

BISCAYAN PLANKTON.

PART XI.—DECAPODA.

By STANLEY W. KEMP, *B.A.**(Communicated by* Dr. G. HERBERT FOWLER, *F.L.S.)*

(Plates 14 & 15.)

Read 7th March, 1907.

So will be readily understood, the large majority of the Decapoda collected by Dr. Fowler in the Bay of Biscay are larval forms.

Tow-nets, unless of exceptional size, are but ill adapted for the capture of free-swimming Macrura, many of which are powerful swimmers and easily avoid capture in small nets. Nevertheless, five species are represented by specimens which have attained adult characters; they are—*Amalopenæus elegans*, Smith, *Sergestes arcticus*, Kr., *AcanthePHYRA purpurea*, A. M.-Edw., *AcanthePHYRA (Systellaspis) debilis*, A. M.-Edw., and *Hymenodora glacialis*, Buchholz. The last named is represented only by macerated fragments, and its identification therefore cannot be regarded as absolutely satisfactory.

So far as is at present known, only a small percentage of Macrura are pelagic, so that the five species mentioned above probably represent about one-half of the free-swimming forms which might occur in the district under observation.

The chief interest of the collection centres in the fine series of larval *AcanthePHYRA purpurea*. The later stages in the development of this form have been determined by Coutière, and the material before me enables me to substantiate his suggestion that the species leaves the egg in the form of a zoæa. A comparison of the development of this species with that of *A. debilis* renders this feature noteworthy enough: *A. debilis* has much larger eggs than *A. purpurea*, and Coutière states that the young leave the egg in a post-larval condition*.

This series of young *A. purpurea* comprises the vast majority of the larvæ in the collection, but in addition there are a few interesting Hippolytidæ closely allied to Spence Bate's larval genus *Caricyphus*. Only three larval Anomura are present; and Brachyura are represented by a few metazoææ and megalopæ. Numerous examples of all these larvæ occur in our extensive material from the west coast of Ireland, and it seems best to defer any detailed notice of the few specimens taken in the Bay of Biscay until such time as I can deal with this large collection, which will probably enable many of them to be connected with well-known adult forms.

* This statement is, however, incorrect: see note on p. 214.

All the specimens were taken in approximately the same locality, between latitude $46^{\circ} 43'$ to $47^{\circ} 29'$ North, and longitude $7^{\circ} 15'$ to $8^{\circ} 18'$ West. The soundings in this area are 2000 fathoms or more.

MACRURA.

AMALOPENÆUS ELEGANS, Smith.

Examples of this species are present in two hauls, the nets fishing between 350 fathoms and the surface (36 *l*), and between 1250 fathoms and the surface (27 *a*). Three small specimens were taken; two measure only 11.5 mm., and the third is broken.

Fragments of two individuals, which almost certainly belong to this species, occur in another haul between 500 and 400 fathoms (35 *i*).

SERGESTES ARCTICUS, Kröyer.

Eighteen examples of this well-known N. Atlantic form are present in the collection; they range in size from 8 to 27 mm.: the smaller specimens have evidently only recently emerged from the *Mastigopus* stage. One individual measuring only 14 mm. possesses antennæ 54 mm. in length.

All the specimens which can definitely be referred to this species were caught between 100 fathoms and the surface, some actually at the surface. Fragments, in all probability of *S. arcticus*, are present in nets fishing between 200 and 100 fathoms, and between 500 and 400 fathoms.

Larval SERGESTIDÆ.

Two *Acanthosoma* larvæ and several *Elaphocaris* were caught, all in the upper strata of the water.

ACANTHEPHYRA PURPUREA, A. Milne-Edwards*. (Pl. 14 and Pl. 15. fig. 1.)

A mature male, 81 mm. in length, was caught in haul 36 *b* between 100 fathoms and the surface. The specimen may be referred to Coutière's var. *multispina*; the rostrum bears ten teeth above and six below; the carinæ of the last four abdominal somites are produced posteriorly as spines, that of the third being the longest, the other much shorter and subequal. The telson is furnished on the right side with nine, and on the left with ten, dorso-lateral spinules.

More than fifty larvæ of this species are present in the collection †; they range in size from specimens which can only just have left the egg up to those which were described by Coutière under the name of *parva*. This author soon realised that he was dealing with larval *A. purpurea*; and in a paper published shortly afterwards (Bull. Mus. Oceanogr. Monaco, No. 70, 1906) he gives a complete account of the development from

* A full discussion of the somewhat lengthy synonymy of this species will be found in my paper, "On the Occurrence of Two Species of *Acanthephyra* off the Coast of Ireland," Fisheries, Ireland, Sci. Invest. 1905, i. (1906).

† In addition to those shown in the table of comparable hauls (pp. 216, 217), three specimens were taken in 21 *d*, 100 to 0 fathoms.

the *parva* stage onwards. He did not possess any younger specimens, but suggested that the earliest form was in all probability a zoea. The material in my hands enables me to confirm this view. In the case of *Acanthephyra* (*Systellaspis*) *debilis*, a species of which the development is now almost completely known, the larva is born with the pereopods fully formed and the pleopods present as buds; in this instance, however, the ova are relatively of a much greater size than is the case with *A. purpurea*.

