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Materials for a Carcinological Fauna of India. No. 4. The Brachyura Cyclometopa. Part II. A Revision of the Cyclometopa with an Account of the Families Portunidae, Cancridae and Corystidae. By A. ALCOCK, M.B., C.M.Z.S., Superintendent of the Indian Museum.

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In correction of my previously expressed opinion (*Journal* 1898, Vol. LXVII, pt. II, pp. 68 and 69) I now have no hesitation in accepting the limits of the Cyclometopa that have been fixed by Miers in *Challenger Brachyura*, pp. 106-215. I am not, however, in agreement with Miers subdivision of this great group.

It seems to me that Ortmann (*Zool. Jahrb., Syst., &c.*, VII, 1893-94 and IX, 1895-97) has struck out a much more natural classification of the Cyclometopa; but as he includes the *Parthenopidae* and excludes the *Corystidae*, I am unable to adopt it in its entirety. There can be little doubt, however, that Ortmann's conceptions of *Xanthini* and *Cancrini* agree with nature.

The present paper contains (1) a statement of my own views as to the classification of the Cyclometopa, and (2) diagnoses of the Indian genera and species of three of the constituent families, namely, the *Portunidae*, the *Cancridae* and the *Corystidae*.

The Indian species of *Portunidae*, as far as I know, number 67 or 68, of which 65 are represented in the Indian Museum: of *Cancridae* 4, all of which are in the Indian Museum: of *Corystidae* only one—a new species of *Nautilocorystes* dredged by the R. I. M. S. "Investigator."

Tribe CYCLOMETOPA, or CANCROIDEA.

Cyclometopes, *Telphusiens* and *Corystiens*, Milne Edwards, *Hist. Nat. Crust.* I, 264 and 363, II. 7 and II. 139.

Cancroidea and *Corystoidea*, Dana, U. S. Expl. Exped., *Crust.* pt. I, pp. 142 and 296.

Cyclometopes and *Corystiens*. A. Milne Edwards, *Ann. Sci. Nat. Zool.* (4) XIV, 1860, p. 185.

Cyclometopa or *Cancroidea*, Miers, *Challenger Brachyura*, pp. 106-215.

Maiodea-corystoidea, pp. 26 and 28; *Cancroidea-portuninea*, pp. 27 and 65; and *Cancroidea-cyclometopa* (*Cancrini* and *Xanthini* only), pp. 412, 421, 428: Ortman, *Zool. Jahrb., Syst.*, etc., VII, 1893-94.

Oxyrhyncha-corystidae and *Cyclometopa* or *Cancroidea* Ortman, in Bronn's *Thier-Reich* V. ii. *Arthropoda*, pp. 1166 and 1165.

Carapace variable, either broader than long (almost all *Telphusidae* *Xanthidae* and *Portunidae*, and some *Cancridae*) or longer than broad (*Corystidae* and most *Cancridae*), the antero-lateral borders generally arched, sometimes very strongly so, the postero-lateral borders generally convergent, sometimes very strongly so. Front broadish or broad, horizontal or obliquely deflexed, occasionally prominent (but never forming a pointed rostrum with the basal antenna-joints for pillars as in the *Oxyrhyncha*).

Buccal orifice square-cut—only in the *Corystidae* may its anterior angles be rounded off and a little convergent and its anterior boundary be indefinite: palp of external maxillipeds almost always articulating with the antero-internal angle of the merus.

Epistome transverse, never long fore and aft, sometimes linear and sunken (not distinguishable in the *Corystidae*).

Antennules folding either nearly transversely or longitudinally.

Branchiae nine on either side, their efferent channels opening on either side of the palate.

The abdomen of the male occupies all the space between the last pair of legs.

The genital ducts of the male open on the bases of the last pair of legs.

The *Cyclometopa* may be divided into the following 5 families:—

Family I. TELPHUSIDÆ. Carapace usually transverse, broader than long, subquadrilateral or oblate-oval, the antero-lateral borders short, the regions not well delimited (although the cervical suture may be deep and conspicuous) and never areolated. Front broad, not separated from the inner supra-orbital angles, obliquely deflexed (occasionally horizontal), commonly entire (occasionally lobed).

