

CONTRIBUTIONS TO THE FAUNA OF THE
ARABIAN SEA, WITH DESCRIPTIONS
OF NEW FISHES AND CRUSTACEA.

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During the early part of 1906, the Indian Marine Survey Ship 'Investigator' proceeded from Muscat to Aden along the south coast of Arabia and returned by the same route. On both passages the trawl was used almost every day, so that ten hauls were obtained, three from less than 200 fathoms, and seven from about 500 fathoms or over. The results were for the most part good. Since this is the first time that the 'Investigator' or, I believe, any other ship has trawled in deep water along this coast, it seems well to publish a general account of the material obtained. So far it has only been possible to identify the Fish and Crustacea, but the greater part of the specimens fall within these two groups. The identification of species has been facilitated by the fine collection of types of Indian deep-sea Fish and Crustacea in the Indian Museum, Calcutta.

On the present collection, as a whole, the following observations may be made, and it is in these that its chief interest seems to lie:—

- I. The number of new species met with is remarkably small considering that the ground was being investigated for the first time. Only two new Crustacea and five new Fish, all species of well-known genera, were obtained. Of these seven species five are from the three stations in less than 200 fathoms, while the seven stations in about 500 fathoms or over only contributed two new species, one Fish and one Crustacean.
- II. The repeated occurrence of many of the species at several different stations is remarkable. Thus, of the seven deeper stations, one fish, *Bathygadus furvescens*, was found at four, while several species were found at three, although the seven stations were distributed irregularly along a line 1,000 miles or more in length.
- III. The occurrence of the giant Isopod *Bathynomus giganteus* and the large bilaterally symmetrical Hydroid *Branchiocerianthus imperator* (which is here recorded from Indian seas for the first time) is noteworthy.

The details of the various stations are as follows:—

STATION No. 355.

Depth 492 fathoms. Lat. $21^{\circ} 49' 50''$ N. Long. $59^{\circ} 48' 00''$ E. Surface temperature 78° F. Bottom, green sandy mud with many Foraminifera.

The trawl came up with the iron beam bent nearly double and the net badly torn; in spite of this many things were obtained from the swabs and from the extreme end of the bag, which was intact.

FISH.

None obtained; any caught must have escaped.

CRUSTACEA.

- Glyphocrangon investigatoris* .. (Three typical specimens).
Munida andamanica .. (Several specimens. The spines at the side of the rostrum are about one-third of the length of the rostrum, *i.e.*, rather shorter than in the type; but this character is very variable).
Munidopsis trifida .. (Several specimens).
 ,, *scobrina* .. (Several specimens).
 ,, *spinihirsuta*, sp. n. (Three small males. Described *postea*, p. 12).
Nematocarcinus cursor .. (Several specimens).
Aristeus crassipes .. (Two specimens).
Aethusa indica .. (One specimen).

Entangled in the net were two specimens of a most beautifully reddish orange Hydroid, which were found to agree almost exactly with the form figured by Merk and subsequently by Miyajima, who named it *Branchiocerianthus imperator*. Similar specimens were subsequently obtained in deep water off the coast of Baluchistan; these will be more fully described elsewhere.

At this station a large number of Polychætes were obtained. Among them were representatives of the Chlorohæmid genera *Trophonia* and *Brada*, two Polynoids (one of which was a large blood-red species about three inches long) and a small Terebellid. A Eunicid contained in a branched parchment tube with openings at regular intervals was also present, and to this tube a colony of *Epizoanthus* was attached.

Besides these forms several bivalve Molluscs of the genus *Nucula*, probably *N. fulloni*, were taken, and the Asterid *Mediaster*, five species of Ophiurids and some Gorgonacea.

STATION No. 356.

Depth 156—200 fathoms. Lat. $17^{\circ} 59' 00''$ N. Long. $57^{\circ} 22' 30''$ E. Bottom temperature 58° F. Surface temperature 77° F. Bottom probably firm, hard sand; no sample was obtained in the sounding tube and the specimens in the trawl were all quite clean.

FISH.

- Cynoglossus carpenteri* .. (Seven specimens of this Sole. They were distinctly bathy-bial in appearance, being of a very dark sepia colour and of a flabby consistency).