The following table shows some of the features of the specimens examined, excluding those which were too broken to afford accurate data. The rostral length is subject to considerable variation during the different stages: I have therefore measured the specimens from the blunt tooth, which is situated at the base of the rostrum, to the tip of the telson (excluding setæ); in the younger forms this tooth is a very prominent characteristic, and it appears to persist throughout the stages as the posterior dorsal spine of the rostrum.

Haul.	Length, mm.	Rostral formula.	Stage.	Haul.	Length, mm.	Rostral formula.	Stage.
22 a	4.3	1	No uropods or pleopods.	32 p	5.6	1	Uropods free, no pleopods.
26 c	4.3	1	" "	30 l	5.7	1	" "
30 f	4.3	1	" "	26 a	5.9	1	" "
36 f	4.3	1	" "	30 l	5.9	1	" "
34 b	4.4	1	" "	32 o	5.9	1	" "
34 d	4.4	1	" "	36 b	6.0	1	" "
33 c	4.5	1	" "	36 b	6.1	1	" "
28 a	4.6	1	" "	32 a	6.3	1	" "
28 a	4.6	1	" "	30 l	6.6	1	" "
30 f	4.6	1	" "	32 m	6.6	1	" "
30 l	4.6	1	" "	21 d	9.1	3	} With both uropods and pleopods; eyes large.
30 l	4.6	1	" "	32 a	9.4	3	
30 l	4.6	1	" "	25 g	10.4	3	" "
32 p	4.6	1	" "	25 g	11.6	3	" "
36 e	4.6	1	" "	21 d	11.7	4	" "
33 f	4.8	1	" "	25 k	12.0	4	" "
28 a	5.0	1	" "	32 m	12.0	4	" "
30 l	5.0	1	Uropods free, no pleopods.	32 m	12.1	4	" "
34 g	5.0	1	" "	33 g	12.1	4	" "
36 b	5.1	1	" "	21 m	12.3	4	Eyes small, " <i>parva</i> " form.
30 g	5.2	1	No uropods or pleopods.	34 f	12.5	5	" "
30 l	5.2	1	Uropods free, no pleopods.	32 h	13.0	5	} With both uropods and pleopods; eyes large.
30 l	5.5	1	" "	30 l	13.2	5	
30 l	5.5	1	" "	25 g	13.4	5	" "

The figures in the second column can only be regarded as approximate, for the accurate measurements of specimens possessing varying degrees of curvature is necessarily attended with some difficulty.

The smallest specimen in the collection measures about 4.3 mm., and there can be no doubt that the larva is but little smaller than this when it leaves the egg.

As will be seen from the table, the collection contains nineteen specimens, ranging from 4.3 to 5.2 mm., in which neither uropods nor pleopods are developed; these represent the earliest stage* in the metamorphosis (Pl. 14. figs. 1-8, 11, 14, and 18).

* It will of course be understood that the word "stage" is merely used to distinguish larval groups differentiated

The rostrum is very slender and nearly as long as, or rather longer than, the carapace ; it bears a blunt spine at its base immediately over the posterior edge of the orbit. The carapace is rather less than twice as long as broad ; it is provided with a blunt spine in the mid-dorsal line near the hinder margin, and occasionally with two or three extremely minute spinules on the posterior basal edge ; the orbital angle is obtuse and rounded, the antero-lateral angle is produced forwards as a long, slender, upcurved spine.

The 3rd abdominal somite is deep, dorsally rounded in side view, and produced posteriorly in the form of a hood over the 4th somite. The 6th somite is not marked off from the telson ; the two together are about four times the length of the 5th somite. The telson (fig. 18) is wide, rather deeply emarginate apically, and is furnished on each side with eight setæ. The uropods are not free, but in some of the specimens, which are evidently about to moult, they may easily be seen lying within the telson (fig. 19) ; in these cases the telson itself is retracted somewhat from the outer edge, a fine filament extending from it down each seta.

The eye (fig. 14) is about as long as the carapace, and is widest across the cornea ; the latter is black and hemispherical, and is composed of approximately 200 to 300 facets.

Eight pairs of limbs are present, the antennules, the antennæ, the mandibles, two pairs of maxillæ, and three pairs of maxillipedes. No pereopods are developed in this stage, but one or two pairs may be represented by buds.

The antennules (fig. 2) reach slightly beyond the eyes ; the peduncle is in some cases two-jointed, in others, in which development has proceeded somewhat, three-jointed. The basal joint is long and shows no trace of the lateral process. The outer flagellum is rather stout, not longer than the ultimate peduncular segment, and is furnished with a few setæ at its apex. The inner flagellum is represented merely by a rounded boss bearing a stout plumose seta of varying length.

The antennæ (fig. 11) scarcely reach to the end of the antennular peduncle ; the single basal joint is as long and as wide as the scale, the latter being elliptical in shape and provided with 10 to 15 finely plumose setæ ; the distal spine is not present, and the extreme apex is divided by two or three faint transverse articulations. The distal end of the basal segment bears on its inner side a stout seta rather longer than the scale ; this doubtless functions as a flagellum.

