

THE CEPHALOPODS COLLECTED BY THE R/V ATLANTIS DURING THE WEST INDIAN CRUISE OF 1954.^{1,2}

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ABSTRACT

The present report is based upon a collection of cephalopods made by the Woods Hole Oceanographic Institution's research vessel ATLANTIS in the West Indies in 1954. The collection consists of 83 specimens representing 17 genera and 18 species of which one genus, *Selenoteuthis*, and two species, *Selenoteuthis scintillans* and *Abralia grimppei*, are new to science.

INTRODUCTION

This study is based upon a small collection of cephalopods collected by the Woods Hole Oceanographic Institution's research vessel ATLANTIS during a cruise to the West Indies in 1954. The material, consisting of 83 specimens, is very rich and contains 17 genera and 18 species of which one genus and two species are new to science. Of particular interest in the collection is the new species of lycoteuthid squid which, by the arrangement and size of its light organs, must rank among the most brilliant of all of our luminous bathypelagic species. Also worthy of note is the new species of *Abralia*. For many years this genus was thought to be primarily Indo-Pacific in distribution and was represented in the Atlantic by a single species. Within only a few years the number of species of this genus has been raised to three and the whole Atlantic cephalopod fauna is being shown to be equal in importance to that of the other large oceanic areas.

The author is indebted to Dr. Richard H. Backus of the Woods Hole Oceanographic Institution for the opportunity to study this collection made by him during the 1954 cruise, for reading the manuscript, and for observations concerning the gear used. In particular he wishes to thank the Woods Hole Oceanographic Institution and Dr. Alfred C. Redfield, formerly Associate Director, for the financial support in the form of a Fellowship which enabled him to carry out the study both at Miami and the Museum of Comparative Zoology at Harvard College. The illustrations of *Abralia* are by the author's wife, Nancy A. Voss; the others were drawn by the author. All abbreviations and measurements are as defined by Voss (1956).

¹Contribution No. 994 from the Woods Hole Oceanographic Institution.

²Contribution No. 213 from The Marine Laboratory, University of Miami.

The specimens were captured by means of an Isaacs-Kidd Midwater Trawl (IKMT). Since this is not a closing net, the specimens might have been taken anywhere between the surface and the depths indicated. As the net fishes at the depth indicated for a period considerably longer than the time needed for lowering or hauling in, statistically the chances are greater that they came from the depth recorded. The depth in meters was obtained by a telemetering device and represents the actual depth fished instead of meters of wire out.

Order SEPIOIDEA

Family SPIRULIDAE Orbigny

Spirula spirula (Linnaeus, 1758)

Nautilus spirula Linnaeus, 1758, p. 710.

Material. 2 ♀ ♀, ML 32.0 and 42.0 mm, Stn. RHB 582, in 504 meters, March 2, 1954. UMMML 31.175.

Both specimens were taken alive and are in an excellent state of preservation. The larger one is intact, with the skin covering the shell both dorsally and ventrally; the smaller one has the skin ruptured and several chambers of the shell are crushed.

Bruun (1943) has summarized the present information on the biology and distribution of this interesting species. In 1955 he also published a more detailed account of the vertical distribution and has suggested the term "mesopelagic" for the level at which they are found. According to his table (1955, p. 67) the present specimens came from a greater depth than any yet recorded from the West Indies.

Order TEUTHOIDEA

SUBORDER OEGOPSIDA

Family LYCOTEUTHIDAE Pfeffer

Selenoteuthis, new genus

Lycoteuthids with short, wide fins; a large round light organ at the end of the mantle and a small round light organ at the tip of the 2nd and 3rd arms; 10 light organs within the mantle cavity and two on each of the tentacular stalks; buccal membrane 8 lobed with 8 supports.

Type species: Selenoteuthis scintillans, n. sp.

Selenoteuthis scintillans, n. sp.

Figure 1 a-e

Holotype. A male, in alcohol, ML 32.5 mm, from Stn. RHB 587, 26°22'N, 76°10'W, IKMT net, from 46 meters; 2003 - 2111 hours,

March 21, 1954. To be deposited in the Museum of Comparative Zoology.

Description. I have referred this specimen to the lycoteuthids with some reservation. It is a remarkable species and a living individual must be spectacular.

