the sternite of the somite bearing the chelipeds is pubescent, in the female the entire anterior portion is pubescent, while some scattered hairs are present on the rest of the surface of this sternite. The tubercles on the next sternite inside the male abdominal fossa are large. In the female the oviducal aperture is rounded and rather swollen, bearing no chitinous projection.

The cheliped is more slender and less stout than in *M. messor*. The teeth of the merus are more acute and spiny and the carpus is much more tuberculate than in *M. messor*. The palm bears a prominent ridge on its external surface. This ridge extends to or almost to the tip of the fixed finger. The external surface of the palm is provided with short ridges and tubercles. There are strong oblique ridges on the lower surface of the palm. The inner surface of the palm also bears short ridges and tubercles. The finger tips are broader than in *M. messor*, they are sharp and equal to each other.

The four pairs of walking legs are very slender. The upper margin of the merus ends in a spine, which is more acute than in *M. messor*. The lower distal extremity of the merus is serrated and the teeth are extremely spiny, there is a large gap between the last two teeth of this serration. The

propodus is much longer than that of *M. messor*, and even than that of *M. thukuhar* or *M. frontalis*. The anterior side of the lower margin of the propodus of the first walking leg bears a dense pubescent area. This area occupies  $\frac{3}{4}$  portion of the propodus and is more densely pubescent than in *M. frontalis*. A similar less dense area is noticed on the lower margin of the propodus of the second and third walking legs, while in the last walking leg it is seldom found, and, if present, is very strongly reduced. Besides this broad pubescent area there is a linear row of soft hairs on the posterior surface of the propodus of the first three pairs of walking legs near the upper border of this segment and on the last pair of walking legs a linear hairy fringe is placed on the upper margin of the propodus. Generally the dactylus of each of the first three pairs of walking legs bears one linear fringe of hairs on the posterior side of the upper border while there is no such fringe on the dactylus of the last pair of walking legs. The number of spines on the dactylus is far greater than in *M. messor* and they are placed very close together. The other characters of these legs are similar to those in *M. messor*.

The sixth segment of the male abdomen is rectangular in shape and is equal to or slightly longer than the fifth. The chitinous projection of the male pleopod is obliquely T-shaped. Its distal margin is strongly curved and incised in the middle. The curved portion is serrated. There is a shallow concavity at the top of this chitinous projection.

Colour. In spirit specimens the carapace and the legs are yellow above, yellowish white below. In life the carapace and the legs are mottled with yellow and reddish brown (White, 1847b), or shining purple marbled with yellow (A. Milne Edwards, 1873).

Habitat. This species lives in the mangroves (A. Milne Edwards, 1873; Tweedie, 1950a).

Distribution. This species is distributed in the Indo-West Pacific region from South India to New Caledonia.

Remark. Tweedie (1936; 1949) pointed out that *Metopograpsus maculatus* II. Milne Edwards and *Metopograpsus pictus* A. Milne Edwards are synonyms of *Metopograpsus latifrons* (White), as other authors had already stated before him. The specimens from Amboina in the collection of the Leiden Museum which De Man (1888) referred to *M. pictus* proved to be *Metopograpsus latifrons*. As already mentioned by De Man (1879 p. 68), the specimen in the Leiden Museum bearing De Haan's manuscript name *Grapsus* (*Grapsus*) *dilatatus* agrees in all details with *M. latifrons*. Also Tesch (1918) examined the type of *Grapsus* (*Grapsus*) *dilatatus* and agreed with De Man.

**Metopograpsus frontalis** Miers (Figs. 5 e, 6 b-e)

*Metopograpsus messor frontalis* Miers, 1880, p. 311.

*Metopograpsus messor gracilipes* De Man, 1891, p. 49, pl. 4 fig. 14.

*Metopograpsus gracilipes* Tweedie, 1949, p. 470, fig. 1g.

## Snellius Expedition

Maratua, reef, August 14-18, 1929; 1 female, cl 8 mm, cb 11.2 mm.

Dobo, Aru Islands, shore, October 10, 1929; 2 females, cl 9 and 10 mm, cb 11.5 and 13.5 mm.

Manumbai, Aru Islands, shore, October 11-14, 1929; 30 males, cl 6.5-15 mm, cb 8-20 mm; 35 females, cl 5-13 mm, cb 7-18.5 mm.

Bima, Sumbawa, shore, December 25, 1929; 29 males, cl 6-19 mm, cb 9-23.9 mm; 35 females, cl 6-18 mm, cb 8.5-24 mm.

Kanbing near Bima, shore, December 26, 1929; 15 males, cl 6-19 mm, cb 8-24.5 mm; 14 females, cl 6.5-19.5 mm, cb 8-22 mm.

Taliabu, Sula Islands, shore, March 18, 1930; 20 males, cl 8-17 mm, cb 11-22 mm; 15 females, cl 7-20 mm, cb 10-26 mm.

Ake Selaka, Kau Bay, Halmahera, shore or reef, May 28, 1930; 1 female, cl 11 mm, cb 15 mm.

Flores, August 18-19, 1930; 5 males, cl 11.5-18 mm, cb 15-23 mm; 3 females cl 8.5-11 mm, cb 12-14 mm.

## Leiden Museum

Port Dickson, Malaya, March, 1949, L. D. Brongersma; 1 female, cl 17 mm, cb 23 mm.

Pulu Lemukutan, W. Borneo, 1893, H. Hallier; 1 female, cl 12 mm, cb 17 mm.