The mandibles (fig. 3) show no trace of a palp, distally they are almost squarely truncate and are provided with a few minute teeth. The 1st maxilla (fig. 4) consists of the two basal lobes and an endopod. The lower lobe is rounded and furnished with about six setæ, the upper rather longer with a narrow truncate apex armed with a few short bristles. The endopod bears two setæ at about the middle of its internal margin and four at the apex. The 2nd maxilla (fig. 5) is widest basally, the internal margin is four-lobed, each lobe being provided with numerous setæ ; the endopod also bears several setæ, while the oval exopod, which reaches to about half the length of the palp, is furnished with five setæ.

by sets of characters by which they may be readily recognized. The term has no special significance, nor is it possible, in the present species, to say how many moults are included in each.

The three pairs of maxillipedes (figs. 6, 7, and 8) have long exopods tipped with three or four long hairs. The endopod is four-jointed, the joints being narrow and subcylindrical, and each provided with one or two setæ. In the first two pairs the endopods are shorter than the exopods, in the third pair they are equal, or the endopod is slightly the longer.

In the larger specimens in this stage buds representing the first appearance of the two anterior pairs of pereopods may be observed. Those of the first pair are longer than those of the second, and are curved forwards between the bases of the outer maxillipedes.

In the next stage of the development the uropods are free, the telson is, however, still more or less laminar, and the abdominal somites are not provided with pleopods. Seventeen specimens with these characteristics, measuring from 5.0 to 6.6 mm., are present in the collection (Pl. 14. figs. 9, 12, 15, 20, and 21).

The rostrum is relatively shorter than in the previous stage, being about two-thirds to one-half the length of the carapace; the large blunt spine at its base persists, and in one of the specimens two very minute teeth are found in front of it. The blunt tooth in the mid-dorsal line of the carapace near the hinder margin is still present, and a few very minute teeth may usually be seen on the posterior basal edges. The characteristic hump of the 3rd abdominal segment is more pronounced and elbowed than in the earlier stage; a notch is present in the mid-dorsal line of the 4th somite near the posterior edge, and the 6th somite is about three times the length of the 5th. The telson (figs. 20 & 21) is still somewhat foliaceous and is subparallel, or rather wider at the apex than at the base. Distally it is emarginate, and, as in the earlier stage, bears eight pairs of setæ. The uropods are free, the outer in the older specimens bearing a spine on its outer distal edge. The endopod is at first short, but rapidly attains to the same length as the exopods.

The eye (fig. 15) has not kept pace with the growth of the carapace, being now little more than half its length; the cornea is still the widest part. The basal joint of the antennular peduncle is very much longer than the 2nd and 3rd combined; it possesses no lateral process, but is proximally somewhat swollen on its outer edge. The outer flagellum is still quite rudimentary, being little longer than the ultimate peduncular joint; it bears a long apical seta. The inner flagellum has now appeared and is about half the length of the outer; the long seta present in the earlier stage has been carried up on its apex. The antennal scale (fig. 12) is longer than the one-jointed basal segment and reaches to the end of the 2nd joint of the antennular peduncle; it is furnished with numerous long setæ and with a stout spine at its outer distal edge. The long seta which represented the flagellum in the previous stage has disappeared and a short thick protuberance, from one-fifth to one-third the length of the scale, has taken its place.

During the course of this stage the first three pairs of pereopods with their exopods are developed; in structure they resemble the outer pair of maxillipedes.

All the remaining specimens in the collection, with the exception of two measuring 12.3 and 12.5 mm., belong to the next stage, in which uropods, pleopods, and all five pereopods are developed, while the eyes remain of relatively large size and are widest across the cornea. These specimens measure from 9.1 to 13.4 mm. (Pl. 14. figs. 10, 13, 16, 22, and 23).

The rostrum is less than half the length of the carapace and is furnished dorsally with

from three to five teeth, the posterior of which, although in some cases small and sharp, appears to represent the blunt spine present in the two preceding stages; ventrally the rostrum is unarmed. The median spine at the posterior edge of the carapace persists, although of comparatively small size, in the larger examples; the minute spinules on the inferior hinder margin of the carapace are present in the smaller specimens only. The elbow on the 3rd abdominal somite is as prominent as in the preceding stage, and the 6th somite is two and a half times the length of the 5th or slightly more. The telson (figs. 22 & 23) is at least three and a half times as long as wide; in younger specimens it is apically emarginate, in older forms more or less truncate. Of the eight original pairs of setæ, two have been carried up the sides of the telson and have become dorso-lateral spinules, others being added during succeeding moults. The apex is thus left provided with six pairs, two of which, the second and fourth counting from the outer angle, are now much stouter and longer than the rest.

