

RICHARD E. YOUNG
and *CLYDE F. E. ROPER*

*A Monograph of the
Cephalopoda of the
North Atlantic:
The Family
Joubiniteuthidae*

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ABSTRACT

Joubiniteuthis portieri (Joubin, 1912) is redescribed on the basis of new material from the Atlantic Ocean. *Valdemaria danae* Joubin, 1931, is synonymized with *Joubiniteuthis portieri*, and the peculiar hectocotylus previously described for *V. danae* is shown to be an artifact. The validity of the family Joubiniteuthidae Naef is confirmed. The Joubiniteuthidae is thought to be most closely related to the Mastigoteuthidae and Promachoteuthidae.

Introduction

Joubin (1912) established *Chiroteuthis portieri*, which he characterized only by the great length of the arms. Later, the species was more completely described by Joubin (1916). Only a single mutilated specimen was available, and in spite of its peculiar characters, Joubin felt that it should be placed in *Chiroteuthis* within the Chiroteuthinae. Berry (1920), however, considered Joubin's species distinct enough to merit the establishment of a separate genus, *Joubiniteuthis*. Shortly afterward, Naef (1922, p. 299) created the family Joubiniteuthidae without giving reasons other than his belief that *Joubiniteuthis* belonged in no existing family. Joubin (1924) repeated his earlier description of the species and maintained its position in *Chiroteuthis*, apparently unaware of the changes introduced by Berry and Naef. Grimpe (1925) listed the Joubiniteuthidae between the Chiroteuthidae and Grimalditeuthidae.

In a preliminary report on the cephalopods collected by the *Dana*, Joubin (1931) described *Valdemaria danae*, a new genus and species, which he placed in the Mastigoteuthinae. The peculiar hectocotylus of a second specimen of *V. danae* was described by Joubin in 1933. Thiele (1935, p. 977) gave a brief diagnosis of the Joubiniteuthidae, which he listed after the Grimalditeuthidae and before the Cranchiidae; he also briefly characterized *Valdemaria*, which he retained in the Mastigoteuthinae.

Recently Clarke (1966) listed *Chiroteuthis portieri* in the Chiroteuthinae, apparently unaware of the nomenclatural changes that have occurred. He also listed *Valdemaria danae* under the Chiroteuthinae but gave

no reason for this change from the Mastigoteuthinae.

The collections of cephalopods at the Institute of Marine Sciences, University of Miami, contain material that conforms to the descriptions of Joubin's two species. Joubin's male specimen of *V. danae* is also in these collections. The study of this material has shown that *Valdemaria danae* is a synonym of *Joubiniteuthis portieri* and that the Joubiniteuthidae is a valid family.

The coauthors wish to acknowledge E. Bertelsen of the Carlsberg Foundation for the loan of the R/V *Dana* material, H. Bullis for the R/V *Silver Bay* material, and G. E. Maul for the loan of the specimen from Madiera. We also would like to thank G. L. Voss for his support and his comments on the manuscript. The illustrations have been prepared by Miss Constance Stolen to whom we express our gratitude. The work was supported in part by research grants from the National Science Foundation, GB-57294, and the National Geographic Society-University of Miami Deep-Sea Biology Program. This article continues the series of papers which was initiated by G. L. Voss (1962) on the families of North Atlantic Cephalopoda.

Family JOUBINITEUTHIDAE Naef, 1922

JOUBINITEUTHIDAE Naef, 1922, p. 299; 1923, p. 795.—Grimpe, 1925, pp. 97, 103.—Thiele, 1935, p. 977.—Young and Roper, 1968, p. 197, et seq.

DIAGNOSIS.—Buccal connectives attach to ventral borders of arms IV; funnel locking-cartilage oval without tragus or antitragus; conus elongate with ventral fusion; tail elongate, filiform, longer than mantle length; arms I-III extremely long with six longitudinal rows of suckers; ventral arms much shorter and with four longitudinal rows of suckers; tentacular clubs laterally compressed with 8-12 suckers in a transverse row; no photophores.

