

No. 12. — *Reports on the Results of Dredging, under the Supervision of ALEXANDER AGASSIZ, along the East Coast of the United States, during the Summer of 1880, by the U. S. Coast Survey Steamer "Blake," COMMANDER J. R. BARTLETT, U. S. N., Commanding.*

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XIII.

Report on the Pycnogonida, by EDMUND B. WILSON.

THE specimens described in the following pages were dredged by Mr. Agassiz, during the summer of 1880, off the eastern coast of the United States, in a region extending from South Carolina to the northeastern extremity of St. George's Banks, lying between N. Lat. $31^{\circ} 57'$ and $41^{\circ} 35'$, and W. Long. $78^{\circ} 18'$ and $65^{\circ} 35'$; the range of depth was from 73 to 1242 fathoms.

It was at first intended to include descriptions of the Pycnogonida in the report on the Crustacea from the same region, which is in course of preparation by Professor Smith, of Yale College. Upon examination, however, the collection was found to possess features of considerable interest; and, though the species are few, they seem to merit independent description and illustration. The most striking feature of the collection is the remarkable size of most of the forms, which may fairly be called colossal in comparison with shallow-water or littoral species. Of the three species of *Colossendeis* (two of which are apparently undescribed) the smallest has a span of 14 cm. between the tips of its outstretched legs, while the largest has an extent four times as great. The new genus *Scæorhynchus* has an extent of more than 19 cm., — a gigantic size as compared with the dimensions of its nearest allies. The most abundant species of *Nymphon* is the largest of that extensive genus; and one species of the new genus *Pallenopsis* is more than twice as large as any of the species of allied genera (*Pallene*, *Phoxichilidium*, *Anoplo-dactylus*), which are known only from the littoral zone or comparatively shallow water.

It is, further, interesting to note that in a number of forms the visual

organs (ocelli) are rudimentary and destitute of pigment (*Colossendeis colossea*, *C. macerrima*, *Scaerhynchus*) or entirely absent (*Colossendeis angusta*). On the other hand, in *Pallenopsis* the ocelli are relatively of unusually great size. All the other species are known to occur also in shallower water, and the ocelli are of the ordinary form.

Scaerhynchus and *Colossendeis* are of especial interest as showing clearly from anatomical evidence the complete independence of the accessory legs and first pair of ambulatory legs, which has been already proved by Dohrn from embryological data. The accessory legs have been something of a stumbling-block in the way of those who would trace the Arachnid affinities of the Pycnogonida by a direct homology of their appendages. In order to reduce the Pycnogonid appendages to a convenient number for such homologizing, the accessory legs have by certain writers been assumed off-hand to be simply branches of the first pair of ambulatory legs, with which they are usually closely united. Dohrn showed that in the early stages there was every reason to believe that the two appendages were innervated by entirely distinct ganglia, and therefore belonged to different segments of the body. And in some adult forms the first ventral ganglion, which supplies nerves to the palpi, accessory legs, and first ambulatory legs, is divided into an anterior part supplying the two former appendages, and a posterior part sending nerves to the latter pair of appendages. In *Nymphon*, and perhaps in some other forms, these two portions are quite separate as two independent ganglia, although remaining in close proximity. In *Scaerhynchus* they are separated by a considerable interval, and connected by slender commissures. These two ganglia are nearly as large as the other ventral ganglia, so that there seems to be one more than the usual number. Moreover, the accessory legs are separated by a wide interval from the ambulatory legs, and are articulated to prominent lateral processes from the body, scarcely distinguishable, except in size, from those to which the ambulatory legs are attached. It is clear from this case that this pair of appendages has nothing to do with the ambulatory legs, but really belongs to another segment. In *Colossendeis* the accessory legs have undergone still another and very remarkable change of position. They have moved forwards and become so closely united to the *palpi* that the two appear precisely like the outer and inner rami of a single appendage. As in the case of *Scaerhynchus*, the ganglion from which they derive their nerves is entirely distinct from that of the first ambulatory legs, the two being connected by long commissures.

In all cases, however, the palpi and accessory legs are innervated by

the same ganglion, and the latter shows, in the adult, no indication of being composed of two coalesced ganglia. So that if the accessory legs are not independent appendages, they must belong to the same segment with the *palpi*. According to Dohrn, however, the ganglion in question is represented in the larva (of *Achelia*) by two partially coalescent ganglia, and it must be regarded in the adult as representing two segments.

In the face of these facts, it seems impossible to homologize the Pycnogonid appendages with those of the Arachnida unless a segment of the latter has been suppressed somewhere between the chelicerae and ambulatory legs. The possibility of such a suppression is shown by the fact that in a number of Pycnogonida the process has taken place, and without leaving a trace in the embryological record. Thus in *Pallene* the palpi are wholly wanting, both in the adult and in the larva. Granting that such a suppression may have taken place, the homology of the Pycnogonid and Arachnid appendages is manifest. This suggestion must however be taken for what it is worth, for it is easily possible that the external resemblances of a Pycnogonid to an Arachnid are those of analogy only, and have no morphological significance. This is the more probable from the extreme variability of the three anterior pairs of appendages in position and structure.*

One more point of interest may be noted. In *Scæorhynchus* the anterior pair of appendages (chelicerae or "antennæ") present very decided sexual differences. This has not before been observed in the Pycnogonida, and furnishes another illustration of the surprising modifications which the anterior pairs of appendages undergo in this group.