The eyes (fig. 16) are still relatively large, one-half the length of the carapace or rather less; as in both the previous stages, the cornea is by far the widest part. The basal joint of the antennular peduncle is proximally much widened on its outer edge, this widened part being produced forwards to an acute point representing the lateral process; this point does not reach forward more than one-third the length of the basal joint. The two flagella in large specimens are about equal and almost as long as the peduncle. The antennal scale (fig. 13) reaches almost to or beyond the end of the antennular peduncle: the flagellum is of varying length, in large examples reaching as far forward as the flagella of the inner antennæ; it possesses two well-marked basal segments. The antennal peduncle is two-jointed.

All the five pereopods with their exopods have now appeared. Pleurobranchs are present at the base of all five, the arthrobranchs being still rudimentary and represented by buds. Epipods are in evidence at the base of the first three pairs. The legs are all of roughly the same length and are but little longer than their exopods; their respective joints bear much the same proportion to one another as those of the adult, with the exception of the dactylus of the 5th pair, which is as long as that of the 4th. The first two pairs are not chelate and no traces of the spines on the inferior border of the ischium and merus of the last three pairs are yet to be observed.

The two remaining specimens in the collection, of 12.3 and 12.5 mm., represent the post-larval stage to which Coutière has given the name of "*parva*" (Pl. 14, fig. 24; Pl. 15, fig. 1). The smallest specimen of this stage that he found measured only 10.5 mm. It will be seen from the table that some examples in the previous stage attain a length of over 13 mm. This very considerable overlapping of the lengths of the oldest larval and youngest post-larval stages is remarkable, but when the extraordinary variation of the adult is considered it must be admitted that it would be even more remarkable if some sort of variation did not also extend to the development.

By far the most noteworthy feature of the change to the *parva* form is the great reduction of the eye (fig. 17)*. It is now less than one-third the length of the carapace and the cornea is not so wide as the stalk. A rather obscure convex disc situated on the

* Figs. 14, 15, 16, and 17 are drawn to the same scale and show the growth and subsequent reduction of the eye.

upper interior portion of the stalk near the cornea represents the first appearance of the ocular papilla.

The rostrum is now not much more than one-quarter the length of the carapace; dorsally it is armed with from six to eleven teeth; ventrally it is at first unarmed, teeth however, soon appear in the form of nicks in the thin margin. The blunt dorsal spine near the posterior margin of the carapace is still present, but it is still quite rudimentary and shortly disappears. The 6th abdominal somite is less than three times the length of the 5th, and more dorso-lateral spines appear on the telson (fig. 24), the terminal spines of which have all disappeared, with the exception of the two large pairs and one small one which has taken up a central position.

The oral appendages have now assumed a form closely resembling those of the adult, and the first two pairs of pereopods have, by an outgrowth of the propodus parallel to the dactylus, become possessed of chelæ; these, however, in smaller examples are still quite rudimentary. The ischium and merus of the last three pairs bear a few spines on their inferior border, the full complement being formed subsequently.

The growth of the rostrum and other changes which the *parva* form undergoes before finally attaining its full dimensions have been adequately treated by Coutière (*loc. cit.*).

The most interesting and remarkable feature of the metamorphoses of *A. purpurea* is the reduction and subsequent growth of the cornea and rostrum. In the youngest stages the rostrum is long and is gradually reduced in size until a minimum is reached in the "*parva*" form, from thence onwards it grows with each succeeding moult until the adult form is attained. In old specimens the extreme apex frequently appears to be worn down and is thus to some slight extent again reduced.

The development of the eye is somewhat different; it shows a gradual growth with an increasing number of facets and is widest across the cornea until the "*parva*" form is reached. It is then suddenly diminished in size and the cornea becomes narrower than the eye-stalk; the number of facets has nevertheless very considerably increased. By subsequent growth the eye at length reaches the adult condition with the cornea once more wider than the stalk.

All these young specimens were caught between 100 fathoms and the surface, with the exception of the two referable to the post-larval or "*parva*" form; these were taken between 750 and 500 and between 500 and 400 fathoms respectively*.

The frequent occurrence of the larvæ of this species in the upper strata of the water and the apparent absence in that horizon of the post-larval forms seem to suggest that at the approach of the "*parva*" stage the animals descend to what is probably the normal

* [Treated as in earlier papers of this series, these larvæ

were taken at	$\left(\begin{array}{c} 0 \\ 25 \\ 50 \\ 75 \\ 100 \end{array} \right)$	fathoms in	$\left(\begin{array}{c} 0 \\ 25 \\ 69 \\ 27 \\ 40 \end{array} \right)$	per cent. hauls, with	$\left(\begin{array}{c} 0 \\ 0.5 \\ 1.8 \\ 0.5 \\ 0.5 \end{array} \right)$	average specimens per hour haul.
---------------	--------------------------------------------------------------------------	------------	-------------------------------------------------------------------------	-----------------------	-----------------------------------------------------------------------------	----------------------------------

Both sets of figures point to 50 fathoms being the preferred horizon; but the total numbers are unfortunately small.—G. H. F.]

level of the adult. The evidence is, of course, far from conclusive and other records of the post-larval forms throw no light on the subject. Coutière's specimens were caught in vertical nets at two stations, the hauls being 1000 m. to the surface and 3250 m. to the surface; those taken by the 'Helga' off the Irish coast were captured in a mid-water otter-trawl, which was lowered to about 350 fathoms, the net fishing while being hauled to the surface.

