Acta Adriat., 31 (1/2): 275—291 (1990)

YU ISSN: 0001-5113
AADRAY

UDC 594 (262.3)
Original scientific paper

THE CEPHALOPOD FAUNA OF THE ADRIATIC

FAUNA CEFALOPODA JADRANSKOG MORA

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The list of the Cephalopods from the Adriatic Sea, which includes 41 species, is reported. References are given to the findings that occurred in the last 15 years; the presence of *Heteroteuthis dispar* and *Neorossia caroli*, cephalopods new to the Adriatic, is also recorded. The overall distribution of the Adriatic teuthofauna and its affinities with the eastern Mediterranean fauna are discussed.

INTRODUCTION

The main purpose of this paper is to update the list of the Cephalopods of the Adriatic Sea made by Gamulin-Brida & Ilijanić (1972). This list, which reports 29 species, was prepared by bringing together information from several sources, i.e. personal observations of the authors, unpublished reports, museum material, and a nearly exhaustive review of the existing literature. However, in the relatively short time elapsed since 1972, the presence in the Adriatic of ten more species of Cephalopods was detected, thanks to the renewed interest in this class of Molluscs by Italian and Yugoslavian workers, and thanks to the exploration of new zones. After 1972 a few partial Cephalopod lists were prepared, but they were restricted either to a limited geographic zone or to a single taxonomic group or to both (Mandić, 1973a; Marano *et al.*, 1982; Bello & Motolese, 1983a; Bello, 1984; Guescini & Manfrin, 1986a). Some comments about the distribution of Adriatic Cephalopods of importance to the fishing industry made by Gamulin-Brida (1981); Mandić (1984) presented comprehensive results about the ecology of the South-East Adriatic teuthofauna. A few other papers reported the occasional findings of one or more species (references are given in the discussion of each species). Major advances in the assessment of the geonemy of the Adriatic Cephalopods came from investigations in the southern part of the Sea.

In addition to the newly found Cephalopods, there were two others, *Sepiola affinis* and *Brachioteuthis riisei*, which were not listed by Gamulin-Brida & Ilijanić (1972), though their occurrence had already been recorded before 1972.

At the present the catalogue of the Adriatic teuthofauna includes 41 species.

DESCRIPTION OF THE ADRIATIC SEA

The Adriatic is one of the geographically best defined basins of the Mediterranean. It extends for about 800 Km from NW to SE, between 40° and 46°N of latitude and between 12° and 20°E of longitude; its width ranges between 90 and 220 Km (Fig. 1).

The depth distribution of the Adriatic is roughly symmetrical about the longitudinal axis, but very uneven from NW to SE, and therefore this sea can be clearly subdivided into two parts separated by the Sill of Palagruža, which runs from the Gargano promontory, to the Tremiti and Palagruža islands and to Lastovo and Mljet islands. The north-western basin is rather shallow and uniform (max. depth = 270 m, in the Jabuka pit), whereas the south-eastern basin is almost entirely occupied by a fairly deep pit, which reaches 1223 m of depth. The Adriatic communicates with the Eastern Mediterranean through the Strait of Otranto, whose sill is 741 m deep (Alfirević, 1981).

A synthetic report of the Adriatic hydrology is given by Zore-Armanda (1981). The conditions of the Adriatic are quite different from those of the Ionian, its neighbouring sea. During the cold part of the year its waters are colder and less salty, because of the discharge in its northern part of the comparatively large rivers Po and Adige; both surface temperature and salinity increase southward. The general circulation, which is governed by a cyclonic gyre, favours water exchange with the Mediterranean through the Strait of Otranto. The NW inflow prevails in the surface and intermediate layers, down to about 400 m in the South Adriatic, while the SE outflow prevails in the bottom layers. During the warm season the water is stratified into three layers. From the surface down to the depth of the thermocline (20—40 m) the temperature increases towards the northern part and causes the SE outflow to prevail, following again a cyclonic gyre. The intermediate layer keeps the same pattern of circulation all year round. The water exchange between the Adriatic and the Mediterranean has been estimated to be 7.8×10^3 Km^3/year, but it seems that this value may vary up to 30-fold in particular years. On the average, according to the above mentioned data, the complete renewal of the water of the Adriatic occurs over a five years period.