Java; 11 males, cl 16-23 mm, cb 22-30 mm; 3 females, cl 9-21.5 mm, cb 11-27.5 mm, one of which is a syntype of *Grapsus (Grapsus) dilatatus* De Haan (MS.) Herklots (nom. nud.) (dry preserved specimens).

Tandjong Priok, N. coast of W. Java, shore, May, 1926, February, 1927, November, 1929, P. Buitendijk; 7 males, cl 8-20 mm, cb 11.1-26 mm; 5 females, cl 8-19 mm, cb 11-21 mm.

Beach near Tandjong Priok, February, 1927, P. Buitendijk; 1 male, cl 11 mm, cb 15 mm.

Semarang, N. coast of Central Java, May, 1914, P. Buitendijk; 1 male, cl 15 mm, cb 19 mm.

Tjilatjap, S. coast of Java, 1905, P. Buitendijk; 1 male, cl 11 mm, cb 13 mm.

River near Surabaya, E. Java, brackish water, January, 1917, P. Buitendijk; 2 females, cl 17 mm, cb 21 mm.

Madura, February, 1913, P. Buitendijk; 3 males, cl 10-18 mm, cb 13-24 mm; 2 females, cl 13 and 17.5 mm, cb 18 and 22 mm.

S. coast of Madura, January, 1917, P. Buitendijk; 1 male, cl 18 mm, cb 20.5 mm; 1 female, cl 16 mm, cb 20 mm.

Makassar, Celebes, D. M. Piller; 5 males, cl 16-20.5 mm, cb 20-27 mm.

Kisar, N. E. of Timor, 1898, K. Schädler; 1 male, cl 11.2 mm, cb 15 mm.

Pacific Ocean, Museum Godeffroy; 1 male, cl 15 mm, cb 20 mm (type of *Metopograpsus messor gracilipes* De Man).

## Amsterdam Museum

Brandewijnsbaai, Padang, Sumatra, 1888, M. Weber; 1 male, cl 8 mm, cb 11 mm; 1 female, cl 12.5 mm, cb 16 mm.



G. Pajung, Borneo, September 1909, in growth on a gas buoy, S. S. "Pharus"; 1 male, cl 10 mm, cb 12 mm.

Balikpapan, Borneo, W. J. Tissot van Patot; 1 male, cl 15 mm, cb 20 mm.

Batavia, Java, along breakwater, March, 1906; 1 male, cl 16 mm, cb 20 mm.

Aru Islands, December 6, 1909; 1 male, cl 12 mm, cb 16 mm; 2 females, cl 9 and 11.5 mm, cb 11 and 15 mm.

Trangon Island, Aru Islands, fresh water, W. J. Tissot van Patot; 1 female, cl 15 mm, cb 18 mm.

Merauke, New Guinea, New Guinea Exp., 1904-1905, J. W. R. Koch; 13 males, cl 11-23 mm, cb 16-20 mm; 8 females, cl 11-20 mm, cb 15-27 mm.

Siboga Exp., Sta. 47, Bay of Bima, Sumbawa; 12 males, cl 4-20 mm, cb 6-25 mm, 1 female, cl 18 mm, cb 23 mm.

Siboga Exp., Sta. 71, Makassar, Celebes; 1 male, cl 16 mm, cb 20 mm.

#### British Museum (Natural History)

Ceylon, W. A. Herdman; 4 females, cl 14-17 mm, cb 17-22 mm.

Singapore, M. W. F. Tweedie; 1 male, cl 20 mm, cb 26 mm.

Celebes; 1 male, cl 22.2 mm, cb 29 mm (lectotype of *Metopograpsus frontalis* Miers).

West Island, Prince of Wales Channel, N. W. of Australia, beach, R. Coppinger, H. M. S. "Alert"; 1 male, cl 13.5 mm, cb 18 mm; 1 female, cl 16 mm, cb 21 mm.

Northwest of Australia, B. Grey; 1 male, cl 21 mm, cb 27 mm; 4 females, cl 14.5-21 mm, cb 19-32 mm.

Nicol Bay, N. W. coast of Australia; 3 females, cl 14-22.5 mm, cb 18-29 mm.

Cape Boilean, N. W. Australia, B. Grey; 2 males, cl 13 and 17 mm, cb 17 and 22 mm.

Thursday Island, Torres Strait, beach, R. Coppinger, H. M. S. "Alert"; 1 female, cl 10 mm, cb 13.5 mm.

Port Curtis, Queensland, R. Coppinger, H. M. S. "Alert"; 2 males, cl 20 and 21 mm, cb 27 and 27 mm.

Port Mollie, Queensland, sandy beach, R. Coppinger, H. M. S. "Alert"; 1 male, cl 18 mm, cb 23 mm; 1 female, cl 18 mm, cb 24 mm.

Description. The lateral margins of the carapace are distinctly convergent backwards but less in small than in large specimens. There is no tooth on the lateral margin behind the external orbital angle. The regions of the carapace are not well defined. The cervical groove is distinct. As in *Metopograpsus thukuhar*, the hepatic region bears one or two transverse ridges just before the cervical groove. The posterior of these ridges, which is placed between the first ridge and the cervical groove, ends at some distance before reaching the lateral margin of the carapace. The median two post-frontal lobes are smaller than the outer two. Their free edges are neither sharp nor distinct, and possess small tubercles and ridges. The dorsal surface of the post-frontal lobes shows distinct transverse ridges. The branchio-cardiac groove is absent. The urogastric groove is distinct. The cardiac and intestinal regions are smooth and there is no demarcation between them.

The front is exactly similar to that of *Metopograpsus messor*.

The orbit is rather transverse or slightly oblique.