Even in the case of the adult, a *Macruran* of almost world-wide distribution, but little is known of the bathymetric range. The adult male present in this collection was caught between 100 fathoms and the surface, a young male was caught off the American coast actually on the surface, while the species has been trawled between 107 and 2949 fathoms. The probability, in the latter case, that the specimen was caught during the ascent of the net renders it and similar records almost worthless from a bathymetric point of view. The solution of the problem is to be sought either in successive hauls to the surface from varying depths of wide-mouthed vertical nets, or, more certainly, by the use of a self-closing net of very large dimensions.

ACANTHEPHYRA DEBILIS, A. Milne-Edwards.

A mature male, 67 mm. in length, was caught in haul 30 *m*, between 25 fathoms and the surface. The basal crest of the rostrum bears four teeth, the rostrum itself being furnished with twelve teeth above and eight below.

The specimen, which is preserved in formalin, has retained a considerable amount of the deep scarlet-red pigment so frequently met with among deep-sea *Macrura*, and the numerous luminous spots and streaks so fully described by Coutière (Bull. Mus. Oceanogr. Monaco, No. 70, 1906) are well shown. The distribution of the red pigment in connection with these presents features of some interest. Over each photophore is seen a small clear area, quite devoid of pigment, forming as it were a small window to allow of the passage of light outwards. These transparent areas are of similar shape to the photogenic spots over which they are placed; over single round photophores they are round, over the prominent vertical luminous organ which is situated behind the 5th pair of thoracic legs there is a quite large elliptical area, while a narrow transparent line is to be seen over the row of closely approximated photophores along the anterior basal edge of the carapace.

A. debilis is apparently a somewhat rare species and has been recorded from depths of 350 to 2512 fathoms. These captures were made with open nets and are consequently of little value for the determination of the bathymetric range; still it seems certain that the present specimen was far above its normal horizon.

The occasional appearance at the surface of species normally frequenting deep water is a phenomenon of considerable interest. It has been suggested that the females rise to the surface to liberate their eggs in order that the larvæ may have warmer water in which to undergo their metamorphoses and a better chance of distribution by means of ocean-currents. In the present species, however, the young leave the egg more fully developed than is the case with *A. purpurea*, presumably that they may be enabled to survive under conditions which would prove fatal to a zoëa.

HYMENODORA GLACIALIS (Buchholz) ?

Macerated fragments from haul 26 *b*, 2000–1500 fathoms, may almost certainly be referred to this species. If correctly determined, the record marks the most southern limit in the known distribution of the species.

Unknown larva allied to *CARICYPHUS*, Spence Bate. (Pl. 15. figs. 2–8.)

The whole animal is strongly laterally compressed; the rostrum unarmed and slender and about two-thirds the length of the carapace. The carapace itself is more than three times as long as deep, carinate on its anterior third and furnished with a blunt spinule behind the orbital notch; it is extended as an acute point above the insertion of the antennæ and the anterior basal edge is marked by a short slender spine.

The last four abdominal somites are dorsally carinate, the 3rd is very pronouncedly elbowed, the segment extending to an acute hump, forming a most prominent feature in side view; the 6th somite is rather more than two and a half times the length of the 5th. The telson (fig. 8) is almost twice the length of the 6th somite, apically it is rather broad, somewhat truncate, and furnished with five pairs of spines, the second pair counting from the outer edge being very much longer than the rest. Laterally it bears five or six pairs of spinules.

The eye is not one-third the length of the carapace; the cornea is very large, somewhat elliptical, and set obliquely on the stalk. The basal joint of the inner antennæ reaches to the distal extremity of the eye; proximally the segment is laterally expanded and in larger specimens there is a small acute point projecting forwards forming the first beginnings of the lateral process. On the inner side of the joint at about its middle are set three rather long forwardly directed spines. The 2nd joint is somewhat longer than the 3rd and the outer flagellum is at its base considerably stouter than the inner. The antennal scale reaches slightly beyond the peduncle of the inner antennæ; it is narrow and bears the usual spine at its outer distal edge.

The mandibles (fig. 3) show both molar and cutting edges, the latter being furnished with three strong teeth. In the first maxillæ (fig. 4) the basal lobe is broad and bears many setæ, the upper lobe being narrower and provided with stiff bristles. The endopod is one-jointed and is furnished apically with three stout setæ, while from a tubercle on the inner side two others arise. The basal portion of the second maxilla (fig. 5) is internally trilobed and setiferous; the endopod is short, one-jointed, and bears apically five or six setæ, while two or three others are situated on two prominences on the inner aspect. The exopod is long and narrow, externally it is slightly concave; the anterior lobe projects forward about twice the length of the endopod, the narrow posterior lobe being about half its length. The margin is uniformly clothed with fine setæ.