CRUSTACEA.

- Paralia alcocki* .. (Over fifty specimens, including two giant males).

Many specimens of the Molluscs *Rostellaria delicatula* and *Pirula investigatoris*. These specimens are generally found together and have been met with several times in the Bay of Bengal and off the West Coast of India, always from about the 200-fathom line.

A small Eunicid in a sandy tube was also obtained.

STATION No. 357.

Depth 555 fathoms. Lat. $16^{\circ} 51' 00''$ N. Long. $54^{\circ} 55' 00''$ E. Bottom temperature 48.5° F. Surface temperature 78° F. Bottom, finely divided greenish mud.

FISH.

- Lamprogrammus fragilis* .. (One specimen).
Bathygadus furvescens .. (One specimen).

CRUSTACEA.

- Nephropsis stewartii* .. (One specimen).
Aristeus crassipes .. (Three specimens).
Sergestes bisulcatus .. (One specimen).
Lyreideus channeri .. (One specimen).

Besides these species the following Polychætes were obtained :— two large specimens of *Hyalinæcia tubicola*, the tubes of which were about 10 inches in length, and an interesting genus which comes under the group Sigalionima and is perhaps *Thalanessa*. Its most remarkable features are a pair of large pink eyes and a median tentacle on the extensible proboscis. Also two small blood-red Polynoids, which were embedded in the outer skin of an Elaspod Holothurian. Also several large *Dentalia*, probably *D. magnificum*; the empty shells of a species of *Cryptodon*; a species of *Phormosoma*, and a Pennatulid with a quadrangular rachis bearing polyps on one side only.

STATION No. 358.

Depth 585 fathoms. Lat. $15^{\circ} 55' 30''$ N. Long. $52^{\circ} 38' 30''$ E. Bottom temperature 47.5° F. Surface temperature 77° F. Bottom, green sandy mud.

FISH.

- Lamprogrammus fragilis* .. (Three specimens).
Bathygadus furvescens .. (Two specimens).
Benthobatis moresbyi .. (One small specimen of this interesting bathybial Torpedo, which is now found for the third time).

CRUSTACEA.

- Bathynomus giganteus* .. (Two specimens, a female 7 inches long and a male 4 inches; generative apparatus was not present in either specimen. The female had undeveloped oöstegites to the thoracic legs. Both specimens were alive when taken from the trawl. The pleopods were covered with a small Barnacle described by Annandale under the name *Dichelaspis bathynomi* [*Ann. Mag. Nat. Hist.*, ser. 7, vol. xviii, July, 1906].)
- Aristeus crassipes* .. (One specimen).
Acanthephyra armata .. (One specimen).
Pandalus (Plesionika) martius (One incomplete specimen).
Munida militaris .. (Several specimens).
Nephropsis ensirostris .. (One specimen).
Scalpellum bengalense .. (Several specimens).

Many other species were obtained at this station, e.g., Asterids of the genera *Persephonaster* and *Zoroaster*, with portions of a *Brisinga* including two central disks showing facets for sixteen arms. Also representatives of the Echinoid genera *Phormosoma* and *Cidaris* or allied genera. Also the Molluscs *Amussium* and *Cryptodon* and a shell-less Tectibranchiate form probably belonging to the genus *Neda*; Holothurians of the genus *Ankyroderma*; and a large quantity of a thin parchment-like tubing having the calibre of a crow's quill and bearing occasional side branches. These tubes contained an interesting little Polychæte of a dark green colour and resembling *Chætopterus* in its general form, but bearing two long white cephalic tentacles. Most probably it comes into the genus *Phyllochætopterus*.

STATION No. 359.

Depth 674 fathoms. Lat. 14° 41' 30" N. Long. 50° 33' 15" E. Bottom temperature 47.2° F. Surface temperature 78° F. Bottom, green mud.

A poor result. One fine specimen of the Prawn *Acanthephyra armata*; the Molluscs *Amussium* and *Solenomya*; the Holothurian

Ankyroderma: the Polychætes *Hyalinæcia tubicola* and an interesting form with over one hundred segments all bearing elytra. This is probably a species of *Sigalion*.