The antennules fold transversely in narrow fossæ.

The antennal flagella short.

Epistome of fair length fore and aft, well demarcated and never encroached upon by the external maxillipeds.

Buccal orifice quadrate, a little elongate and a little bit rounded and contracted at the anterior angles.

Legs gressorial.

Sternum broad.

The Telphusidæ are the highest Cyclometopes, and approach the *Catometopa*. They appear to me, from consideration both of structure and of habitat, to have branched off from the Ozine or Eriphiine stocks, but are now inhabitants of fresh-water or damp jungle.

I do not propose to treat this family further, in this series of papers, until I have finished the other Brachyura.

Family II. XANTHIDÆ. Carapace transversely oval, or transversely hexagonal, or subquadriangular, or (rarely) subcircular, but almost always broader than long; the regions very often, but by no means always, well defined and multi-areolate. Front broadish or very broad, oftener than not it is *not* sharply separated from the supra-orbital angles, often obliquely deflexed, usually showing a division into two lobes (each of which may, in some cases, show a further subdivision into two lobules).

The antennules fold either quite transversely or obliquely transversely.

Antennal flagella short or slender.

Epistome of fair length fore and aft, well demarcated, not encroached on by the external maxillipeds.

Buccal orifice quadrate, commonly broader than long.

Legs gressorial.

Sternum moderately broad—much narrower than in the *Telphusidæ*.

I have already in this *Journal*, Vol. LXVII, part 2, 1898, pp. 69-233, dealt with the family *Xanthidæ* in detail.

The family is there divided into the following 7 sub-families:—

Sub-family	I.	<i>Xanthinæ</i> ,	loc. cit. p.	77.
"	II.	<i>Actæinæ</i>	"	p. 137.
"	III.	<i>Chlorodinæ</i>	"	p. 156.
"	IV.	<i>Menippinæ</i>	"	p. 177.
"	V.	<i>Ozinæ</i>	"	p. 181.
"	VI.	<i>Filumninæ</i>	"	p. 190.
"	VII.	<i>Eriphiinæ</i>	"	p. 213.

In the *Oziinæ* and *Eriphiinæ* this family approaches the *Telphusidæ*: by the *Pilumninæ* and *Xanthinæ* it is linked with the section *Carcininæ* of the *Portunidæ* and, through these, with the *Cancriidæ*.

Family III. PORTUNIDÆ. Carapace transversely hexagonal, sometimes subquadrate, occasionally elongate-obovate or even subcircular, but generally broader (typically much broader) than long, the regions often not well defined and seldom areolated. Front remarkably broad, generally well separated from the supra-orbital angles and almost always cut into teeth or lobes which are from two to six in number exclusive of the supra-orbital angles.

The antennules fold transversely or obliquely transversely.

The antennal flagella are almost always long and slender.

The epistome may be of fair length fore and aft, or may be linear: it may be, but is not usually, encroached upon by the external maxillipeds.

Buccal orifice quadrate, well defined anteriorly, usually, but by no means always, broader than long.

The last pair of legs are (with a few exceptions in which their dactylus is hook-like or is merely lanceolate) peculiarly modified for swimming, having at least the last two joints compressed, broadly-foliaceous, and paddle-like.

Sternum broad.

This family is here divided into 4 sub-families, namely:—

Sub-family	I.	<i>Carcininæ</i>	see ahead	pp. 6, 7.
"	II.	<i>Portuninæ</i>	"	pp. 6, 7.
"	III.	<i>Caphyrinæ</i>	"	pp. 6, 8.
"	IV.	<i>Lupinæ</i>	"	pp. 6, 8.

The *Carcininæ*, by way of *Carcinus*, approach the *Xanthidæ*, by way of *Hoplozanthus*.

Family IV. CANCRIDÆ. Carapace either transversely oval (*Cancriinæ*) or, more commonly, elongate-oval or subcircular, the regions rarely strongly delimited and areolate. Front not very broad, very often cut into 3 (sometimes 2 or 4) sharp teeth, sometimes rather prominent.