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Genus *Joubiniteuthis* Berry, 1920*Chiroteuthis* Joubin, 1912, p. 396.*Joubiniteuthis* Berry, 1920, p. 152.—Naef, 1921, p. 147; 1922, p. 299.—Thiele, 1935, p. 977.—Young and Roper, 1968, p. 201.*Valdemaria* Joubin, 1931, p. 176; 1933, p. 44.TYPE-SPECIES.—*Joubiniteuthis portieri* (Joubin, 1912). [By monotypy.]*Joubiniteuthis portieri* (Joubin, 1912)*Chiroteuthis portieri* Joubin, 1912, p. 396; 1916, p. 1; 1924, p. 80.—Clarke, 1966, p. 203.*Joubiniteuthis portieri*, Berry, 1920, p. 152.—Naef, 1922, p. 299; 1923, pp. 237, 810.—Grimpe, 1925, pp. 97, 103.—Thiele, 1935, p. 977.*Valdemaria danae* Joubin, 1931, p. 176; 1933, p. 44.—Clarke, 1966, p. 206.

List of Material

Sex	ML, mm	Sta. no.	Location	Date	Estimated depth, m
M	105	<i>Pillsbury</i> 344	09°26'N 77°36'W	10 VI 1966	800-900
M ¹	89	<i>Dana</i> 1185 XIII	17°41'N 60°58'W	27 XI 1921	2,000
M	74	<i>Dana</i> 3978 VI	30°15'S 13°15'E	13 XI 1930	2,500
?	94	<i>Silver Bay</i> 3729	29°24'N 80°08'W	3 II 1962	350
F	70	<i>Silver Bay</i> 3738	29°58'N 80°10'W	5 II 1962	330
juv.	34	<i>Aphanopus carbo</i> stomach, Madcira		4 I 1960	-

¹ Joubin's specimen (1933).

DESCRIPTION.—The *mantle* is long and slender (Figures 1A, D); its walls are heavily invaded with gelatinous tissue. The muscular portion of the mantle terminates in the region of the anterior one-third of the fins. The small *fins* are thick and gelatinous medially but are thin around the free edges. They are slightly longer than broad and are oval in outline; no free lobes occur (see measurements in Table 1). Posteriorly the fins terminate abruptly. The extremely long, slender *tail* is slightly longer than the length of the mantle. The needle-like tail tapers gradually to a sharp point; for its full length it is primarily comprised of the elongate conus of the gladius which is covered only by soft, thickened integument.

The *gladius* (Figure 1B) is an extremely long, thin, tapering rod. The rhachis is free for nearly one-third the length of the gladius. The vane is weakly developed; it folds ventrally from its point of origin, and the edges fuse in the posterior one-third of the gladius to form a long conus.

The *funnel* extends to the level of the middle of the eyes. Only the short, narrow exhalent tip is free, and the remainder of the funnel is embedded in the soft tissue of the head. The funnel is thick-walled and has a semigelatinous consistency. Two pairs of muscular bridles connect the anterior portion of the funnel to the head. The *funnel locking-cartilage* is small and oval; it consists of a deep, oval concavity that deepens

posteriorly and undercuts the posterior edge of the cartilage. A membranous flange encircles the cartilage. Both tragus and antitragus are lacking. The bulbous mantle component protrudes conspicuously from the inner surface of the mantle (Figure 2D). The dorsal member of the *funnel organ* is an inverted U-shaped pad; the limbs are broad and rounded. The surface of the organ has convolutions. A low, median ridge on the organ extends anteriorly as a short, spatulate, apical papilla. The ventral members are small, oval pads (Figure 2F). A funnel valve is present.

The *head* is elongate and cylindrical; it bears moderate-sized eyes. The finger-like olfactory papillae arise at the back of the head just lateral to the anterior portion of the funnel.

The *arms* are extraordinarily long, slender, and whiplike. The bases of the arms are broad and robust. The arms taper gradually and terminate in minute, blunt, or conical tips. Arms I-III are nearly subequal and are two to four times longer than the length of the mantle (exclusive of the tail). The fourth arms are relatively short and slender, approximately 80 percent as long as the mantle.