STATION No. 360.

Depth 130 fathoms. Lat. 13° 36' 00" N. Long. 47° 32' 00" E. Temperature not taken. Bottom probably firm sand; no sample obtained in the tube and all the specimens quite clean.

FISH.

A good haul containing four new species.

- Raia philipi*, sp. n. .. (One small male. Described in *Ann. Mag. Nat. Hist.*, ser. 7, vol. xviii, Oct. 1906).
- Uranoscopus crassiceps* .. (Four specimens).
- Peristethius adeni*, sp. n. .. (One specimen. Described *postea*, p. 8).
- Bregmaceros macclellandi* .. (One specimen).
- Lophius lugubris* .. (Three specimens).
- indicus* .. (One specimen).
- Bembrops caudimacula* .. (Many specimens. These are slightly unlike the type; the eye is relatively smaller and the cutaneous appendages on the lower end of the maxilla are longer).
- Callionymus carebares* .. (Many specimens).
- Narcine mollis*, sp. n. .. (Two specimens. Described *postea*, p. 8).
- Solca umbratilis* .. (Many specimens. These seem darker in colour than the type and the skin feels rougher owing to the spinelets which project over the posterior border of the scales being somewhat stronger and more prominent).
- Læops nigrescens*, sp. n. .. Many specimens. Described *postea*, p. 9).
- Lepidotrigla spiloptera* var. *longipennis* .. (Many specimens).

CRUSTACEA.

Only three species, but the numbers obtained were very large.

- Palinurus angulatus* .. (Seventy-five of these Crayfish were taken. They made a loud creaking noise with their sound-producing apparatus as the net was hauled in).

- Arctus orientalis* .. (Forty-five specimens).
Mursia bicristimana .. (Twenty-five specimens).

The Molluscan genera *Persona* and *Pirula* (a species of the latter closely allied to *P. investigatoris*) and the Nudibranch *Pleurophylloidea* were represented. Also the Echinoderm genera *Cidaris*, *Clypeaster* and *Zoroaster*; and the Pennatulids *Veretillum*, *Umbellularia*, and *Pennatula*, all in great numbers.

STATION No. 361.

Depth 540 fathoms. Bottom temperature 51.5° F. Surface temperature 82° F. Bottom, green mud.

Another good result.

FISH.

- Macrurus macrolophus* .. (One specimen. Almost typical but differs from the type in two respects: (a) the spinelets on the scales are longer, (b) the barbels are minute. These two characters, the reduction of the barbels and the increase of the spinelets, are the principal features which separate *M. macrolophus* from *M. investigatoris*. This specimen goes somewhat further along the same line of variation).
- Dicrolene intronigra* .. (One specimen).
Xenomystax trucidans .. (One specimen).
Bathygadus furvescens .. (Two specimens).
Saurenhelys tæniola .. (One specimen).
Diplacanthopoma squamiceps..
 sp. n. .. (Two specimens. Described *postea*, p. 10).
Lamprogrammus fragilis .. (Two specimens).

CRUSTACEA.

- Glyphocrangon investigatoris* .. (Two specimens).
Lyreideus channeri .. (Two specimens).
Pentacheles phosphorus .. (One specimen).
Pandalus alcocki .. (Many specimens).
Aristeus semidentatus .. (One specimen).
Homola megalops .. (Many specimens).
Aethusa indica .. (Five specimens).
Nephropsis stewartii .. (One specimen).
Munidopsis wardeni .. (Many specimens).
Munida andamanica .. (Three specimens).

The Echinoderm genera *Zoroaster* and *Phormosoma* are repre-

sented. Also the Mollusc *Verticordia eburnea* and a species of the Cephalopod genus *Cirrotheuthis*.

STATION No. 362.

Depth 480 fathoms. Lat. $13^{\circ} 50' 00''$ N. Long. $48^{\circ} 18' 00''$ E. Bottom temperature 55° F. Surface temperature 79° F. Bottom, green sandy mud.

FISH.

Macrurus macrolophus .. (One specimen).
Bathygadus furvescens .. (Two specimens).

