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CONTRIBUTIONS TOWARDS A REVISION OF
MACROPHTHALMUS (CRUSTACEA: BRACHYURA), VIII.
 A RE-EXAMINATION OF THE *M. TELESCOPICUS* (OWEN)
 COMPLEX; THE STATUS OF *M. LAEVIS*
 A. MILNE EDWARDS; AND THE AFFINITIES OF
M. HOLTHUISI SERÈNE

by

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With 7 text-figures

INTRODUCTION

To date (1976), this author in his gradual revision of the ocypodid genus *Macrophthalmus* Latreille has described or redescribed thirty one valid extant species, noted three extinct species, and listed twenty seven other specific names as being synonyms (Barnes, 1966a, 1966b, 1967, 1968, 1970, 1971, 1973). In this paper, he had hoped to complete the revision by considering the remaining thirteen described species, and by re-examining one species earlier reduced to a synonym. However, it has proved extremely difficult to trace material of some, and to examine material of other, of the species, particularly those known only from a holotype. Accordingly, rather than delay matters indefinitely, he has had to content himself with consideration of the following species: *M. verreauxi* H. Milne Edwards, 1848, *M. laevis* A. Milne Edwards, 1867, *M. milloti* Crosnier, 1965, *M. ceratophorus* Sakai, 1969, *M. resslii* Pretzmann, 1971, *M. holthuisi* Serène, 1973.

It is hoped that an investigation of the remaining eight species (*M. leptophthalmus* (H. Milne Edwards, 1852), *M. consobrinus* Nobili, 1906, *M. gastrodes* Kemp, 1915, *M. franchettii* Maccagno, 1936, *M. boteltobagoe* Sakai, 1939, *M. gallardoi* Serène, 1971, *M. philippinensis* Serène, 1971 and *M. vietnamensis* Serène, 1971) can be completed in the not-too-distant future.

THE *MACROPHTHALMUS TELESCOPICUS* COMPLEX

Since the publication of Tesch's (1915) review of *Macrophthalmus*, most authors (including this one, e.g., Barnes, 1967, 1970) have regarded *M.*

telescopicus (Owen), *M. podophthalmus* Souleyet and *M. verreauxi* H. Milne Edwards as synonyms; whilst in 1965 Crosnier described another species, *M. milloti*, which Barnes (1967) suggested was extremely closely related to, if not synonymous with, *M. telescopicus*. Other species belonging to the same subgroup of the subgenus *Macrophthalmus* (sensu Barnes, 1967) as *M. telescopicus* are also known; e.g. *M. gracffci* A. Milne Edwards (see Barnes, 1971) and *M. ceratophorus* Sakai (see below), and *M. latipes* Borradaile, *M. dentatus* Stimpson and *M. philippinensis* Serène are also possibly to be included (see Barnes, 1971 and 1973 for the two former).

There appears to be little doubt that *M. telescopicus* and *M. podophthalmus* are in fact synonyms, but Serène (1973) (and see Crosnier, 1975) has recently reopened the question of the status of *M. verreauxi* and *M. milloti* as possible synonyms of *M. telescopicus*. He differentiated *M. telescopicus*, *M. verreauxi* and *M. milloti* on the basis of the following characters: (a) length of the ocular peduncles, (b) relative height of the palm of the male chela, (c) the presence of an excavation on the palm's anterior margin between the bases of the fingers, (d) the development of a longitudinal ridge on the outer surface and of (e) granulation on the inner surface of the palm, (f) the sizes of the teeth on the cutting margins of the dactylus and index, (g) the orientation of the external orbital angle, (h) the granulation of the branchial region, (i) the length/breadth ratio of the carapace, (j) the shape of the terminal process of the first male pleopod, (k) the presence of patches of hair on the pereopod meri, and (l) size. He further suggested that *M. verreauxi* and *M. milloti* were comparatively small, widespread species, whilst *M. telescopicus* was a large species confined to the central Pacific region (Serène, 1973, and personal communications).

This author has examined or re-examined specimens of '*M. telescopicus*' from Zanzibar, Dar es Salaam, the Red Sea, Indonesia, Malaysia, Australasia and from various Pacific islands (being the material previously described by Barnes, 1967-1971, and that described by Hartnoll, 1975, and various other authors), and whilst he disagrees with many of the criteria suggested by Serène, he nevertheless agrees that three more or less distinct types can be recognised within this 'species'. Several of Serène's distinguishing characters vary with size of the animal regardless of the type to which it can be assigned (e.g. (b), (d), (e), (g), (h) & (i) above), and others vary within specimens from a single locality referable to a single type (e.g. (a), (f), (g) & (k) above).

Although, therefore, several of Serène's characters overlap considerably between the three types and variations suggested to differentiate some of the species are in fact displayed within individuals of each single such species, separation can be effected on a combination of four characters. These are

1) length of ocular peduncles, (2) the shape of the terminal process of the first male pleopod, (3) the relative sizes of the anterolateral carapace teeth, and (4) overall size.

These differences notwithstanding, it is evident that all three types are extremely similar morphologically and if the three types are accorded specific rank (as *M. telescopicus*, *M. verreauxi* and *M. milloti*) they must be regarded as sibling species within one aggregate superspecies, to which *M. graeffei* and *M. ceratophorus* also belong. *M. telescopicus* and *M. verreauxi*, in particular, are extremely closely related, being separable only on the relative sizes of the anterolateral teeth, on details of the terminal process of the pleopod, and on the fact that the former attains a larger size. Within each of the three species, a considerable amount of variation in such features as length of ocular peduncles, size and shape of anterolateral teeth, form of male chela, etc., are still apparent (figs. 1-3).

The description of '*M. telescopicus*' given earlier (Barnes, 1967) will serve as a description of the aggregate superspecies, the three component species under discussion here being separable as described below.