The inter-antennular septum is slightly narrower than in *M. messor*. The junction of the front and the inter-antennular septum is more curved than in *M. messor*.

The entire surface of the base of the antennal peduncle is not densely pubescent, only its margin bears a row of soft hairs. The suborbital tooth is acute and distinctly keeled from its tip to the base. The sub-orbital border is like that of *M. messor*, its notch near the external orbital angle is shallow.

The epistome, as usual, bears two elevated ridges in each half, these ridges are less strongly curved than in *M. thukuhar*. Generally there is no tuft of soft hairs between this ridge and the sub-orbital border but in a few specimens some scattered small hairs may be observed there.

The upper border of the buccal cavern is straight, in a few cases it is  $\infty$ -shaped. The palate and the external maxilliped are of the same shape as in *M. messor*.

The upper margin of the second sternite is less concave than in *M. messor*. There is a pair of tubercles in the male abdominal fossa on the third sternite. These tubercles are somewhat larger than in *M. messor* and in *M. thukuhar*. In the female the oviducal aperture is bent in the middle like an angle; this character proves to be very constant and can be used as an easy means to distinguish females of this species from related forms.

The finger tips of the cheliped are sharp. The other characters of the cheliped are similar to those of *M. messor*.

The four pairs of walking legs are more slender than in *M. messor*. The lower distal extremity of the merus of each walking leg is serrated, and the teeth of this serration are more spiny and acute than in *M. messor*; there is a large gap between the last two teeth of the lower portion of this serration. A narrow pubescent area is present on the anterior side of the lower border of the propodus of the first walking leg. This area does not extend over the entire length of the propodus. In the propodi of the other three pairs of walking legs no such area is visible. In some specimens the propodi of the second, third, and last walking legs bear a median linear row of hairs on the posterior surface. The propodus of the last walking leg possesses a fringe of hairs on its upper margin besides another linear hairy fringe on the posterior surface of its lower margin. By this character, which is very constant and easy to see, the present species differs from *M. messor* and *M. thukuhar*. All the other characters of the four pairs of walking legs are similar to those of *M. messor*.

In the male abdomen the fifth segment is equal to or slightly longer than the sixth segment. The chitinous projection of the male pleopod is not

compressed but it bears a concavity at its top. The upper margin of this projection is not serrated. This character is very important to distinguish this species from the others.

Colour. In spirit specimens the carapace and the legs are reddish yellow above, variegated with dark brown patches, while they are yellowish white below. The colour of the chelae is pale yellowish white or white. The finger tips of the chelipeds are dark tan or chocolate brown.

Distribution. This species is known from the larger part of the Indo-West Pacific region, namely from Ceylon to the Pacific Ocean.

Remarks. Tweedie (1949) stated that *Metopograpsus intermedius* H. Milne Edwards is represented in the collection of the Paris Museum by two syntypes belonging to two distinct species; the smaller of these is a specimen of *Metopograpsus thukuhar* (Owen), while the larger is identical with *Metopograpsus gracilipes* De Man. Later Tweedie (1954) designated the smaller of these two syntypes as the lectotype of *Metopograpsus intermedius* H. Milne Edwards to make *Metopograpsus intermedius* a junior synonym of *Metopograpsus thukuhar* (Owen) and to establish *Metopograpsus gracilipes* as the valid name for the species represented by the larger co-type of *Metopograpsus intermedius* H. Milne Edwards.

At my request Dr. L. B. Holthuis examined for me the two syntypes of *Metopograpsus messor* var. *frontalis* Miers in the collection of the British Museum (Natural History). One of these (a male from Makassar, Celebes) belongs to *Metopograpsus gracilipes* De Man, and this specimen has been selected as the lectotype of *Metopograpsus frontalis* Miers. The second syntype clearly belongs to *Metopograpsus oceanicus* (Jacquinot) and now becomes a paratype of *M. frontalis*.

The oldest available specific name for the present species is *frontalis* Miers, 1880, which is a senior subjective synonym of *gracilipes* De Man, 1891. Miers's name therefore has to be used.

In the British Museum (Natural History) I examined the materials of these species collected by H. M. S. "Alert" and described by Miers (1884) as *Metopograpsus messor*. Already Miers (1884) considered all but one of these Australian specimens to belong to the form which was named *Metopograpsus intermedius* by H. Milne Edwards. The only exception is the specimen from West Island, which Miers considered to be *Metopograpsus thukuhar*. Actually, however, all of Miers's specimens prove to belong to *Metopograpsus frontalis* Miers.

I could examine in the British Museum the Ceylon material collected by W. A. Herdman, reported upon by Laurie (1906), while also the material from Netherlands New Guinea dealt with by Roux (1917) which is present

in the Zoological Museum at Amsterdam could be studied. The material mentioned by the two above authors as *Metopograpsus messor* proved to belong to *Metopograpsus frontalis* Miers.

### **Metopograpsus thukuhar** (Owen) (Fig. 6 f, g)

*Grapsus thukuhar* Owen, 1830, p. 80, pl. 24 fig. 3.

*Metopograpsus Eydouxi* H. Milne Edwards, 1853, p. 165.

*Metopograpsus intermedius* H. Milne Edwards, 1853, p. 165.

*Metopograpsus thukuhar* H. Milne Edwards, 1853, p. 165.

#### Snellius Expedition

Maratua, reef, August 14-18, 1929; 12 males, cl 6-15 mm, cb 8-18 mm.

Paleleh, Celebes, shore, August 21, 1929; 1 female, cl 7.5 mm, cb 9 mm.