Following is a list of the species :—

Pycnogonum littorale, STRÖM.

Colossendeis angusta, SARS.

colossea, nov. sp.

macerrima, nov. sp.

Scæorhynchus armatus, nov. gen. & sp.

* I may take this opportunity to correct a misleading statement on page 466 of my "Report on the Pycnogonida of New England and adjacent Waters," in the Report of the United States Commissioner of Fish and Fisheries, Part VI., for 1878. The account there given of the innervation of the three anterior pairs of appendages, taken from Zenker's paper, is certainly incorrect, as I have since satisfied myself by studies on the development of *Pallene*. Zenker appears to have mistaken the anterior ganglionic mass for a single (supra-oesophageal) ganglion, and his statements are therefore very misleading. There is still considerable doubt as to the exact origin of the nerves of the so-called antennæ, but there is no doubt that the palpi and accessory legs are innervated from the first sub-oesophageal ganglion.

Pallenopsis forcifer, nov. gen. & sp.

longirostris, nov. sp.

Nymphon grossipes (L.), CHR. FABR.

Strömi, KRÖYER.

pallenoides, SARS.

Of these, the five previously known species have their geographical and bathymetrical range greatly extended by the collection; two of them were previously known only from the extreme North Atlantic.

Through the courtesy of Prof. Verrill I am enabled to insert a description and figures of a second species of the genus *Pallenopsis* from the deep-water dredgings of the Fish Commission, off the coast of Southern New England.

Pycnogonum littorale, STRÖM.

The geographical and bathymetrical range of this species, already surprisingly great, is considerably increased by the Blake dredgings. The specimens are as follows.

Stat.	Locality.	Depth.	No. and Sex.
302	N. Lat. 41° 30' 0'', W. Lon. 66° 0' 0''	73 fathoms.	1 ♀ sp.
303	" 41° 34' 30'', " 65° 54' 30''	306 "	9 ♀ 4 ♂ sp.
304	" 41° 35' 0'', " 65° 57' 35''	139 "	1 ♀ sp.
305	" 41° 33' 15'', " 65° 51' 25''	810 "	1 ♀ sp.

The greatest depth hitherto recorded is 406 fathoms (off St. George's Banks, Smith and Harger, U. S. Fish Comm. 1872). At Eastport, Me., it occurs between tide marks. The specimens appear in all respects similar to those from shallow water. The males are rather smaller than the females. A large female specimen measured, body (without rostrum), 10 mm.; rostrum, 5 mm.; legs, 15 mm.

COLOSSENDEIS, JARZYNSKY.

"Antennæ" wanting. Palpi 10-(9?)-jointed. Accessory legs 11-(10?)-jointed. Legs without auxiliary claws upon the dactylus. A remarkable feature of this genus, as pointed out before, is the close union of the accessory legs with the palpi, and their complete separation from the ambulatory legs. In counting the joints of the palpi it is hard to say whether there are two distinct short basal joints, or only one articulated to a prominent process of the body. In our specimens there appear to be two joints. The point is of little importance save to avoid confusion in description. Other authors describe only one joint.

This genus, including, for the most part, species of colossal size, differs from Wood-Mason's genus *Rhopalorhynchus* only in the absence of distinct segmentation of the body, and the greater development of the abdomen. These

characters do not appear of sufficient importance to warrant a separation of the genera; for the segmentation is sometimes obscurely indicated in *Colossendeis*, and the size of the abdomen cannot have more than a specific significance. Unfortunately, I have been unable to obtain Jarzynsky's paper, and I cannot ascertain its exact date. *Rhopalorhynchus* was described in 1873, and probably has priority. In the want of certain evidence, however, I have preferred to follow Sars in adopting the former name. Miers has recently redescribed the genus (*Annals and Magazine of Natural History*, January, 1881) under the name *Anomorhynchus*. If *Rhopalorhynchus* and *Colossendeis* are distinct, Miers's genus is identical with the latter, with which his description agrees in every particular.

The species described by Jarzynsky as *C. borealis* is stated by Sars to be identical with Sabine's *Phoxichilus proboscideus*, described many years ago. If Sabine's description is trustworthy, his species is widely different from any of the forms described below.

Colossendeis angusta, Sars.

Prodromus Descriptionis Crustaceorum et Pycnogonidarum, quæ in Expeditione Norvegica Anno 1876, observavit G. O. Sars. < Archiv for Mathematik og Naturvidenskab, Andet Bind, 1877, pp. 268, 269 (368, 369 by error).

Plate III. Figs. 8, 13.

SPECIMENS EXAMINED.

Stat.	Locality.	Depth.	No.
338	N. Lat. 38° 18' 40", W. Long. 73° 18' 10"	922 fathoms.	1 sp.
308	" 41° 24' 45", " 65° 35' 30"	1242 "	2 sp.
305	" 41° 33' 15", " 65° 51' 25"	810 "	2 sp.

This beautiful species has hitherto been known from three specimens dredged by Sars off the west coast of Norway, N. Lat. 63° 10.2', W. Long. 4° 59.6', 417 fathoms. Its range is thus extended nearly 25 degrees of latitude southwards, and from 417 down to 1242 fathoms, — a striking instance of the southward extension of arctic forms in deep water.