The antennules fold longitudinally.

Antennal flagella usually long, coarse, and setaceous.

Epistome usually of fair length, often sunken, always overlapped, more or less, by the external maxillipeds, which are commonly, though not always, elongate. Buccal orifice quadrate, commonly a little elongate.

Legs grossorial.

Sternum narrow.

The family is here divided into 6 sub-families :—

Sub-family	I. <i>Oancrinæ</i>	see ahead	p. 95.
"	II. <i>Pirimelinæ</i>	"	p. 95.
"	III. <i>Thiinæ</i>	"	p. 96.
"	IV. <i>Atelecyclinæ</i>	"	p. 96.
"	V. <i>Acanthocyclinæ</i>	"	p. 96.
[? Subfamily VI.	<i>Trichiinæ</i>	"	p. 96.]

In the *Pirimelinæ* and *Thiinæ* this family approaches the *Carcininae* among the *Portunidae*; and by the *Atelecyclinæ* it is allied to the *Corystidae*.

Family V. CORYSTIDÆ. Carapace a good deal longer than broad, elongate-oval, the regions fairly well defined or not, not areolated. Front rather prominent, not very broad, cut into 2 or 3 teeth.

The antennules are small and fold longitudinally.

The antennal flagella, when present, are long—sometimes longer than the carapace—coarse, and setaceous.

There is no epistome, and the maxillipeds, which occasionally have a pediform cast, are elongate and extend almost up to the antennules.

Buccal cavern rather elongate, its sides slightly convergent quite at their anterior end.

Legs either gressorial, or the last pair modified for swimming.

Sternum narrow and elongate.

In some of the genera of this group the antennal flagella are as long as the carapace and the dactyli of the legs are almost styliform: in others the dactyli are larveolate—the last pair broadly so—and the antennal flagella are not more than half as long as the carapace.

The *Corystidae* are the lowest *Cyclometopa* and have much the same relative position to the higher families of *Cyclometopes* as the *Raninidae* have to the higher families of *Oxystomes*.

Family PORTUNIDÆ.

Portuniens, Milne Edwards, Hist. Nat. Crust. I. 432: A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, p. 195; and Archiv. du Mus. X. 1861, p. 310.

Portunidae and *Platyonychidae*, Dana, U. S. Expl. Exp. Crust. pt. I. pp. 267, 290.

Portunidae, Miers, Challenger Brachyura, p. 189.

Portuninea, Ortmann, Zool. Jahrb., Syst., VII. 1893, p. 65.

Carapace depressed, or little convex (strongly convex in *Sphærocarcinus*), hexagonal, sometimes subquadrate, occasionally elongate-obovate or even subcircular, but generally broader (typically much broader) than long; the regions most often not well defined; seldom areolated;

the antero-lateral borders cut into teeth which are from 5 (very rarely 4) to 9 in number (in *Podophthalmus* and some species of *Euphyllax*, in which the antero-lateral borders are excavated for the enormously prolonged orbits, the number of teeth is reduced further).

Front remarkably broad, generally well separated from the supra-orbital angles, almost always cut into teeth or lobes, which are from 2 to 6 in number exclusive of the supra-orbital angles.

The antennules fold transversely or obliquely transversely.

Anteunal flagella almost always long and slender.

The epistome may be of fair length fore and aft, or may be linear and sunken, but the palate is well defined anteriorly.

Buccal cavern quadrate, commonly broader than long, the merus of the external maxillipeds never decidedly elongate.

The last pair of legs are, with few exceptions, modified for swimming, having at least the last two joints compressed, greatly broadened, and paddle-like. (In *Caphyra* and *Sphærocarcinus* the last pair of legs are much like the other three pairs, are subdorsal, and end in a hook-like dactylus. In *Carcinus*, *Nectocarcinus* and *Portumnus* the dactylus of the last pair of legs is merely lanceolate).