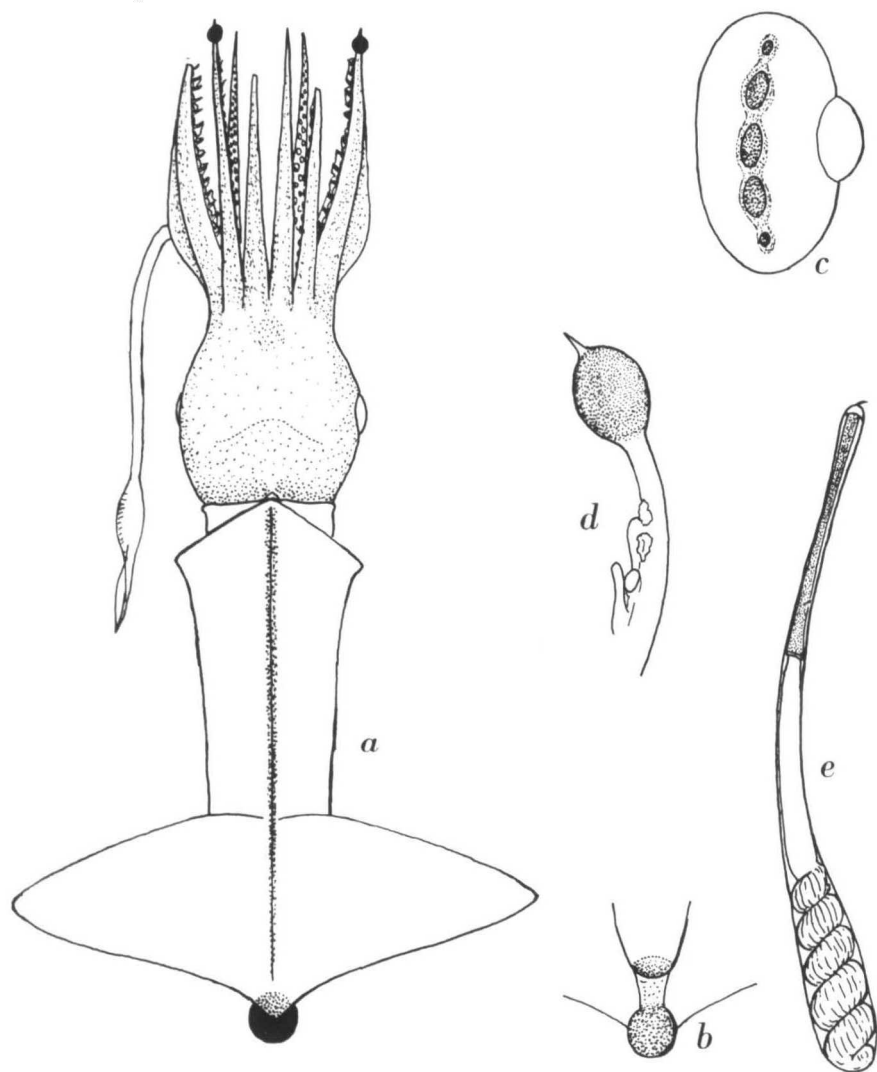


FIGURE 1. *Selenoteuthis scintillans* n. sp. a. Dorsal view, b. Terminal light organ of mantle, c. Left eyeball, ventral view to show light organs, d. Apical light organ of left dorso-lateral arm, e. Spermatophore.

The *mantle* is rather long and slender (Fig. 1 a), the anterodorsal margin sharply produced. There is no excavation in the ventral mantle margin beneath the funnel. The posterior end is bluntly pointed, but the mantle is somewhat curved downward due to fixation and a break in the dorsal surface of the mantle, so that the true contour is difficult to see. At the end of the mantle and entirely projecting beyond the fins is a large round light organ (Fig. 1 b). This does not occur in any other lycoteuthid.

The *fins* are short and very broad, terminal except for the black photophore projecting beyond them. The anterior margins are convex, the posterior margins concave. The lateral corners are sharply pointed.

The *funnel* is large and stout, free for only the distal $\frac{1}{4}$ of its length and provided with a small but strong dorsal support. The funnel organ is uncomplicated and consists of an inverted V shaped dorsal member with short, shouldered limbs, and fat, thick ventral pads. The funnel valve is large, sub-terminal and slightly bilobed. The mantle locking apparatus consists of a simple, slightly curved funnel groove on each side and a corresponding ridge on either side of the mantle. The nuchal cartilage is elongate, swollen and rounded posteriorly and widely pointed anteriorly.

The *gladius* may be seen through the dorsal mantle wall but was not dissected out.

The *head* is short and broad, nearly as wide as the mantle, with large eyes. The eyes are equipped with five light organs around their periphery ventrally. At each end there is a very small round organ, separated by three large round organs (Fig. 1 c). All appeared to have been bright red in the living animal and in the preserved specimen they had a distinct reddish hue. The light organs on both eyes were somewhat damaged. The beaks were not dissected out but appeared normal. The buccal membrane is 8 lobed with 8 prominent supports. The entire membrane is reddish purple and is strongly papillose on the outer surface.

The *arms* are in the order $2 = 3.1 = 4$. No keels could be seen, but all of the arm tips are very attenuate. In addition, there is a small brownish black light organ just below the tip on the 3rd arm of the right side and the 2nd arm of the left side (Fig. 1 d). The tips of the corresponding arms of these pairs were missing. The suckers of the arms are biserially arranged, bordered dorsally by a low indistinct protective membrane and ventrally by a very broad membrane with stout supports. The supports, however, are torn free from the mem-

brane and present a fringed appearance. The suckers are equipped with about 7-9 long teeth on the distal margin of the horny ring. The proximal edge of the ring is entire. There is no apparent hectocotylization of any of the arms.

Only the left *tentacle* is present. It is long and stout and bears a short club which is broad basally but attenuate for the distal 2/3. The suckers are in four rows upon the hand part with the entire margin finely toothed. The carpal cluster is compact and consists of five suckers and about three discernible buttons. A protective membrane with prominent supports is located ventrally and a swimming membrane occupies about 1/3 of the distal border on the dorsal side. Two large light organs of a silvery appearance are embedded on the aboral surface of the tentacular stalks, one basally, the other near the carpal section.

Internally there are 10 *light organs*. Two elongate, oval light organs lie within the funnel chamber, one on each side of the rectum. In the midsection of the mantle cavity are five light organs: a small longitudinally oval central organ, a large transversely oval light organ on each side, and a small round light organ attached to the base of each gill. In the posterior part of the mantle cavity there appear to be three photophores arranged in a transverse row, but these organs are badly damaged and their exact shape and number cannot be ascertained.

The spermatophores are short and stout and there are only a few turns of the sperm reservoir. The structure of the spermatophores is different from any yet described and is illustrated in Figure 1 e.

TABLE 1
MEASUREMENTS (IN MM) OF THE HOLOTYPE OF *Selenoteuthis scintillans* n. sp.

Sex	♂	Arms, I	12.0
ML	32.5	II	12.9
MW	12.0	III	12.9
HW		IV	12.0
HL	11.5	TL	27.5
FL	11.0	CL	6.8
FW	30.0	Diam. terminal light organ	3.0

The generic name *Selenoteuthis* or moon squid is derived from the Greek SELENE—moon and TEUTHIS—a squid, in reference to the large terminal light organ, and is in the feminine gender. The specific name *scintillans* is the present participle of the Latin *scintillo*, to glitter, sparkle or shine, here used as an adjective, sparkling.

Discussion. *Selenoteuthis scintillans* is the sixth species to be included

in the family Lycoteuthidae, and all six belong to monotypic genera. In general, in modern systematics, such generic splitting is frowned upon, but in the present situation no other recourse is at hand. With the exception of *Lycoteuthis diadema* (Chun, 1900) all of the other genera and species are known from unique specimens only. Lycoteuthids are rarely obtained, living apparently in the bathypelagic habitat, and little is known of their life history. Also, as most of the species are known only from females, the morphology of the males and differences in the genitalia are unknown.

Lycoteuthis diadema (Chun, 1900)

Enoploteuthis diadema Chun, 1900, p. 532.

Lycoteuthis diadema, Pfeffer, 1908, p. 294; 1912, p. 114; Voss, 1956, p. 118.

Asthenoteuthion planctonicum Pfeffer, 1912, p. 172, Pl. 15, figs. 8-14.