Macrophthalmus (Macrophthalmus) telescopicus (Owen, 1839) (fig. 1)

1. Ocular peduncles extend beyond tip of external orbital angle for more than 36% of their length — up to a maximum of some 60% — measured from the base of the distal segment to the tip of the cornea.

2. First male pleopod with a moderately long, slightly curved terminal process.

3. Second and third anterolateral carapace teeth project as far as, or beyond the external orbital angle.

4. Attains a maximum size in excess of 35 mm carapace breadth.

Macrophthalmus (Macrophthalmus) verreauxi H. Milne Edwards, 1848
(fig. 2)

1. Ocular peduncles extend beyond tip of external orbital angle for more than 36% of their length, up to a maximum of some 55%.

2. First male pleopod with a very long, curved terminal process.

3. External orbital angle projects beyond second and third anterolateral teeth.

4. Attains a maximum size of some 20-25 mm carapace breadth.

Macrophthalmus (Macrophthalmus) milloti Crosnier, 1965 (fig. 3)

1. Ocular peduncles extend beyond tip of external orbital angle for less than 36% of the length and for less than a distance equal to twice the length of the cornea.

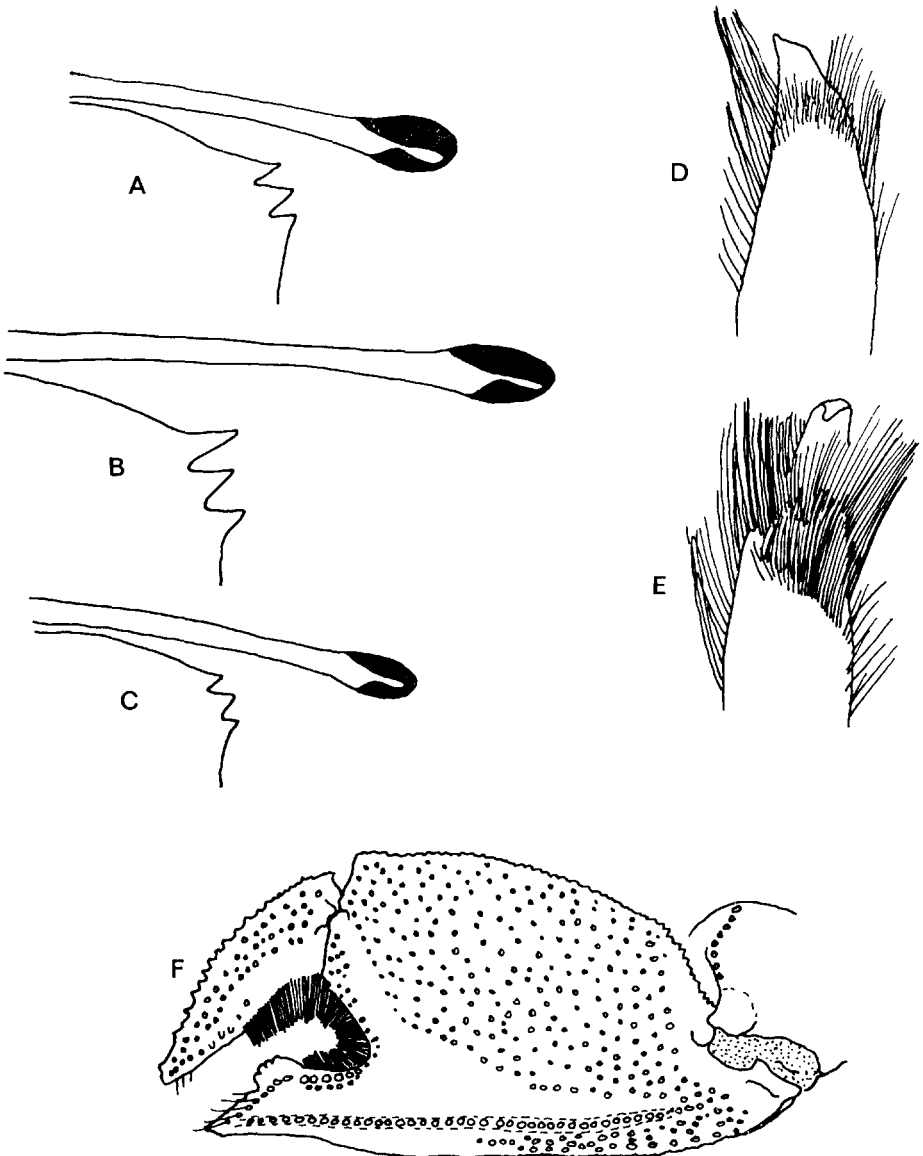


Fig. 1. The morphology of *Macrophthalmus telescopicus* (Owen) sens. strict. A, B, C, anterolateral carapace teeth and ocular peduncles (A, Zanzibar; B, Hawaii; C, New Guinea); D, abdominal face, and E, sternal face of the tip of the right first male pleopod; F, left male chela.

2. First male pleopod with a short, strongly curved terminal process.
3. External orbital angle projects beyond second and third anterolateral teeth.
4. Attains a maximum size of some 20 mm carapace breadth.