As regards the Adriatic faunistic affinities to the remaining Eastern Mediterranean, the existence of both endemic and relict species has been reported. This is due to the physical and/or the ecological isolation of the Adriatic Sea (Canzoneri, 1968; Giordani Soika, 1967). The difference between the Adriatic and the Mediterranean biocenoses are even clearer when the flora is taken into account (Lovrić, 1972). A paramount importance in the differentiation of a peculiar Adriatic fauna-floral complex has to be attributed to the separation of the Adriatic during the last glacial period, Würm, which caused a drastic selection because of the severe drop of salinity and tempe-

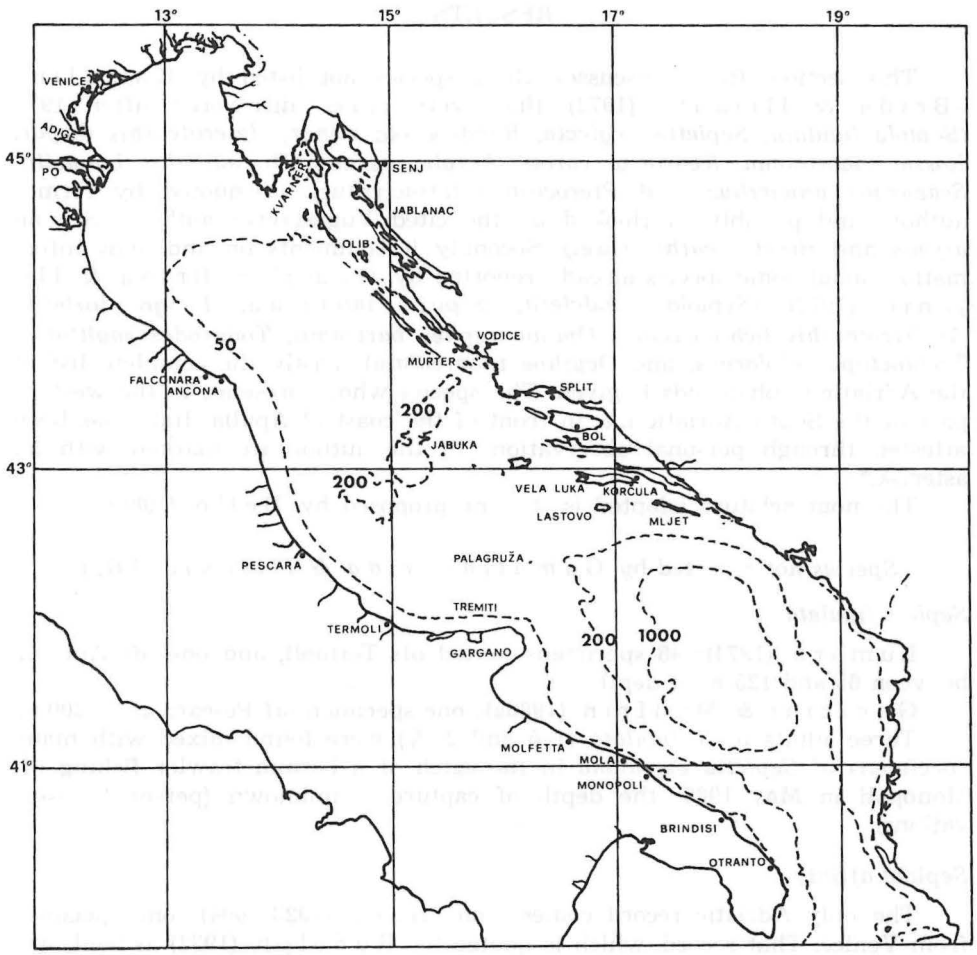

Fig. 1 — Adriatic Sea.

rature (Giordani Soika, 1967). It must be stressed that all the species described as endemic or as relict are benthic, either sessile (the flora component) or littoral and small-sized (the faunal elements) and capable of very limited movement if any at all. They are mostly euryhaline and psychrophilic and are confined to the northernmost part of the Adriatic, which is strongly influenced by the ingression of large amounts of freshwater and by the »bora«, a cold winter wind blowing from NE. On the contrary, on several instances, the application of the »relict species« label both to nektonic and planktonic species has proved to be fallacious (cf. for instance the discussion about and the distribution of the cladoceran *Evadne nordmanni* Lovén reported by Specchi *et al.*, 1974).

The affinities between the Adriatic teuthofauna and that of the adjacent seas have never been discussed.

RESULTS

This section firstly discusses those species not listed by Gamulin-Brida & Ilijanić (1972) that were either discovered after 1972 (*Sepiola ligulata, Sepietta neglecta, Rondeletiola minor, Heteroteuthis dispar, Rossia macrosoma, Neorossia caroli, Abralia verany, Histioteuthis bonnellii, Scaeurgus unicirrhus,* and *Pteroctopus tetracirrhus),* or quoted by former authors and possibly overlooked by the cited Yugoslavian authors *(Sepiola affinis* and *Brachioteuthis riisei).* Secondly it comments on and adds information about some species already reported by Gamulin-Brida & Ilijanić (1972) *(Sepiola rondeletii, Sepiola intermedia, Loligo forbesii, Ancistroteuthis lichtensteinii, Ommastrephes bartramii, Todarodes sagittatus, Tremoctopus violaceus,* and *Ocythoe tuberculata).* Lastly the complete list of the Adriatic Cephalopods is given. The species whose presence in the western part of the South Adriatic i. e. in front of the coast of Apulia, Italy, has been attested through personal observations of the author are marked with an asterisk.*

The nomenclature adopted is the one proposed by Bello (1986).