I would propose to divide the Portunidæ into four sub-families:—

1. Sub-family *Lupinæ*. The chelipeds are longer, usually much longer, than any of the legs, the first three pair of which have a tendency to be slender and the last pair of which end in typical swimming-paddles: the antero-lateral borders of the carapace are cut into from 5 (very rarely 4) to 9 distinct teeth. The carapace may be subrotund, but it is usually conspicuously broad.

2. Sub-family *Caphyrinæ*. The chelipeds and legs are short, but the chelipeds are distinctly, if only slightly, longer than the legs. The carapace is either as long as broad or very little broader than long, and is either smooth or is traversed on either side by a single ridge running inwards from the last of the (4 or) 5 teeth or puckers into which the antero-lateral border is divided. The last pair of legs are either swimming-paddles or are subdorsal and end in a prehensile dactylus.

3. Sub-family *Portuninæ*. The legs often have a tendency to be stout, and at least one pair of them is at least as long as the chelipeds: the last pair are typical swimming-paddles. The carapace is seldom very broad and its antero-lateral borders are cut into 5 teeth. The basal antenna-joint may be either fixed or movable: it is seldom broader than long, often longer than broad, and lies almost in the longitudinal axis of the carapace.

4. Sub-family *Carcininæ*. The legs have a tendency to be stout, and at least one pair of them is at least as long as the chelipeds: the

last pair end in a lanceolate dactylus and otherwise do not differ much from the other three pairs. Carapace not at all broad, its antero-lateral borders cut into 4 or 5 teeth. The basal antenna-joint is fixed: it is longer than broad and lies in the longitudinal axis of the carapace.

Sub-family I. CARCININÆ.

This sub-family comes nearest to the other Cancroid families. Of its constituent genera *Carcinus* touches the Cancridæ and Xanthidæ, *Nectocarcinus* touches the Xanthidæ, and *Portumnus* touches the Corys-tidæ.

It may be divided into two Alliances:—

Alliance 1. *Portumnoida*. Carapace as long as broad: antennæ setaceous: crests of endostome? For the single genus.

Portumnus, Leach, Malac. Pod. Brit. text of pl. iv. (= *Xaiva*, Macleay in Smith's Ill. Annulosa S. Africa, p. 62).

Alliance 2. *Carcinoida*. Carapace broader than long: antennæ not setaceous, the basal antenna-joint fixed: the palatal crests defining the efferent branchial channels are either interrupted or completely wanting. Constituent genera:—

1. **Carcinus*, Leach.

2. **Nectocarcinus*. A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XIV. 1860, pp. 220, 228; and Archiv. du Mus. X. 1861, p. 404.

Sub-family II. PORTUNINÆ.

The material at my disposal is not sufficient to enable me with any confidence to separate the genera of this sub-family into groups, so that the following classification is meant to be merely a suggestion.

Alliance 1. *Portunoida*: The last pair of legs are typical swimming-paddles: the basal antenna-joint may be either fixed or movable: the palatal crests defining the efferent branchial channels may either be distinct and complete or be wanting. Constituent genera:—

1. *Bathynectes*, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 145 (= *Thranites*, Bovallius, Ofversigt Kongl. Vetensk.-Ak. Forhandl. 1876, No. 9, p. 61).

2. **Benthochascon*, Alcock.

3. **Liocarcinus*, Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 146 (footnote).

4. **Ovalipes*, M. J. Rathbun, Proc. U. S. Nat. Mus. XXI. 1898, p. 597 (for *Platyonychus* as restricted by Miers, Challenger Brachyura, p. 201; = *Anisopus* DeHaan Faun. Japon. Crust. p. 12).

5. **Parathranites*, Miers, Alcock.

6. *Polybius*, Leach, Malac. Pod. Brit. text of pl. ix. B: and Milne Edwards, Hist. Nat. Crust. I. 438.

7. **Portunus*, Fabr.: Milne Edwards, Hist. Nat. Crust. I. 439.

Alliance 2. *Cœnophthalmoida*. As *Portunoida*, but the inner infra-orbital angle is fused with the inner supra-orbital angle. For the single genus.

Cœnophthalmus, A. Milne Edwards, Miss. Sci. Mex. Crust. p. 237.

Sub-family III. CAPHYRINÆ.

