

MATERIALS

FOR A

CARCINOLOGICAL FAUNA OF INDIA.

No. 5.

THE BRACHYURA PRIMIGENIA

OR

DROMIACEA.

BY

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INVERTEBRATE
ZOOLOGY
Crustacea

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Materials for a Carcinological Fauna of India. No. 5. The Brachyura Primigenia, or Dromiacea. By A. ALCOCK, M.B., C.M.Z.S., Superintendent of the Indian Museum.

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The opinions adopted in this paper are those of Boas, that the *Dromiacea* are *Brachyura*; and of BOUVIER, that they connect the higher *Brachyura* with the Homarid family of *Macrura*.

I have endeavoured to show that the *Dromiacea*, or *Brachyura Primigenia*, include two natural groups—*Dromiidea* and *Homolidea*—each of which is a collection of families equivalent to the collections of families recognized as *Catometopa*, *Cyclometopa*, etc.; but, as is only to be expected in dealing with primitive groups, the families are small.

After raising a family to the rank of a tribe, and splitting it up into several independent families, it may seem inconsistent to unite the recognized genera of other authors, as is done in this paper with the genera *Dromia*, *Dromidia*, *Cryptodromia*, and *Petalomera*, all of which are treated as sub-genera of *Dromia*. But the reason for this treatment is that these are all linked together by intermediate forms.

The Indian species of *Dromiacea* number 28 and belong to the following genera and families:—

DEOMIIDEA { Homolodromidæ:—*Arachnodromia* (= *Homolodromia*).
Dynomeneidæ:—*Dynomene*, *Acanthodromia*.
Dromiidæ:—*Dromia* (*Dromidia*, *Cryptodromia*, *Petalomera*),
Pseudodromia, *Conchoecetes*, *Sphaerodromia*.

HOMOLIDEA { Homolidae:—*Homola* (*Paromola*, *Homolax*) *Paromolopsis*,
Hypsophrys.
 Latreillidae:—*Latreillopsis*, *Latreillia*.

DROMIACEA or BRACHYURA PRIMIGENIA.

Anomoures Dromiens and *Homoliens*, (part) Milne Edwards, Hist Nat. Crust. II., pp. 168, 180.

Dromiacea, De Haan, Faun. Japon. Crust. p. 102.

Dromiidea vel Anomoura Maïidica Superiora, Dana, U.S. Expl. Exp. Crust. pt. 1, p. 400.

Anomoura Dromidea, Miers, Cat. Crust. New Zealand, p. 57.

Dromiacea, J. E. V. Bois, Recherches sur les affinités des Crustacés décapodes, p. 202.

Anomoura Dromiidea, Haswell, Cat. Austral. Crust. p. 138.

Anomoura Dromiidea, Henderson, Challenger Reports, Zoology, Vol. XXVI., p. 2.

Dromiacés (Études Comparatives des), Bouvier, Bull. Soc. Philomath. Paris, (8) VIII., 1896, pp. 34-108.

Dromiidea, Ortmaun in Bronn's Thier Reich, V. ii., Arthropoda, p. 1153.

Carapace seldom broader than long, subquadrilateral or subovoid (sometimes sub-circular, or urn-shaped, or sub-pentagonal), often (as also the appendages) pilose. Front narrow.

Orbits and antennular fossæ may either be altogether wanting, or there may be common orbito-antennular fossæ into which the eyes and antennules are both retractile.

The antennal peduncle consists of four separate joints, and the antennal flagellum is long.

The epistome is triangular or truncate-triangular, and is well delimited from the palate.

The buccal cavern is quadrilateral, but is usually broader in front than behind. The external maxillipeds may be pediform, or sub-pediform, or completely opercular.

The last pair of legs are dorsal in position, and, with few exceptions, are prehensile slender and reduced in size, or even sometimes rudimentary. The penultimate pair sometimes resemble the last pair.

The abdomen in both sexes is large, and usually consists of seven separate segments: in the male it has the usual anterior two pairs of modified copulatory appendages: in the female it has the usual four pairs of ovigerous appendages and, in addition, a pair of smaller uniramous appendages situated on the first segment.