Material. 2 juveniles, ML 8.3 and 7.2 mm, from Stn. RHB 553, in 57 meters, Feb. 7, 1954. UMML 31.194.

1 juvenile, ML 8.7 mm, from Stn. RHB 574, in 46 meters, Feb. 25, 1954. UMML 31.194.

These three specimens seem definitely referable to this species on the basis of the shape of the fins, the light organs on the ventral surface of the eyeball, and the arrangement and number of the light organs within the mantle cavity.

In 1912 Pfeffer described a new genus and species, *Asthenoteuthion planctonicum*, based upon three larval specimens obtained by the German Plankton-Expedition. The mantle lengths were 4.5, 3.5 and 2.0 mm respectively. Due to the shape of the gladius in the largest of these, he considered them to belong to the family Enoploteuthidae and suggested relationship to the larvae of *Abraliopsis*, *Abralia*, etc. because of the shape and position of the fins. Finally he remarks, "Man könnte auf Grunde der Fünffzahl der Leuchtorgane des Bulbus vielleicht an eine Verwandtschaft mit *Lycoteuthis* denken; aber der Gladius von *Asthenoteuthion* ist ein echter Enoploteuthiden-Gladius."

In the present specimens the gladius of the 8.3 mm specimen was dissected out and found to lie midway between the enoploteuthid like gladius described by Pfeffer and the true lycoteuthid gladius. Evidently Pfeffer's younger specimen was not far enough advanced in development to show its true affinities.

The most notable character of these larvae or juveniles, as well as in *Asthenoteuthion*, is the presence of five light organs on the ventral surface of the bulbus. The five organs are large, crowded and round, but as in *Lycoteuthis* the middle or 3rd organ is distinctly different

in color from the others. It is reddish in contrast to the clear opaque appearance of the other four and in the largest specimen available, 8.7 mm, a purplish sheen is distinctly visible. This coincides exactly with the organs in *Lycoteuthis*.

The mantle cavity of each specimen was opened and the visceral mass searched for the presence of the light organs peculiar to the lycoteuthids. In the 7.2 mm specimen, there were two light organs in the funnel, one on each side of the rectum, a small light organ at the base of the gills, and two light organs lying between the gills in a line across the visceral mass. In the 8.7 mm specimen there was a minute light organ lying between the median pair between the gills. These light organs correspond to those found in *Lycoteuthis* with the exception of the posterior three photophores which were completely missing in the present specimens, nor was there any evidence of the photophores in the tentacular stalks. Evidently these missing organs develop at a later stage.

The fins are small but have already attained their typical wide, pointed, lycoteuthid appearance.

Family ENOPLUTEUTHIDAE Pfeffer

Abralia grimpei, n. sp.

Holotype. ♀, preserved in alcohol, ML 27.0 mm, from Stn. RHB 551, 26°25'N, 79°45'W, IKMT net, from 57 meters, Feb. 6, 1954. To be deposited in the Museum of Comparative Zoology.

Diagnosis. Two rows of suckers on tips of arms; fins half the length of the mantle or less; two hooks on tentacular clubs; six to seven light organs on ventral periphery of eyeball; about nine rows of photophores on ventral surface of head.

Description. A single female of an *Abralia* was found in the collections. A number of characters distinguish it from the other members of the genus found in the Atlantic and Indo-Pacific areas and warrant its description here as a new species.

The *mantle* is long and cylindrical (Figs. 2 a, b), slightly produced in the midline dorsally and emarginated beneath the funnel. The posterior end is bluntly pointed.

The *fins* are of moderate length, united posteriorly, and with free anterior lobes. The anterior margin is strongly convex, the posterior margin concave. The mantle locking apparatus is slightly curved and strong.

The *funnel* is strongly developed (Fig. 2 c). The funnel organ (Fig. 2 d) is composed of a dorsal member shaped like an inverted