Near Kampong Tjobo, Tidore, shore, September 24-29, 1929; 4 males, cl 6-12 mm, cb 9-15 mm; 2 females, cl 10 and 13 mm, cb 13 and 17 mm.

Tidore, shore, September 24-29, 1929; 3 males, cl 6-12 mm, cb 8.2-15 mm; 10 females, cl 9-14 mm, cb 12-17.5 mm.

Kafal near Misool, shore or reef, October 3-5, 1929; 1 male, cl 8 mm, cb 10 mm; 1 female, cl 11 mm, cb 15 mm.

Dobo, Aru Islands, shore, October 10, 1929; 1 male, cl 16 mm, cb 19 mm; 1 female, cl 12.5 mm, cb 16 mm.

Near Hainsisi, Semau near Timor, shore, November 27, 1929; 2 males, cl 9 and 12.2 mm, cb 11.9 and 16 mm; 1 female, cl 16.5 mm, cb 21.5 mm.

Kudingareng Lompo ("Groot Hertebeest") near Makassar, shore, February 3, 1930; 3 males, cl 6-12 mm, cb 8-16 mm; 4 females, cl 10.9-13.5 mm, cb 13.9-16.5 mm.

Sailus besar, Paternoster Islands, shore or reef, February 9, 1930; 5 females, cl 9-13 mm, cb 12-17 mm.

Tanah Djampea, shore or reef, February 21-22, 1930; 1 male, cl 13 mm, cb 16.5 mm.

Obi Latu, shore or reef, April 23-27, 1930; 1 female, cl 8 mm, cb 11 mm.

Bula, Ceram, April 25, 1930; 1 female, cl 15.5 mm, cb 20 mm.

Haruku, shore or reef, May 3-7, 1930; 25 males, cl 6-15 mm, cb 8-19 mm; 26 females, cl 7-15 mm, cb 9-19 mm; one specimen heavily damaged, measurements and sex determination not possible.

Morotai, June 3-10, 1930; 1 male, cl 12 mm, cb 15 mm; 1 female, cl 11 mm, cb 13 mm.

Beo, Karakelong, Talant Islands, shore or reef, June 14-21, 1930; 2 males, cl 9.5 and 11.5 mm, cb 12 and 14 mm; 2 females, cl 16 and 18 mm, cb 20 and 21.5 mm.

Flores, August 18-19, 1930; 1 male, cl 9.5 mm, cb 12.6 mm; 3 females, cl 9-11 mm, cb 11-15 mm.

Kaledupa, Tukang Besi Islands, August 27, 1930; 12 males, cl 6-13 mm, cb 8-16 mm; 11 females, cl 7.5-15 mm, cb 10-18 mm.

Amboina, September 10-17, 1930; 26 males, cl 6-15 mm, cb 9-17.5 mm; 27 females, cl 7-13 mm, cb 10-17 mm.

Island near Menado, Celebes, September 25, 1930; 1 male, cl 18.5 mm, cb 23 mm; 6 females, cl 9-15 mm, cb 12-20 mm.

#### Leiden Museum

Java; 1 male, cl 18 mm, cb 23 mm (dry preserved specimen).

Tjilatjap, S. coast of Java, 1905, P. Buitendijk; 1 female, cl 17 mm, cb 19.5 mm.

Banda Neira, 1881, J. Semmelink; 1 male, cl 13 mm, cb 15.6 mm; 1 female, cl 11.4 mm, cb 14.9 mm.

Kisar, N. of Timor, 1898, K. Schädler; 1 female, cl 11.5 mm, cb 15 mm.

Japan; 1 male, cl 24 mm, cb 29 mm; 1 female, cl 23.5 mm, cb 28 mm.

Ine, Arno Atoll, Marshall Archipelago, June-September, 1950, R. W. Hiatt; 1 female, cl 12 mm, cb 15 mm.

Pacific Ocean, Museum Godefroy, 1887; 1 male, cl 18.5 mm, cb 22.9 mm; 1 female, cl 17 mm, cb 20.5 mm.

#### Amsterdam Museum

P. Pari, Duizend Islands, N. of W. Java, March 3, 1909; 1 male, cl 12 mm, cb 15 mm.

Noordwachter Island, Java Sea, De Man collection; 1 female, cl 11 mm, cb 15 mm.

N.E. coast of Adonare, near Flores, May 25, 1909, G. A. J. van der Sande; 1 male, cl 12 mm, cb 15 mm.

Siboga Exp., Sta. 50, Labuan Badjo, W. coast of Flores; 1 male, cl 9 mm, cb 10 mm.

Siboga Exp., Sta. 142, Obi Major, S. of Halmahera; 1 male, cl 14 mm, cb 18 mm.

#### British Museum (Natural History)

Mongue Ferry, Moifumbene Estuary, Portuguese East Africa, mangrove swamp; 2 females, cl 11.5 and 15 mm, cb 15 and 20 mm.

Durban, don. E. Chubb; 2 females, cl 15 and 18 mm, cb 19 and 23 mm.

Tamatave, Madagascar, Rev. Deans Cowan; 3 females, cl 9-17 mm, cb 12-21 mm.

Rodríguez, G. Gulliver; 1 male, cl 16.5 mm, cb 20 mm; 1 female, cl 18 mm, cb 23 mm.

Mahé Island, beach, R. Coppinger, H. M. S. "Alert"; 1 male, cl 17 mm, cb 23 mm.

Madras, J. R. Henderson; 1 male, cl 23 mm, cb 28 mm; 1 female, cl 24 mm, cb 29 mm.

Indian Museum; 1 male, cl 16 mm, cb 20 mm.