The genital ducts of the female open upon the bases of the 2nd pair of legs (third pereopods): those of the male open on the bases of the fourth pair of legs (5th pereopods).

The gills are usually phyllobranchiæ, but may be trichobranchiæ,

or may be intermediate in character. The gill-plumes vary in number from 20 to 8 on either side.

I follow Professor Boas, without hesitation, in placing the *Dromiacea* at the base of the *Brachyura*; and I further think that no one who has access to a good spirit-collection of the two groups in question can read M. E.-L. Bouvier's clever paper, cited above, *Sur l'origine Homaridienne des Crabes*, without accepting the opinion of the latter author—an opinion previously suggested, as the author states, by Huxley—that the *Dromiacea* are the directly-connecting link between the Crabs (*Brachyura vera*) and the *Homaridæ*.

The *Dromiacea* may be divided into two groups, which seem to me to have something more than family value, namely, the *Dromiidea* and the *Homolidea*, each of which has retained certain primitive characters while following its own line of evolution.

Tribe I. DROMIIDEA.

Dromicus, Milne Edwards, Hist. Nat. Crust. II. 168.

Dromider, Henderson, Challenger Anomura, p. 2.

Dromider et *Dynomandæ*, Ortman, in Brauer's Tier Reich, V. ii. Arthropoda, p. 1155.

Carpace sometimes longer than broad, often broader than long, without *linea anomurica*.

Eyes and antennules almost always (*Homolodromia* is the only exception) retractile into common orbito-antennular pits, the lower wall of which is formed about equally (1) by the basal joint of the antennule itself, (2) by the basal joint of the antenna, and (3) by a sub-orbital spine or dentiform lobe.

These orbito-antennular pits very often show traces of a subdivision into two fossæ, one for the antennule the other for the eye—the boundary between the two fossæ often being a tooth or a sort of fold in the upper margin of the "orbit."

Eye of the ordinary form, situated at the end of a short stout eye-stalk, the basal joint of the eye-stalk being inconspicuous.

Epistome triangular, its apex usually being in close contact with the deflexed tip of the front. Vault of the palate of good depth.

External maxillipeds usually opercular, sometimes subpediform.

Fingers of the chelipeds generally short, stout, channelled along their opposed surfaces, and strongly calcified in their distal half.

Sternum of the female traversed longitudinally, in part or in almost all of its extent, by a pair of special grooves that sometimes end in special tubercles.

The abdomen of both sexes consists of seven separate segments. Very often a pair of small lateral plates—the rudiments, probably, of

the 6th pair of abdominal appendages—is intercalated between the 6th and 7th somites.

The gill-plumes vary in number from 20 to 14 on either side, and are either trichobranchiæ or phyllobranchiæ.

Many of the species are protected by a commensal Sponge or Ascidian, or by an empty valve of a Lamellibranch shell, carried over the back.

Tribe II. HOMOLIDEA. p. 154

Homoliens (part), Milne Edwards, Hist. Nat. Crust. II. 180.

Homolida, Henderson, Challenger Anomura, p. 18: Ortman in Bronn's Thier Reich, V. ii., Arthropoda, p. 1155.

Carapace longer than broad: *linea anomurica*, usually present.* The eyes are not retractile into orbits, nor the antennules into pits. Basal antennulary joint subglobular.

The eye-stalks each consist of two movable joints, a slender conspicuous basal joint which is sometimes of great length, and a stout terminal joint that carries the eye. The antennal flagella are, except in the *Latreillida*, much longer than the carapace.

The interantennulary septum is a distinct vertical process, and is not formed merely by the close apposition of the apex of the epistome to the front.

The front forms a slender triangular prominent rostrum which may be bifid at tip, and often has a spine on either side of its base.

The division between the epistome and palate is distinct, but the vault of the palate is shallow.

External maxillipeds pediform or sub-operculiform.

The chelipeds and legs are long and slender: the fingers are not channelled *en cuillère*. Only the last pair of legs is dorsal and reduced in size.

Sternum of the female broad, without any special longitudinal grooves.

The abdomen of the male, and usually but not always of the female also, consists of seven separate segments. There are no lateral platelets intercalated between the 6th and 7th segments.