Both basal joints of the first maxillipede (fig. 6) are broad, the second being densely clothed with setæ on its inner edge; the endopod is three-jointed and bears few setæ. The exopod is slender, about three times the length of the endopod; it is divided distally into several annulations. The epipod is bilobed, the lower lobe being the larger. The second maxillipedes (fig. 7) possess a five-jointed endopod, an exopod which is slightly shorter

and very slender, and a large epipod. A small leaf-like extrusion at the base of the epipod may represent the first appearance of a podobranchia.

The third maxillipedes and first four pereopods are provided with long setose exopods. The fifth pair are much shorter and possess no exopods. None of the legs show any signs of chelæ and the dactyli in all of them are minute. Short pleopods are present in specimens measuring 23 to 25 mm., in a specimen of about 15 mm. they are quite rudimentary.

Four specimens of this larva measuring from 15 to 25 mm. are present in the collection. Two were caught between 50 fathoms and the surface and two between 100 fathoms and the surface (21 *d*).

Although in general aspect this larva bears some resemblance to young *A. purpurea*, the absence of an exopod on the last pereopod proves there is no close affinity between them. They closely resemble certain of the immature forms described by Spence Bate (Chall. Rep. 1888) under the name of *Caricyphus*, which have since been considered to be larval Hippolytidæ; it is, however, probable that young individuals of several genera are included under this name.

ANOMURA.

A Pagurid metazoæa was caught between 100 fathoms and the surface; the specimen is unfortunately dry.

Two other Anomurous larvæ were caught between 75 fathoms and the surface: numerous specimens of this larva and of some of its later stages have been met with off the Irish coast; it therefore seems best to defer any account of it until opportunity occurs of dealing with this more abundant material.

BRACHYURA.

Three metazoææ were caught between 50, 75, and 100 fathoms and the surface and four megalopæ occurred at the same depths.

ADDITIONAL NOTE.

Since the above was written, a specimen of *AcanthePHYRA debilis*, only 10.2 mm. in length, has been found off the W. coast of Ireland. This specimen, which possesses only six pairs of photophores, is very different from that figured by Coutière as the form in which the species leaves the egg. The rostrum is scarcely longer than the eyes, the pleopods are short and bud-like, no uropods are developed, and the telson is broad, rounded, and apically emarginate, as in young *A. purpurea*. All the pereopods are developed, and a bud at the base of each represents the first appearance of a pleurobranch.

Although the discovery of this specimen shows that the differences between the earliest forms of *A. purpurea* and *A. debilis* are less than was previously thought, there is still evidence to show that the *A. debilis* larva is much the more advanced of the two, for all its pereopods are formed and the pleopods, although rudimentary, are not totally undeveloped.

[September 1907.]

EXPLANATION OF THE PLATES.

PLATE 14.

Acantheephyra purpurea, A. M.-Edw.

- Fig. 1. Zoæa measuring 4·3 mm. side view, right eye removed.
 2. Antennule of zoæa.
 3. Mandible of zoæa.
 4. First maxilla of zoæa.
 5. Second maxilla of zoæa.
 6. First maxillipede of zoæa.
 7. Second maxillipede of zoæa.
 8. Third maxillipede of zoæa.
 9. Larva measuring 6 mm. ; side view.
 10. Larva measuring 10·4 mm. ; side view.
 11. Antennæ of zoæa.
 12. Antennæ of larva measuring 6 mm.
 13. Antennæ of larva measuring 10·4 mm.
 14. Eye of zoæa.
 15. Eye of larva measuring 6 mm.
 16. Eye of larva measuring 10·4 mm.
 17. Eye of post-larval or "parva" form. } Drawn to the same scale.
 18-24. Development of telson and uropods : fig. 18, telson of zoæa ; fig. 24, telson of "parva" form.

PLATE 15.

Fig. 1. *Acantheephyra purpurea*, A. M.-Edw., post-larval or "parva" form.Larva allied to *Caricyphus*, Spence Bate.