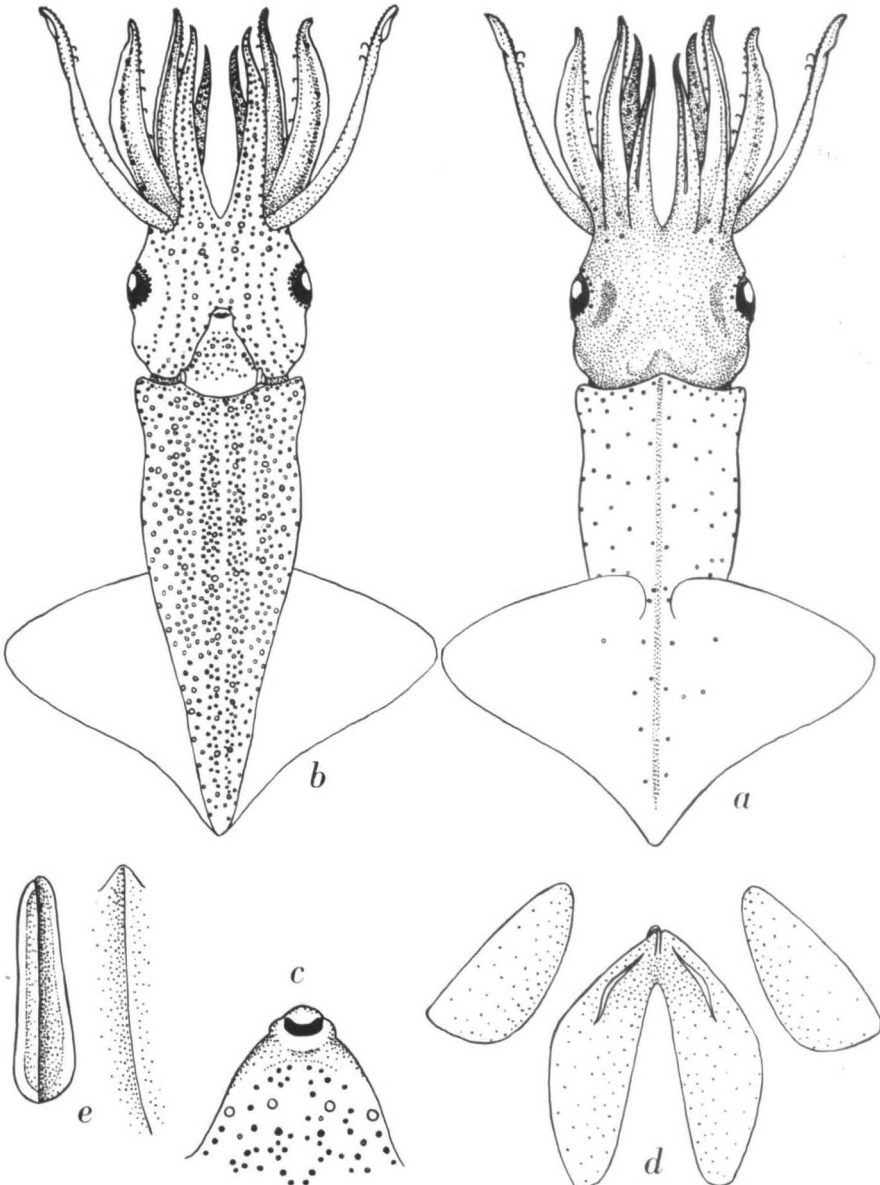


FIGURE 2. *Abralia grimpei* n. sp. a. Dorsal view, b. ventral view, c. Funnel, d. Funnel organ, e. Locking apparatus.

V with angled shoulders and two ventral pads which are large and slightly angled. The locking apparatus is shown in Figure 2 e.

The *arms* are in the order $4.1.2 = 3$. All of the arms, with the exception of those of the fourth pair, are keeled at least distally. The third pair is equipped with a strong swimming membrane. All of the arms (Fig. 3 a) bear about 13 hooks on the proximal 2/3 of the arms (12 in IV) after which there are about 10-12 small suckers followed distally by a few minute suckers in two rows. The hooks (Fig. 3 b) and suckers are bordered by low protective membranes, the ventral one of III being somewhat larger than the others. The sucker rings are toothed on their outer margins but are entire on the inner margin (Fig. 3 c).

The *tentacles* are short and stout, the stalks oval in cross section and grooved orally. The clubs (Fig. 3 d) are moderately expanded and on the hand part are equipped with two rows of suckers with finely toothed margins (Fig. 3 e) and two large hooks (Fig. 3 f) on the ventral row. Distally the club bears four rows of small suckers. The carpal cluster consists of a block of five small, smooth ringed suckers and

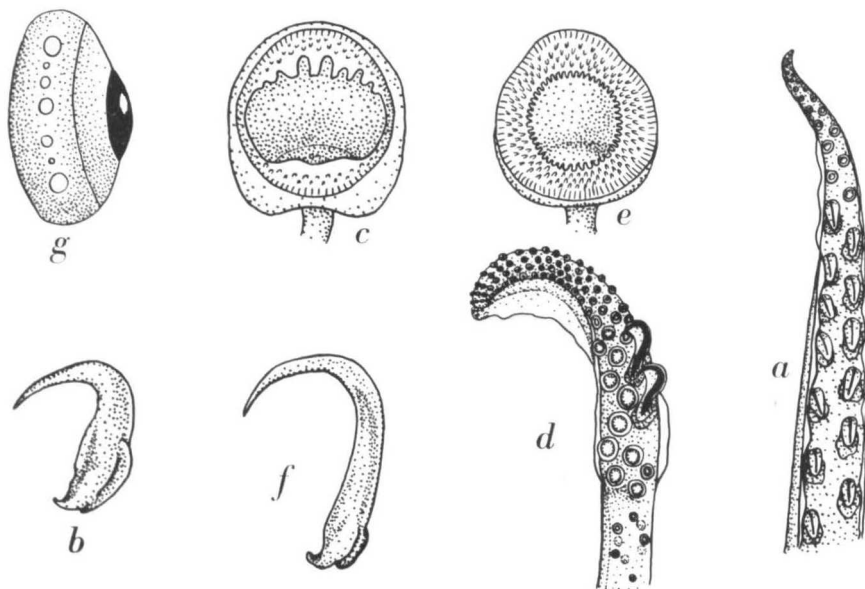


FIGURE 3. *Abralia grimpei* n. sp. a. Right dorso-lateral arm, b. Hook from fifth pair of dorso-lateral arm, c. Sucker from second pair of right dorso-lateral arm, d. Left tentacular club, e. Sucker from left tentacular club, inner row, third pair, f. Distal hook from left tentacular club, g. Left eyeball, ventral view.

about four low pads. Ventrally there is a semicircular protective membrane originating near the carpus and ending at the base of the distal hook. Beyond this is a low protective membrane which extends to the tip of the club. Aborally there is a strong keel on the distal half. Dorsally there is a low protective membrane originating at the carpus and extending over about half of the club.

As in all *Abralia* the specimen is liberally supplied with light organs. These are of the typical three types on the ventral surface of the head, funnel and mantle. There are large clear-centered organs, medium size dark ones and small dark organs with minute clear centers. They are arranged as follows.

On the ventral surface of the mantle and extending over the lower part of the sides are numerous light organs separated in the ventral midline and laterally by distinct bands of clear skin. This apparent orderly distribution may well be due to the action of the preservative. There are also scattered photophores on the dorsal side of the mantle. The ventral surface of the funnel (Fig. 2 c) bears about 56 light organs, 28 on each side, besides a patch of about 16 on each side of the funnel on the dorsal surface, squeezed in against the posterior surface of the head.

The ventral surface of the head bears about nine indistinct rows of photophores which unite anteriorly to form three distinct rows of light organs on the ventral arms occupying about 4/5 of the length of the arms. The dorsal row terminates here but the other two rows continue to just short of the tip. Only the median row continues to the extremity of the arm. There are about five small light organs on the ventro-lateral arms, distributed along the base of the swimming membrane. In addition, there are two light organs on the head at the base of the dorso-lateral arms and a single photophore a few millimeters from the base of these arms. Each eye has a distinct and orderly row of small light organs bordering the eyelids.

TABLE 2

MEASUREMENTS (IN MM) OF THE HOLOTYPE OF *Abralia grimpei* n. sp.