The gills are phyllobranchia, and the gill-plumes vary in number from 14 to 8 on either side.

* The *linea anomurica* is a curious suture-line running fore and aft on either side from the posterior border of the carapace to the inner side of the antennal spine. For its homologue among the nearer relatives of the Homolidea we have to go to certain species of *Pencus*.

In comparing the above synopses of characters it will be seen that the *Dromideæ* as a whole have developed along Brachyurous lines in respect of the antennal flagella, orbits, external maxillipeds, and shape of the carapace, but have kept near to the primitive (Homarid) branchial arrangements. Whereas the *Homolideæ* as a whole show a tendency to approach the higher Brachyura in the reduction of the branchia, but have not departed much from the primitive (Homarid) type in the form of the antennal flagella, external maxillipeds and very imperfect orbits.

Tribe I. DROMIDEÆ.

The *Dromideæ* which, notwithstanding the more Brachyurous form of the carapace of their best known representatives, are as a whole more primitive than the *Homolideæ* may be divided into three families—*Homolodromidæ*, *Dynomenidæ* and *Dromidæ*—characterized as follows:—

Family I. HOMOLODROMIDÆ.

Carapace longer than broad, convex in both directions, the true cervical and the branchial grooves both present.

Front cut into two prominent teeth, between which, but on a much lower plane, a third small tooth is *sometimes* present.

Antennal flagella longer than the carapace.

External maxillipeds with a marked pediform cast.

Chelipeds equal, slender, though stouter than the legs.

First two pair of legs much longer than the chelipeds: last two pair much shorter than the first two pair, subdorsal, prehensile.

The abdomen in both sexes consists of 7 separate segments: there are no lateral platelets intercalated between the 6th and 7th segments.

The gills are trichobranchiæ, or are intermediate between trichobranchiæ and phyllobranchiæ: the gill-plumes are very numerous—there may be as many as 20 on either side.

Epipodites are present on the chelipeds and first two or three pairs of legs.

The sternal grooves of the female are short, ending at the level of the genital openings.

To this family belong the following genera:—

1. *Homolodromia*, A. Milne Edwards, Bull. Mus. Comp. Zool., VIII. 1880, p. 33: Recueil de Fig. de Crustacés Nouveaux, pl. 39, fig. 2.
2. *Dicranodromia*, A. Milne Edwards, Bull. Mus. Comp. Zool., VIII. 1880, p. 31: Recueil de Fig. de Crust. Nouv. pl. 10.
3. **Arachnodromia*, Alcock, seq.

Family II. DYNOMENIDÆ, Ortmann.

Dynomenida, Ortmann in Brauer's Thier Reich, V. ii., Arthropoda, p. 1155.

Carapace variable, either longer than broad and convex, or broader

than long and flattish. Branchial groove usually present, cervical groove sometimes present.

Front broadly triangular, sometimes notched at tip. Antennal flagella not so long as the carapace.

External maxillipeds typically opercular, completely closing the buccal cavern.

Chelipeds equal or slightly unequal, generally much stouter than the legs.

First three pair of legs stout, about as long as the chelipeds. Fourth (last) pair of legs dorsal and rudimentary.

The abdomen in both sexes consists of 7 segments, and there is a pair of lateral platelets intercalated between the last two segments.

The gills are phyllobranchiæ but sometimes show the transition from tricho- to phyllobranchiæ. The gill-plumes are 16 (?) on either side.

Epipodites are present on the chelipeds and first three pair of legs.

Sternal grooves of the female ending at the level of the genital openings.

To this family belong (1) *Dynomene* and (2) *Acanthodromia*, both of which are represented in Indian Seas.

Family III. DROMIDÆ, *restr.*

Carapace variable, sometimes as long as or even a little longer than broad, sometimes slightly broader than long; generally strongly convex in both directions, sometimes flat; commonly ovoid or subcircular, occasionally pentagonal.

* Branchial groove almost always conspicuous, the true cervical groove present or absent on the dorsum of the carapace.

Front usually cut into 3 teeth, the middle one of which is always on a much lower plane than the others and is often of insignificant size or even absent: the front is rarely triangular, without lateral teeth. Antennal flagella shorter than the carapace.