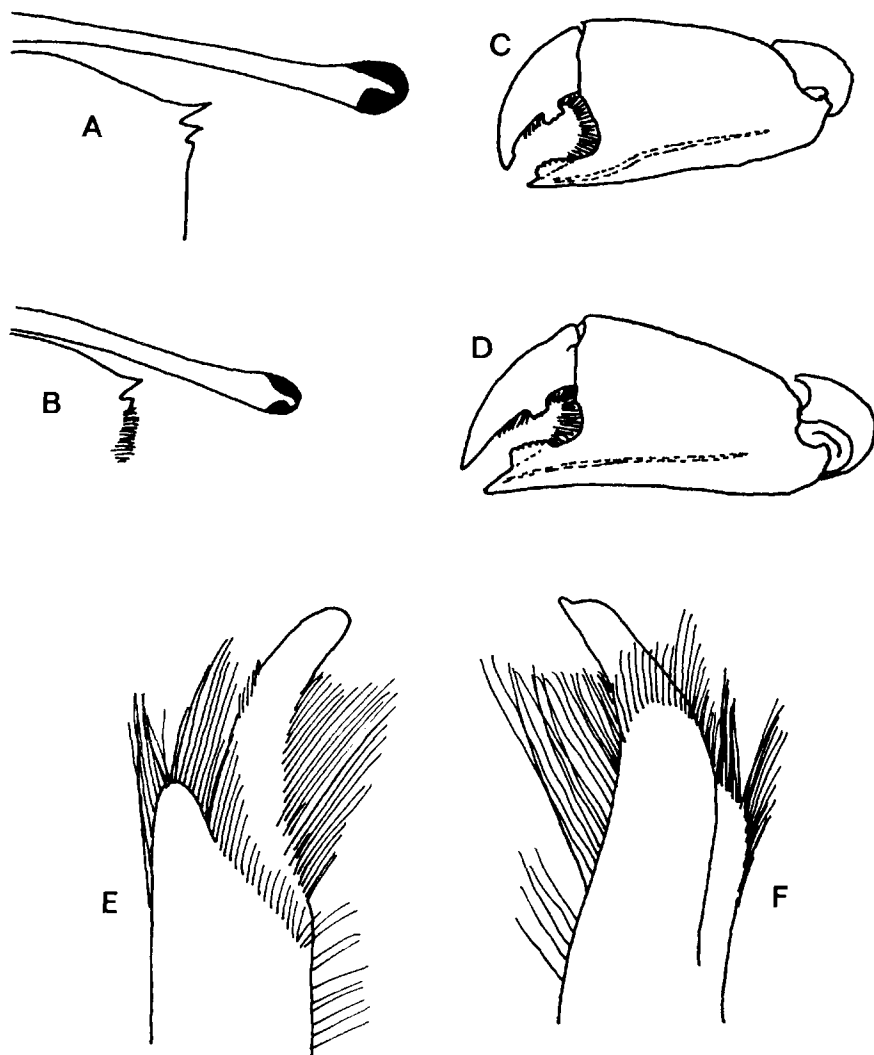


Fig. 2. The morphology of *Macrophthalmus verreauxi* H. Milne Edwards. A, B, anterolateral carapace teeth and ocular peduncles (A, Red Sea; B, Dar es Salaam); C, D, left male chelae (C, Malaysia; D, Red Sea); E, sternal face, and F, abdominal face of right first male pleopod tip.

In addition, one can note that *M. telescopicus* has most frequently been recorded from the sublittoral region, and it is by no means confined to the central Pacific region, as was thought by Serène — a large specimen, typical in all respects save the comparatively short ocular peduncles, has been collected

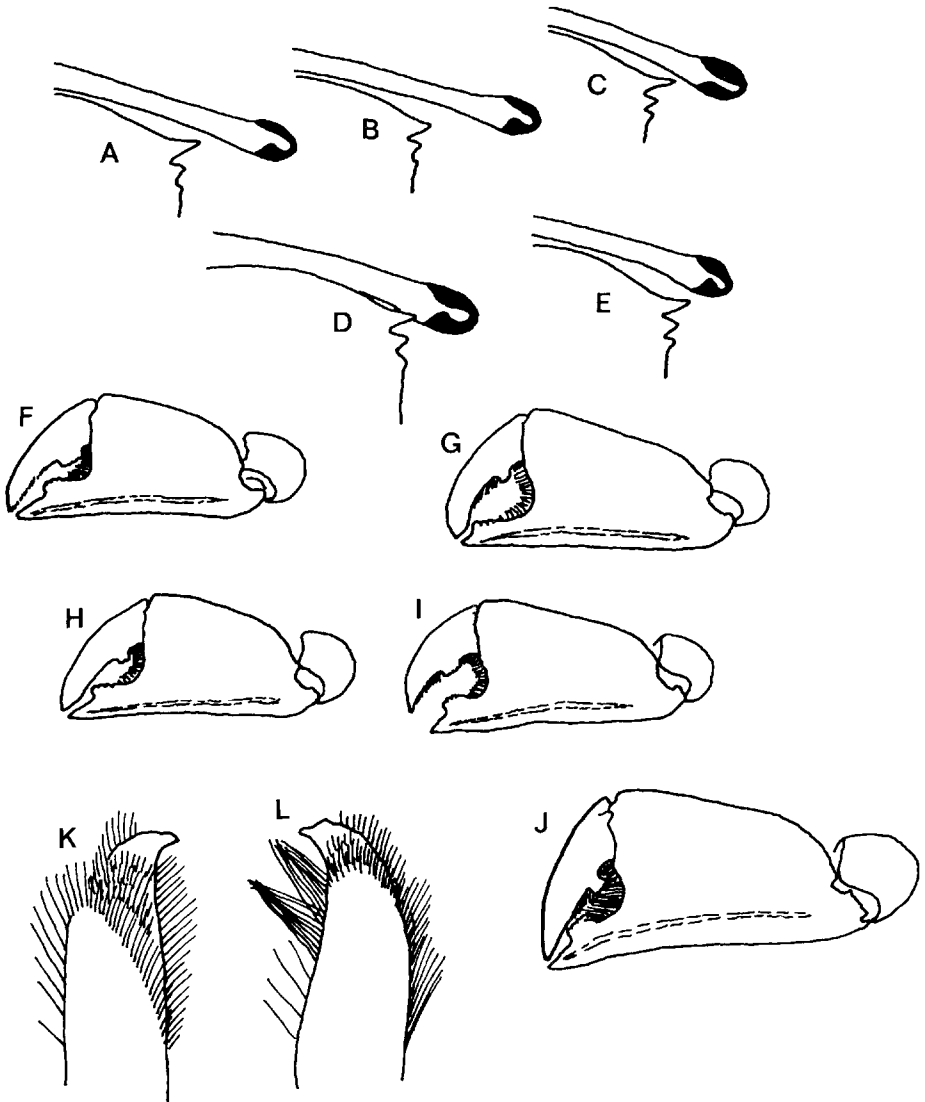


Fig. 3. The morphology of *Macrophthalmus miloti* Crosnier. A-E, variation in length of the anterolateral carapace teeth and ocular peduncles (A, B are comparatively elongate peduncles, specimens from Dar es Salaam); F-J, variation in shape of the left male chela; K, sternal face, and L, abdominal face of the tip of the right first male pleopod.



