

ON NEPHROPSIS STEWARTI, A NEW GENUS AND SPECIES OF MACRUROUS CRUSTACEANS, DREDGED IN DEEP WATER OFF THE EASTERN COAST OF THE ANDAMAN ISLANDS,—*by* JAS. WOOD-MASON.

(Read 7th August, 1872, received 16th January, 1873).

[With plate IV.]

In April of last year, I was deputed by the Trustees of the Indian Museum, with the sanction of the Government of India, to proceed to the Andaman Islands for the purpose of making a collection illustrative of the marine fauna of that part of the sea of Bengal in which those islands are situated. I reached Port Blair about the 6th of April, and immediately put myself in communication with the Chief Commissioner, who at once placed at my disposal a well-manned boat and a small steam-launch, with which I dredged for nearly two months with much success from low-water line down to near 50 fathoms. Towards the end of my stay, General Stewart knowing my intense desire to try my fortune in deeper water, placed at my disposal for one day the S. S. "Undaunted" which had been recently armed and put into commission for service as a guard ship. The time allowed was short, but sufficiently long to enable me to bring away samples of the life supported by the sea-bed at, and beyond, the 100 fathoms' line, and to ascertain that the sea-bed was uniformly covered with a thick deposit of fine olive-coloured mud derived from the waste of the coral-reefs and of the sandstone and serpentine rocks of the islands.* This mud was not very productive, yielding only a few annelids, but was crowded with dead shells of Pteropods and *Dentalium* and with fragments of a large Brachiopod.

It was in the last cast of the dredge that I had the good fortune to capture the interesting addition to the crustacean fauna of these seas, described in the following pages. It is closely allied to *Nephrops Norvegicus* of northern European seas, so closely allied, indeed, that were it not for the absence of the squamiform appendage of the antennæ, I should be under the necessity of placing it in the same genus as a second species. The absence of this appendage, however, leaves me no choice but to establish a new genus for its reception.

* The following rough analysis by Mr. Tween, the chemist of the Geological Survey of India, will show the proportion of insoluble matter :

Soluble in H Cl mostly Ca O Co ₂ ,	42·8
Insoluble clay and sand,	57·2
	<hr/>
	100·0

The discovery in these warm seas of a very near, of the nearest ally in fact, of so characteristic a cold-water species, remarkable though it is, will not appear so surprising when I mention the fact that my crustacean lived and burrowed in the mud of the sea-bed at a depth of nearly 300 fathoms in a temperature not certainly exceeding 50° Fahr.

One of the chief points of interest attaching to this new form lies in the loss of its organs of vision by disuse, as in *Calocaris MacAndrewæ*, Bell, in *Cambarus pellucidus*—a member of the same family as that to which *Nephropsis* belongs—and in the other crustaceans and animals inhabiting the caves of Carniola and Kentucky. I not only agree with Mr. Darwin* in attributing the loss of the eyes to disuse, but I also regard the great length and delicacy of the antennæ, and the great development of the auditory organs as modifications effected by natural selection in compensation for blindness.†

NEPHROPSIS, gen. nov.

Diag. *Antennal scale absent.*

NEPHROPSIS STEWARTI, sp. nov. Pl. IV.

Body covered with fine rounded tubercles and with a short but dense pubescence. The carapace is sub-ovoid, armed on each side, just externally to the base of the rostrum, and behind the anterior margin, with an acute forwardly directed spine; a similar spine springs from each side of the anterior margin itself at about the level of the upper surface of the antennal peduncle; the basis of each of these two spines is confluent with a conspicuous convexity to be seen just behind it; immediately in front of each of these convexities lies a smooth, slightly excavated surface bounded in front by a curvilinear row of tubercles. The cervical suture, dividing the carapace into an anterior or cephalostegal, and into a posterior or omostegal portion, is broad and deeply impressed mesially and laterally, until it reaches the level

* Origin of Species, 5th Edit., pp. 171-173.

† Since these remarks appeared in the abstract of my paper (Proc. Asiat. Soc. Ben. viii, 1872, p. 151) Dr. Hagen's Monograph of N. American *Astacidæ* has reached Calcutta, and from it I give the following extract, on account of its obvious applicability to the species here described, merely remarking that the perusal of it led me to note also the stoutness of the rostrum and the great development of the cephalostegal spines in *Nephropsis* as compared with the slenderness of the one and the minuteness of the others in *Nephrops*: "But it seems to be a somewhat well recognized law in nature (Rathke, Metamorph. Retrograd., p. 135) that if any part is atrophied, or stopped in development, the nearest parts show an abnormal increase of development. This is apparently the case in *C. pellucidus*; the eyes are atrophied, and the rostrum, the fore border of the cephalothorax, the antennal lamina, the basal joint of the inner antennæ, and the epistoma are altered or largely developed." Op. Cit. 34.