Species not reported by Gamulin-Brida & Ilijanić (1972)

Sepiola ligulata

Lumare (1974): 48 specimens netted off Termoli, and one off Ancona, between 65 and 125 m of depth.

Guescini & Manfrin (1986a): one specimen off Pescara at — 200 m.

Three adults of *S. ligulata* (1 ♂ and 2 ♀♀) were found mixed with many specimens of *Sepietta oweniana* in the catch of a bottom trawler fishing off Monopoli in May 1983; the depth of capture is unknown (personal observations).

Sepiola affinis

The only Adriatic record comes from Naef (1923: 604): one specimen from Venice. That record, which is quoted by Rudolph (1932) as well, was probably overlooked by Gamulin-Brida & Ilijanić (1972).

Sepietta neglecta

Bello & Motolese (1983a): one sexually mature male caught between 30 and 50 m of depth off Molfetta.

Guescini & Manfrin (1986a): several specimens from the North and Central Adriatic.

Rondeletiola minor

Lumare (1974): one male caught at — 90 m, off Termoli.

Bello & Motolese (1983a) and Bello (1984) collected many specimens on several occasions from the catch of trawlers fishing off Mola di Bari on bottoms exceeding a depth of 150 m.

Guescini & Manfrin (1986a) recorded its presence in the central part of the Adriatic: six specimens netted at 150—200 m of depth.

Heteroteuthis dispar

First record for the Adriatic.

Several specimens were recovered from the stomach content of *Etmopterus spinax* (L.) (Selachii, Squalidae), *Scyliorhinus canicula* (L.) and *Galeus melastomus* Raf. (Selachii, Scyliorhinidae) netted on the bottom, around the South Adriatic Pit, at depths between 150 and 630 m, in May 1985.[1] Other remains were found in the stomach of swordfish, *Xiphias gladius* L. (Osteichtyes, Xiphiidae), caught by drifting long-line in July 1984, 45 nautical miles off Mola di Bari.

The following diagnostic elements, after Naef (1923), were taken into account: lack of fusion between mantle and head, typical chromatophore arrangement on ventral side of the mantle (large chromatophore surrounded by smaller ones), very large lens-shaped light organ inside the mantle cavity, typical mandibules, large arm suckers in mature males.

The resuls are summarized in Table 1 and Fig. 2.

H. dispar is a pelagic sepiolid distributed in the whole Mediterranean (Rudolph, 1932).

Rossia macrosoma

Mandić (1973a and 1973b): several specimens in the South Adriatic Sea, between 200 and 500 m of depth.

Gamulin-Brida *et al.* (1977); Mandić & Stjepčević (1977); Jardas (1979); Bello & Motolese (1983b); Bello (1984); Mandić (1984); Guescini & Manfrin (1986a).

This cephalopod is distributed in a band around the South Adriatic Pit and in the Jabuka Pit, at depths ranging from 100 to 500 m.

Neorossia caroli

A species new to the Adriatic Sea.

Several specimens were caught at about 450 and 630 m of depth off the coast of Apulia (South Adriatic), in May and October 1985, within the »Demersal Resources Assessment« program: 13 individuals in spring (1 at station 22; 12 at sta. 42) and 4 in autumn (1 at sta. 22; 3 at sta. 42) (Fig. 2).

Its occurrence has already been reported with no further comment by Bello *et al.* (1988).

Elements of diagnosis: large head, rounded posterior end of mantle, two rows of suckers on all arms, chromatophores on the funnel (Mangold-Wirz, 1963b); absence of a functional ink sac (Boletzky, 1971).

According to Mangold & Boletzky (1987) *N. caroli* is distributed in the Western and the Eastern Mediterranean, between 300 and 800 m of depth. Its distribution in the South Adriatic is limited to the South Adriatic Pit.

Abralia veranyi

Guescini & Manfrin (1986b); two female individuals captured off Termoli, on the bottom at — 250 m, during daytime in June 1984.

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[1] within the »Dmersal Resources Assessment« program (cf. Bello *et al.*, 1988).