Kandavu, Fiji Islands, H. M. S. "Challenger"; 1 male, cl 10 mm, cb 13 mm.

Lalomanu, Upolu Island, Samoa, Buxton and Hopkins; 1 female, cl 18 mm, cb 22 mm.

Upolu, Samoa, S. J. Whitmer; 1 male, cl 17.5 mm, cb 21.9 mm.

Papeete, Tahiti, brackish water, H. M. S. "Challenger"; 5 females, cl 10-20 mm, cb 12-24 mm.

Tahiti, near the reefs, H. M. S. "Challenger"; 2 males, cl 10.5 and 13 mm, cb 13 and 17 mm; 2 females, cl 11 and 15 mm, cb 15 and 19 mm.

Hilo, Hawaii; 2 males, cl 14 and 22.9 mm, cb 17 and 27.1 mm; 3 females, cl 11-19 mm, cb 13-22.5 mm.

Hawaii, don. Hawaiian Govt.; 1 male, cl 18.9 mm, cb 22 mm; 2 females, cl 17 and 19 mm, cb 21.9 and 22.5 mm.

Hawaii; 1 male, cl 16.5 mm, cb 20 mm.

Description. The carapace is more quadrate than in *Metopograpsus messor* (Forskål) and *Metopograpsus frontalis* Miers. Its lateral margins are usually parallel but in a few specimens they are scarcely convergent backwards. There is no tooth on the lateral margin behind the external orbital angle. The cervical groove is less distinct than in *M. messor* and *M. frontalis*. There is a prominent transverse ridge on the hepatic region just before the cervical groove. In the space between this long ridge and the cervical groove sometimes an additional small transverse ridge may be seen. The

four post-frontal lobes are more or less of equal size. Their free edges are not very prominent and are not sharply defined, they bear small tubercles. The upper surface of these lobes possesses distinct ridges. The branchio-cardiac groove is distinct.

The frontal margin is not straight but slightly depressed in the middle. The surface of the front is provided with scattered tubercles.

The inter-antennular septum is smooth. The junction of the front and the inter-antennular septum is more curved than in *M. messor*.

The entire surface of the base of the antenna is pubescent. The sub-orbital tooth is blunt. Usually it is not keeled, but rarely there is a very faint keel near its tip. The sub-orbital border is similar to that of *M. messor*, only the notch near the external orbital angle is smaller than that in that species.

The epistome is provided with very small tubercles. The space between the curved elevated ridge and the sub-orbital border is pubescent.

The upper border of the buccal cavern is straight. The palate is broader than in *M. messor* and slightly flattened. There is no prominent median ridge on the palate.

The external maxilliped is of the same shape as in *M. messor* but the outer lateral margin of the merus is more convex.

The antero-lateral corner of the buccal cavern bears a strong keel. This keel is slightly longer than in *M. messor*.

The upper margin of the second sternite is less concave than in *M. messor*. In the male the tubercles on the third sternite inside the male abdominal fossa are smaller than in *M. frontalis*. In the female the oviducal aperture bears no chitinous projection. The slit of the oviducal aperture is rounded and not bent in the middle like an angle as in *M. frontalis*. This character is of great systematic value for this species.

The cheliped is more or less like that of *M. messor*, only the teeth on the outer lower lateral border of the merus are smaller than in *M. messor*, and the depression at the proximal base of the fixed finger is shallow. The finger tips are of equal size and are sharper than in *M. messor*.

The four pairs of walking legs have the carpus, propodus, and dactylus more bristly than those of *M. messor* and of *M. frontalis* while the bristles are longer than in these two species. The spines are more prominent and more numerous than in *M. messor*. The lower distal extremity of the merus is strongly serrated and the teeth of the lower portion of this serration are generally larger than in *M. messor*, but this serration of the two specimens from Japan (Leiden Museum) is quite similar to that in *M. messor*. Like the latter species the upper border of the propodus of the last walking

leg has no linear fringe of hairs. The other characters of these legs are quite similar to those of *M. messor*.

In the male the abdominal segment is equal to or slightly longer than the fifth segment. The male pleopod bears a simple finger-shaped compressed chitinous projection at its top. There is no concavity at the top of the chitinous projection and its distal margin is not serrated.

Colour. In spirit specimens the carapace and the legs are deep chocolate brown or dead greyish black above, variegated with deep yellow or deep brown patches; the lower surface of the body is greyish white or yellow. In life the colour is dull yellow sprinkled all over with minute brown spots (Owen, 1839), or mottled with various shades of olive grey, brown, and red, the effect being dull and cryptic, the chelae are brownish pink, deeper on the under surface (Tweedie, 1950b).

Habitat. This crab is found among stones and under weed near low water level and high water mark (Tweedie, 1950b).

Distribution. *M. thukuhar* is distributed over the far larger part of the Indo-West Pacific region from the East and South African coasts to Hawaii. Ortmann (1894) suggested that this species does not occur in the Indian Ocean but Tweedie proved that this assumption is incorrect. Some specimens from the Indian Ocean, which I examined in the collection of the British Museum confirm Tweedie's view.

### **Metopograpsus oceanicus** (Jacquinot) (Figs. 5f, 6h)

*Grapsus oceanicus* Jacquinot, 1812-1853, pl. 6 fig. 9.

*Metopograpsus oceanicus* H. Milne Edwards, 1853, p. 166.

*Grapsus (Grapsus) Sulcifer* (De Haan MS.) Herklots, 1861, p. 129 (nom. nud.).