A well-developed web joins the bases of arms I-III: it is not present between arms IV and it is very low between arms III and IV. Protective membranes are very low and weakly developed on all the arms. Near the bases of the arms the membranes are apparently

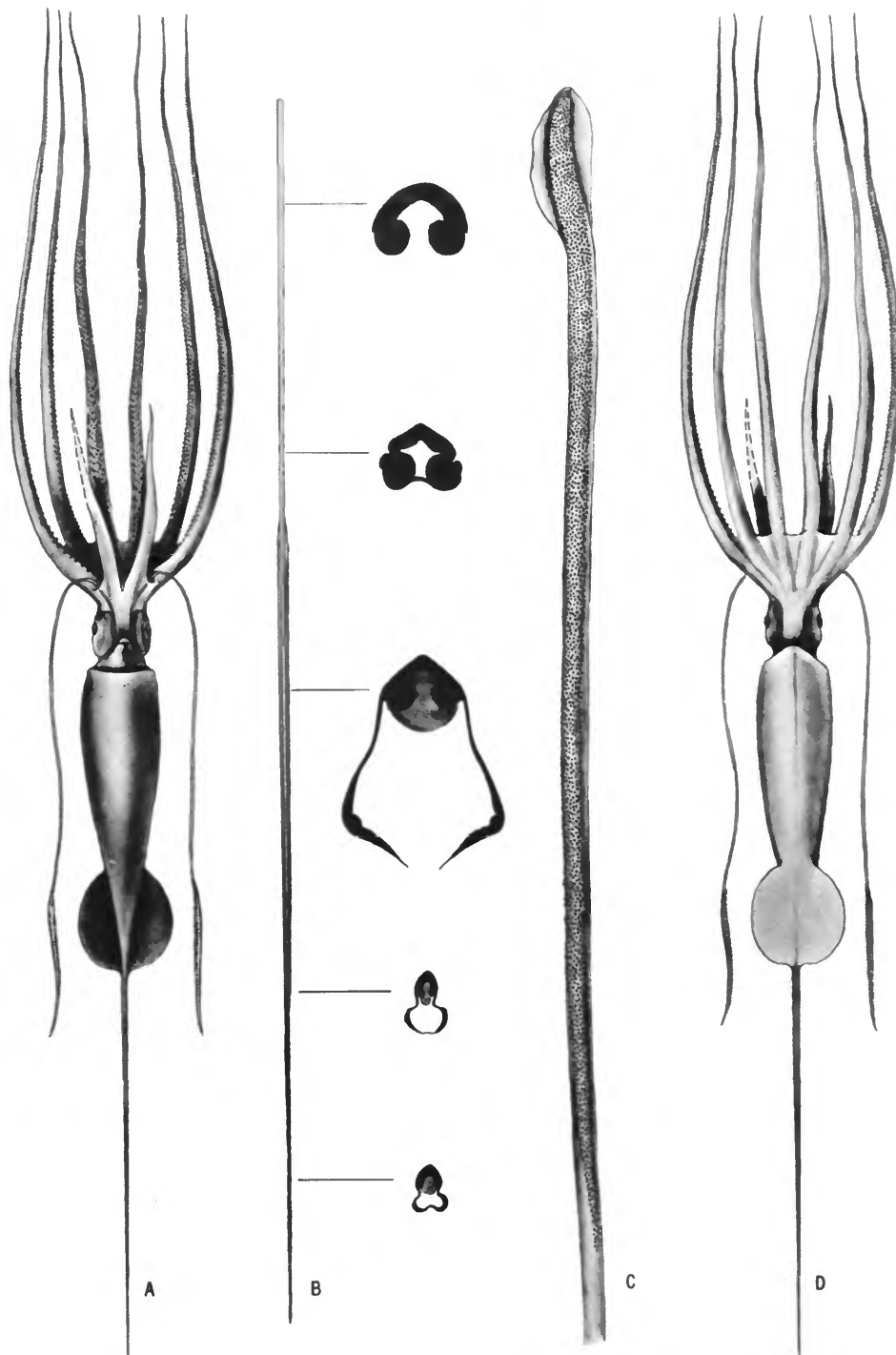


FIGURE 1.—*Joubiniteuthis portieri* (Dana 1185 XIII, ML 89 mm): A, Ventral aspect. B, Gladius, entire, and cross sections. C, Tentacular club. D, Dorsal aspect.