External maxillipeds typically opercular, completely closing the buccal cavern.

Chelipeds equal, generally much stouter than the legs.

First two pair of legs generally stout, not much shorter than the chelipeds.

Last two pair of legs generally much reduced in length and slender, subdorsal and prehensile. There is a tendency for the fourth (last)

* The branchial groove of Bouvier, which by most authors is called the "cervical" groove.

pair to be a little longer than the third pair, and occasionally the fourth pair are as long as either of the first two pair.

The abdomen in both sexes consists of 7 segments, and there is a pair of lateral platelets intercalated between the last two segments.

The gills are phyllobranchiæ and are 14 in number on either side.†

An epipodite of small size is present on the chelipeds but not on any of the legs.†

The sternal grooves of the female are variable: they may end at the level of the genital openings, or at the bases of the first pair of legs, or at the bases of the chelipeds.

To this Family the following genera belong:—

1. **Dromia*, Fabr.: *seq.* 1722
2. **Dromidia*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 225 (subgenus of *Dromia*).
3. **Cryptodromia*, Stimpson: *seq.* (subgenus of *Dromia*).
4. **Petalomera*, Stimpson: *seq.* (subgenus of *Dromia*).
5. **Pseudodromia*, Stimpson: *seq.* (? subgenus of *Dromia*).
6. *Eudromia*, Henderson, Challenger Anomura, p. 13.
7. ???*Asciophilus*, Richters, in Mobius, Meeresf. Maurit. p. 158 (it is very doubtful whether this form really belongs to the Dromiacea).
8. **Conchoecetes*, Stimpson: *seq.*
9. *Hypochoncha*, Guérin, Rev. et Magasin de Zool. (2) VI. 1854, p. 333.
10. **Spharodromia*, Alcock, *seq.*

Tribe II. HOMOLIDEA.

The *Homolidea* may be divided into two families *Homolidæ* and *Latreillidæ*.

To the *Homolidæ* belong (1) *Homola* (with subgenera *Homolax* and *Paromola*), (2) *Paromolopsis* and (3) *Hypsophrys*, all of which are represented in Indian Seas.

To the *Latreillidæ* belong (1) *Latreillia* and (2) *Latreillopsis*, both of which are found in Indian Seas.

I am uncertain of the position of *Homologenus* A. Milne Edwards, which, but for its singular branchial formula, would be placed with the *Homolidæ*. It may perhaps have to be separated as a distinct subfamily of the *Homolidæ*. The references to the literature of this genus are: Bull. Mus. Comp. Zool. VIII., 1880, p. 34, (*Homolopsis* name pre-occupied): Challenger Anomura, p. 20: Bull. Soc. Philom., Paris, (8) VIII., 1896, p. 63: Bronn's Thier Reich V. ii., Arthropoda, p. 1156.

† Huxley (P. Z. S. 1878, p. 785) gave, as the sum of the branchial formula of *Dromia*, gills 16+1 epipodite. Milne Edwards (Hist. Nat. Crust. II. 172) stated that the gills are 14 in number on either side. I have examined *Dromia Rumphii* and *D. ciliata*, *Cryptodromia lateralis*, *Petalomera granulata* and *Conchoecetes artisciosus*, in all of which I find 14 branchiæ and 4 epipodites on either side: of the epipodites, 3 belong to the maxillipeds, and one—a small one—to the chelipeds.

Family I. HOMOLIDÆ *restr.*

Carapace elongate-quadrangular, or ovoid, or urn-shaped.

Terminal joint of the eyestalk (with the eye) either longer or shorter than the slender basal joint. Antennal flagella much longer than the carapace.

External maxillipeds pediform or subpediform.

The gill-plumes are 14 in number on either side, and there are epipodites to the chelipeds and first two pair of legs.

Homola, *Paromolopsis* and *Hypsophrys*, *vid. seq.*

Family II. LATREILLIDÆ.

Carapace elongate-quadrangular, or piriform.

Basal joint of eye-stalk very much longer than the terminal joint.

Antennal flagella not so long as the carapace.