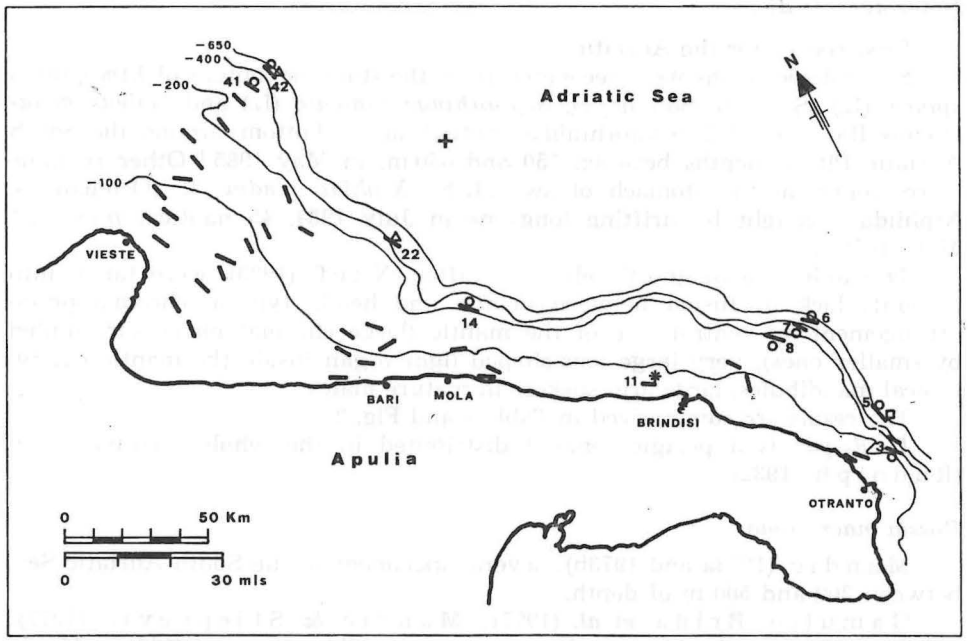

Fig. 2 — Sites of occurrence of *Sepiola robusta* (*), *Heteroteuthis dispar* (+ = in swordfish stomach, o = in selachian stomach), *Neorossia caroli* (△), and *Histioteuthis reversa* (□). Only positive stations are numbered.

Histioteuthis bonnellii

A species new to the Adriatic.

An adult specimen was found in the gastric content of a swordfish, *X. gladius*, caught in the South Adriatic in July 1990 (Bello, in preparation).

Brachioteuthis riisei

The occurrence of this species in the Adriatic is indirectly asserted by Naef (1923: 348): »I have also a few specimens from the Adriatic which will be mentioned elsewhere«.

Scaeurgus unicirrhus

Mandić (1973a): in the South Adriatic Sea at depths between 200 and 400 m.

Gamulin-Brida *et al.* (1977): in the South Adriatic at — 300 m. Mandić (1984): in the South Adriatic between 200 and 400 m of depth.

This octopus has also been netted by trawlers from Apulian harbours when fishing on bottoms deeper than 100 m; usually very few individuals are caught, which are associated with *Eledone cirrhosa* (own observations).

The presence of *S. unicirrhus* seems to be limited to the Southern Adriatic.

Table 1 — Remains of *Heteroteuthis dispar* in the stomach content of selachians *(Etmopterus spinax, Scyliorhinus canicula,* and *Galeus melastomus)* and swordfish *(Xiphias gladius)* caught in the South Adriatic. The location of the capture stations is reported in Fig. 2.

Digestion stage (DS): 1 = early; 2 = advanced; 3 = very advanced. TL = total body length of selachians. FL = fork length of swordfish. ML = mantle length of *H. dispar* (mm).

Predator species	Sta.	Depth (m)	TL (cm)	*Heteroteuthis dispar* remains
E. spinax	3	156	16	1 pair of beaks
	5	554	11	1 unpaired beak
S. canicula	7	319	45	1 individual (DS = 2)
	14	169	21	1 unpaired beak
	„	„	22	1 individual (DS = 3)
	41	365	46	1 female, ML = 14 (DS = 1)
G. melastomus	5	554	31	1 unpaired beak
	„	„	43	2 pairs of beaks
	6	549	42	1 unpaired + 2 paired beaks
	„	„	50	1 unpaired beak
	7	319	43	2 individuals (DS = 2)
	„	„	50	1 individual (DS = 3)
	8	178	51	1 juvenile (DS = 2)
	42	630	25	1 individual (DS = 2)
	„	„	26	1 juvenile, ML = 5 (DS = 2)
	„	„	28	1 female, ML = 20 (DS = 2)
	„	„	29	1 individual (DS = 3)
	„	„	30	1 individual, ML = 15 (DS = 1)
	„	„	30	1 par of beaks
	„	„	32	2 unpaired beaks
	„	„	33	1 individual (DS = 2)
	„	„	33	2 pairs of beaks
	„	„	33	1 male, ML = 23 (DS = 1)
	„	„	33	1 individual (DS = 2)
	„	„	36	1 individual (DS = 2)
	„	„	37	1 unpaired beak
	„	„	37	1 male, ML = 24 (DS = 1)
	„	„	37	1 juvenile (DS — 1)
	„	„	38	1 pair of beaks
	„	„	39	1 unpaired beak
	„	„	42	1 individual (DS = 2)
	„	„	45	1 pair of beaks
	„	„	46	1 unpaired beak
	„	„	48	1 individual (DS = 3)
	„	„	50	1 male, ML = 19 (DS = 1)
	„	„	51	2 unpaired beaks
X. gladius	FL = 80 cm			7 lower and 8 upper beaks
	FL = 110 cm			1 lower and 2 upper beaks
	FL = 170 cm			4 lower and 3 upper beaks

Pteroctopus tetracirrhus

Gamulin-Brida *et al.* (1977) and Mandić & Stjepčević (1977): in the South Adriatic at 200—400 m of depth.