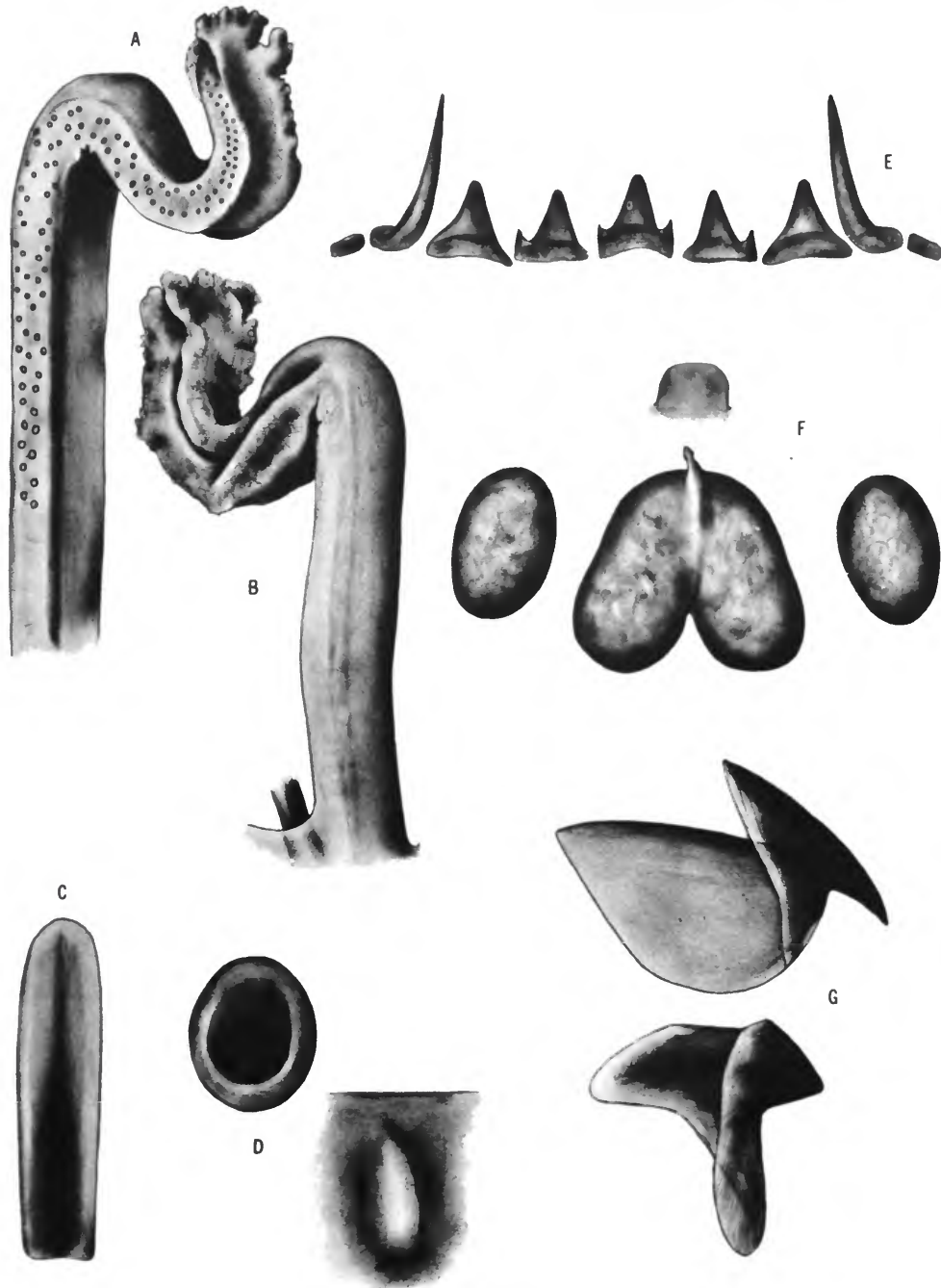


FIGURE 2.—*Joubiniteuthis portieri* (Dana 1185 XIII, ML 89 mm): A, Oral surface of anomalous right arm IV. B, Aboral surface of anomalous right arm IV. C, Nuchal locking cartilage. D, Funnel and mantle locking-cartilages. E, Radula. F, Funnel organ and funnel valve. G, Upper and lower beaks.