Sex	♀	Arms	I	12.0
ML	34.0		II	11.5
MW	11.4		III	11.5
HW	12.4		IV	12.5
HL	11.0	Hooks	I	13
FL	18.6		II	13
FW	28.0		III	13
TL	16.0		IV	12
CL	6.0			

The eyeballs bear light organs on the lower half of their periphery, arranged in a single row. The photophores are six in number on the right eyeball, consisting of a posterior and anterior roundish organ with three slightly smaller and less well-defined light organs between them and a minute light organ between the anteriormost one and its fellow. In addition to these, on the left eyeball (Fig. 3 g) a minute organ lies between the posteriormost light organ and its adjacent fellow, making seven photophores in all.

The beaks and radula were not examined.

Discussion. With the description of this species, the number of species of *Abralia* in the Atlantic is raised to three, each of which is easily distinguished from the others. These are compared below and a key is given to the Atlantic species. The species of the genus *Abralia* of the Pacific and Indian Oceans are presently being revised and will be published upon shortly.

The first Atlantic species, *Abralia veranyi*, was described from the Mediterranean in 1844 by Rüppell. It is characterized by the presence of five light organs on the eyeball of which the first and the last members are large and oval, the posterior one with a slight sinus, and there are four hooks on the tentacular club of which the proximal is minute, the second largest, and the others decreasing in size. There are four rows of minute suckers on the ends of the arms. The second species, *Abralia redfieldi*, was described by the author in 1955 and separated from the preceding species by the presence of five light organs on the eyeball all of which are round, three hooks on the tentacular club and two rows of suckers on the sessile arm tips.

A. veranyi is recorded from the Mediterranean, the eastern Atlantic from Madeira to West Africa, and the Western Atlantic from the Bahamas, Cuba and the Gulf of Mexico. *A. redfieldi* is known at present from the Florida Current off Miami and the coast of Cuba. The present species. It has been well figured and described by Pfeffer (1912). ing only two rows of minute suckers on the ends of the arms. It differs from both in having only two large hooks on the tentacular club and differs also from both in the arrangement and size of the light organs on the eyeball. It does not correspond to any of the known Indo-Pacific forms.

The specific name *grimpei* is given in honor of Dr. Georg Grimpe, the noted German teuthologist who contributed greatly to our knowledge of this genus.

KEY TO THE ATLANTIC SPECIES OF *Abralia*

1. 4 rows of suckers on the tips of the sessile arms; 4 hooks on the tentacular club; light organs on eyeball with large oval anterior and posterior members with a sinus in the dorsal margin of the posterior one; fins large, well over half the mantle length in the adult.

Abralia veranyi Rüppell, 1844

2 rows of suckers on the tips of the sessile arms; less than 4 hooks on the tentacular club; light organs on the eyeball all round; fins small.....2

2. 3 hooks on the tentacular club; light organs on eyeball round, 1st, 3rd and 5th large, 2nd and 4th small; body large and stout.

Abralia redfieldi Voss, 1955

2 hooks on the tentacular club; light organs on eyeball less clearly defined, 6-7 in number with anterior and posterior ones largest, 2nd and often next to last minute; mantle long and slender.

Abralia grimpei, n. sp.

Abralia juv.

Material. 1 juv., ML 6.8 mm, from Stn. RHB 551 from 57 meters, Feb. 6, 1954.

3 juv., ML 10.5, 9.5 and 11.6 mm, from Stn. RHB 560 from 46 meters, Feb. 22, 1954.

It does not seem possible to make a definite identification of the four specimens listed above. The tentacles are missing in all but the largest specimen from Stn. 560, in which it appears that the distalmost hook on the club is the largest. In this specimen the 1st and 5th light organs on the eyeball are nearly the same size as the 3rd and in this respect it most closely resembles *A. redfieldi*, but there seem to be four rows of suckers on the tips of the sessile arms which would place it in *A. veranyi*. The remaining two specimens from Stn. 560 have very large, rather round 1st and 5th photophores which would place it in the same species.

The smallest specimen in the series, from Stn. 551, seems to have smaller fins and a narrower body and the light organs of 1, 3 and 5 on the eyeball are of equal size. From these characters it would seem best to call it *A. redfieldi* but I hesitate to do so until the larval and juvenile stages and the accompanying morphological changes are known. In all of the specimens, the dorsal row of light organs on the ventral arms alone is present, and the photophores on the ventral surface of the head and mantle are much less numerous than in the adults.

? *Abraliopsis morissi* (Verany, 1837)

Onychoteuthis Morissii Verany, 1837, p. 100.

Enoploteuthis Morissii, Orbigny, 1848, p. 338.

Abralia Morissii, Gray, 1849, p. 50.

Abraliopsis Morissii, Pfeffer, 1900, p. 168.

Material. 1 ♂, damaged, ML 18.6 mm, from Stn. RHB 572 in 505 meters, Feb. 25, 1954.

1 ♀, damaged, ML 16.5 mm, from Stn. RHB 589, in 370 meters, March 22, 1954.

The present specimens are in such a poor state of preservation that definite identification is impossible. The distal ends of the ventral arms are missing in both specimens so that it cannot be determined if they possessed the three photophores at their tips. However, the much larger fins, the light organs arranged in more or less regular rows on the mantle, and the dark purplish violet buccal membrane all indicate that the specimens are referable to this species.

Pyroteuthis margaritifera (Rüppell, 1844)

Enoploteuthis margaritifera Rüppell, 1844.

Pterygoteuthis margaritifera, Pfeffer, 1900, p. 166.

Pyroteuthis margaritifera, Hoyle, 1902, p. 1.

Material. 2 ♀ ♀, ML 14.5 and 13.5 mm, from Stn. RHB 552, in 485 meters, Feb. 7, 1954.

These two specimens were the sole representatives of this common species. It has been well figured and described by Pfeffer (1912). They are easily differentiated from *Pterygoteuthis giardi* Fischer by the wide insertion of the fins, the presence of suckers on the ventral arms and the numerous large chromatophores on the dorsal surface of the head and mantle. This is a widely distributed species occurring in the Mediterranean Sea, Azores (Joubin), Madeira (Rees), Cuba (Voss). Joubin's specimen from the Azores was described as a new subspecies, *P. m. aurantiaca*.

Pterygoteuthis giardi H. Fischer, 1896

Pterygoteuthis giardi H. Fischer, 1896, p. 205.

Material. 4 ♂ ♂, ML 10.5 - 16.5 mm, 3 ♀ ♀, ML 8.4 - 19.0 mm, from Stn. RHB 553, in 57 meters, Feb. 7, 1954.