The specimens differ slightly from Sars's description, but the disagreement is probably within the limits of variation. It may be convenient to describe some of the characters of the specimens.

The body is very trimly built, with nearly parallel sides, and with only very obscure indications of articulations between the segments. Lateral processes short, separated by nearly equal intervals about as wide as the processes. Abdomen about one third the length of the body (without the rostrum). Oculiferous segment very short indeed, suddenly widening just in front of the first pair of lateral processes, and there forming the widest portion of the body. The oculiferous tubercle is variable. Sars described it as "spinam longam et acuminatam formans . . . , pigmento et lentibus omnino destituta." The spine is scarcely "long and acuminate" in our specimens, though forming a very acute

conical elevation. The ocelli are very rudimentary, or entirely wanting. The rostrum is almost as long as the body and abdomen together. It is somewhat cylindrical, more or less swollen a little behind the middle, and also toward the tip. In one specimen the rostrum is almost clavate.

The palpi extend considerably beyond the rostrum; their joints have, in a general way, the same proportions as in the species described below, but the eighth (counting ten joints in the palpi) is very short, even globose.

Accessory legs much as in the other species. The terminal claw, though small, is distinct from and movable upon the preceding. The spines of the outer joints are of peculiar and characteristic form (Fig. 13), being flattened, obliquely truncate, broadest at base and tip, and narrower in the middle. They are arranged in several irregular rows along the lower (i. e. concave) sides of the 7th to 10th joints. They are longest in the inner rows; in the outer rows they become much shorter, and finally quite disappear; those of the outer rows are not truncate at the tip, but evenly rounded, and of a broadly spatulate form. Legs long and slender, four times as long as the body (including rostrum and abdomen). Fourth joint longest; tarsus and propodus (7th and 8th) nearly equal, former a little longer; both are simple and unarmed. Dactylus (Fig. 8) *excessively long and slender*, — more so than in any other Pycnogonid known to me; it is much longer than the propodus. Color varying from straw-yellow to nearly white.

Length of body (including rostrum and abdomen)	17 mm.
Rostrum	8.5 "
Palpi	11 "
Accessory legs	27 "
Ambulatory legs	67 "
Extent	138 "

Colossendeis colossea, sp. nov.

Plates I. and III.

Body very short and stout, unsegmented; three anterior pairs of lateral processes separated by very small intervals, last pair usually separated from the next anterior by a somewhat greater interval. The processes are very short and swollen; their length scarcely equals the width of the body; they are constricted at the base, and separated from the body by a suture. Abdomen very small, less than one fourth the body (exclusive of rostrum), of slender pyriform shape, obtusely conical towards extremity.

The rostrum is of great size, its length being about one and a half times that of the body, and of peculiar and characteristic form. At the base it is of slightly less diameter than that of the body (2.5 mm.) and continues of the same size for about one third its length; it then suddenly expands to a diameter of nearly 5 mm. and then gradually tapers toward the tip; the terminal portion is cylindrical and about 3.5 mm. in diameter. The rostrum is articulated to the body, upon which it is somewhat movable. Mouth large, sharply triangular.

Oculiferous segment very short, anterior part nearly triangular. Oculiferous tubercle in the middle of the anterior part, large, smoothly rounded, or sometimes terminating in a low conical tip, transverse diameter greatest; ocelli two, widely separated, without pigment, rudimentary.

Palpi (Fig. 5) nearly twice the rostrum, attached at the sides of and a little below the latter. Two extremely short basal joints are followed by a long slender one, and this by a short quadrate one; 5th is seven eighths the 3d; 6th, one fourth to one third the 5th; 7th, a little more than twice the 6th; 8th, a little longer and much more slender than the 6th; 9th, equal to the 8th, or a little less; 10th, about equal to the 9th, very slender, rounded at the end. Basal joints nearly naked; outer joints with rather sparse, stoutish, simple hairs, which are somewhat more numerous on the lower side.

Accessory legs (Fig. 6) of great length, more than twice as long as the entire body (including rostrum and abdomen). The three basal joints are very short, the 5th about three times as long as broad, the 4th and 6th greatly elongated; 6th longest, very slender, nearly straight; 7th to 10th, short, curved, bearing the peculiar spines characteristic of the appendage; terminal joint claw-like and coalescent with the preceding. The five terminal joints can be folded tightly together and form an efficient prehensile organ. Terminal claw without spines, with a marked and peculiar curvature. Spines of the 7th to 10th joints arranged as in the last species, forming a crowded mass on the concave side of the joint. They are of a slender spatulate shape, those of the inner row larger and more or less truncate at the end; along their edges they are very finely serrate.

Legs enormously long, five and a half times the body (including rostrum and abdomen). The three basal joints very short; 4th, very long and slender (seven times the three basal ones taken together); 5th, exactly equal to the 4th; 6th, three fourths the 5th; 7th, about one eighth the 6th; 8th, a little more than one half the 7th; 9th (dactylus), less than one half the 8th, very slightly curved, acute. Propodus and tarsus (Fig. 7) entirely without spines along the lower side.

The surface is everywhere finely tuberculose. Scattered at considerable but pretty regular intervals over the legs are short, stout, appressed hairs which show a distinctly linear arrangement. At the distal extremities of the joints they are more numerous, and form incomplete rings.

Color clear straw-yellow. A narrow dark stripe runs along each side of the appendages, representing a thickening of the chitin.