FIGURE 3.—*Joubiniteuthis portieri* (Dana 1185 XIII, ML 89 mm): A, Right arm III. B, Left arm IV. Suckers from arm I: c, from fifth row; g, taken 4 cm from arm base; k, taken 6.5 cm from arm base. Suckers from arm II: d, from sixth row; h, taken 4 cm from arm base; l, taken 6.5 cm from arm base. Suckers from arm III: e, from fifth row; i, taken 4 cm from arm base; m, taken 6.5 cm from arm base. Suckers from arm IV: f, from fifth row; j, taken 4 cm from arm base; n, taken 6.5 cm from arm base. o, Sucker from tentacular club. p, Sucker from arm III taken 6.5 cm from arm base showing outer ring.

entirely absent, but minute bumplike trabeculae are present.

Suckers are biserially arranged at the bases of arms I–III, but they increase to four, then to six, often irregularly arranged rows that appear to extend to the tips of the arms (Figure 3A). The closely packed, irregular arrangement of suckers near the arm tips, however, makes it difficult to determine the exact number of rows. The suckers on arms IV originate in two rows, then quickly increase to four rows which remain distinct nearly to the tips of the arms (Figure 3B). The arm suckers are small and extremely numerous. The diameter of the suckers on all arms decreases as the number of rows increases. The medial suckers are one and one-half to two times the diameter of the marginal suckers along most of each arm length. The basal suckers that lie in two rows are large with small apertures; the most proximal few suckers have smooth sucker rings. The next suckers bear small pointed teeth; farther distally the teeth are larger and number between seven to nine on the distal two-thirds of the ring. At the point where the number of sucker rows reaches six, the suckers decrease in size and bear six or seven pointed to truncate teeth on the distal margin (Figures 3C–N, P). The suckers again increase in size toward the middle of the arms.

The tentacles are long and threadlike; the stalks are naked. The club is elongate (about half as long as the mantle length exclusive of the tail) and laterally compressed. The oral face is rounded and no division into dactylus, manus, and carpus occurs. The club is covered with numerous, minute, closely packed suckers that arise proximally in one or two rows, then increase to 5–6 transverse rows; 8–12 rows span the width of the club in its distal two-thirds. The tip of the club appears to be the growing area where new suckers are formed. The distal fifth or sixth of the club is bordered by a distinct protective membrane with no apparent trabeculae. Protective membranes are lacking elsewhere on the club. The suckers have small apertures and smooth rings (Figure 3C).

The buccal membrane has seven lappets. The indistinct buccal connectives are embedded in gelatinous tissue and attach to the dorsal sides of arms I and II and to the ventral sides of arms III and IV. The distal area of the oral face of the buccal membrane bears numerous long, finger-like papillae dorsally that decrease in number and size ventrally. Papillae are lacking on the proximal region of the membrane, particu-

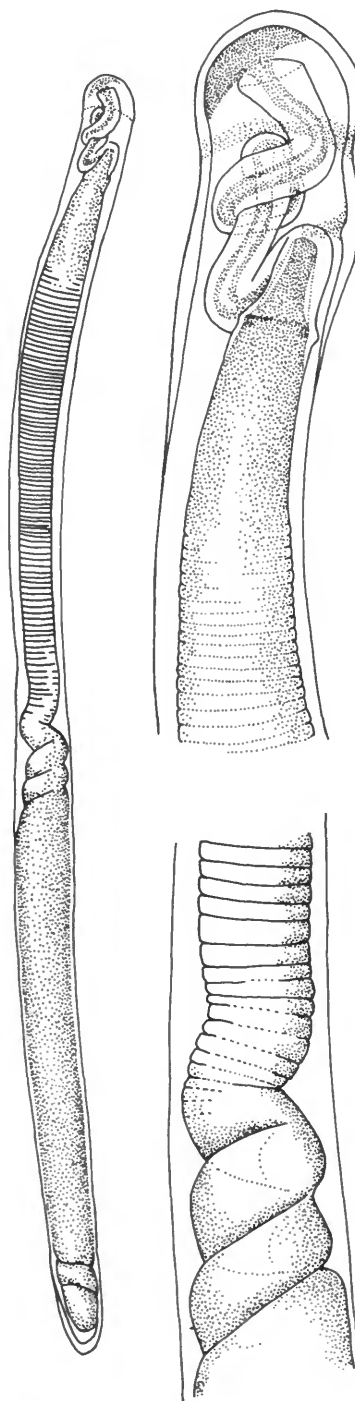


FIGURE 4.—Spermatophore from mature male (Pillsbury 344).