Mandić (1984): same area and depth.

Four adult specimens (3 ôô and 1 ♀), which were fished off Mola at — 200 m, were acquired by the author. Normally the octopuses of this non-commercial species are thrown overboard soon after they are hauled in, and thus do not reach the fish market, therefore they appear rarer than they really are.

Comments about and additions to some species reported by

Gamulin-Brida & Ilijanić (1972)

Sepiola rondeletii

It is desirable not to take account of the Adriatic findings recorded prior to the publication of Naef's papers on Sepiolidae (1912a, 1912b, 1916) that described several new species, because the undescribed species were mostly and erroneously assigned to *S. rondeletii*. Unfortunately subsequent records of improbable distributions of this sepiolid, together with the ostensible absence of other *Sepiola* species, makes one suspect that the habit of lumping under the name *rondeletii* all *Sepiola species* species (and even sepiolids of other genera!) has remained alive till recent times. In fact, according to Mangold-Wirz (1963a) *S. rondeletii* is strictly infralittoral: it was never netted beyond — 35 m in the Catalonian Sea and beyond — 20 m in the North Adriatic. In the South Adriatic all the specimens observed by the author (Bello, 1983/84 and subsequent observations) were collected on rather shallow bottoms, at depths from a few decimeters to about 30 m. However Orsi Relini & Bertuletti (1989) netted in the Ligurian Sea some young females (ML from 13 to 15 mm) at slightly greater depths, down to at least — 50 m, whilst two immature females (ML = 19 and 24 mm) were collected at — 190 m by Guerra (1982) outside the Mediterranean, in the Gulf of Cadiz. Hence Orsi Relini & Bertuletti (*op. cit.*) suggest that »a greater dispersal of young may be supposed«.

Sepiola intermedia

The only Adriatic record quoted by Gamulin-Brida & Ilijanić (1972) is that of Rudolph (1932).[2]

Afterwards the occurrence of the species was recorded by Bello (1984) in the South Adriatic, at — 60 m, and by Guescini & Manfrin (1986a) in the North Central Adriatic.

Sepiola robusta

The occurrence of a few specimens in the North Central Adriatic was recently recorded by Guescini & Manfrin (1986a). One individual was found by the author in the South Adriatic, off Brindisi at — 80 m, in November 1986.

The only previous Adriatic records were by Rudolph (1932).

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[2] Actually the Yugoslavian authors cite also »Wirz (1958)« and »Torchio (1968)«, but those two papers simply refer to the work by Rudolph.

Loligo forbesii

The author collected on one occasion in August 1985, several adult specimens of this rarely caught squid. They had been netted on a bottom 220 m deep, off Mola di Bari.

Ancistroteuthis lichtensteinii

Only one specimen from the Adriatic, which is kept at the National Croatian Museum of Zoology of Zagreb, is known; the precise locality where it was found is unknown (Gamulin-Brida & Ilijanić, 1965).

The author recovered 10 upper and 8 lower mandibules of *A. lichtensteinii* from the stomach content of a swordfish (fork length = 80 cm) caught in the South Adriatic. The beaks were identified after Naef (1923) and by comparison with beaks removed from whole specimens of the same species and of the closely related *Onychoteuthis banksii;* they were also compared with the illustration of the lower beak of *O. banksii* reported by Clarke (1986).

Histioteuthis reversa

A pair of mandibules of this species were recovered from the stomach content of a specimen of *Galeus melastomus* collected in May 1985 at a station of coordinates 40°20'N 18°40'E, about 14 miles NE of Otranto, at 550 m of depth(Fig. 2). The identification was made after Voss (1969) and Clarke (1986), and by comparison with mandibules removed from whole specimens of the same species.

The only previous Adriatic finding was recorded by Naef (1923).

Ommastrephes bartramii

In addition to an old find of this rare ommastrephid, which occurred in 1910 near the village of Vodice (Gamulin-Brida & Ilijanić, 1965) there is a recent record by Guescini & Manfrin (1986b) of the capture of a female of this species (ML = 56 cm) netted by midwater trawl, 20 mls off Falconara, in March 1986; the authors report it as »*Ommastrephes caroli* (Furtado, 1887)«, which name is considered to be a synonym of *O. bartramii* (Lesueur, 1821) (cf. Bello, 1986).

In the South Adriatic a few individuals have been caught by drifting long-line for swordfish since the mid '70s, when this fishery started (own observations).

Todarodes sagittatus

This squid, which was said to be rare in the Adriatic (Gamulin-Brida & Ilijanić, 1972), is on the contrary comparatively common (cf. Mandić, 1973a and 1984; Bello, 1985).