The genus *Lissocarcinus* connects this sub-family, by means of *Thalamonyx*, with the Lupinæ. *Caphyra* is another link with the Lupinæ, and *Sphærocarcinus* connects *Lissocarcinus* and *Caphyra*.

The three constituent genera are as follows, and, in my opinion, each genus is equivalent to an "alliance" in the other sub-families:—

1. **Lissocarcinus*, Adams and White. The basal antenna-joint has its antero-external angle produced to touch the front and occlude the orbital hiatus—much as in *Charybdis* (= *Goniosoma*): the last pair of legs are swimming paddles.

2. *Sphærocarcinus*, Zehntner, Rev. Suisse Zool., Ann. Mus. d' Hist. Nat. Genève, II. 1894, p. 163. As *Lissocarcinus*, but the last pair of legs are as in *Caphyra*, and the carapace is *very strongly convex*.

3. **Caphyra*, Guérin, Ann. Sci. Nat. XXV. 1832, pp. 285, 286 (= *Camptonyx*, Heller SB. Ak. Wien, XLIII. 1861, i. p. 357). The last pair of legs are subdorsal in position, are almost similar to the other legs and end in a hook-like dactylus. The basal antenna-joint is as in *Charybdis* (= *Goniosoma*).

Sub-family IV. LUPINÆ.

The genera of this sub-family fall into the 3 following alliances:—

Alliance 1. *Lupoida*. The basal antenna-joint is short and squat and decidedly broader than long; or it has its greatest diameter transverse, or obliquely transverse, owing to the extension of its antero-external angle towards or into the orbit or up to the front.

The chelipeds are usually very much longer than the legs, of which the first 3 pairs have a tendency to be slender and the fourth pair usually has the last four joints much broadened.

The carapace is usually decidedly transverse with the antero-lateral borders longer than the postero-lateral, and is very often crossed by a few long definitely-placed transverse ridges, of which one that arches inwards from the last tooth or spine of the antero-lateral border on either side is the most constant.

The genera that constitute this Alliance are the following:—

1. **Charybdis*, De Haan (or *Goniosoma*, A. Milne Edwards) with subgenera **Gonioneptunus* Ortmann and **Goniohellenus* (*nov.*).

2. *Cronius*, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1860, p. 225 (*Charybdella*, M. J. Rathbun, Proc. Biol. Soc. Washington, XI. 1897, p. 166).

3. *Lupa*, De Haan, Faun. Japon. Crust. p. 11: A. Milne Edwards, Archiv. du Mus. X. 1861, p. 351 (*Lupella*, M. J. Rathbun, *tom. cit.* p. 155).

4. **Neptunus*, De Haan (*Portunus*, M. J. Rathbun, *tom. cit.* p. 155, *nec auctorum*) with sub-genera **Achelous*, **Amphitrite*, **Callinectes*, **Hellenus* (including **Xiphonectes*) and **Lupocycloporus* (*nov.*).

5. **Scylla*, De Haan.

6. **Thalamita*, Latreille: with sub-genus *Thalamitoides* A. Milne Edwards, Nouv. Archiv. du Mus. V. 1869, p. 146.

7. **Thalamonyx*, A. Milne Edwards.

[8. *Hedrophthalmus*, Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 67].

Alliance 2. *Podophthalmoida*. As *Lupoida*, but the eyes are borne on basal stalks of enormous length and the orbits are continued along the whole of the antero-lateral borders of the carapace.

The genera that constitute this Alliance are:—

1. **Podophthalmus*, Lamarck.

2. *Euphyllax*, Stimpson, Ann. Lyc. Nat. Hist. New York, VII. 1862, p. 225.

Alliance 3. *Lupocycloida*. The basal antenna-joint, though not long, is rather slender and does not lie transversely or have its antero-external angle produced to any extent.

The chelipeds are considerably, sometimes very much, longer than any of the legs, of which the first three pairs are slender.

In the fourth pair of legs the last two joints are much broadened, but the merus and carpus *may be* slender.