TABLE 1.—List of measurements of *Joubiniteuthis portieri* (Joubin 1912)

Station no.	Pillsbury 344		Dana 1185 XIII		Dana 3978 VI		Silver Bay 3729		Silver Bay 3738		Madeira	
Sex	♂		♂		♂		?		♀		juvenile	
Mantle length	105		89		74		94		70		34	
Tail length	155		122		112		101		83		51	
Mantle width	—		20		19		16		12		6	
Head length	30		22		21		29		22		12	
Head width	—		17		13		17		10		5	
Fin length	—		27		23		26		19		11	
Fin width	—		26		22		24		15		11	
ARMS I	R	L	R	L	R	L	R	L	R	L	R	L
	200	200	172	165	174	190	220	215	—	—	86	100
II	240	220	163	163	200	220	240	—	—	175	135	114
III	240	220	175	183	187	187	230	—	195	—	115	—
IV	70	70	47+	64	53	64	78	75	—	—	31	31
Tentacle length	—		157		—		—		—		90	
Club length	—		40		—		—		—		20	

larly ventrally where only small crenulations occur. The lips are thick and bear many low grooves and folds but lack papillae.

The beaks are illustrated on Figure 2g. The upper beak has a slender, sharply pointed rostrum and a long, triangular hood; the insertion plate of the palatine lamella is long. The rostrum of the lower beak is blunt and triangular; no ridge occurs across the gular lamella.

The radula consists of seven rows of teeth in a transverse series (Figure 2E). The rhachidian tooth has a broad, blunt median cusp and two small, pointed lateral cusps. The first and second lateral teeth have broad, blunt primary cusps that are only slightly smaller than the primary cusp of the rhachidian tooth; small, sharp lateral cusps occur on the first lateral teeth. The third lateral teeth are long, slender, and pointed. Rectangular marginal plaques are present.

Photophores are absent.

The males lack hectocotylization. In the mature male the penis is very large and reaches about the level of the anterior end of the funnel. A spermatophore is illustrated in Figure 4.

The surfaces of the mantle, fins, funnel, head, and arms bear small brown or purplish-brown chromatophores. The oral surface of the brachial crown, and particularly the buccal region, are pigmented with a dull purple color.

LOCATION OF TYPE.—Oceanographic Museum, Monaco? (not verified).

TYPE-LOCALITY.—29°03'N, 16°08'30"W, in the region of the Salvage Islands.

DISTRIBUTION.—The geographic distribution of all known records of *J. portieri* is plotted in Figure 5. All specimens were captured in open nets. The type of *J. portieri* was taken at 0–3500 m; the type of *V. danae* came from an estimated depth of 500 m; the present specimens came from estimated depths that range from 330 m to 2500 m.

Discussion

COMPARISON OF *Joubiniteuthis portieri* AND *Valdemaria danae*.—Joubin's lengthy descriptions of *Joubiniteuthis portieri* (1916, 1924) and *Valdemaria danae* (1931, 1933) give few characters that can be used to separate these forms, and it is difficult to understand why he placed the two species in separate families (his subfamilies). The apparent differences, which Joubin may have considered important, can be easily reconciled. Two distinctive features of *Valdemaria*, the very elongate tail and the peculiar tentacles, were missing in the badly damaged specimen of *Joubiniteuthis portieri*. (The original illustrations of *V. danae* and *J. portieri* are reproduced in Figure 6). Although Joubin described a funnel valve in *V. danae*, he was unable to detect one in *J. portieri*, also undoubtedly due to its deteriorated condition. The lengths of arms I–III differ considerably in the two descriptions. The type of *J. portieri* has arms three to four times longer than the