Tremoctopus violaceus

The most recent reference quoted by Gamulin-Brida & Ilijanić (1972) is »Carus (1890)«.

The presence of this species was subsequently detected again, as referred by Lane (1974): »In 1936 ... blanket octopuses (*Tremoctopus violaceus*) appeared in huge number for a few days in the Northern Adriatic Sea«.

Ocythoe tuberculata

Gamulin-Brida & Ilijanić (1972) give only two references to findings that occurred in the last century. In addition to them the captures of several specimens near the following Yugoslavian localities have been recorded: Bol (island of Brač) (1889), Split (1890 and 1904), Senj (1909), Jablanac (1913), Korčula (1930), Murter (1950), Olib (1950), Kvarner Bay (1960 and 1964), and Vela Luka (Korčula island) (June 12th 1979); the last individual, the one from Vela Luka, as reported and photographed by the local newspapers, was a female of TL = 36 cm and 1.65 Kg (Dr. Tamara Vučetić, *in litteris*).

A list of the Cephalopods of the Adriatic

An asterisk (*) marks the species recorded by the author in the South Adriatic.

Order SEPIOIDEA

Family SEPIIDAE

* *Sepia officinalis* Linnaeus, 1758
* *Sepia orbignyana* Férussac, 1826
* *Sepia elegans* Blainville, 1827

Family SEPIOLIDAE

* *Sepiola rondeletii* Leach, 1817
* *Sepiola streenstrupiana* Levy, 1912
* *Sepiola intermedia* Naef, 1912
* *Sepiola ligulata* Naef, 1912
* *Sepiola robusta* Naef, 1912
* *Sepiola affinis* Naef, 1912
* *Sepietta oweniana* (Orbigny, 1840)
* *Sepietta neglecta* Naef, 1912
* *Sepietta oweniana* (Orbiony, 1840)
* *Sepietta neglecta* Naef, 1916
* *Sepietta obscura* Naef, 1916
* *Rondeletiola minor* (Naef, 1912)
* *Heteroteuthis dispar* (Rüppell, 1844)
* *Rossia macrosoma* (Delle Chiaje, 1830)
* *Neorossia caroli* (Joubin, 1902)

Order TEUTHOIDEA

Family LOLIGINIDAE

* *Loligo vulgaris* Lamarck, 1798
* *Logio forbesii* Steenstrup, 1856
* *Alloteuthis media* (Linnaeus, 1758)
Alloteuthis subulata (Lamarck, 1798)

Family ENOPLOTEUTHIADE

Abralia verany (Rüppell, 1844)

Family ONYCHOTEUTHIDAE

Onychoteuthis banksii (Leach, 1817)
* *Ancistroteuthis lichtensteinii* (Férussac, 1848)

Family HISTIOTEUTHIDAE

* *Histioteuthis bonnellii* (Férussac, 1835)

* *Histioteuthis reversa* (Verrill, 1880)

Family BRACHIOTEUTHIDAE

Brachioteuthis riisei (Steenstrup, 1882)

Family OMMASTREPHIDAE

* *Ommastrephes bartramii* (Lesueur, 1821)
* *Illex coindetii* (Vérany, 1839)
* *Todaropsis eblanae* (Ball, 1841)
* *Todarodes sagittatus* (Lamarck, 1798)

Family CHIROTEUTHIDAE

Chiroteuthis veranyi (Férussac, 1835)

Order OCTOPODA

Family OCTOPODIDAE

* *Octopus vulgaris* Cuvier, 1797
* *Octopus macropus* Risso, 1826
* *Octopus salutii* Verany, 1839
* *Scaeurgus unicirrhus* (Delle Chiaje, 1840)
* *Pteroctopus tetracirrhus* (Delle Chiaje, 1830)
* *Eledone moschata* (Lamarck, 1798)
* *Eledone cirrhosa* (Lamarck, 1798)

Family TREMOCTOPODIDAE

* *Tremoctopus violaceus* Delle Chiaje, 1830

Family OCYTHOIDAE

* *Ocythoe tuberculata* Rafinesque, 1814

Family ARGONAUTIDAE

* *Argonauta argo* Linnaeus, 1758

GENERAL REMARKS

The Cephalopod distribution within the Adriatic is not uniform. A few deep-living species, viz. *Heteroteuthis dispar, Neorossia caroli, Todarodes sagittatus, Pteroctopus tetracirrhus* and possibly *Loligo forbesii, Ancistroteuthis lichtensteinii,* and *Scaeurgus unicirrhus,* are limited to the deep southern part of the Sea. Some other species are much more abundant in the south than in the north, *Eledone cirrhosa* and *Octopus salutii* for instance. Te distribution of the pelagic octopod *Ocythoe tuberculata* seems to be confined to the north-