#### Snellius Expedition

Mamudju, Celebes, reef or shore, August 4-5, 1929; 3 males, cl 20-30 mm, cb 24-34 mm.  
Maratua, reef, August 14-18, 1929; 3 males, cl 13-22.0 mm, cb 16-26.7 mm.

Paleleh, Celebes, shore, August 21-22, 1929; 3 males, cl 8-21.5 mm, cb 11-26 mm;  
2 females, cl 10-20 mm, cb 12-25 mm.

Small island east of Bongao, Tawi Tawi, Sulu Archipelago, shore, September 16, 1929; 1 male, cl 12 mm, cb 16 mm; 1 female, cl 15 mm, cb 19 mm.

Kafal near Misool, shore or reef, October 3-5, 1929; 2 males, cl 13 and 20.5 mm, cb 16 and 25 mm; 1 female, cl 16.5 mm, cb 20 mm.

Near Hainsisi, Semaun near Timor, shore, November 27, 1929; 5 males, cl 10-24 mm, cb 13-29 mm.

Bima, Sumbawa, shore, December 25, 1929; 1 male carapace, damaged, measurements not possible; 1 female, cl 13 mm, cb 16 mm.

Kambing near Bima, Sumbawa, shore, December 26, 1929; 8 males, cl 7.5-13.5 mm; 10 females, cl 5-20 mm, cb 6.5-25 mm.

Tanah Djampea, shore or reef, February 21-22, 1930; 16 males, cl 8-25.5 mm, cb 10-30 mm; 17 females, cl 10-28.5 mm, cb 13-33.9 mm.

Taliabu, Sula Islands, shore, March 1, 1930; 13 males, cl 14-28 mm, cb 16-31 mm; 17 females, cl 17-27 mm, cb 20-32.5 mm.

Morotai, June 3-10, 1930; 3 males, cl 23.5-31 mm, cb 27-36.5 mm.

Beo, Karakelong, Talaut Islands, shore or reef, June 14-21, 1930; 3 males, cl 20-23 mm, cb 24-28 mm.

Kaledupa, Tukang Besi Islands, August 27, 1930; 2 males, cl 14 and 15 mm, cb 17 and 18.5 mm.

Small island near Manado, Celebes, September 25, 1930; 3 females, cl 23-27 mm, cb 28-31 mm.

Locality unknown; 3 males, cl 10-26 mm, cb 19-31.5 mm; 4 females, cl 21-27 mm, cb 24-31.5 mm.

### Leiden Museum

Estuary of Arakundur river, E. coast of Atjeh, Sumatra, July 19, 1901, G. A. J. van der Sande; 1 female, cl 32 mm, cb 39 mm.

Java, H. Kuhl and J. C. van Hasselt; 2 males, cl 24 and 27 mm, cb 29 and 33 mm, types of *Grapsus* (*Grapsus*) *sulcifer* De Haan (MS.) Herklots (nom. nud.) (dry preserved specimens).

Gebeli Island, Moluccas, September, 1864, H. A. Bernstein; 1 male, cl 27 mm, cb 31 mm; 2 females, cl 28 and 29 mm, cb 32 and 34 mm.

Amboina, 1863, E. W. A. Ludeking; 1 male, cl 29 mm, cb 33 mm; 2 females, cl 21 and 22 mm, cb 25 and 26 mm.

Sekru, New Guinea, 1867, K. Schädler; 1 female, cl 13 mm, cb 17 mm.

Sinabang, Simalur near Sumatra, March, 1913, E. Jacobson; 1 female, cl 18 mm, cb 22.5 mm.

Pacific Ocean, Museum Godeffroy; 1 female, cl 15.5 mm, cb 19 mm.

### Amsterdam Museum

Java; 1 male, cl 21.5 mm, cb 26 mm; 1 female, cl 16.5 mm, cb 20 mm.

Wahai, Ceram, March 21, 1907; 1 male, cl 26 mm, cb 31 mm.

Siboga Exp., Sta. 16, Kangeang, E. of Madura; 1 female, cl 16 mm, cb 18 mm.

Siboga Exp., Sta. 47, Bay of Bima, Sumbawa; 1 male, cl 11 mm, cb 13.5 mm.

Siboga Exp., Sta. 86, Dongala, W. coast of Celebes; 2 males, cl 12 and 13 mm, cb 15 and 16 mm; 2 females, cl 18 and 19 mm, cb 22 and 24 mm.

Siboga Exp., Sta. 115, Bay of Kwandang, N. coast of Celebes; 1 male, cl 14 mm, cb 17 mm.

Siboga Exp., Sta. 163, Seget, W. coast of New Guinea; 1 male, cl 24 mm, cb 30 mm.

### British Museum (Natural History)

Nairobi, Kenya, don. H. Copley; 1 male, cl 11 mm, cb 14 mm; 1 female, cl 11 mm, cb 14 mm.

Mombasa, E. Africa, L. F. Brown; 1 male, cl 22 mm, cb 26 mm; 1 female, cl 19 mm, cb 24 mm.

Shimoni, 50 miles S. of Mombasa, E. Africa; 1 male, cl 21 mm, cb 25 mm.

Tanga, Tanganyika, E. Africa, L. F. Brown; 2 males, cl 18.5 and 25 mm, cb 22 and 30 mm; 1 female, cl 25 mm, cb 30 mm.

Malaysia; 1 male, cl 27 mm, cb 32 mm (syntype of *Metopograpsus messor* var. *frontalis* Miers).

Singapore; 5 males, cl 13.5-24 mm, cb 16-29 mm; 7 females, cl 13.5-28.5 mm, cb 16.5-34.1 mm.