2 ♀ ♀, ML 18.0 and 14.0 mm, 2 ♀ ♀ damaged from Stn. RHB 555 in 560 meters, Feb. 10, 1954.

2 ♂ ♂, ML 12.8 and 8.3 mm, 3 ♀ ♀, ML 8.0 - 18.0 mm, and 1 damaged specimen, from Stn. 560, in 46 meters, Feb. 22, 1954.

1 ♂, ML 14.3 mm, 1 ♀, ML 15.6 mm and 3 badly damaged specimens from Stn. RHB 572, in 505 meters, Feb. 25, 1954.

1 ♂, ML 11.8 mm, 7 ♀ ♀, ML 5.3 - 18.0 mm, from Stn. RHB 574, in 46 meters, Feb. 25, 1954.

2 ♂ ♂, ML 11.0 and 13.4 mm, from Stn. RHB 575, in 505 meters, Feb. 26, 1954.

2 ♀ ♀, ML 16.0 and 20.0 mm, from Stn. RHB 587, in 46 meters, March 21, 1954.

The 34 specimens listed above were the most numerous of any species taken by the ATLANTIS on this cruise and the females were nearly twice as numerous as the males (10 males, 18 females). Their vertical distribution extended from 46 meters to 560 meters but no particular change in level seemed to occur with increase in size.

Pfeffer (1912) has discussed the relationship of this genus with *Pyroteuthis* and considered it to be a subgenus of the latter. However, the hectocotylization of the left arm in *Pterygioteuthis* in contrast with the right arm in *Pyroteuthis* seems alone to be of sufficient weight to keep it at the generic level.

Whether, as Pfeffer suggests, there are two races or subspecies of this species, one in the Atlantic and the other in the Pacific (*P. giardi hoylei*) must await the analysis of a larger number of specimens than is now available. Apparently a closely related species, *P. gemmata* Chun, occurs in the South Atlantic, but the author has seen specimens from the tropical Atlantic referred to *P. giardi* which had the peculiar faceted light organs of the former species.

Family OCTOPODOTEUTHIDAE Berry

Octopodoteuthopsis megaptera (Verrill, 1885)

Ancistrocheirus megaptera Verrill, 1885, p. 399.

Octopodoteuthopsis megaptera, Pfeffer, 1912, p. 223; Voss, 1955, p. 125.

Material. 1 juv., ML 11.7 mm, from Stn. RHB 550, in 329 meters, Feb. 6, 1954.

This small specimen has had the posterior end of the mantle cut off even with the fins, and if intact would probably have measured about 14.0 mm. The fins are very broad and somewhat narrow, 19.0 mm by 11.0 mm. The funnel organ has the peculiar hollowed out ventral pads described by Voss (1955, p. 125). The arms are apparently in the order 3.4.2.1, the third pair much longer than the others. None of the light organs described for this species were observable.

The ventral surface of the head and mantle is liberally spotted with small reddish brown chromatophores, and there is a transverse row of larger, dark brown chromatophores across the ventral surface of the head at the midpoint of the eyes.

Family ONYCHOTEUTHIDAE Gray

Onychoteuthis banksi (Leach, 1817)

Loligo banksi Leach, 1817, p. 141.

Onychoteuthis banksi, Orbigny, 1826, p. 61; Voss, 1955, p. 129.

Material. 1 juv., ML 16.5 mm, from Stn. RHB 551, in 57 meters, Feb. 26, 1954.

1 juv., ML 10.5 mm, from Stn. RHB 553, in 57 meters, Feb. 7, 1954.

5 juv., ML 6.6-9.5 mm, from Stn. RHB 574, in 46 meters, Feb. 25, 1954.

3 juv., ML 5.3-17.0 mm, from Stn. 581, in 95 meters, Feb. 26, 1954.

The 10 juveniles listed above were easily distinguished as belonging to this species. The rows of chromatophores in the midline on the dorsal surface, small fins, and sharply curved and projecting end conus of the gladius serve to distinguish this from all other known teuthoid larvae and juveniles. As might be expected of a surface pelagic species, the larvae all came from the shallower stations.

Family HISTIOTEUTHIDAE Verrill

Calliteuthis reversa Verrill, 1880

Calliteuthis reversa Verrill, 1880, p. 393.

Material. 1 ♂, ML 33.5 mm, Stn. RHB 450, in 137 meters, July 16, 1953. UMML 31.190.

1 ♀, ML 42.0 mm, Stn. RHB 584, in ??? meters, March 4, 1954. UMML 31.192.

1 ♀, ML 34.5 mm, Stn. RHB 591, in 524 meters, March 22, 1954. UMML 31.191.

2 ♀♀, ML 22.5 - 25.0 mm, Stn. RHB 555, in 560 meters, Feb. 10, 1954. UMML 31.193.

Five specimens, tentatively identified as *C. reversa*, were taken by the BLUE DOLPHIN and the ATLANTIS. Four of these, all females, seem similar to those described by me (Voss, 1956) from the Gulf of Mexico. Their measurements and indices are given in Table 3.

The mantle is short, cone-shaped, widest at the anterior margin and bluntly pointed. The fins are small, round, indented posteriorly, and projecting slightly beyond the end of the mantle. In all the arm suckers are smooth on the proximal half and bear about twelve small, semi-circular teeth on the distal half, the teeth minute and difficult to see basally, distinct distally. The tentacular suckers are minutely but distinctly armed with sharp teeth numbering about 60 on the largest sucker of the largest specimen. This may be compared with about 33 teeth from the Gulf of Mexico specimens. The photophores are few and scattered with three rows on the ventral arms. The dorsal member of the funnel organ bears a large flap on each lateral arm.

The fifth specimen, a male, differs considerably from the others. The mantle is more elongate and slender, with nearly parallel sides on the anterior half. The arm suckers are nearly smooth proximally armed with very minute teeth which are hardly discernible, but are more evident distally. The tentacular suckers are also toothed, but very minutely. In addition, the tentacles are quite short. There are no flaps on the dorsal member of the funnel organs, these being replaced by low mounds.

TABLE 3
MEASUREMENTS AND INDICES OF 5 SPECIMENS OF
Calliteuthis reversa Verrill, 1880.