Length of body, inclusive of rostrum and abdomen	5 cm.
“ rostrum	3 “
Diameter of rostrum at base	2.5 mm.
“ “ at widest part	4.7 “
“ “ at tip	3.5 “
Length of palpi	5.7 cm.
“ accessory legs	10.3 “
“ ambulatory legs	27.2 “
Extent	55 “

The description and measurements are taken mainly from the largest specimen, captured at locality 307, in 980 fathoms. So far as I know, this is the largest Pycnogonid of which exact measurements have ever been given, though Willemoes-Suhm has recorded a species taken by the "Challenger" Expedition in the Indian Ocean "measuring nearly two feet across the legs."

SPECIMENS EXAMINED.

Stat	Locality.	Depth.	No.
305	N. Lat. 41° 33' 15'', W. Long. 65° 51' 25''	810 fms.	3 sp.
306	" 41° 32' 50'', " 65° 55' 0''	524 "	1 "
307	" 41° 29' 45'', " 65° 47' 10''	980 "	1 "
339	" 38° 16' 45'', " 73° 10' 30''	1186 "	4 "
342	" 39° 43' 0'', " 70° 55' 25''	1002 "	1 "

Colossendeis macerrima, sp. nov.

Plates I., III., and V.

Body slender, unsegmented, lateral processes separated by intervals equal to about one half their width. The anterior pair of processes turn sharply forwards and somewhat upwards; the anterior side is extremely short, so that the articulatory surface looks nearly forwards. Oculiferous segment (Fig. 32), considerably longer than in the two preceding species, rather swollen, with nearly parallel sides. It is concave in front, and the antero-lateral angles are very prominent and darker colored. Oculiferous tubercle scarcely at all elevated, otherwise as in the last; ocelli widely separated, rudimentary, without pigment. Rostrum of remarkable length, being twice as long as the body (including abdomen). In its present condition it is pretty regularly triangular in outline, but this appears to be due to shrinkage; normally, it is probably round. It is very slender, swelling slightly a little behind the middle; toward the tip the sides are parallel. Viewed from the side, the rostrum is seen to have a peculiar and characteristic curvature; the basal half is gently convex toward the dorsal side, the distal half gently convex toward the ventral side.

Abdomen a little more than one third the rest of the body (without rostrum) slightly clavate.

Palpi (Fig. 9) only a little longer than the rostrum, very slender. There are two very short basal joints; 3d, extremely long and slender; 4th, very short and small; 5th, greatly elongate, more than one and one half times the 3d, almost perfectly cylindrical, though slightly swollen near the distal end; 6th, about one seventh the 5th; 7th, equal to the 6th; terminal three joints nearly equal, very short and small.

Accessory legs (Fig. 10) attached to the extreme anterior end of the oculiferous segment immediately below and behind the palpi. The proportions of the joints are nearly as in the preceding species, but the 4th and 6th are still more elongated and attenuated. The terminal claw (11th joint) is movably articulated with the preceding; the spines of the 7th to 10th joints (Fig. 12)

are of slender spatulate shape, evenly rounded at the end, and beautifully and finely serrate. Legs excessively slender and elongated, three and three fourths times the length of the body (with rostrum and abdomen). The proportion of the joints are much as in *C. colossea* but the tarsus (7th) is more than twice the propodus, and the dactylus is scarcely more than one third the propodus. Both tarsus and propodus (Fig. 11) are unarmed. The surface is everywhere finely granular. The legs have a few hairs, arranged as in *C. colossea*. Color pale yellowish, the stomach showing through as a conspicuous reddish-brown stripe.

Length of body (including rostrum and abdomen)	44.5 mm.
“ rostrum	31 “
“ palpi	35 “
“ accessory legs	62 “
“ ambulatory legs	165 “
Extent	343 “

A single specimen from locality 338, 922 fathoms, N. Lat. $38^{\circ} 18' 40''$, W. Long. $73^{\circ} 18' 10''$.

This wonderfully attenuated species is widely different from the two preceding, from which it is easily distinguishable by its extraordinary rostrum, peculiar oculiferous segment, and the proportions of the palpal joints.

SCÆORHYNCHUS, gen. nov.

Body conspicuously segmented. Oculiferous segment elongate. Rostrum large, pyriform, unjointed. Accessory legs present in both sexes, with eleven joints. “Antennæ” four-jointed, chelate. Palpi composed of ten joints. Abdomen unjointed. Legs slender; dactylus without auxiliary claws.

This genus resembles in general appearance *Eurycide*, Schiödt (Zetes, Kröyer), and forms one of a very distinct group of genera, including *Eurycide*, *Parazetes*, *Ascorhynchus* *Gnamptorhynchus*, which should perhaps constitute an independent family. All possess a very characteristic, large, pyriform, three-sided rostrum, which is usually directed downwards, and may be folded backwards under the body. They further agree in the small rudimentary “antennæ,” well-developed palpi, slender legs, straight and simple tarsus and propodus, absence of auxiliary claws, and in the possession of accessory legs by both sexes. The most marked character of *Scæorhynchus* is the presence of strongly chelate “antennæ” in the male, while in the female the chelæ are quite rudimentary. *Eurycide*, as described by Kröyer and others, has non-chelate, three-jointed “antennæ.” The form figured in Gaimard’s *Voyages en Scandinavie, Laponie, etc.*, as Kröyer’s species, appears to have the rudiment of a fourth joint, agreeing with the female of *Scæorhynchus*; and it is therefore possible that the two genera do not differ essentially in the structure of the “antennæ.” The other characters are, however, quite sufficient to separate them.