Singapore, F. B. Bedford and W. F. Lanchester; 5 males, cl 13-22 mm, cb 16-26 mm; 7 females, cl 14-22.5 mm, cb 17-26.5 mm.

Telok Paku, Singapore, M. W. F. Tweedie; 1 male, cl 26 mm, cb 31 mm.

Pulau Salu, Singapore, M. W. F. Tweedie; 1 male, cl 26.9 mm, cb 31 mm.

Timor Laut (Tenimber Islands), H. O. Forbes; 1 male, cl 21 mm, cb 25 mm.

Description. The lateral margins of the carapace are convergent posteriorly. There is a tooth on the lateral margin behind the external orbital angle. The cervical groove is distinct, deep, and continuous. There is only one transverse ridge placed on the hepatic region before the cervical groove. The four post-frontal lobes are distinct; the outer two are larger than the two median. The free edges of these lobes are provided with tuberculate ridges. Their dorsal surfaces possess strong ridges. The mesogastric region is rather smooth, and bears no ridge or marking. In the branchial region the usual oblique ridges are present. The branchio-cardiac groove is not very distinct.

The front is deflexed. Its margin is not straight but slightly depressed in the middle. A little portion of this margin is oblique at both ends. The surface of the front is deep and sunken.

The orbit is slightly oblique.

The inter-antennular septum is slightly sunken and bears some hairs. The surface of the base of the antenna does not possess any hair, only its margin bears a fringe of hairs.

The sub-orbital tooth is acute and strongly keeled; for a considerable distance it is in contact with the front. The notch of the suborbital border near the external angle is not deep.

The inside of the orbit bears some scattered hairs but no tuft of hairs, like that in *Metopograpsus latifrons*, is present.

The ridge at each side of the epistome touches the sub-orbital border.

Of the external maxilliped the outer lateral margin of the merus is more curved than in *Metopograpsus messor*. The ischium bears a hairy fringe on its outer lateral margin; this fringe is more dense than in *M. messor*, and also the tuft of hair at the base of the exopodite is more dense than in that species.

The upper border of the buccal cavern is generally straight.

The second sternite of the somite bearing the chelipeds possesses some scattered hairs. The oviducal aperture of the female is rather rounded in shape.

In the cheliped the serration of the merus is more prominent than in *M. messor* and the teeth of this serration are more spiny than in that species. The carpus is similar to that of *M. messor*, only the tubercles are

more salient. There is a long strong ridge on the external surface of the palm which extends to very near tip of the fixed finger. Below this ridge there are some oblique ridges. These ridges run up to the lower border of the palm. The external surface of the palm bears some squamous ridges near its junction with the wrist. The upper border and a portion of the upper half of the external surface of the palm are provided with strong tubercles. The finger tips are broad and are of equal size.

The four pairs of walking legs are more slender than in *M. messor*. The merus of each walking leg is serrated at its lower distal extremity and there is a large gap between the last two teeth of the lower portion of this serration; this gap is smaller than in *Metopograpsus thukuhar*, while the serration is more distinct than in *M. messor*. The propodus of each walking leg is long. The anterior side of the lower margin of the propodus of the first walking leg possesses a pubescent area which is similar to that in *Metopograpsus frontalis*, but is less dense and less extensive than in *M. latifrons*. The propodi of the first three walking legs bear a linear row of soft hairs on their posterior surface whereas the propodus of the last walking leg bears a fringe of hairs on its upper margin and another less distinct row on the posterior side of the lower margin. As in *M. latifrons* the dactylus of each of the first three pairs of walking legs possesses a linear row of hairs like that of the propodus. This row is absent or very ill-defined on the dactylus of the last pair.

In the male the sixth segment of the abdomen is equal in length to the fifth segment. The chitinous projection of the male pleopod is shorter than in *M. latifrons*, its distal margin is curved, very finely serrated, and is not incised. The inner lateral margin of this projection is much more curved than in *M. latifrons* and there is a concavity at its top.

Colour. In spirit specimens the carapace and the legs are greyish brown above, variegated with deep brown, they are greyish white below.

Distribution. This species is found in the Indo-West Pacific region from the East coast of Africa to the Malayan Archipelago.

Remark. One of the three female specimens from Dongala, West coast of Celebes (Siboga Exp., St. 86) in the collection of the Amsterdam Museum, which were described by Tesch (1918) as *Metopograpsus oceanicus*, belongs to a species of the Sesarminae.

### **Metopograpsus quadridentatus** Stimpson (Figs. 5 *g*, 6 *i*)

*Metopograpsus quadridentatus* Stimpson, 1858, p. 102.

*Grapsus* (*Grapsus*) *plicatus* (De Haan MS.) Herklots, 1861, p. 129 (nom. nud.).

*Pachygrapsus quadratus* Tweedie, 1936, p. 48, pl. 15 fig. 1.

## Leiden Museum

Indian Ocean; 1 male specimen, damaged, measurements not possible.

Malacca, 1806, Storm; 1 male, cl 15 mm, cb 18 mm; 1 female, cl 16 mm, cb 19 mm.

Java; 7 males, cl 21-24 mm, cb 25-26 mm; 7 females, cl 19-22 mm, cb 23-26 mm; 8 males, cl 20-25 mm, cb 24-29 mm, types of *Grapsus* (*Grapsus*) *plicatus* De Haan (MS.) Herklots (nom. nud.) (dry preserved specimens).

Tandjong Priok, N. coast of Java, 1906, P. Buitendijk; 5 males, cl 10-23 mm, cb 16-28 mm; 4 females, cl 10-19 mm, cb 13-22 mm, moreover one damaged female.