CRUSTACEA.

Homola megalops .. (Three specimens).
Lyreideus channeri .. (One specimen).

Besides these, the Holothurian *Ankyroderma*, some Polychætes of the same species as were obtained at Station No. 357 (*Thalenessa* sp.), and several empty shells belonging to the genera *Cryptodon*, *Dentalium*, *Pleurotoma* (three species), *Solariella* and *Velutina*.

STATION No. 363.

Depth 810 fathoms. Lat. $14^{\circ} 28' 45''$ N. Long. $50^{\circ} 0' 15''$ E. Bottom temperature 43° F. Surface temperature 80° F. Bottom, green mud with many shells.

CRUSTACEA.

Aristeus crassipes.

Also the Holothurian *Ankyroderma* and the Polychætes *Hyalinæcia tubicola*, *Phyllochætoptorus* sp., and *Thalenessa* sp., the two latter belonging to the species obtained before. A large Schizonemertine, most probably of the genus *Cerebratulus*, was also taken.

STATION No. 364.

Depth 110 fathoms. Lat. $15^{\circ} 8' 30''$ N. Long. $51^{\circ} 52' 15''$ E. Bottom temperature 63.5° F. Surface temperature 80° F. Bottom, sandy mud.

CRUSTACEA.

Squilla investigatoris, sp. n. .. (Over five hundred specimens of this new species were the principal feature of this haul. Described *postea*, p. 10).

Also the Mollusc *Pirula investigatoris* and Pennatulids of the genera *Veretillum*, *Lituarina* and *Virgularia*.

DESCRIPTIONS OF NEW SPÉCIES.

FISH.

Peristethus adeni, sp. nov.

Br.r. 7 | a.D. 7 | p.D. 14 | v. 5 | P. 12 2 | L.L. 24 | L.tr. 4 | A. 14 |

The length of the præorbital process is equal to one-third of the distance between its extremity and the anterior border of the orbit. The præocular ridge has a prominent, finely serrated border; it ends behind in a sharp spine, which is nearly as long as the eye. The inner borders of the præorbital processes are parallel, their outer borders, if prolonged, would meet in front at an angle of 40°. The præorbital processes therefore appear to converge. The length of each labial tentacle is equal to the width of the mouth.

The osseous plates between the ventral fins are unusually thick. The greatest length of each anterior ventral plate is equal to the greatest breadth of both combined. The greatest length of the posterior ventral plates is half that of the anterior ones. The greatest length, in both cases, is to one side of the middle line. A quadrangular portion of the posterior plates fits into a corresponding hiatus in the anterior plates. Throughout the length of the body, on either side, there are four rows of plates, each with a large spine shaped somewhat like a rose-thorn, their points curving backwards. The lowest row is much less conspicuous than the others.

There are large postorbital, occipital, post-temporal, and two opercular spines, a small upper and a large lower one, on either side. There is one small median spine, an orbit's length in front of the orbits.

The greatest height is one-fifth the total length. Total length of the single specimen $6\frac{1}{2}$ inches: greatest length of the head three inches.

Colour—Reddish yellow; pectorals grey; dorsals tipped with black.

Habitat—Gulf of Aden; 130 fathoms.

Narcine mollis, sp. nov.

The vent is slightly nearer the anterior margin of the snout than the tip of the tail. The disc is evenly rounded, it is slightly broader than long. The margin of the flap formed by the confluent nasal valves is most prominent at the sides, unlike *N. timlei*, the other Indian species. The whole quadrangular space which lies between the two nasal clefts is nearly as long as it is broad. In *N. timlei* this space is three times as broad as it is long.

The anterior dorsal is slightly smaller than the posterior; it commences just behind the ventrals. The dorsal and caudal fins have blunt pointed ends and the folds of skin along the sides

of the tail are obvious, but not prominent. The dorsal and ventral parts of the caudal fin are confluent.

The teeth are in 10 to 12 rows in both jaws; the front row has only 3 or 4 teeth; behind this the number gradually increases in succeeding rows up to about 16. The teeth of the front rows have triangular, flat surfaces; behind, the teeth bear a sharp median cusp.