It may be questionable whether our form should be generically separated from

Böhm's genus *Gnamptorhynchus*. The presence of dactyli in the first pair of legs and the differences in the antennæ appear, however, to warrant the separation.

***Scæorhynchus armatus*, sp. nov.**

Plates II. and V.

Body slender, segments constricted in the middle. Lateral processes longer than the width of the body, widely separated. The two anterior pairs are directed somewhat forwards, the two posterior somewhat backwards. Each has a very prominent conical vertical spine near its outer end. In the median line of each of the three hinder segments of the body is a similar, though somewhat shorter spine.

Oculiferous segment as long as the rest of the body to the base of the abdomen, narrow, with nearly parallel sides. A little behind the middle is the very prominent, acute, conical oculiferous tubercle. Ocelli rudimentary, without pigment.

Abdomen slender, clavate, two thirds as long as the oculiferous segment.

The rostrum (Fig. 4) has been partially described above. At its point of attachment its diameter is not more than one fifth that of the widest part. Mouth large, triangular, with three powerful chitinous jaws and three fleshy lips corresponding in position with the jaws.

"Antennæ" a little more than one third the rostrum, directed straight forwards, separated by a considerable interval; the oculiferous segment is not at all emarginate between them. There are two equal cylindrical joints followed in the female (Fig. 27) by a very small swollen rudimentary chela, and in the male (Fig. 26) by a still small but well developed chela with long, slender, curved unarmed claws.

Palpi (Fig. 28) nearly or quite twice the rostrum, slender, tapering, and simple. The two basal joints are very short, as in *Colossendeis*; 3d, about seven times as long as the two basal joints taken together; 4th, about one fifth the 3d; 5th, seven eighths the 3d; 6th, short, quadrate; 7th, one third the 3d; 8th, one half the 3d; 9th, a little less than the 8th; 10th, straight and slender, less than the 9th. Outer joint sparsely hairy; hairs simple, short, more numerous along the lower side. The palpi usually have a sigmoid flexure bending sharply backwards at the fourth joint and forwards again at the sixth.

The accessory legs (Fig. 30) are rather larger in the male, but do not otherwise differ markedly in the two sexes. There are three very short basal joints; 4th, more than twice as long as the three basal joints taken together, curved, with a slight scarcely conical elevation on its anterior side which is very constant and characteristic; 5th, slightly clavate, shorter than 4th; 6th, 7th, 8th, 9th, 10th, diminish pretty regularly in length; 6th, strongly clavate, with a brush of slender hairs at its lower distal angle which are much longer and more numerous in the male. Spines of 7th to 10th joints (Fig. 31) arranged, as in *Colossendeis*, in several irregular rows. They are lanceolate, acute, coarsely serrate,

more numerous and larger in the male. Terminal joint claw-like, very short and stout.

Ambulatory legs (in the female) about three times as long as the body (without the rostrum), slender and tapering; 2d joint about two and one half times the 1st or 3d, with a slight but characteristic elevation on the anterior side outside the middle; 4th and 5th, longest, equal; 6th, two thirds the fifth; 7th, one third the 6th; 8th, less than 7th; dactyli (Fig. 29) very short and small; those of the anterior pair of legs are considerably smaller than the others, but are unmistakably present (compare *Gnamptorhynchus*).

In the male the legs are relatively shorter. The whole surface is granular with fine close-set tubercles. Color pale dull yellow to dusky, sometimes irregularly mottled with yellowish and dingy chocolate-brown.

As shown by the measurements, the sexes differ conspicuously in size.

Female :—	Length of body (not including rostrum)	. . . . .	30.5 mm.
“	rostrum	. . . . .	17 “
“	antennæ	. . . . .	5.8 “
“	palpi	. . . . .	35.5 “
“	accessory legs	. . . . .	36 “
“	ambulatory legs	. . . . .	90 “
Male :—	Length of body	. . . . .	22 “
“	legs	. . . . .	58 “

Four males and five females from locality 308, N. Lat. 41° 24' 45", W. Long. 65° 35' 30", 1242 fathoms.

This is an interesting species. The accessory legs, as noted above, arise from distinct lateral processes, near the middle of the oculiferous segment. The palpi also are attached to prominent processes of the same segment. The presence of well-marked sexual characters in the “antennæ” has not before been observed in the group. The male seems for some reason to retain the larval chelate antennæ, which undergo in the female a further retrograde development, and become functionally useless.

I cannot absolutely demonstrate the specific identity of the two forms described as male and female, though there can be scarcely a doubt that they are of the same species. They are all from the same haul, agree in every respect except size and the structure of the antennæ and accessory legs; and the differences of the latter correspond with those known to exist among other Pycnogonida. The sexes were determined by examination of the internal generative organs.

The chelate or simple character of the “antennæ” is commonly accepted as a family character, but the small value of such a distinction is shown by the structure of this species. A very slight further reduction of the antennæ in the female would bring the latter into the *Achelidæ*, as now defined, while the male falls into the *Nymphonidæ*. The need for an entire revision of the systematic arrangement of the Pycnogonida is sufficiently obvious, but no acceptable one seems possible until our knowledge of the development is more complete.