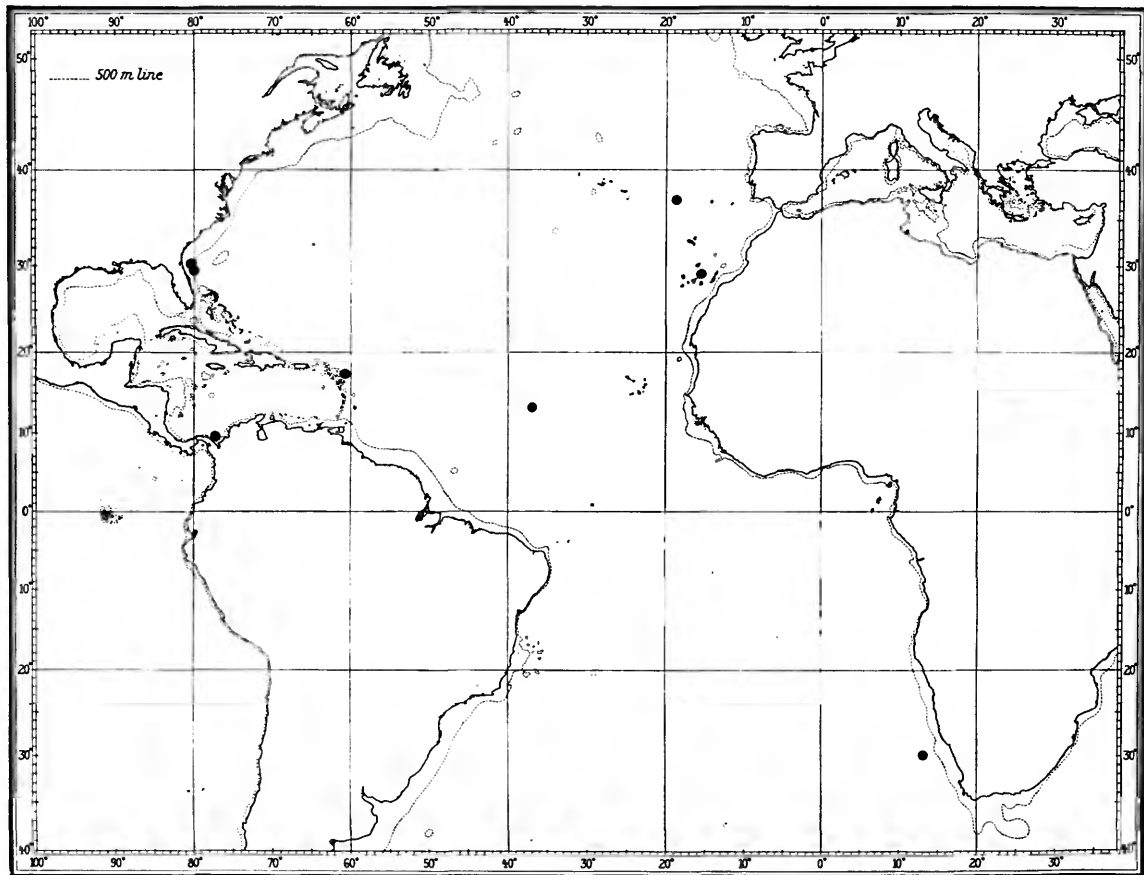


FIGURE 5.—Geographical distribution of *Joubiniteuthis portieri* based on all known records.

length of the mantle, while the type of *V. danae* has arms about two and one-half times the mantle length. The lengths of arms I–III in our specimens show variation from two to nearly four times greater than the length of the mantle, depending on the condition of the specimen. The differences in the lengths of the arms of Joubin's specimens clearly are of no significance. The only remaining difference between the two nominal species concerns the number of rows of suckers on arms IV. *V. danae* is described as having only two rows of suckers on each of these arms with additional, irregularly interspersed suckers (Joubin, 1931). In the subsequent description of *V. danae* (1933), however, Joubin stated that all of the arms except the hectocotylus have four to six rows. Our examination of the same specimen (*Dana* 1185 XIII) shows the ventral arms to have a maximum of four rows of suckers. Joubin

described six rows of suckers in the midportion of the ventral arms of *J. portieri*. Specimens that are not in perfect condition, however, generally have suckers that are very irregularly arranged along the twisted, contracted, serpentine arms, and it is difficult to determine the exact number of rows. Poor condition of the specimen also probably accounts for the discrepancy in the small number of rows of suckers reported at the tips of the arms in *J. portieri*.

We conclude, on the basis of the well-preserved material available and of the type descriptions, that *Valdemaria danae* is synonymous with *Joubiniteuthis portieri*. We have been unable to examine the types.