The spiracle is immediately behind the eye and is the same size as the eye.

The electric organs seem well developed. The fish gave no perceptible shock to the hand and died soon after capture.

Round the margin of the disc, and along the sides of the tail, and over the snout, are the openings of mucous pores symmetrically arranged.

Consistency and general appearance distinctly bathybial.

Colour—Dark brown above, greyish brown below.

Habitat—Gulf of Aden; 130 fathoms.

Læops nigrescens, sp. nov.

D. 95 | A. 82 | C. 17. | P.d. & 5.13. | V.d. & s. 6. |

This species is closely allied to *L. guentheri* and *L. parviceps*. It differs from these in the following respects:—

It is bathybial in appearance. The pectoral fins are longer than the head. The head is $\frac{1}{4}$ th the length without the caudal fin; the height without the fins is $2\frac{2}{3}$ in the total length. The pectoral fins are better developed on the left side; the length of the left pectoral is longer than the entire head in most specimens; it is never less than the length of the head. The left pectoral fin is much longer than the right, in some specimens nearly twice as long. The ventral fins are about equal: the left is in a line with the anal. The caudal fin is pointed, its length is 6 in the total. The length of the dorsal and anal fin rays are about equal and are about $2\frac{1}{2}$ in the body height. The lateral line forms a strong pectoral curve; the scales are small and deciduous. The snout is half the major diameter of the eye, the lower eye is in advance of the upper; the eyes are separated by a prominent ridge.

The major diameter of the eye is one-third the length of the head.

Teeth on the blind side only.

Vomer prominent, devoid of teeth.

Seven specimens, the longest $6\frac{3}{4}$ inches in length.

Colour—Left side dark sepia, with irregular patches of a darker sooty tone, fins nearly black. The colour resembles that of *Læops macrophthalmatus* from 100 fathoms and differs widely from that of *L. guentheri* and *L. parviceps* from shallow water.

Habitat—Gulf of Aden; 130 fathoms.

Diplacanthopoma squamiceps, sp. nov.

Corresponds with the generic definition in the following respects:—the form and arrangement of the fins, of the teeth and the gills, in the number of the branchiostegals (8), in the absence of pseudobranchiæ and pyloric cæca, in the obscurity of the lateral line, and in the presence of radiating spines on the opercles. It differs from all known species in this important respect:—there are scales on the head as far forward as the posterior limit of the eyes and on the opercles and sides of the head as far forward as a line dropped vertically from the posterior border of the eyes. The head is much depressed and the eyes are close together and look upwards to a great extent, being separated by less than their diameter; this gives the head a very different appearance from that of the other three known Indian species of the genus, in all of which the eyes are separated by about $1\frac{1}{2}$ times their diameter.

There are deep mucus pits on the head and in a semicircle below the orbits.

There are no pseudobranchiæ, but in the position of these organs there are two very short and slender filaments which are vestiges of this organ. I find that the type specimens of *D. rivers-andersoni* and *D. raniceps* have precisely similar vestiges. This seems to be a strong argument for including this new species under the genus *Diplacanthopoma*.

The length of the head is $3\frac{1}{2}$ in the total without the caudal fin.

The greatest height is one-sixth the length without the caudal fin.

The length of the eyes is a little less than the length of the snout.

There are 19 rays in the pectoral fins.

The filaments composing the ventral fins are composed of two rays.

The male has a well-developed penis.

Two specimens, a male and a female, both about five inches long.

Habitat—Off the S.-E. coast of Arabia; 540 fathoms.

CRUSTACEA.

Squilla investigatoris, sp. nov.

Eyes large, consisting of two subequal lobes. The carinal axis is slightly oblique to, and a little longer than, the peduncular axis.

The rostrum is ovate, and is a little longer than its breadth at the base, without a carina, but with raised lateral margins.

There are five carinae on the carapace; the median one becomes flattened out and obscured anteriorly, and a little less than a rostrum's length behind the rostrum, it bifurcates. The antero-lateral angles of the carapace bear spines, which do not extend

as far forward as the level of the rostral base. The postero-lateral angles are smoothly rounded.