PALLENOPSIS, gen. nov.

Body slender, as in *Phoxichilidium*, segmented. Rostrum cylindrical. Abdomen slender, simple. Antennæ with four joints, large and chelate. Palpi rudimentary, composed of a single joint. Accessory legs present in both sexes, ten-jointed. Legs slender, dactylus with auxiliary claws. Two very unequal pairs of large ocelli.

This genus has the general appearance of a *Pallene* or *Phoxichilidium*. It is however very distinct from them on account of the division of the basal joint of the antennæ into two, and in the different structure of the accessory legs; and it differs from all known genera in the existence of rudimentary palpi, which are reduced to a single joint like the antennæ of *Tanystylum* or *Lecythorhynchus*. In all other genera, so far as I know, palpi are either quite absent or fully developed (apparently serving as tactile organs); and their presence or absence is a convenient family character. Their structure in this genus shows of how little value this character is, save as a matter of convenience. The genus is exactly intermediate between the Nymphonidæ and Pallenidæ, as *Scæorhynchus* is intermediate between the former family and the Achelidæ.

The peculiar glandular duct near the middle of the fourth joints of the legs in the *male* is perhaps a character of generic significance. It has not to my knowledge been observed in any other Pycnogonid.

Böhm has described and figured* a form from Patagonia which he identifies with Kröyer's *Phoxichilidium fluminense* from Rio Janeiro, and which evidently should be referred to *Pallenopsis*. Kröyer did not observe the rudimentary palpi, but the close agreement in other characters leaves little reason to doubt the correctness of Böhm's identification. Neither Kröyer nor Böhm mentions the extra joint of the antenna, though the latter observed a "charakteristischen durch eine Linie stärkerer Haare markirten Knick," near the middle of the basal joint. There can be no doubt of the presence of a distinct articulation at this point in our specimens. The species described below are very distinct from Kröyer's species; the most striking difference is the much smaller size of the auxiliary claws in the former, and the non-plumose character of the hairs on the ambulatory legs.

Pallenopsis forficifer, sp. nov.**Plates IV. and V.**

Body (Fig. 15) comparatively stout, distinctly segmented. Lateral processes very distinct and prominent, slightly longer than the width of the body, separated by intervals less than their own width. The anterior pair are directed somewhat forwards and upwards, the posterior pair obliquely backwards like the branches of a V.

* Monatsbericht der Königlich Preussischen Akademie der Wissenschaften zu Berlin, Februar, 1879, p. 180, Tafel I. Fig. 4.

Oculiferous segment swollen, of greater diameter than that of the body, narrowing slightly in front; it is nearly as long as the two following segments taken together. Its vertical diameter is much less in front than behind, the lower surface being oblique. Oculiferous tubercle extremely prominent, conical, acute, placed at the extreme anterior end of the segment, almost directly above the attachment of the antennæ. Ocelli dark chestnut-brown, iridescent; anterior pair three times as large as the posterior, lying at a much lower level.

Rostrum considerably longer than the oculiferous segment, nearly cylindrical but slightly swollen near the middle and again near the tip. Abdomen slender, slightly clavate, about as long as the three posterior body-segments taken together.

"Antennæ" (Fig. 18) with two slender equal basal joints which extend beyond the rostrum; they are separated by a delicate slightly marked articulation; chelæ stout, swollen, very hairy; claws very short, flattened, with thin overlapping cutting edges forming a scissors-like organ.

Palpi (Fig. 17) represented by a pair of simple rounded knobs at the sides of the rostrum. They are articulated to the body, and seem to represent a single joint.

Accessory legs (Fig. 17) stout and well developed in the male, small and weak in the female; 1st joint (male) short, swollen, about equal to 3d; 2d, 4th, and 5th, nearly equal and about twice the 3d; 6th, less than 5th, strongly curved, swollen at distal extremity; 7th, still less, with a peculiar twist, so that the appendage cannot be straightened; 8th and 9th, equal to 7th, or less; 10th, very small, rounded. Outer joints sparsely covered with simple hair-like spines, many of which are directed backward, especially at the distal extremity of the 6th joint, where they are very short and stout, and form an irregular circlet.

Legs long, rather slender, three and a half times as long as the body (including rostrum and abdomen); 1st and 3d joints very short; 2d, much longer, clavate; 4th, 5th, and 6th, very long and slender; 6th, longest and most slender; 7th (tarsus), very short, nearly triangular, with a row of strong spines along the lower side; 8th (propodus), gently curved, three and a half times the tarsus (longer margin) armed with an irregular series of strong, more or less appressed spines along the lower side (Fig. 16), which vary in arrangement, but are longer towards the proximal end; dactylus a little more than one half the propodus, auxiliary claws one fourth the dactylus.

The surface is everywhere finely tuberculose; the tuberculation is coarser on the accessory legs than elsewhere. The body is sparsely hairy, the rostrum is also hairy, and the abdomen still more so. The legs are rather conspicuously hairy, the hairs becoming stouter and more spine-like on the outer joints.

Color, pale yellowish or straw-color. A narrow brown stripe, representing a thickening of the chitin, extends along each side of the legs.

Near the middle of the fourth joint of each ambulatory leg on its anterior side, in the *male*, is a slight elevation, from which arises a short tubular organ, which is apparently the duct of a glandular organ within the joint.