Fig. 4. The distribution of A, *Macrophthalmus verreauxi* H. Milne Edwards; B, *M. telescopicus* (Owen); C, *M. milloti* Crosnier.

off Zanzibar, for example (see fig. 1), and other specimens are known from the Comores (Crosnier, 1975). Otherwise it is known from New Guinea and the Torres Strait, Fiji, Hawaii and other Pacific regions. In large specimens of this species, both carapace and chelar granulation achieve their maximum development; in the adult male chela, for example, a series of spines occur along the upper margin of the dactylus. Fig. 4 shows the recorded distribution of the three species.

Macrophthalmus (Macrophthalmus) ceratophorus Sakai, 1969

Material examined: Holotype (Smithsonian No. 125870); an adult male obtained from 30-50 m, Shimogusui, Kii Province, Honshu, Japan.

This species, known only from the holotype material, was described by Sakai in 1969. As the following description shows, it is clearly closely related to the *M. telescopicus* group of species and particularly to *M. telescopicus* itself and to *M. gracffei*. The particular characteristics of *M. ceratophorus* are (a) the stylophorous condition of its ocular peduncles -- seen in incipient form in *M. gracffei*, but otherwise unknown in *Macrophthalmus* (in contrast to other stylophorous ocypodids, e.g. *Ocyropde ceratophthalma* (Pallas), *Tmethypocoelis ceratophora* (Koelbel) and *Uca styliifera* (H. Milne Edwards)), the style in *M. ceratophorus* lacks setae) -- and (b) the heavily spinous and granular nature of the margins of the male cheliped, particularly of those of the chela, which show a further development of the state in *M. telescopicus* and *M. gracffei*. Like the latter two species, *M. ceratophorus* appears to inhabit sublittoral regions.

Otherwise (and in terms of the characters used above to separate the three sibling species of '*M. telescopicus*'), *M. ceratophorus* resembles *M. telescopicus* in the length of its ocular peduncle and in its large size, resembles *M. verreauxi* in the shape of the terminal process of the first male pleopod (although the process is more slender in *M. ceratophorus*), and approaches *M. telescopicus* in the form of its anterolateral carapace teeth albeit that these are poorly defined in *M. ceratophorus*. A full description of this species is given below (and see fig. 5).

Front deflexed, markedly constricted between bases of ocular peduncles, with smooth margins, narrow median furrow, markedly bilobed anterior margin, smooth surface.

Upper orbital border curved, slightly backwardly sloping; margin beaded by small rounded granules inclined somewhat towards external orbital angle. Lower orbital border beaded by small rounded granules, with fringe of hairs along distal third.

Anterolateral teeth poorly defined. External orbital angle triangular or tuberculiform, pointed, directed outwards and forwards; margins with few rounded granules or smooth, tooth capped by rounded granule; separated from second lateral tooth by wide, shallow, U-shaped incision. Second lateral tooth scarcely more than bulge in lateral carapace margin; margins with few rounded granules and thick hairs; separated from third lateral tooth by indistinct U- or V-shaped incision. Third lateral tooth indistinct, merging indistinguishably into lateral carapace margin posteriorly; margins with rounded granules and thick hairs.

Carapace smooth centrally, pitted laterally; with scattered large rounded granules on branchial regions, those near posterolateral carapace margins loosely arranged in two longitudinal series subparallel with that margin; without hair except on lateral margins, with comparatively indistinct furrows. Greatest carapace breadth in region of third anterolateral teeth. Lateral margins subparallel, with row of rounded or pointed granules and short hair; posterior margin smooth.

Ocular peduncles long and narrow, cornea extending well beyond tips of external orbital angles (for a distance equal to about one half of total length of peduncle as measured to tip of cornea); with slender, hairless, terminal filament, divided into some nine segments and equal in length to some $1/4-1/5$ length of remaining part of peduncle, projecting beyond cornea.

Epistome with marked, pointed, triangular protuberance centrally.

Male cheliped. (a) Merus. Upper margin with large pointed granules and row of fine hairs; inner margin with row of large, rounded or pointed granules and long hairs; outer margin with scattered, large, pointed granules, without hair. Inner surface smooth, except near inner margin where few, large, rounded granules; outer surface smooth; lower surface smooth except near outer margin where few, large, pointed granules.

(b) Carpus. Without hair. Outer surface smooth except near upper and lower margins where large, pointed granules; inner surface smooth. Upper margin with few, large, pointed granules and 1-3 large spines; lower margin with large, pointed, forwardly directed granules.