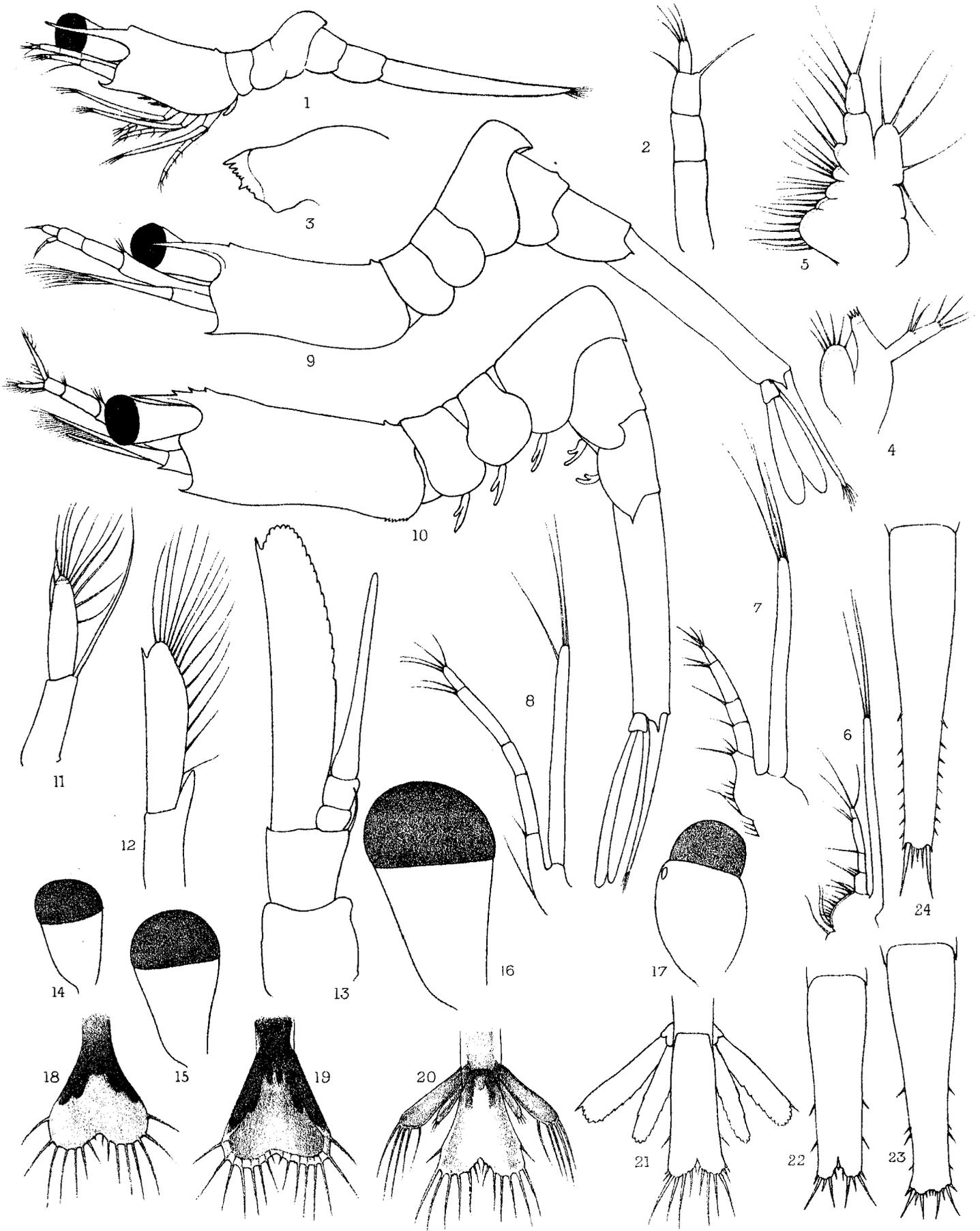
- Fig. 2. Side view of a specimen measuring 22 mm.
 3. Mandible.
 4. First maxilla.
 5. Second maxilla.
 6. First maxillipede.
 7. Second maxillipede.
 8. Telson.

NOTE ON DISTRIBUTION.

By G. HERBERT FOWLER, *Ph.D.*, *F.L.S.*

In the following table of "comparable hauls," in the column headed *Acantheephyra purpurea*, A = adult, P = "parva"-stage.