-eastern side of the Adriatic, i. e. along the Albanian and Yugoslavian coasts, which can be related to the Adriatic gyre that follows a counter-clockwise pattern. A quite large number of species have been collected so rarely that no reasonable conclusion about their distribution can be drawn; they are *Sepiola steenstrupiana, Sepiola robusta, Sepiola affinis, Sepietta neglecta, Alloteuthis subulata, Abralia verany, Onychoteuthis banksii, Ancistroteuthis lichtensteinii, Histioteuthis bonnelli, Histioteuthis reversa, Brachioteuthis riisei, Ommastrephes bartramii, Chiroteuthis veranyi,* and *Tremoctopus violaceus.*

On the whole the southern teuthofaunal assemblage is more diverse than that of the NW basin and it can be assumed that it has closer affinities to the Ionian teuthofauna (see the discussion hereafter); on the other hand there is no evidence of any isolated population of any cephalopod species whatever in the North Adriatic.

Table 2 — Gross composition of the Adriatic and the Mediterranean teuthofauna.

	Sepioidea	Teuthoidea	Octopoda	Total
Species reported by Gamulin-Brida & Ilijanić (1972)	9	12	8	29
Species recorded by Naef (1923) (not reported by Gamulin-Brida & Ilijanić, 1972)	1	1	—	2
Species recorded after 1972	6	2	2	10
Adriatic species (present work)	16	15	10	41
Mediterranean species (after Bello, 1986)	18	27	13	58

The comparison between the Adriatic Cephalopod fauna and that of the whole Mediterranean (Table 2), shows slight differences for the orders Sepioidea and Octopoda, and a fairly large discrepancy for the order Teuthoidea. The two Mediterranean sepioids missing in the Adriatic, namely *Heteroteuthis atlantis* G. L. Voss, 1955 (a pelagic species) and *Sepiola aurantiaca* Jatta, 1896, have been very seldom recorded in the Mediterranean. Of the three octopods missing, *Opisthoteuthis agassizii* Verrill, 1883, a bathybenthic species, seems not to have passed the sill of the Straits of Sicily to enter the Eastern Mediterranean; *Octopus defilippi* Véran y, 1851, was rarely collected in the Eastern basin, both during its pelagic larval stages named »*Macrotritopus*« Degner, 1925; p. 79, fig. 52: »*Scaeurgus* spec. juv.«) and as an adult (Adam, 1967)[3]; whereas the third one, *Bathypolypus sponsalis* (P. & H. Fischer, 1892), is much more abundant than the other two octopods and was recorded in the North Ionian Sea as well (Mangold & Boletzky, 1987). The Mediterranean teuthoids not found so far in the Adriatic number about 13; it would take too long and would be beyond the purpose of this paper to discuss their absence species by species. On the whole the missing oegopsid squids

[3] The ostensible presence of *O. defilippi* in the Adriatic reported by Mangold & Boletzky (1987, 1988) is clearly based on an erroneous information (Dr. Sigurd von Boletzky personal communication).

are almost all strictly pelagic[4] and their supposed »absence« can be largely ascribed to the lack of proper investigations.

Among the cephalopods missing from the Adriatic there are some whose presence has been recorded in the Eastern Mediterranean, either in the Gulf of Taranto, such as *Abraliopsis morrisii* (V e r a n y, 1839) (cf. B e l l o, 1987) or in the Levant Basin, viz. *Ctenopteryx sicula* (V e r a n y, 1851) *Pyroteuthis margaritifera* (R ü p p e l l, 1844), *Octopoteuthis sicula* (R ü p p e l l, 1844), and *Galiteuthis armata* J o u b i n, 1898 (= *Taonidium pfefferi)* (cf. R u b y & K n u d s e n, 1972). All those species are plagic ones! On the contrary the Adriatic is much richer in sepioids, which are mostly benthic: 16 species vs. 9 in the Gulf of Taranto (B e l l o, 1987) and 11 in the Levant Basin (K n u d s e n, 1981).

K n u d s e n (1981) suggests that »The Adriatic is rather isolated from the remaining Mediterranean and this may explain the low number of oceanic species«. I do not fully agree with this statement. As already mentioned in the introduction, the Adriatic basin receives a large inflow of Mediterranean water, prevailingly in the surface and intermediate layers, down to at least 400 m of depth, and this flow can occasionally undergo a several-fold increase.[5] Therefore it is reasonable to think that between the surface and depths of at least 400 m there is no barrier to stop pelagic cephalopods from entering the Adriatic. Besides, the uniformity of temperature in wintertime in the South Adriatic along the whole water column down to the bottom (Z o r e - A r m a n d a, 1981) should favour the displacement of pelagic cephalopods from one depth-zone to the other, and in turn further favour their passage through the Otranto Strait since, as pointed out by V o s s (1968), the vertical distribution of cephalopods depends more on temperature that on »meters of depth«.[6] In addition M a n d i ć (1984) found that temperature is a very important factor in determining the distribution and diplacement of South Adriatic cephalopods. To sum up, only very few strictly bathypelagic species may not be able to enter the Adriatic. Therefore, in my opinion, the above mentioned differences between the Adriatic and its adjacent seas are at least in part artificial and are due to the uneven investigations in the Eastern Mediterraean basin. The Adriatic teuthofauna has been surveyed in recent times almost exclusively by bottom trawl sampling, which explains the occurrence of a large number of benthic species, whilst in the Levant Basin prevailed the historical Mediterranean expeditions (among which the »Thor« expedition is outstanding; its teuthological results were reported by D e g n e r, 1925), which sampled largely in the water column.