Stn. No.	584	591	555	555	450
Sex	♀	♀	♀	♀	♂
ML	42.0	34.5	22.5	25.0	33.5
MWI	56.0	58.0	55.5	54.0	37.4
HWI	64.2	66.8	66.7	56.0	43.3
HLI	69.0	66.8	66.7	68.0	40.3
FLI	37.0	36.3	37.3	38.0	32.9
FWI	71.5	65.2	62.3	66.0	53.8
Arms I	85.0	63.0	33.0	41.0	33.5
II	101.0	61.0	37.0	44.0	38.0
III	101.0	70.0	38.0	44.0	37.5
IV	87.5	57.0	33.0	39.0	32.0
TLI	303.0	336.0	235.0	280.0	110.0
CLI	47.7	49.3	35.6	40.0	26.9
MAI	241.0	200.0	169.0	176.0	113.0

This last specimen compares very favorably with the original description and measurements of the holotype given by Verrill (1880). However, at this time we know too little about sexual differences in this group to even surmise whether all five specimens belong to *C. reversa* or whether they represent two distinct species. A revision of this genus is now underway by the author and it is hoped that some of the perplexing problems in this group may be cleared up.

Family OMMASTREPHIDAE Gill

Ommastrephid larvae (*Rhynchoteuthis*)

Material. 1 juv., ML 3.3 mm, Stn. RHB 560 in 46 meters, Feb. 22, 1954.

2 juv., ML 5.1 mm, one damaged, Stn. RHB 574 in 46 meters, Feb. 25, 1954.

These three small larvae cannot be identified to species at this time. The entire problem of the *Rhynchoteuthis* larvae has yet to be solved, although it has been assumed that at least some of the known larvae belong to *Ommastrephes pteropus* and *O. bartrami*. Various stages in

the development of these larvae have been illustrated by Pfeffer (1912), who considered that there might be two species represented in his material. Additional comments on this problem have been given by Robson (1948). This form is commonly found in the plankton and it is somewhat surprising that the ATLANTIS took so few during this cruise.

Family CHIROTEUTHIDAE Gray

Mastigoteuthis sp.

Material. 1 specimen, ML 36.0 mm, Stn. RHB 572 in 505 meters, Feb. 25, 1954.

A single specimen, very badly damaged, with all of the arms mutilated and tentacles missing, was obtained at the above station. Because of its condition the specimen is unidentifiable. The skin is lacking over almost the entire surface, the greater part of all of the arms is missing and the head is detached from the body. However, just anterior to and somewhat ventral to the eyes is a large photophore on either side. These may be double or both may have been torn in two. According to Degner (1925), only two species of this genus have photophores on or near the eyes, *M. glaucopsis* and *M. hjorti*. The shape of the fins and the posterior extremity of the body do not agree with the figures of *glaucopsis* nor does the animal fit the description of *hjorti* in all respects.

Liocranchia reinhardtii (Steenstrup, 1856)

Leachia Reinhardtii Steenstrup, 1856, p. 200.

Cranchia Reinhardtii, Steenstrup, 1861, p. 76.

Loligopsis Reinhardtii, Tryon, 1879, p. 165.

Perothis Reinhardtii, Rochebrune, 1884, p. 25.

Liocranchia Reinhardtii, Pfeffer, 1900, p. 194.

Material. 1 specimen, ML 38.5 mm, Stn. RHB 560 in 46 meters, Feb. 22, 1954.

The present specimen shows some small differences from the typical specimens of this species, but they do not warrant any change in the identification. The fins are large and slightly broader than long, with no indentation on the posterior median border. The V shaped rows of tubercles on either side of the mantle at the fusion with the funnel are large with conspicuous tubercles, roughly alternating between large tri- or quadrifid tubercles and simple ones. At the apex of the V is a large multicuspid tubercle much larger than any described or figured in the literature. Dorsally there is a row of widely spaced simple tubercles in the midline on the gladius or lanceola, but in the posterior widened section the tubercles are few and small.

In my paper on the Cuban cephalopods (Voss, 1955), I erroneously gave the specimen recorded in that paper as the first record from the Western Atlantic, but a perusal of Pfeffer's 1912 monograph yielded a record by Issel from the Caribbean.

Pyrgopsis lemur Berry, 1920

Pyrgopsis lemur Berry, 1920, p. 298.

Material. 1 specimen, ML 21.0 mm, Stn. RHB 560, in 46 meters, Feb. 22, 1954.

This specimen seems to be conspecific with Berry's species according to the published preliminary description. The mantle is long and slender, completely colorless and tapers to a long narrow point posteriorly. The ventral surface of the mantle bears two longitudinal rows of cartilaginous tubercles consisting of large, spinous tubercles with small simple ones between them. The tubercle rows appear to be less than $\frac{1}{4}$ the mantle length. The fins are slightly broader than long, transversely elliptical with smooth outlines. The gladius is visible through the mantle but was not distinct enough for descriptive purposes.

Degner (1925) has compared his material of *P. atlantica* with the present species, and has remarked upon its similarity to *P. pacifica* and *P. schnehageni*.

The present specimen is apparently only the second record of this small cranchiid.

Order OCTOPODA

Family OCTOPODIDAE Orbigny

Scaevargus unicolor (Orbigny, 1840)

Octopus unicolor Orbigny, 1840, p. 70.

Scaevargus unicolor, Tiberi, 1880, p. 12.

Material. 3 juv., ML 5.1, 6.0 and 7.5 mm, Stn. RHB 560, in 46 meters, Feb. 22, 1954.

4 juv., badly damaged, Stn. RHB 572, in 505 meters, Feb. 25, 1954.

2 juv., ML 7.5 and 7.5 mm, Stn. RHB 574, in 46 meters, Feb. 25, 1954.

Macrotritopus stage

The present specimens are all larval or juvenile forms with the typical extreme elongation of the third arms which has given this stage the generic name *Macrotritopus*. The identity of this species has long been in doubt and until recently about six separate species have been described. In 1954 Rees showed that all of the known specimens of

this genus are young specimens of *Scaevargus unicirrhus*. The present specimens present no unusual features and agree well with all of the particulars enumerated by Rees. The various species assigned to the genus *Macrotritopus* are not listed here but a full larval synonymy is given in the paper cited above.

Eledonella pygmaea Verrill, 1884

Eledonella pygmaea Verrill, 1884, p. 145.

Material. 1 ♂, ML ?, from Stn. RHB 572, in 505 meters, Feb. 25, 1954.