The first free thoracic segment bears two lateral spines, a long anterior one, curving downwards and forwards, and a short posterior blunter spine projecting transversely outwards; there are no ventral spines. The second free thoracic segment has a bilobed lateral margin, the anterior lobe being smaller and more pointed than the posterior. The lateral margin of the third thoracic segment is also bilobed, the anterior lobe being much the smaller.

Excepting the first, each of the free thoracic segments bears four carinæ, the submedian ones being somewhat obscure. All the abdominal segments excepting the last bear eight carinæ, the submedian pair are obscure. On the upper surface of the second to the fifth abdominal segments there is a small dorsal tubercle which is duplicated by a transverse groove. The lateral carinæ of the first to the sixth, the sublateral carinæ of the third to the sixth, and the submedian carinæ of the fifth and sixth end in a spine posteriorly.

The length of the telson is slightly greater than its breadth. The margin bears four large spines, a pair of submedian and a pair of sublateral; anterior to each sublateral are two lesser marginal spines, the posterior of these bears a small tubercle at its hinder angle. Between the submedian spines there are 8 to 10 teeth. Between the submedian and sublateral spines on each side there are 9 to 10 teeth. The telson bears a mid-dorsal ridge and a ventral tuberculated keel, the dorsal ridge ends posteriorly in a spine, beneath which there are, in some specimens, two or three other spines. At the anterior end of the dorsal ridge is another blunt spine. The basal prolongation of the uropod is finely serrated on its inner margin, the inner division is by far the larger and bears a sharp spine in the middle of its outer edge. The proximal joint of the exopodite is a little longer than the distal and bears seven moveable spines on its outer border.

(Up to this point in the description this species differs only on minor points from *S. nepa*, *S. stridulans* and several other species.)

In the raptatorial claw we find the most distinctive feature. The dactylus bears about fifteen long, delicate curved teeth, the number varying within wide limits. The number of teeth in sixteen counted specimens was as follows:—13, 17, 16, 16, 14, 18, 14, 14, 13, 10, 16, 13, 17, 15, 17, 16.

This variation has no relation to sex. Not only does the number vary, but the length of the teeth and the amount of their curvature is very variable.

The opposing border of the propodite is finely serrated and bears three moveable denticles near its base; of these the middle one is much the smallest. The carpus bears three stout blunt spines. The posterior angle of the claw, when folded up, does not reach as far as the posterior angle of the carapace.

Numerous specimens; sexes about equally distributed.

Colour—Very variable, thorax and abdomen sand-colour with

minute black spots; telson and uropodites show a blue-black colouration irregular in its distribution.

Habitat—S.-E. coast of Arabia, 110 fathoms.

Munidopsis spinihirsuta, sp. nov.

The length of the carapace is very slightly greater than the breadth.

The rostrum, which is less than half the length of the carapace, curves upwards especially towards the tip, is carinate and bears an obscurely serrated lateral margin. The entire upper surface and lateral margins of the carapace are covered with large pointed spines which curve forwards; these spines are arranged with some approach to symmetry; they are most numerous over the gastric regions; they all bear long hairs.

There are six spines on the posterior border of the carapace. The upper surfaces of the first three abdominal segments bear hairy spines.

The eyes are colourless, egg-shaped, and one-third the length of the rostrum; they are surmounted by a flat, curved, hirsute spine.

There is a small spine on the anterior border of the carapace between the eye and the second antenna forming the boundary of an orbit.

The chelipeds are nearly equal and are about as long as the entire body in the male (female unknown). The merus and carpus are covered with spines; there is a row of small spinules on the inner border of the propodite; the fingers are shorter than the palm. From the second to the fourth thoracic leg, the mero-, carpo-, and propodite are covered with small spines on their upper surfaces; the dactylus in these appendages is half the length of the propodite. There are no epipodites on the chelipeds or any of the walking legs. The basal joint of the peduncle of the second antenna has an external and an internal spine of equal size. The flagellum is about the same length as the body.

Three small males; largest $1\frac{1}{8}$ inch from telson to rostrum.

Colour—Pinkish yellow.

Habitat—Off S.-E. coast of Arabia; 492 fathoms.