External maxillipeds sub-operculiform.

The gill-plumes are 8 in number on either side and there are no epipodites to the chelipeds or legs.

Latreillia and *Latreillopsis*, *vid. seq.*

Tribe DROMIDEA.

Family HOMOLODROMIDÆ.

ARACHNODROMIA, Alcock.

Arachnodromia, Alcock, Investigator Deep Sea Brachyura, p. 17.

Carapace elongate-oblong but somewhat broader behind than in front, deep, inflated, tomentose, its texture thin but well calcified: two creases break either lateral border, the posterior one being the more distinct and being continued to the cardiac region (=brauchial groove), the anterior one, or true cervical groove, not proceeding far on to the dorsum of the carapace.

The front is horizontal, prominent, and deeply bifid.

The antennule and eye of either side are completely retractile into a common deep fossa (just as in *Dromia*) which affords them complete protection. As in *Dromia*, the floor of this common antennular-orbital fossa is formed by a subocular ("antennal") tooth in contact with the basal joint of the antenna, and, as in *Dromia*, the outer wall of the orbit is breached by a wide gap. The orbital portion of the fossa, which is loosely filled by the eyes, has the hollow for the eyes much deeper than the hollow for the eyestalk. The eyestalks are long and slender, the eyes small but perfectly formed and well pigmented.

The two basal joints of the antennæ, which are quite freely movable, largely fill the gap in the lower wall of the orbit, and lie in the

same plane with the antennules; the second joint has its antero-external angle produced to form a coarsish spine: the antennal flagella are longer than the carapace.

The palato is particularly well demarcated from the epistome and is rather broader in front than behind: the ridges that define the expiratory canals are very distinct. The epistome is in the closest possible contact with the front, but without complete fusion. The external maxillipeds are distinctly operculiform, but owing to the moderate expansion of the merus and to the coarseness of the palp, they have a slight pediform cast: they close the buccal cavern, but not so tightly as in *Dromia*.

The chelipeds are equal and are rather slender, though considerably stouter than the legs: the fingers are well calcified and are hollowed *en cuillère*, the tip of the dactylus shuts into a notch in the tip of the opposed finger.

The legs are cylindrical: the first two pairs are very long, the last two are short, subdorsal in position, and cheliform rather than subcheliform.

The sternal grooves of the female end opposite the openings of the oviducts, without tubercles.

The abdomen of both sexes consists of seven distinct segments. In both sexes the pleuræ of the 3rd-6th abdominal somites are remarkably free and independent (*i.e.* not in contact with those in front and behind) and the last abdominal tergum is nearly as long as the preceding five combined. In the male this last tergum is marked in a way that suggests its formation out of a segment fused with a pair of appendages.

This crustacean, as I have previously remarked, so closely resembles the *Homolodromia* described and figured by Milne Edwards* and referred to by Bouvier,† that at first sight it might be supposed to be the same form.

In *Homolodromia*, however, it is distinctly stated that the antennules are not retractile, and that there are no special orbits.

In *Arachnodromia*, on the other hand, there are orbits formed on exactly the same plan as, and hardly less perfect than, those of *Dromia*, and they afford complete protection to the retracted eyes and antennules, the antennulary flagella folding, as in *Dromia*, behind the eyes.

* A. Milne Edwards, Bull. Mus. Comp. Zool. Vol. VIII. 1880, p. 32, and Recueil de figures de Crustacés Nouveaux etc. pl. 39, fig. 2. Not the *Homalodromia* of Miers, which ought to be placed with *Pseudodromia*.

† E. L. Bouvier, Bull. Soc. Philom. Paris (8) VIII. 1895-96, p. 37, *et seq.*

The branchial formula is as follows:—

Somites and their appendages.	Podobranchiæ.	Arthrobranchiæ.	Pleurobranchiæ.
VII. ...	0 ep.	0	0 = ep.
VIII. ...	1+ep.	1	0 = 2+ep.
IX. ...	1+ep.	2	0 = 3+ep.
X. ...	1+ep.	2	0 = 3+ep.
XI. ...	1+ep.	2	1 = 4+ep.
XII. ...	1+ep.	2	1 = 4+ep.
XIII. ...	0	2	1 = 3
XIV. ...	0	0	1 = 1
	5+6 ep.	11	4 20+6 ep.