New Guinea, H. C. Macklot; 3 males, cl 18-23 mm, cb 21-26 mm (dry preserved specimens).

Amoy, China, G. Schlegel; 7 males, cl 10-25 mm, cb 12.1-29 mm; 3 females, cl 10-17 mm, cb 13-21 mm.

## Amsterdam Museum

Malacca, 1805, De Man collection; 3 males, cl 15-18 mm, cb 19-22 mm; 4 females, cl 11-20 mm, cb 13-24 mm.

Off Semarang, Java, May, 1913, P. Buitendijk; 3 males, cl 19-23 mm, cb 22-28 mm; 2 females, cl 13 and 19 mm, cb 16 and 21 mm.

Balikpapan, Borneo, W. J. Tissot van Patot; 1 male, cl 11 mm, cb 14 mm.

Merauke, New Guinea, New Guinea Exp., 1904-1905, J. W. R. Koch; 1 male, cl 24 mm, cb 28.5 mm; 1 female, cl 19 mm, cb 22.5 mm.

## British Museum (Natural History)

Singapore, R. Coppinger, H. M. S. "Alert"; 1 male, cl 19.5 mm, cb 24 mm.

Hongkong, Barney collection; 2 males, cl 20 and 21.9 mm, cb 23.5 and 25.9 mm; 1 female, cl 16 mm, cb 19 mm.

Amoy, China, C. J. Shen; 2 males, cl 14 and 20 mm, cb 17.5 and 23 mm; 2 females, cl 13.5 and 17.5 mm, cb 19 and 21 mm.

Description. The carapace, like in *Metopograpsus oceanicus*, is quadrangular in shape. Its lateral margins are slightly less convergent backwards than in that species. There is a tooth on the lateral margin of the carapace just behind the external orbital angle. The cervical groove is indistinct. There are two distinct long transverse ridges on the hepatic region just before the cervical groove. These ridges are parallel to each other; the anterior reaches to or almost to the lateral margin of the carapace, while the posterior does not reach that margin by far. The four post-frontal lobes are less distinct than in *M. oceanicus*, their ridges and tubercles too are less salient. The mesogastric region bears faint ridges or markings. The urogastric groove is less deep than in *M. oceanicus*. The branchio-cardiac groove is ill-defined. The cardio-intestinal region is slightly flattened. There is no demarcation between the cardiac and the intestinal regions.

The front is less declivous than that in *M. oceanicus*. Its margin is crenulated and is of the same shape as in *M. oceanicus*.

The orbit is more or less transverse and less oblique than in *M. oceanicus*.

The inter-antennular septum is not or very little sunken. It bears some small hairs. As in *M. oceanicus*, the entire surface of the basal segment of the antenna is naked, only the margin bears a row of soft hairs.

The sub-orbital tooth is obtuse and not or very little keeled; it is in contact with the front for a very short distance only. The sub-orbital border is similar to that of *M. oceanicus* in all respects for the notch which is more deeply incised and larger than the latter species.

The epistome is exactly similar to that of *M. oceanicus*.

The upper border of the buccal cavern, the palate and the external maxilliped do not show any appreciable difference from those of *Metopograpsus messor*. The antero-lateral corner of the buccal cavern possesses a strong keel.

In the female the oviducal aperture is rounded.

The external surface of the carpus of the cheliped is less tuberculate than in *M. oceanicus*. The external surface of the palm is quite smooth, the tubercles are less prominent and are fewer in number. The long ridge on the lower external surface of the palm is absent or very ill-defined. The other oblique ridges on the lower external surface below this long ridge are small and also ill-defined. The other characters of the cheliped are similar to those of *M. oceanicus*.

The four pairs of walking legs are stout, and especially the propodi are less slender than in *M. oceanicus*. The lower part of the anterior surface of the propodus of the first walking leg bears no pubescent area. There is no linear row of hairs on the posterior surface of the propodus of each walking leg. The upper margin of the propodus of the last walking leg possesses an ill-defined hairy fringe, in some specimens this fringe is totally absent; the same applies to another row of hairs on the posterior side of its lower margin. None of the dactyli of the walking legs bear a hairy fringe or row. The remaining characters of these walking legs are similar to those of *M. oceanicus*.

The male abdomen resembles that of *M. oceanicus* but the male pleopod is quite different from that of the latter species. The chitinous projection of the male pleopod, namely, is shorter than in *M. oceanicus* but its top is rounded, its distal margin is finely serrated. There is no or a very shallow concavity on the top of the projection and so the surface of this rounded top is more or less plain. The male pleopod is more distinctly spirally twisted than in *M. oceanicus*.

Colour. In spirit specimens the carapace and the legs are dark brownish yellow above, being yellowish white below. The finger tips of the chelipeds are deep brown or chocolate brown.

Habitat. The crab is found running about between tide marks (Stimpson, 1907).

Distribution. This species is known from the Malayan Archipelago and China.

Remark. Tweedie (1949) observed that one male specimen of *Metopograpsus quadridentatus* from Merauke, New Guinea, is somewhat unusual in some of its characters. It differs from normal specimens in having hypertrophy of the truncate teeth of the chitinous projection of the male pleopod, and shows a slight difference in the abdomen. It seems probable that these differences are not of a specific nature but are due to individual variation or to some deformation. This is the more likely since the merus of the right third walking leg of the specimen, which I examined in the Amsterdam Museum, is abnormal in having the inferior distal extremity not serrated but deformed to a chitinous nodule; the left third walking leg of the specimen is normal.

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