(c) Palm. Outer surface with medium-sized, scattered, rounded or pointed granules, with very poorly developed longitudinal ridge near to and subparallel with lower margin (most distinct distally, proximally marked only by row of comparatively few, widely spaced granules), anterior margin scarcely excavated between bases of fingers; inner surface with rounded or pointed granules as on outer surface, without spine near joint with carpus, with distinct and discrete thick patch of hair near joint with dactylus, with row of long hairs near to and subparallel with upper margin. Upper margin with

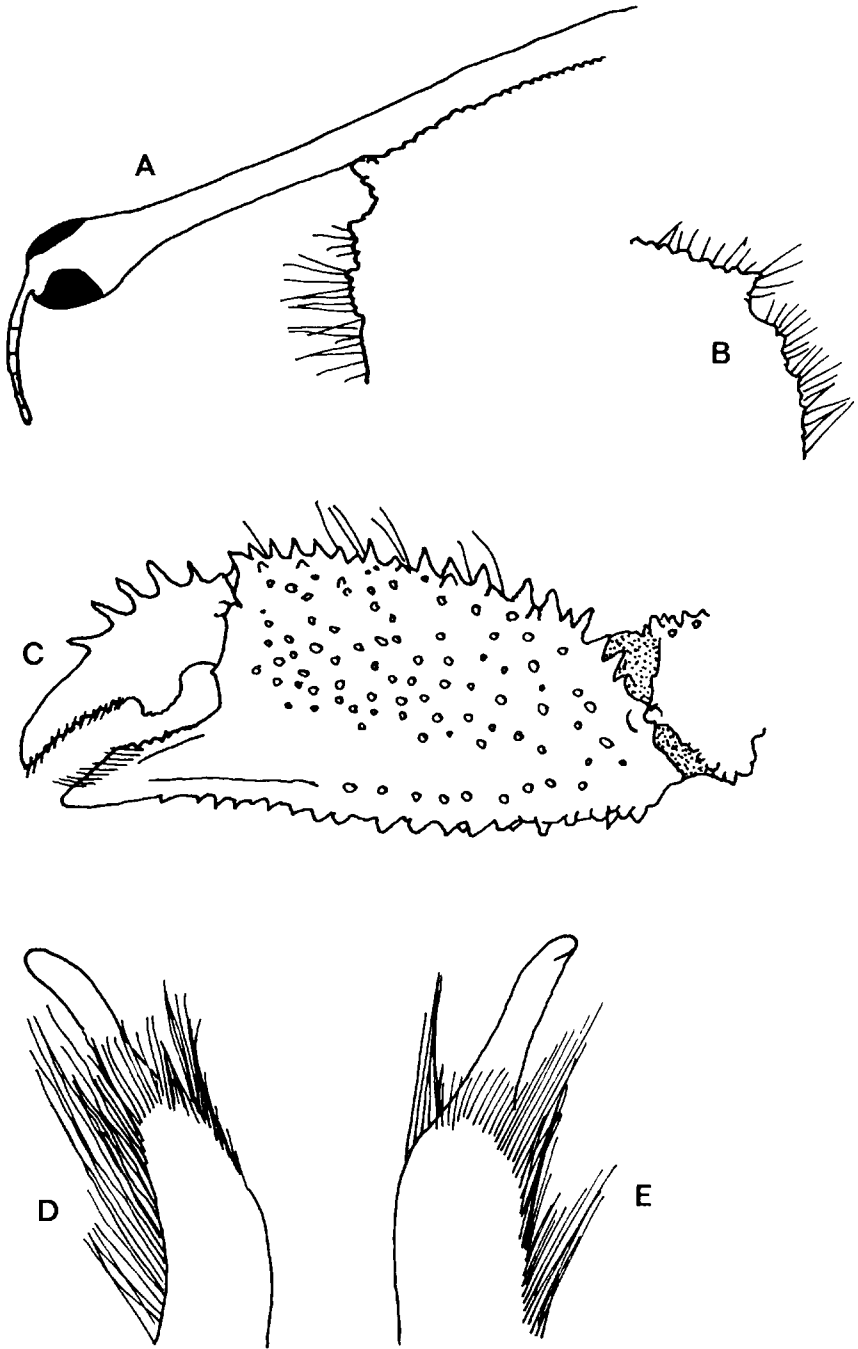


Fig. 5. *Macrophthalmus (M). ceratophorus* Sakai. A, stylophorous ocular peduncle and left anterolateral carapace teeth; B, right anterolateral teeth; C, left male chela; D, sternal face and E, abdominal face of left first male pleopod.

row of very long spines along whole length; lower margin with row of large pointed tubercles.

(d) Index. Slightly deflexed. Outer surface without granules, with row of hairs distally near to and subparallel with cutting margin, with smooth continuation of longitudinal ridge of palm; inner surface with few small granules or smooth, with row of long hairs near cutting margin. Cutting margin without differentiated tooth, with row of pointed granules from base to a point some $2/3$ rd of distance to tip, granules increasing in size distally; lower margin with continuation of row of pointed tubercles of palm proximally, smooth distally.

(e) Dactylus. Curved. Outer surface smooth except for a few granules near upper margin, with row of hairs close to cutting margin distally; inner surface without granules, with distinct and discrete, elongate patch of dense hair in centre of surface proximally, with scattered hairs near upper margin and with row of hairs near cutting margin. Upper margin with about 5 large spines proximally, smooth distally except for a few small granules near tip; cutting margin with large, quadrangular, crenulated tooth near base, distally with row of pointed granules, largest proximally.

Margins of pereopod meri with rows of pointed granules; upper margins with large subterminal spine and row of hairs.

Male abdomen. Lateral margins of sixth segment with small rounded convexity in morphologically anterior position; those of fourth and fifth segments straight. Third segment with transverse ridge across centre. Posterior margins of sternal segments with rows of granules.

External maxilliped. Internal margin of ischium markedly convex; external margin sinuous. Internal margin of merus convex, although \pm straight along much of its length; external margin slightly convex or straight, without well-developed posteroexternal convexity; anterior margin shallowly concave.

First male pleopod straight through much of its length; with very well developed, slightly curved, elongate terminal process; external margin heavily haired, internal margin hairless.

Dimensions: carapace breadth 30.3 mm, carapace length 19.2 mm, breadth of front 4.2 mm, length of male chela 17.0 and 17.7 mm.