The formula is thus the same as that given by Bouvier for *Homodromia*.

1. *Arachnodromia Baffini*, Alcock and Anderson.

Arachnodromia Baffini, Alcock and Anderson, Ann. Mag. Nat. Hist., Jan. 1899, p. 7: Alcock, Investigator Deep Sea Brachyura, p. 19, pl. ii. fig. 1.

Carapace square-cut, dorsally convex, very distinctly (from a fourth to a fifth) longer than broad, its greatest breadth being just in front of the posterior border, its greatest depth approximating its greatest breadth, its surface—like that of the appendages and other parts of the body—tomentose. Except for a few small sharp granules anteriorly and laterally and along the lateral border, the carapace is unarmed.

The front is deeply cleft to its base, and has the form of two acutely triangular teeth.

Upper margin of orbit notched near its outer angle which is dentiform, the outer angle of the lower margin of the orbit is much more strongly dentiform, and the (outer) orbital wall between the two spines is deficient.

Antennal flagella longer than the carapace.

Chelipeds rather slender, unarmed except for a few granules seen on denudation, about $1\frac{2}{3}$ times the length of the carapace: fingers strongly hollowed 'en cuillère,' especially the immovable one, which alone has teeth: wrist not elongate.

First two pairs of legs more than twice the length of the carapace: their dactyli are about two-thirds the length of the preceding joint, are stout, are sharply spinate along the posterior edge, and end in a claw. The last two pairs of legs are about the same length as the carapace: their small claw-like dactyli shut down on a ring of spines at the end of the preceding joint.

Colours: dirty whitish, with a bluish tinge on the carapace and a faint reddish tinge elsewhere; eyes chocolate.

Two males and a female, from off the Travancore coast, 430 fms.: a small male from the Andamans, 238-290 fms.

The carapace of the largest male is 20 millim. long and 15 millim. broad, that of the female is 30 millim. long and 24 millim. broad.

Named in memory of the great Arctic explorer William Baffin, who, according to Sir Clements Markham, was the first Englishman to actually plot charts in these Seas.

Family DYNOMENIDÆ.

This family includes two genera which may be thus diagnosed:—

- I. Carapace flattish, broader than long,
covered with hairs DYNOMENE.
- II. Carapace convex, longer than broad,
covered with spines or spinules..... ACANTRODROMIA.

DYNOMENE, Latreille.

Dynomene, Latreille in Cuvier's Règne An. (nouv. ed. 1829) p. 69: Desmarest, Consid. Gen. Crust. p. 133: Milne Edwards, Hist. Nat. Crust. II., 179: Lamarck, Hist. Nat. Anim. sans Vert. (2nd ed.) p. 482: De Haan, Faun. Japon. Crust. p. 104: Dana, U. S. Expl. Exp. Crust. pt. I. p. 402: A. Milne Edwards, Ann. Sci. Nat. Zool., (6) VIII. 1879, Art. 3: Ortmann in Bronn's Thier Reich, V. ii., Arthropoda, p. 1155.

All parts usually tomentose.

Carapace subcircular, flattish, broader than long.

Front broadly triangular, dorsally grooved, more or less distinctly notched or divided at tip.

Palate well delimited from epistome: efferent branchial channels well defined.

The chelipeds usually do not differ greatly in size from the first 3 pair of legs: these are stout and of about equal length.

The 4th (last) pair of legs are quite rudimentary and alone are dorsal in position.

As regards the branchial formula, according to Bouvier it follows the *Dicranodromia* and *Homolodromia* type.*

Distribution: Tropical Indo-Pacific, from Madagascar to California.

2. *Dynomene pilumnoides*, n. sp.

The carapace and appendages are covered with an exceedingly thick tomentum of club-shaped hairs, the chelipeds and legs are also

* The material at my disposal, at present, does not permit me to indulge in dissection; but I have been able to make out that the branchial plumes and epipodites are more numerous than they are in *Dromia*, *Cryptodromia*, &c.