The carapace is of no very remarkable breadth, the antero-lateral borders are about as long as the postero-lateral, and at least one transverse ridge is present on either side.

Two genera enter into this Alliance, namely,

1. **Carupa*, Dana (in which the merus and carpus of the last pair of legs are not broadened).

2. **Lupocyclus*, Adams and White (in which the merus and carpus of the last pair of legs may either be broadened or not).

In the preceding scheme of classification the Indian genera are printed in Roman type and the genera known to me by autopsy are marked with an asterisk.

Key to the Indian genera of the Sub-families Carcininae and Fortuninae.

- A. Propodite of the last pair of legs merely dilated, the dactylus lanceolate.....
- B. Propodite of the last pair of legs typically foliaceous and paddle-like.—
 - 1. Carapace smooth; orbits with two very indistinct grooves in the upper margin: arm short, without spines; legs stout.....
 - 2. Carapace with definitely-disposed tubercles; orbits with two open fissures in the upper wall: arm longish, with a spine or spines; legs slender.....

CARCINUS.

BENTHO-HASCON.

PARAFORTUNINAE.

Key to the Indian representatives of the Sub-family Caphyrinae.

Chelipeds and legs short: carapace as long as broad or not much broader than long, smooth or with a single transverse ridge on either side: eyes and orbits normal: fronto-orbital border very much less than the greatest width of the carapace: antero-external angle of basal antenna-joint produced to meet the front and fill the orbital hiatus to the exclusion of the flagellum: front cut into two broad lobes besides the inner supra-orbital angles, or subentire.....

LISSOCARCINUS.

Key to the Indian Genera of the Sub-family Lupinae.

- I. The eyes, eyestalks, and orbits are normal in size and position:—
 - A. The extent of the fronto-orbital border is decidedly less, and is commonly very much less than the greatest breadth of the carapace, so that the antero-lateral borders are oblique and more or less arched. The antennal flagellum is near the orbital hiatus and sometimes in it:—
 - 1. The antero-external angle of the basal antenna-joint not appreciably produced, the flagellum standing in the orbital hiatus:—
 - i. Carapace very decidedly broader than long, its antero-lateral borders cut into seven rather irregular teeth.....
 - ii. Carapace little broader than long, its antero-lateral borders cut into nine teeth which are alternately large and small (the small teeth sometimes obsolescent) ..

CARUPA.

LUPOCYCLUS.

2. The prolongation of the antero-external angle of the basal antenna-joint is small and lies in the orbit, the flagellum standing in the orbital hiatus: antero-lateral borders of carapace cut into nine large teeth:—
- i. Hand inflated and almost smooth: surface of carapace almost always in some way broken.....
 - ii. Hand prismatic and costate: surface of carapace almost always in some way broken.....
3. The prolongation of the antero-external angle of the basal antenna-joint is large and fills up either all or the greater part of the orbital hiatus:—
- i. The prolongation of the basal antenna-joint does not reach the front, so that the flagellum stands in the upper part of the orbital hiatus: other characters as in *Charybdis*.....
 - ii. The prolongation of the basal antenna-joint fills up all the orbital hiatus to the complete exclusion of the flagellum:—
 - a. Front cut into six lobes or teeth besides the inner supra-orbital angles: antero-lateral borders cut into six teeth.....
 - b. Front cut into two broad lobes besides the inner supra-orbital angles: antero-lateral borders cut into five teeth.....
- B. The extent of the fronto-orbital border is nearly equal to the greatest breadth of the carapace, so that the antero-lateral borders of the carapace are nearly at right angles with the front: the prolongation of the basal antenna-joint that meets the front and occludes the orbital hiatus is so long that the flagellum is far distant from the orbit. The antero-lateral borders are cut into five teeth of which the fourth is often small, or rudimentary, or sometimes obsolete....
- II. The eyes are borne on basal stalks of enormous length, and the orbits extend along the entire length of the antero-lateral borders of the carapace.....

SCYLLA.

NEPTUNUS.

GONIOMETUNUS.

CHARYBDIS
(= GONIOSOMA).

THALAMONYX.

THALAMITA.

PODOPHTHALMUS.