Macrophthalmus laevis A. Milne Edwards, 1867

In 1867, A. Milne Edwards described a new species of *Macrophthalmus* from "la mer des Indes". This species, *M. laevis*, was based on two female specimens, now housed in the Muséum National d'Histoire Naturelle, Paris. No further material referable to this species has been discovered, and almost all authors have ignored it (the original description being extremely brief

and vague); Tesch (1915), for example, gave as his opinion that the species is "involved in much obscurity and may remain so unless the type specimen be again examined". To this author's knowledge, the type specimen remained unexamined.

In 1971, Pretzmann described *M. (Macrophthalmus) resslii* from the mouth of the Persian Gulf, his material being two male specimens now housed in the Naturhistorisches Museum, Vienna. Mme Guinot has been so kind as to supply the author with photographs of A. Milne Edwards' specimens and the paratype of Pretzmann's species has been examined through the courtesy of Herr Gruber.

Comparison reveals the two described species to be identical insofar as comparison is possible. Their synonymy must, however, remain conjectural, as many of the diagnostic features of *M. resslii* (as of all *Macrophthalmus* species) are located on the chelipeds of the male, and no males of *M. laevis* are known. Indeed, we will never know what the male of *M. laevis* looks like, as the association of male and female specimens must be conjectural in view of the sexual dimorphism displayed by this genus (except, of course, in living material). Such considerations apart, however, *M. laevis* and *M. resslii* share the other diagnostic features of *M. resslii*, namely the form of the carapace and, particularly, of the anterolateral carapace teeth. The only difference between the two lies in the degree of expression of the branchial granulation: in *M. laevis* it is comparatively poorly developed; but this is only to be expected in a female!

In summary, *M. laevis* is exactly what one would expect the female of *M. resslii* to look like, and therefore, although one can never be certain for the reasons outlined above, it seems reasonable and logical to unite A. Milne Edwards' and Pretzmann's material into the one *M. laevis* A. Milne Edwards, 1867.

M. laevis is clearly a primitive, although specialized, member of the subgenus *Macrophthalmus* (viz., e.g., the length/breadth ratio of the carapace). Some of its peculiarities, e.g., the form of the anterolateral carapace teeth, the lack or poor development of the longitudinal ridge on the palm, the presence of two teeth on the cutting margins of both fingers, and some aspects of the branchial granulation, suggest affinities with *M. laetimanus* H. Milne Edwards (see Barnes, 1970). In fact, *M. laevis* shows some of the features (e.g. the carapace length/breadth ratio, the shape of the chela, the form of the branchial granulation, etc.) which one might expect to find in a species ancestral to such 'typical' species as *M. brevis* (Herbst) and its relatives. In that sense, it has attained a similar stage to *M. dentatus* and the *M. telescopicus* group, but with fewer and less extreme specializations.

A description of this species is given below (based largely on the paratype of *M. resli*, Naturhistor. Mus. Wien No. 3701, collected on a sandy beach near Bandarabass, Iran) — and see fig. 6.

Front deflexed, markedly constricted between bases of ocular peduncles, with smooth margins, bilobed but \perp straight-sided anterior margin, smooth surface, faint median furrow, two concave marks at base demarcating front from remaining carapace.

Upper orbital border curved, slightly backwardly sloping; margin beaded by small sub-pointed granules inclined towards external orbital angle. Lower orbital border serrated by large tubercular granules inclined somewhat towards front.

Two large and one very small anterolateral teeth. External orbital angle large, broad, directed outwards and forwards, pointed anteriorly; anterior margin straight or slightly concave, with continuation of granulation of upper orbital border; outer margin straight anteriorly becoming convex posteriorly, armed with tall, conical, pointed granules; separated posteriorly from second lateral tooth by wide, deep incision. Second lateral tooth larger than external orbital angle, wedge-shaped, directed outwards, upwards and slightly forwards, projecting beyond external orbital angle; anterior margin straight, with rounded granules; outer margin straight, with tall, conical, pointed granules; separated from third lateral tooth by small indistinct incision. Third lateral tooth small, obscured by hair.

Carapace with central regions smooth to naked eye, microscopically with small rounded granules; lateral regions with larger, denser granules; with shallow but distinct furrows; without hair on surface except on posterior lateral margins along which a thick hairy mat extends from third lateral tooth to above base of penultimate pereopod. Carapace sides abruptly sloping; angle marked by elongate patch of large granules on branchial region, by indistinct row of granules anterior to the patch, and by a few large granules above base of last pereopod. Posterior carapace margin smooth. Greatest carapace breadth across second lateral teeth.

Epistome with central protuberance.

Ocular peduncles long and narrow; cornea extending to middle of external orbital angle.

Male cheliped. (a) Merus. Inner margin with row of tubercles or tubercular spines increasing in size distally and continuing around distal angle; upper margin with small pointed granules and row of hairs along proximal half; outer margin with large, pointed, conical tubercles or spines increasing in size distally (as on inner margin), tubercles irregularly scattered proximally but arranged in a row distally. Inner surface with row of hairs near to and