of the anterior margin of the epistoma when it bends boldly upwards and backwards upon itself passing into the well-defined semicircular depression that bounds the lateral convexities described above. The cardiac region is broader than long, very convex transversely and bounded on each side by a densely-tuberculated elevation which running backwards, downwards, and forwards along the line of the granulated rim of the branchiostegite, and finally bending upwards almost opposite the origin of the second pair of abdominal appendages, passes again into the swollen anterior boundary of the omostegite; the ovoidal area thus limited off is more sparsely beset with tubercles and presents a marked depression on its anterior half.

The rostrum carries on each side a most acute spine directed upwards and forwards, and curved slightly inwards; and above presents two roughly granulated ridges coalescent towards the tip but divergent at the base; beyond the spines it is canaliculate on each side, above and below, and each lateral ridge is fringed with long hairs; below it is carinated and coarsely granulated at the base. A faint linear impression, continuous with the groove between the ridges on the rostrum, passes along the middle line of the carapace almost to its posterior border; situated in this line, and marking the anterior limit of the convex gastric region, lies an almost erect spiniform tubercle.

Antennæ and antennules.—The peduncles of these appendages lie as in *Nephrops Norvegicus* in the same horizontal line, and their inner margins are ciliate. The basal joint, or coxocerite, of the former is extremely short, and wants the apical spine in *Nephrops*, but the perforated conical process on its inferior surface is remarkably salient; the second is devoid both of the prominent spine into which, in *Nephrops*, its distal and external angle is produced, and of the squamiform appendage or scale seen in all the other recognized genera of *Astacidae*,* and developed to such an extraordinary degree in Carideous Crustacea; one or two small folds or impressions between, or upon, the second and fourth joints being all that remains of the antennal scale, and of the rudimentary joint that in *Nephrops* corresponds to the moveable spine of *Astacus*.†

* The antennal scale in *Astacoides* escaped the notice of Guérin who founded his genus on its supposed absence.

† There appears to be no doubt but that the antennal scale is the representative of the outer of the two appendages borne upon the protopodite at an early stage of embryonic life, and, if the moveable spine in *Astacus* and its undoubted homologue in the antennæ of *Nephrops* represent the inner of these appendages, then must the three distal joints of the peduncle with the flagellum be looked upon, as Dr. Fritz Müller looks upon them, as a new formation (*Neubildung*) and no longer as being in serial homology with the five distal joints of the other appendages, *e. g.*, of an ambulatory leg, which represent the endopodite, the exopodite being completely aborted or represented at most, as Rolleston remarks, by the annular constriction on

The flagella of the antennæ are remarkably long and of excessive fineness at their extremities.

The basal joint of the antennules has its upper surface greatly inflated, owing to the remarkable development of the auditory organ to which, in most Podophthalmatous Crustacea at any rate,* this joint gives lodgment; and the almost globular appearance of the joint as seen from the side contrasts strongly with the flatness of its upper surface in *Nephrops* or *Astacus*. Of the two remaining joints of the antennular peduncle, the first is short and cylindrical, being less than half the length of the last which in *Nephrops* is short and equal to that which precedes it. The peduncle terminates in the usual manner in a double flagellum, the outer branch of which is conspicuously stouter than its filamentous and cylindrical fellow, perceptibly compressed, and thickly fringed below with short hairs along its distal third.

The *epistoma* is much the same as in *Nephrops*, save that its posterior edge is straight and presents two small tubercles which give it the appearance of being slightly roundly-emarginate in the middle.

The *external maxillipeds* and the parts of the mouth in front of them are identical in structure with those of *Nephrops*.

The *eyes* are completely rudimentary, neither pigment nor corneal membrane being developed; the peduncles indeed are present, but even these are short, subcylindrical, mere aborted structures, concealed entirely from view by the stout base of the overhanging rostrum; in spirit they have become perfectly blanched like the rest of the appendages, but in life the delicate rose-pink coloration of the animal extended itself to their very tips. The peduncles are far less conspicuous from the side view than represented in the plate.