Lastly the recent finding in the Adriatic of two more oceanic squids, *Abralia verany* and *Histioteuthis bonnellii,* and of the pelagic sepiolid *Heteroteuthis dispar* (cfr. results) is further evidence of the incompleteness of the cephalopod list, especially as regards the pelagic component.

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[4] Information about the Mediterraean teuthoids that have some contact with the sea-bottom is reported by M a n g o l d - W i r z (1963a).

[5] Incidentally, the occurrence of »Adriatic ingressions«, intensive impact of the Mediterranean upon the Adriatic (Z o r e - A r m a n d a, 1981) may explain some rare events, such as the appearance in 1936 of large schools of *Tremoctopus violaceus* in the North Adriatic, as reported by L a n e (1974).

[6] In fact in the Mediterranean, because of the high temperature of its botom water, there is no true abyssal cephalopod (M a n g o l d - W i r z, 1973).

In conclusion it can be stated that the knowledge of the Adriatic teuthofauna is still incomplete and uneven, in spite of the recent increase in interest and thus investigations for this class of Molluscs; in fact the increased interest has by itself pointed out the patchiness of our knowledge. Therefore further studies are needed to better define the composition of the cephalopod fauna of the Adriatic Sea, especially of its pelagic fraction by midwater sampling. The benthic cephalopods, which include several species that play an important role in demersal fisheries, have to be further studied in order to better understand their reproductive biology, their seasonal movements and their distribution in relation to the type of bottom. As shown by a series of papers (see for instance C a d d y, 1983), the decline of finfish fisheries in several parts of the world (and the Adriatic is no exception) can be at least in part compensated for by a controlled exploitation of cephalopod populations. This is one more reason to make sustained investigative efforts on cephalopods.

ACKNOWLEDGEMENTS

It is a pleasure to thank Dr. M. Zore-Armanda (Split, Yugoslavia) for reading and commenting on the parts of the paper dealing with hydrology, Dr. T. Vučetić (Split) for the information about the findings of *Ocythoe tuberculata,* and Dr. S. v. Boltezky (Banylus-sur-Mer, France) for critically reading the manususcript.

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Accepted: September 8, 1989

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The cephalopod fauna of the Adriatic
Acta Adriat., 31 (1/2): 275—291

FAUNA CEFALOPODA JADRANSKG MORA

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KRATKI SADRŽAJ

Za proteklih 15 godina otkada je objavljen popis cefalopoda Jadranskog mora (Gamulin-Brida i Ilijanić, 1972), pojava nekolicine novih vrsta zabilježena je u literaturi koje se bavi ovim predmetom: *Sepiola ligulata, Sepietta neglecta, Rondeletiola minor, Rossia macrosoma, Abralia verany, Scaeurgus unicirrhus i Pteroctopus tetracirrhus.* Zabilježene su i dvije nove vrste Sepiolida i jedna Teuthoidna vrsta za Jadran, *Heteroteuthis dispar, Neorossia caroli* i *Histioteuthis bonnellii.* Osim novih vrsta cafalopoda u popis treba unijeti vrste *Sepiola affinis* i *Brachioteuthis riisei* čije prisustvo u Jadranu Gamulin-Brida i Ilijanić (1972) nisu zabilježili unatoč činjenici da je o njenom prisustvu u ovom moru pisao Naef (1923)

Donose se i neke zabilješke o slijedećim vrstama: *Sepiola rondeletii, Sepiola intermedia, Loligo forbesii, Ancistroteuthis lichensteinii, Ommastrephes bartramii, Todarodes sagittatus, Tremoctopus violaceus* i *Ocythoe tuberculata.*

Cjelovita lista cefalopoda Jadranskog mora koja sadrži 41 posebnu cjelinu je također priložena.

Kod ukupne rasprostranjenosti i sklonosti jadranskih cefalopoda,, razlikujemo dva područja, sjeverozapadno i jugoistočno područje Jadrana. Prvo područje koje pokriva plići dio jadranskog bazena odlikuje se siromaštvom teutofaune. Drugo, mnogo dublje područje, odlukuje se, međutim, većom raznolikošću faune cefalopoda koja, izgleda, nalikuje više onoj iz istočnog Sredozemlja. To što neke oceanske vrste teutoida nisu zabilježene u Jadranu vjerojatno je posljedica nedovoljne istraženosti ovog područja.