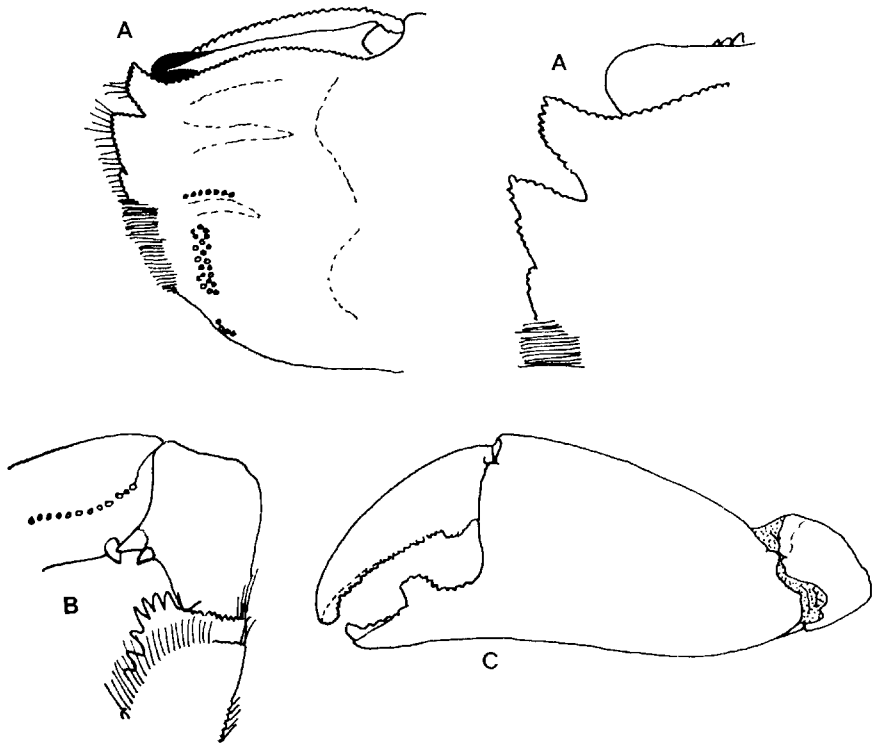


Fig. 6. *Macrophthalmus (M.) laevis* A. Milne Edwards. A, left-hand half of the carapace, with (right) an enlarged view of the anterolateral carapace teeth; B, carpus, distal part of merus, and proximal part of palm of right male cheliped; C, left male chela.

subparallel with inner margin, row diverging from that margin distally, otherwise without hair, without granules; lower surface with covering of small granules; outer surface with scattered, isolated individual hairs, otherwise smooth.

(b) Carpus. Upper margin with scattered, rounded or pointed granules; lower margin with scattered, pointed granules. Outer surface covered with small, rounded or pointed granules; inner surface with group of large spines centrally -- one group of spines with smaller subsidiary tubercles near upper margin, second group near lower articulation with palm, and a spine midway between the two latter groups -- surface otherwise smooth.

(c) Palm. Short. Outer surface densely covered with small, rounded granules, without longitudinal ridge; inner surface with similar granular covering, with large backwardly-directed spine and associated tubercles near joint with carpus. Upper and lower margins with pointed granules, largest proximally. Without hair.

(d) Index. Slightly deflexed. Outer and inner surfaces with continuation of granulation of palm, inner surface with row of hairs subparallel with cutting margin. Lower margin with very small granules, becoming smooth distally; cutting margin with two teeth — large, sub-rectangular, crenulated tooth in centre, and smaller, triangular or tuberculiform tooth at tip — otherwise with series of pointed tubercles.

(c) Dactylus. Curved. Outer and inner surfaces and upper margin with dense covering of small pointed granules. Cutting margin with small, crenulate, quadrangular or wedge-shaped tooth near base, and long, low tooth at tip, with series of pointed tubercles between the two teeth.

Pereiopod meri with fringe of hairs and with small subterminal spine on upper margins.

Male abdomen. Lateral margins of fourth and fifth segments straight or slightly convex; sixth segment with convexity in morphologically anterior position on lateral margins. Sternal segments adjacent to abdomen granular.

External maxilliped. Internal margin of ischium straight or slightly convex; external margin slightly concave. Internal margin of merus slightly convex; external margin with flat or rounded posteroexternal convexity; anterior margin shallowly concave.

First male pleopod \pm straight, without well developed terminal process, with densely hairy outer margin.

Dimensions: carapace breadth 24.0 mm, carapace length 13.6 mm, breadth of front 3.4 mm, length of male chela 17.0 and 17.0 mm.

Macrophthalmus holthuisi Serène, 1973¹⁾

Macrophthalmus (*Marcotis*) *holthuisi* Serène, described in 1973, is clearly very closely related to *M. crato* De Man and *M. quadratus* A. Milne Edwards, as was noted by Serène (1973), and like those species it occupies a position to some extent intermediate between the subgenera *Mopsocarcinus* and *Marcotis*. Of the three species, it appears to be the most primitive, having retained the carapace form, the structure of the external maxilliped, and several aspects of the chelar form of *Mopsocarcinus*. In fact, were it not for its evident relationships with *M. quadratus* and *M. crato*, *M. holthuisi* would be better placed in *Mopsocarcinus* than in *Marcotis*.

Besides the stridulatory apparatus, which differs little from those of its relatives in *Marcotis*, its main specialisations are the loss of the ridge on the external surface of the chela from all but the index finger, and the protuberant

1) This species will be further considered in the final part of the revision of *Macrophthalmus* — at present in typescript — particularly in relation to *M. batclibayoc* Sakai, 1939. (Note added in proof.)

central region of the epistome. The significance of the latter character is somewhat of a mystery, as indeed is its function unless it be concerned with the direction of flow of external respiratory currents. Primitively (i.e., in *Mopsocarcinus*), the central region of the epistome is straight, and this form is retained in *Hemiplax* and *Vcnitus*. The remaining subgenera show specialisations of structure in this region; *Marcotis* has developed an excavation (although the primitive *M. crato* and *M. quadratus* have retained the straight configuration), whilst *Macrophthalmus* and *Tasmanoplax* have evolved a blunt or pointed protuberance. Hence the presence of a protuberant central region to the epistome in the primitive *M. holthuisi*, which straddles the *Mopsocarcinus*/*Marcotis* boundary, is most surprising. One other *Marcotis* species, *M. teschi* Kemp — a considerably more advanced species — shows this specialisation, but in neither case can the explanation be suggested. The value of the epistome as a diagnostic character at the subgeneric level is, of course, weakened by the aberrant nature of *M. teschi* and *M. holthuisi*, but as it remains consistent in the other thirty five or so known species it seems desirable to retain the character for the moment.