Length of body (without rostrum)	. . . . .	12 mm.
“ rostrum	. . . . .	4 “
“ legs	. . . . .	54 “

SPECIMENS EXAMINED.

Stat.	Locality.	Depth.	No. and Sex.
317	N. Lat. 31° 57', W. Long. 78° 18' 35"	333 fathoms.	2 ♂ and ♀
319	“ 32° 25', “ 77° 42' 30"	262 “	1 ♂

Pallenopsis longirostris, sp. nov.

Plates IV. and V.

I have received from Professor Verrill a second species of this curious genus from the deep-water dredgings of the Fish Commission, which may be advantageously described in connection with the last. Body somewhat more robust than in the last. Oculiferous segment longer than the two following taken together, much swollen in front, so that there appears to be a distinct neck, which is, however, scarcely narrower than the rest of the body. Oculiferous tubercle obtuse, much less prominent than in the last; ocelli nearly the same, lighter colored.

Rostrum as long as the oculiferous and two succeeding segments taken together, somewhat fusiform, slightly swollen a little behind the middle, expanding very slightly near the tip.

“Antennæ” (Fig. 21) extremely slender; the two basal joints barely extend beyond the tip of the rostrum. Chelæ rather slender, scarcely swollen; claws much longer and more slender than in the preceding form, and decidedly curved towards their tips. Along the middle part of their cutting edges they are finely but very irregularly serrate.

Palpi in the male nearly as in the preceding species; in the female, still smaller and more rudimentary.

Accessory legs (Fig. 25) much as in the last species, much smaller and less spinose in the female. In the male the sixth joint is sub-globose at its distal extremity, where it is surrounded by a tolerably definite circlet of very strong tapering, acute, backward-pointing spines or hooks, by means of which the egg-mass is securely held.

Legs more slender than in the former species. Tarsus usually with a larger spine at the lower distal angle. Spines of the propodus far less numerous than in the last; there are usually three larger ones on the basal half of the joint, followed after a naked space by three or four shorter ones, and these by a pair of divergent slender longer spines. Dactylus about one half the propodus.

Surface everywhere finely tuberculose. Hairs absent from body, and less numerous on legs than in the last. On the legs (as in the preceding species) the hairs are longer and more slender on the upper side. They have on the outer joints a very peculiar structure; along their outer margins are a number of more or less prominent barbs pointing towards the tip of the spine.

As in the last species, there is a tubular organ near the middle of the fourth joint of each leg; but this is relatively six or eight times as long as in the former, and has the appearance of a long, blunt spine.

Color nearly white.

Length of body (without rostrum)	6.0 mm.
“ rostrum	3.5 “
“ legs	26.5 “

One male (with egg-mass) and one female specimen from locality 891, N. Lat. $39^{\circ} 46'$, W. Long. $71^{\circ} 10'$, 500 fathoms, mud and fine sand. U. S. F. C. 1880.

It seems possible that a larger series may show the two forms described to be only varieties of the same species. But so far as shown by the specimens at hand (which are adult), they appear perfectly distinct, the most striking points of difference being in the “antennæ,” rostrum, oculiferous segment, and especially in the armature of the propodus, which is characteristic and pretty constant. There is also a marked difference in the length of the glandular duct of the fourth joint of the legs.

Nymphon grossipes (L.), CHR. FABR.

A single specimen from locality 306, N. Lat. $41^{\circ} 32' 50''$, W. Long. $65^{\circ} 55'$, 524 fathoms, which extends its known range of depth more than 100 fathoms. It is of the variety described by Kröyer as *Nymphon mixtum*, the tarsus being much longer than the propodus, and the oculiferous segment long and slender. The oculiferous tubercle is not much elevated, and the auxiliary claws are rather large. Ocelli are well developed. Color nearly white.

Length of body (including rostrum, etc.)	8.0 mm.
“ legs	33.5 “

Nymphon Strömii, KRÖYER.

Eight specimens (of which three are males with eggs) from locality 306 (with last species), one specimen from 310, N. Lat. $39^{\circ} 59' 16''$, W. Long. $70^{\circ} 18' 30''$, 260 fathoms.

The greatest depth previously recorded for this species is 115 fathoms; its range is thus extended downwards more than 400 fathoms. The specimens are in every respect typical, but are not of unusually great size for the species, as shown by the measurements (from an average male specimen).

Length of body (including rostrum, etc.)	12.0 mm.
“ rostrum	3.5 “
“ legs	75.0 “

Nymphon pallenoides, Sars.

Crustacea et Pycnogonida nova in Itinere 2^{do} et 3^{do} Expeditionis Norvegicæ Anno 1877 et '78 collecta (Prodromus Descriptionis) < Archiv for Mathematik og Naturvidenskab, Fjerde Bind, Fjerde Hefte, p. 470.

Plate III. Fig. 14.

I have, with some hesitation, referred a single specimen in the collection to Sars's species. While agreeing much more nearly with it than with any other known form, it differs in certain slight characters. These differences probably fall, however, within the limits of variation.

The body is robust, the lateral processes short, and separated by rather small intervals. Oculiferous segment nearly as in *N. Strömii*, i. e. constricted in the middle, swollen in front and slightly emarginate between the bases of the antennæ. Oculiferous tubercle conical, rather low. Ocelli of unequal size, as in *Pallenopsis*, of a dark chestnut-brown color. Rostrum cylindrical, scarcely as long as the oculiferous segment.