The first pair of *abdominal appendages*, those which bear the great *chelæ*, are unfortunately absent, the specimen having lost its claws a considerable period previous to its capture, as the presence of uncalcified reproduced rudiments of these appendages indicates; the other legs are smooth and slender; the second and third pairs are didactyle; of these the former has both its upper and lower margins, from the base of the carpopodite to the extremity of the claws, fringed with long hairs; the latter, much the slenderer as well as the longer of the two, has its propodite greatly elongated, and its claws only are ciliated. The fourth pair, the longest of all and ciliated only on the outer face of the dactylopodite, and the fifth, about as long as the second pair, are monodactyle.

the ischiopodite. For the facts relating to the transformation of the embryonic exopodite into the antennal scale of the Prawn *pari passu* with the budding out of the flagellum and the abortion of the endopodite, *vide* Fritz Müller's admirable essay on the development of the crustacea entitled "Für Darwin," p. 41, fig. 31.

* The caudal ear of *Mysis* forms an exception to this.

The last abdominal somite is immoveably united to that which precedes it as in *Nephrops* and the common Lobster;* and the sternum is linear as in the *Astacidæ* generally.

Post-abdomen.—The post-abdomen is gradually attenuated to the extremity of the telson. The appendages of its first somite are as completely rudimentary as they are in the female of *Nephrops Norvegicus*;† those which follow are long and slender, their foliaceous branches being very narrow, produced to a sharp point, and fringed with excessively long cilia. All the terga are covered with minute rounded tubercles, and present at their anterior ends, just behind the tergal facets, a broad smooth transverse groove with its hinder margin convex backwards.

The pleuron of the first somite is precisely similar to that of *Nephrops Norvegicus*, but those of the remaining somites are even more acutely triangular than in that species, and have their margins denticulate and furnished with a fringe of long cilia. In all the somites, with the single exception of the first, the tergal and pleural regions are most sharply defined as such, the former not curving continuously with the latter but terminating abruptly at the level of the ventral chords in a line convex outwards; so that, if a somite were detached, deprived of its ventral chord and flattened out on the table with its dorsal surface uppermost, the imaginary continuation from pleuron to pleuron of the plane in which these pleura laid, would pass below that of the surface of the tergum.

The 'swimmeret' constituted as in all other Macrurous Crustacea by the highly modified and backwardly placed appendages of the last postabdominal somite and by the 'telson,' differs in no particular of more than specific value from that of *Nephrops*; the mesial element, or *telson*, is longer in proportion to its breadth, its greatest breadth, being a transverse line separating its anterior from its middle third, and not at the base as in *Nephrops*, is slightly more truncate posteriorly, and the oblique rounded elevations, that gradually narrow as they pass backwards into the spines at its postero-

* On characters furnished by the claws alone Dana artificially divides the recognized genera of *Astacidæ* into two groups, typified respectively by *Astacus* and *Nephrops*; the first of these is further subdivided according to the number of the branchiæ and the mobility or immobility of the last abdominal somite. But no mention is made of the fact that this is firmly fixed in *Nephrops* too. If *Paranephrops*, a genus including only freshwater forms, should turn out to have a mobile last abdominal somite, then we shall have this curious fact presented to us, *viz.*, that all those members of the family *Astacidæ* which live in freshwater or are terrestrial (*Engæus*) have this somite moveably united by membrane only to that which precedes, while those of them that are marine have it fixedly united to the rest of the sternum.

† The ventral plates of the 2nd, 3rd and 4th postabdominal somites in the males of *Nephrops Norvegicus* have an erect spine in the middle line, but the females exhibit no trace of such.

lateral angles, are stronger than in *Nephrops*. The outer plate of the lateral elements of the swimmeret is moveably articulated at its posterior third as in the rest of the *Astacidæ*, but the sutural line is curved and the posterior margin of the proximal and larger division exhibits hardly a trace of the overlapping denticulations seen in other *Astacidæ*.

Length from tip of rostrum to the posterior margin of telson, 98 mm.

Length of carapace in middle line, 42 mm.

„ „ postabdomen, 56 mm.

therefore the postabdomen : carapace (rostrum incl.) :: $1\frac{1}{3}$: 1 exactly.