This small specimen is in very poor shape and is listed here only to complete the record of the specimens in the collection.

TABLE 4
DATA FOR ALL STATIONS AT WHICH CEPHALOPODS WERE TAKEN.

Station	Date	Location	Gear	Time	Depth in meters
450	VII/16/54	39°45'N, 71°08'W	IKMT	2018-2125	137
550	II/6/54	25°53'N, 79°46'W	IKMT	1513-1718	330
551	II/6/54	26°25'N, 79°45'W	IKMT	1957-2159	57
552	II/7/54	26°34'N, 79°04'W	IKMT	1545-1722	485
553	II/7/54	26°35'N, 79°28'W	IKMT	2339-0144	57
555	II/10/54	25°26'N, 76°03'W	IKMT	0110-0419	560
560	II/22/54	18°43'N, 65°10'W	IKMT	2000-0040	46
572	II/25/54	20°17'N, 65°02'W	IKMT	0242-0606	505
574	II/25/54	20°12'N, 65°19'W	IKMT	2000-2400	46
575	II/26/54	19°22'N, 65°57'W	IKMT	1047-1453	505
581	III/2/54	19°21'N, 66°20'W	IKMT	0328-0603	95
582	III/2/54	18°37'N, 66°05'W	IKMT	1939-2311	505
584	III/4/54	18°55'N, 66°10'W	IKMT	2000-0015	Surface to 415
587	III/21/54	26°22'N, 76°10'W	IKMT	2003-2111	46
589	III/22/54	26°08'N, 76°23'W	IKMT	0310-0542	370
591	III/22/54	25°32'N, 77°15'W	IKMT	2135-0103	524

LITERATURE CITED

BERRY, S. STILLMAN

1920. Preliminary diagnoses of new cephalopods from the Western Atlantic. Proc. U. S. Nat. Mus., 58: 293-300, 1 pl.

BRUUN, ANTON FR.

1943. The biology of *Spirula spirula* (L.). Dana Rep., 24: 1-42.
1955. New light on the biology of *Spirula*, a mesopelagic cephalopod. Essays in the natural sciences in honor of Captain Allan Hancock, pp. 61-72.

CHUN, CARL

1900. Aus den Tiefen des Weltmeeres. Jena.

DEGNER, EDUARD

1925. Cephalopoda. Rep. Danish oceanogr. Exped. 1908-10. 2(C.1): 1-94.

FISCHER, H.

1896. Note préliminaire sur le *Pterygioteuthis Giardi*, céphalopode nouveau recueilli dans le cours de l' Expedition scientifique du Talisman (1883). *J. Conchyl.*, 43.

GRAY, J. E.

1849. Catalogue of the mollusca in the collection of the British Museum. I. Cephalopoda antepedia. London.

HOYLE, W. E.

1902. The luminous organs of *Pterygioteuthis margaritifera*, a Mediterranean cephalopod. *Mem. Manchester Soc.*, 46(16): 14 pp.

LEACH, W. E.

1817. Synopsis of the orders, families and genera of the class cephalopoda. *Zool. Miscell.*, 3: 137-141.

LINNAEUS, CAROLUS

1758. *Systema naturae*, Edit. 10.

ORBIGNY, A. D'

1826. Tableau methodique de la Classe des Céphalopodes. *Ann. sci. nat. Paris*, 7: 96-169.
1848. In Ferussac and Orbigny, 1834-1848, *Histoire naturelle générale et particulière des Céphalopodes acétabulifères*, etc. Paris, ix, 1-361, 143 pls.

PFEFFER, GEORG

1900. Synopsis der oegopsiden Cephalopoden. *Mitteil. naturhist. Mus.*, 17: 145-198.
1908. Teuthologische Bemerkungen. *Mitteil. naturhist. Mus.*, 25: 287-295.
1912. Die Cephalopoden der Plankton Expedition. *Ergebn. Plankton Exped.*, 2: 1-815, Atlas.

REES, W. J.

1954. The *Macrotritopus* problem. *Bull. Brit. Mus. Zool.*, 2(4): 69-99, 1 pl.

ROBSON, G. C.

1948. The cephalopoda decapoda of the Arcturus oceanographic expedition, 1925. *Zoologica*, 33(3): 115-132.

ROCHEBRUNE, A. T. DE

1884. Étude monographique sur la famille des Loligopsidae. *Bull. soc. phil. Paris*, 8: 7-28, 2 pls.

RÜPPELL, E.

1844. *Intorno ad alcuni Cefalopodi del mare di Messina*. Messina.

STEENSTRUP, JOH. JAPETUS SM.

1856. Hectocotyldannelsen hos Octopodslægterne *Argonauta* og *Tremoctopus*, oplyst ved iagttagelse af lignende Dannelser hos Blæksprutterne i Almindelighed. *Vedensk. Selsk. Skr. 5 Raekke*, 4: 187-216.
1861. Overblik over de i Kyöbenhavns Museer opbevarede Blæksprutter fra det aabne Hav. *Overs. Dansk. Ved. Selsk. Forh.*, 1861: 69-86.

TIBERI, N.

1880. Cefalopodi . . . viventi nel Mediterraneo. *Boll. Soc. Mal. Ital.*, 6.

TRYON, G. W.

1879. *Manual of Conchology*. I. Cephalopoda.

VERANY, J. B.

1837. Mémoires sur deux nouvelles espèces de Céphalopodes, trouves dans l'océan. *Mem. Accad. Torino*, 1: 99-101.

VERRILL, A. E.

1880. Notice of the remarkable marine fauna occupying the outer banks off the southern coast of New England. *Amer. J. Sci.*, 20(119): 390-403.
1884. Second catalogue of the mollusca, etc. *Trans. Conn. Acad. Arts Sci.*, 6(1): 139-294.
1885. Third catalogue of the mollusca, etc. *Trans. Conn. Acad. Arts Sci.*, 6(2): 395-452.

VOSS, GILBERT L.

1955. The cephalopoda obtained by the Harvard-Havana Expedition off the coast of Cuba in 1938-39. *Bull. Mar. Sci. Gulf & Carib.*, 5(2): 81-115.
1956. A review of the cephalopods of the Gulf of Mexico. *Bull. Mar. Sci. Gulf & Carib.*, 6(2): 85-178.