Joubin (1933) described a peculiar S-shaped hectocotylus in *Valdemaria danae*. We have examined this specimen (*Dana* 1185 XIII) and an illustration of the modified arm appears on Figures 2A, B. The arm is

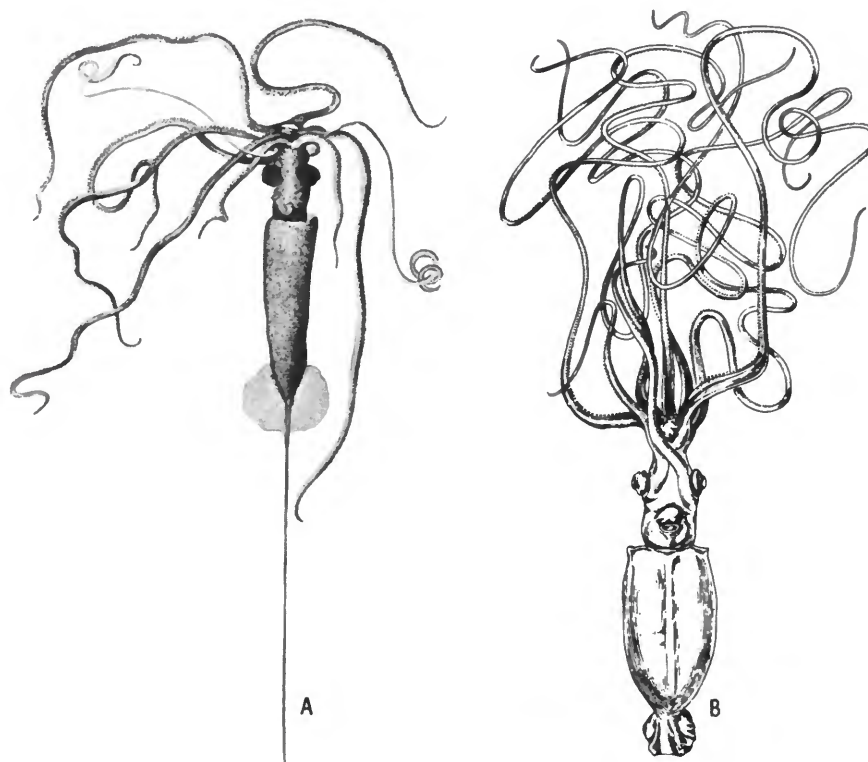


FIGURE 6.—A, *Valdemaria danae* (reproduced from Joubin, 1931). B, *Chiroteuthis portieri* (reproduced from Joubin, 1916).

unusual, and at first we, too, thought that it could represent a form of hectocotylization. When we examined two other male specimens, one of which was sexually mature, and found that no such modification existed, it became apparent that Joubin's specimen had an anomalous arm. Probably the arm was injured while the specimen was living and had begun to heal prior to the capture of the squid.

FAMILIAL RELATIONSHIPS.—The peculiarities of *Joubiniteuthis* clearly confirm that the inclusion of this genus in a separate family is fully warranted. Although the family is distinctive, some evidence for its relationship with other families can be found. Because the buccal connectives attach to the ventral borders of arms IV, the Joubiniteuthidae is aligned with the following families that have the same type of attachment: Onychoteuthidae, Gonatidae, Cycloteuthidae, Thysanoteuthidae, Ctenopterygidae, Octopoteuthidae,

Brachiateuthidae, Lepidoteuthidae, Batoteuthidae, Chiroteuthidae, Mastigoteuthidae, Promachoteuthidae, Grimalditeuthidae, and Cranchiidae.

The presence of a conus formed by the ventral fusion of the lateral edges of the vane occurs in the Joubiniteuthidae, Cycloteuthidae, Brachiateuthidae, Lepidoteuthidae, Batoteuthidae, Mastigoteuthidae, Chiroteuthidae, Grimalditeuthidae, and Cranchiidae. (The Promachoteuthidae, although related to these families, apparently lacks a gladius [Roper and Young, 1968].) The oval funnel locking-cartilage more closely relates the Joubiniteuthidae to the Chiroteuthidae, Mastigoteuthidae, and Promachoteuthidae than to any of the other families. The numerous small suckers in many rows on the tentacular clubs are similar to the condition in the Mastigoteuthidae and Promachoteuthidae. The Joubiniteuthidae probably is most closely related to these two families.

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