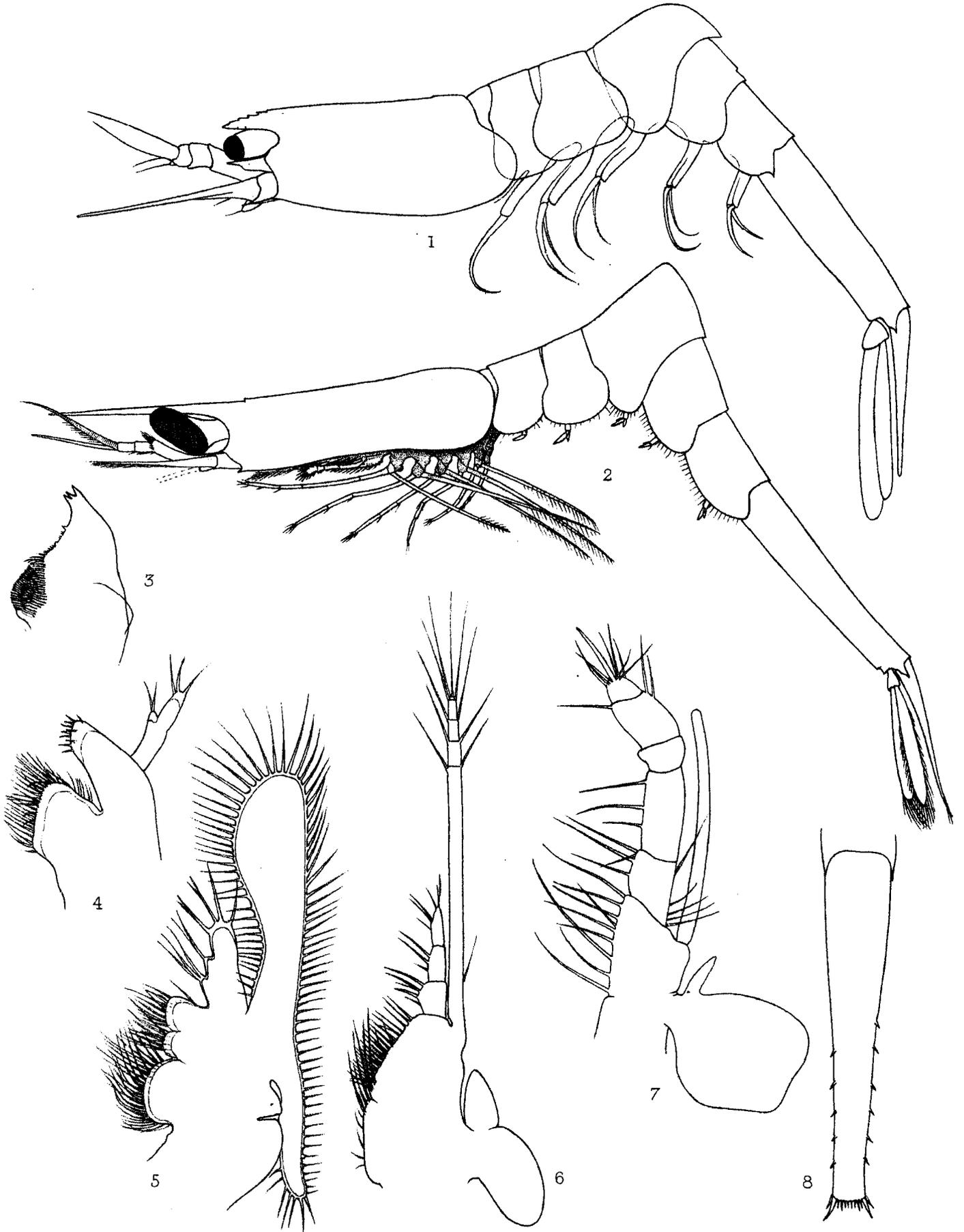
Depth in fathoms.	Haul.	<i>Amalopenus elegans.</i>	<i>Sergestes arcticus.</i>	Larval Sergestidae.	<i>AcanthePHYra purpurea.</i>	<i>AcanthePHYra debilis.</i>	<i>Hymenodora glactalis.</i>	<i>Carocyphus.</i>	Larval Anomura.	Larval Brechyura.
100—0	21 <i>h</i> 21 <i>l</i> 22 <i>a</i> 24 <i>b</i> 24 <i>d</i> 24 <i>e</i> 25 <i>d</i> 30 <i>g</i> 30 <i>h</i> 32 <i>d</i> 32 <i>i</i> 32 <i>n</i> 32 <i>p</i> 33 <i>d</i> 34 <i>b</i> 34 <i>d</i> 35 <i>b</i> 35 <i>d</i> 35 <i>f</i> 35 <i>x</i> 36 <i>b</i> 36 <i>e</i> 36 <i>f</i>	..	1	..	1	..	..	1	1	1
150—0	21 <i>p</i>	..	..	..	3+1 A	..	..	..	..	..
150—50	21 <i>n</i>	..	..	..	1	..	..	..	..	..
150—100	21 <i>a</i>	..	..	..	1	..	..	..	..	..
200—0	36 <i>g</i>	..	..	..	1	..	..	..	..	..
200—100	21 <i>b</i> 21 <i>o</i> 26 <i>e</i> 34 <i>h</i> 35 <i>m</i> 35 <i>n</i> 35 <i>t</i>	..	?	..	..	..	..	..	..	..
250—0	36 <i>h</i> 36 <i>i</i>	..	..	..	..	..	..	..	..	..
250—150	35 <i>o</i> 35 <i>p</i> 35 <i>s</i>	..	..	..	..	..	..	..	..	..
300—0	36 <i>k</i>	..	..	..	..	..	..	..	..	..
300—200	21 <i>c</i> 26 <i>f</i> 35 <i>l</i>	..	..	..	..	..	..	..	..	..
350—0	36 <i>l</i>	1	..	..	..	..	..	..	..	..
400—300	21 <i>k</i> 32 <i>l</i> 35 <i>k</i>	..	..	..	..	..	..	..	..	..
500—400	21 <i>m</i> 35 <i>h</i> 35 <i>i</i>	..	?	..	1 P	..	..	..	..	..
750—500	22 <i>b</i> 30 <i>k</i> 34 <i>e</i> 34 <i>f</i>	..	..	..	1 P	..	..	..	..	..
1000—750	28 <i>a</i> 27 <i>c</i> 31 <i>d</i> 32 <i>f</i> 32 <i>k</i>	..	..	..	..	..	..	..	..	..
1250—1000	24 <i>a</i> 27 <i>b</i> 31 <i>c</i>	..	..	..	..	..	..	..	..	..
1500—1250	25 <i>f</i> 30 <i>i</i>	..	..	..	..	..	..	..	..	..
2000—1500	25 <i>c</i> 26 <i>b</i>	..	..	..	..	..	?	..	..	..



C. T. Kemp, del.

J. T. Rennie Reid, Lith. Edin'

DECAPODA FROM BISCAYAN PLANKTON.



C. T. Kemp, del.

J. T. Renne Reid, Lith. Edin.

DECAPODA FROM BISCAYAN PLANKTON.