Although the description of this species by Serène (1973) is perfectly adequate for its identification, it is desirable to append a description (based on the paratype, Rijksmuseum van Natuurlijke Historie No. D. 27453, collected from mud under mangroves, near Mandon, S.E. coast of Biak Id, Western New Guinea) uniform with those given earlier for the other revised species of *Macrophthalmus*.

Front broad, unconstricted between bases of ocular peduncles, with smooth margins, slightly convex anterior margin, deep median furrow, distinct epigastric ridges.

Upper orbital border sinuous, slightly backwardly sloping; margin beaded by very small granules. Lower orbital border with proximal third (i.e., that nearest front) bearing a ridge capped by up to ten small granules of which most distal is largest, separated by small gap from long, low protuberance occupying distal two-thirds of margin and with its highest point proximally, border terminated by small tooth.

Three well-defined anterolateral teeth. External orbital angle large, broad, subrectangular, pointed anteriorly, directed outwards and forwards; margins beaded by small rounded or sub-pointed granules; separated from second lateral tooth by distinct V-shaped incision. Second lateral tooth large, broad, directed outwards; margins beaded by small rounded or sub-pointed granules; separated from third lateral tooth by V-shaped incision. Third lateral tooth small, wedge-shaped, pointed anteriorly.

Carapace surface smooth, with shallow furrows excepting well-developed

circumgastric, with various rows of hairs on branchial regions — a transverse row at level of third lateral tooth, an oblique row above insertion of last pereopod, several oblique rows longitudinally in line between the two latter, and a series close to and parallel with posterolateral carapace margin. Greatest carapace breadth across second lateral teeth.

Ocular peduncles short and stout; cornea reaching almost to tip of external orbital angle.

Male cheliped. (a) Merus. Inner margin with series of pointed granules increasing in size distally and continuing around distal angle, with row of hairs proximally, with short flange in central region bearing a horny ridge on its crest, flange directed at angle of 90° to inner surface; upper and outer margins with thickly scattered pointed granules. Inner surface with row of hairs near inner margin diverging from that margin distally, with scattered

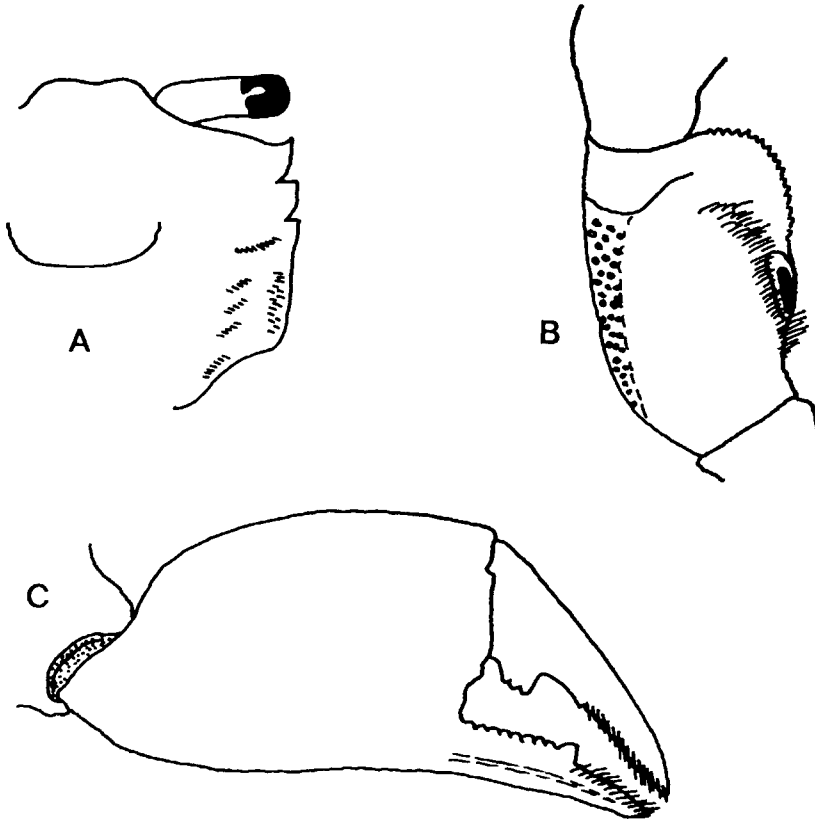


Fig. 7. *Macrophthalmus (Marcotis) holthuisi* Serène. A, right-hand half of the carapace; B, merus of left male cheliped showing the position of the stridulatory organ; C, right male chela.

hairs elsewhere; outer surface with scattered granules continuous with those on upper and outer margins; lower surface more or less smooth.

(a) Carpus. Upper margin with row of granules distally; lower margin smooth. Outer surface smooth; inner surface with row of granules down central region.

(c) Palm. Short. Outer surface and upper and lower margins without granules or hair; inner surface with thinly scattered small granules, without hair or spines.

(d) Index. Slightly deflexed. Outer surface with faint ridge along centre, with rows of hairs near cutting margin; inner surface with similar hairs, without granules. Lower margin smooth; cutting margin with long, low crenulated tooth formed by linear series of large granules along proximal half, with pointed granules distally.

(e) Dactylus. Curved. Inner and outer surfaces without granules, with hair only along cutting margin. Upper margin smooth; cutting margin with small quadrangular tooth near base, distally with row of granules almost to tip.

Male abdomen. Lateral margins of fourth, fifth and sixth segments more or less straight, although sixth segment with small anterior protuberance.

External maxilliped with heavily sculptured, subequal merus and ischium. Internal margin of ischium straight or slightly concave; external margin concave. Internal and external margins of merus generally convex although straight sided along much of their length; anterior margin shallowly excavated.

Epistome with central convexity.

Pereiopod meri with small subterminal spine and sparse hair on upper margin.

First male pleopod with two short, triangular processes at tip.

Dimensions: carapace breadth 6.0 mm, carapace length 4.3 mm, breadth of front 1.4 mm, length of male chela 3.8 mm.

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