Chelæ of "antennæ" with rather long much curved claws, armed along their opposable margins with about seventeen strong, slightly curved, oblique, *well separated* spines, most of which are of a brownish color; they cease abruptly at some distance from the tip.

Palpi rather small. Basal joint very short; second and third longest, nearly equal; fourth and fifth equal, one half the third.

Accessory legs of the usual structure; spines rather blunt, and with the serrations irregular and ill-defined. Legs with the fourth joint rather swollen and fusiform; sixth joint longest, very slender. Tarsus about one half the propodus, somewhat expanded at its distal end. Propodus (Fig. 14) gently curved. Both joints are armed along the lower margin with rather weak, crowded, appressed spines. Dactylus more than one half the propodus, very acute, *flattened*, with a thin knife-like edge. Auxiliary claws very slender, one fourth to one third the propodus.

The body and appendages are rather hairy, though less so than in *N. hirtum*. The legs are rather robust.

This is a peculiar species, looking like a *Pallene*. Its distinctive characters are the unequal size of the ocelli, short neck and rostrum, small palpi, *short tarsus*, and flattened dactylus. Its nearest ally is, perhaps, *N. hirtum*.

Length of body (including rostrum and abdomen)	. . . . .	7.8 mm.
" rostrum	. . . . .	2.4 "
" legs	. . . . .	28.0 "

A single specimen from locality 338, N. Lat. 38° 18' 40", W. Long. 73° 18' 10", 922 fathoms. Sars's single specimen was from "Saltenfjord."

EXPLANATION OF FIGURES.

[Plates I. and II. were drawn by Mr. J H Emerton, the others by the author.]

PLATE I.

- Fig. 1. *Colossendeis colossea*, from one of the smaller specimens, natural size, from the dorsal side.
Fig. 2. *Colossendeis macerrima*, natural size, from the dorsal side.

PLATE II.

- Fig. 3. *Scæorhynchus armatus*, natural size, from the dorsal side.
Fig. 4. The same ; lateral view, with the legs omitted.

PLATE III.

- Fig. 5. *Colossendeis colossea*, palpus.
Fig. 6. The same ; accessory leg.
Fig. 7. The same ; terminal joints of leg.
Fig. 8. *Colossendeis angusta* ; terminal joints of leg.
Fig. 9. *Colossendeis macerrima* ; palpus.
Fig. 10. The same ; accessory leg.
Fig. 11. The same ; terminal joints of leg.
Fig. 12. The same ; spines from accessory legs (the serrations are too fine to be indicated).
Fig. 13. *Colossendeis angusta* ; spines from accessory legs.
Fig. 14. *Nymphon pallenioides* ; terminal joints of leg.

PLATE IV.

- Fig. 15. *Pallenopsis forficifer* ; dorsal view of body.
Fig. 16. The same ; terminal joints of leg.
Fig. 17. The same ; lateral view of anterior part of body.
Fig. 18. The same ; chela of "antenna."
Fig. 19. *Pallenopsis longirostris* ; terminal joints of leg.
Fig. 20. The same ; characteristic spines from ambulatory legs.
Fig. 21. The same ; chela of "antenna."
Fig. 22. The same ; cutting edge of chela.

PLATE V.

- Fig. 23. *Pallenopsis forficifer* ; glandular duct from 4th joint of ambulatory legs in the male.
- Fig. 24. *Pallenopsis longirostris* ; the corresponding duct.
- Fig. 25. The same ; outer joints of accessory legs.
- Fig. 26. *Scæorhynchus armatus* ; chela of "antenna" in male.
- Fig. 27. The same ; chela of female.
- Fig. 28. The same ; palpus.
- Fig. 29. The same ; terminal joints of leg.
- Fig. 30. The same ; outer joints of accessory leg in the female.
- Fig. 31. The same ; spine from accessory leg, male.
- Fig. 32. *Colossendeis macerrima* ; dorsal view of oculiferous segment showing origin of palpi, accessory legs, and first pair of ambulatory legs.

NOTE. — While this article was going through the press an important paper by Dr. P. P. C. Hoek was received. (The Pycnogonids, dredged during the Cruises of the "Willem Barents" in the Years 1878 and 1879. *Niederländisches Archiv für Zoologie*, Supplementband I., Erste Lieferung, 1881, Art. II., pp. 1-28, Plates I. and II.) The author states that *Colossendeis* was described in the year 1870; this name has therefore priority over *Rhopalorhynchus*. From the excellent figures given of *Colossendeis proboscidea* it is evident that this species is very distinct from the two species described as new in this report. The huge swollen rostrum, stout short legs and body, closely approximated lateral processes, elevated conical oculiferous tubercle, the proportions of the palpal joints and of the outer joints of the ambulatory legs, and the very acute lanceolate spines of the accessory legs, — all these are strikingly different from the corresponding characters of both *C. colossea* and *C. macerrima*.



1881. "Report on the Pycnogonidae. Reports on the results of dredging, under the supervision of A. Agassiz, along the East Coast of the United States during the summer of 1880, by the United States Coast Survey steamer, 'Blake,' Commander, J. R. Bartlett, U. S. Navy." *Bulletin of the Museum of Comparative Zoology at Harvard College* 8, 239–256.

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