and the length of body : that of postabdomen :: $1\frac{3}{4}$: 1 „

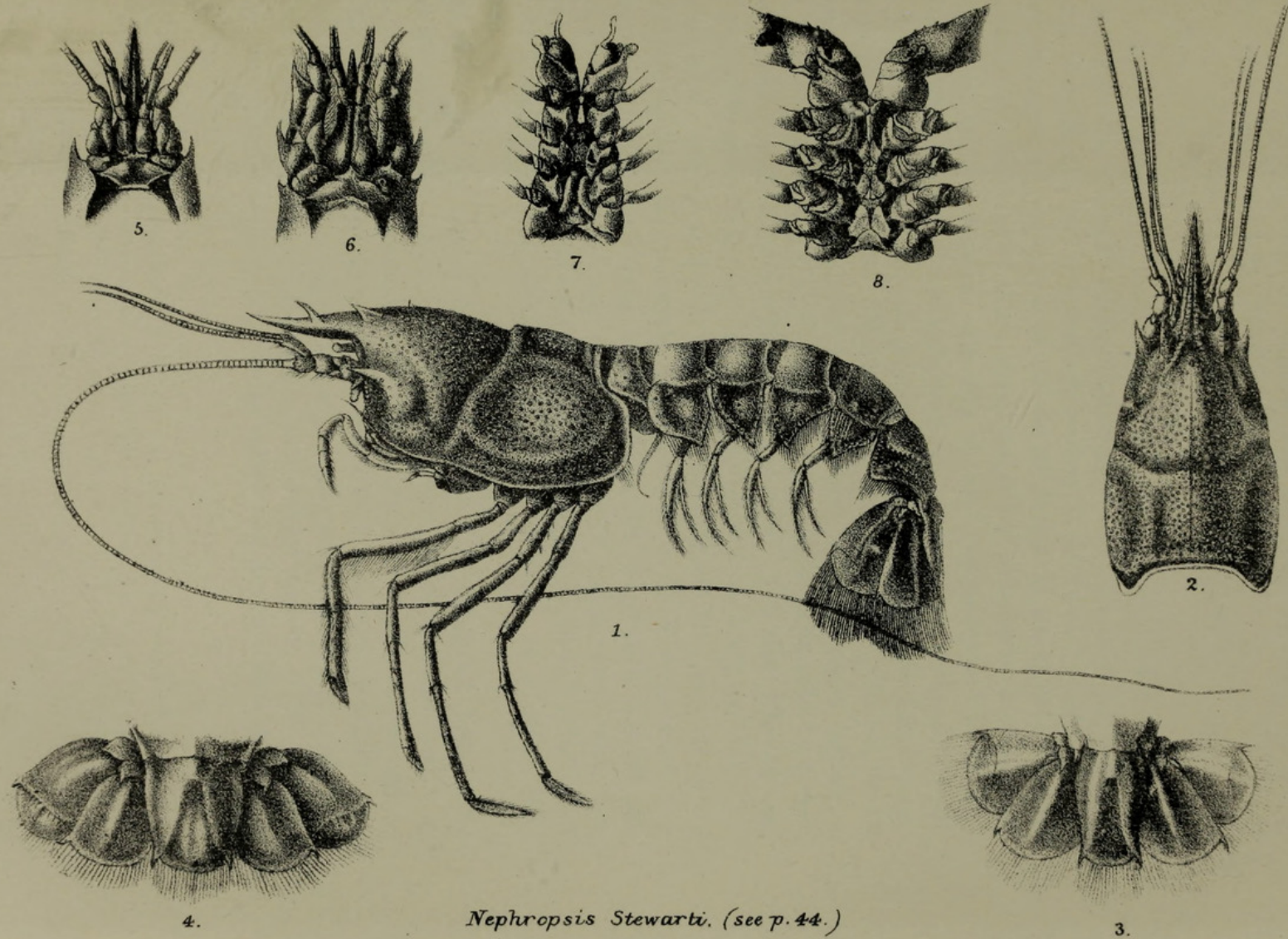
The only specimen (a female) obtained was dredged in from 260 to 300 fathoms about 25 miles off Ross Island on the eastern coast of the Andamans. That the specimen was really brought up from this great depth is certain from the unmistakable signs of crushing from contact with the lip of the dredge, from its position in the dredge bag and from its firmly adherent greenish coating which appears to indicate that like *Calocaris MacAndrewæ* it was a burrower.

In conclusion I have to thank Captain Beresford, the commander of the vessel, for his skilful management of the sounding-line and for the zeal displayed by him in carrying out my wishes during our too short cruise.

I have much pleasure in connecting with this extremely interesting species the name of Major General Donald M. Stewart, C. B., Chief-Commissioner of the Andaman and Nicobar Islands, to whose ever ready help the success of my trip was so largely due.

Explanation of Plate IV.

- Fig. 1. *Nephropsis Stewarti*, ♀, nat. size.
 Fig. 2. Upper view of carapace of the same.
 Fig. 3. Swimmeret of *N. Stewarti*.
 Fig. 4. „ „ *Nephrops Norvegicus*.
 Fig. 5. Inferior view of antennary region of *N. Stewarti*.
 Fig. 6. „ „ „ „ „ *N. Norvegicus*.
 Fig. 7. Sternal region of *N. Stewarti*.
 Fig. 8. „ „ „ *N. Norvegicus*.



Nephropsis Stewarti. (see p. 44.)