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A contribution to the study of biological and ecological characteristics of the catfish (*Scyliorhinus stellaris* L., 1758)

Prilog poznavanju biologije mačke mrkulje (*Scyliorhinus stellaris* L., 1758)

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INTRODUCTION

The catfish *Scyliorhinus stellaris* (Linaeus, 1758) is an Atlantic — Mediterranean species found throughout the Adriatic Sea. It belongs to the family *Scyliorhinidae* as well as two other species: *Scyliorhinus canicula* (Linnaeus, 1758) and *Galeus melastomus* (Rafinesque, 1810) recorded from the Adriatic Sea (Jardas, 1979).

Previous researches on *Scyliorhinus stellaris* were concerned with its distribution in the Adriatic and Mediterranean and some biological and ecological characteristics.

Syrski (1876) considers that they spawn in winter.

Graeffe (1888) asserts that the eggs are deposited in the Bay of Trieste in the months of February and March.

Garstang (1893—95) states that in the area of Plymouth spawning takes place in November, December and January.

Lo Bianco (1909) supplies data on the species *Scyliorhinus stellaris* in the Bay of Neaples, where this fish spawn all year through, very intensively in winter and less so in the autumn.

Ford (1921) is of the opinion that the spawning season for this species does not cover the entire year. He indicates this on the basis of the analysis

of embryo of 20 eggs at Plymouth. Dimensions of newly hatched larvae were 10 to 18 cm.

Šoljan (1948) gives a morphological description of this species in a key for determining the Adriatic fishes.

Maschlanka (1955) in the Bay of Neaples finds developed gonads in fully grown individuals of *Scyliorhinus stellaris* of 70 cm length — the range of length for both sexes in 16—76 cm.

Most information on the species *Scyliorhinus stellaris* in the Adriatic Sea is given by Županović (1961a, 1961b). In the channel areas of the middle Adriatic the maximum length for both sexes was 85 cm with amplitudinal variance of 15—85 mm. The population is to a considerable extent dominated by females in autumn months, and slightly less in February. The same author finds females of the species with developed eggs at the minimum length of 65 cm (Mali Ston Bay) and confidently concludes that in the channel regions of the middle Adriatic, the species reaches sexual maturity at the length of 67—70 cm. Spawning takes place in two seasons: winter and summer. This species is mainly distributed where *Scyliorhinus canicula* is infrequent, and the substratum of the sea bed appears to have an important role in its distribution — it prefers sandy beds.

Bini (1967) gives more information on *Scyliorhinus stellaris*. It reproduces throughout the year, with peaks in winter and summer. It is an oviparous organism with internalfertilisation. Eggs are deposited two at a time, and hang from the branches of gorgonia. The dimension of the eggs is 9.5 cm in length and 3.5 cm width. Incubation lasts 9 months. This species feeds on small fish, crabs, shellfish and cephalopodes, and can go without food for up to four months, after which it can resume feeding normally. It is much larger than the small spotted dogfish, and distributed from the eastern Atlantic to Angola. It is also found in the Mediterranean all along the Italian coast, but not in the Black Sea. The meat is more tasty than that of the small spotted dogfish, but the liver is poisonous. It lives in circalittoral and bathyal zones, and prefers sandy or rocky bottoms with clear water.

Capapé (1977) recorded in Tunis the specimens of mature catfish of the length of 77 cm for the males and 79 cm for females, along the coast of Tunisia. One female produces a maximum of 100 eggs. Egg production lasts the entire year, with increased activity in spring and summer. The population consists of slightly more females than males.

Jardas (1979) gives information that *Scyliorhinus stellaris* is found in the Adriatic in shallower waters up to a depth of 60 m.

Grubišić (1982) reports its presence throughout the Adriatic, but not deeper than 200 m, most frequently between the depths of 40 and 100 m. It is not selective as to the types of sea bed, and is most frequently found along the shoreline, penetrating even the most enclosed waters. It grows up to 1.20 m. Skin and liver can be used.

Tutman (personal communication) states that ten large catfish, which were in the Dubrovnik Aquarim for several years deposited a total of 30 eggs from April 20 to May 13, 1965. The largest quantity of eggs was deposited between May 8 and 10. On February 21, 1966 one egg was deposited. In the autumn of the same year (unfortunately the date was not recorded) one egg

was placed in a small laboratory tank, where hatching took place on October 19, 1966. The larva emerged with a large yolk sack. On November 30 typical pigmentation of the young catfish appeared, but the sack had not decreased at all in size. By December 3 the sack was almost totally absorbed. The author gave the catfish a small smelt, which it immediately swallowed. On December 5 however it was wholly regurgitated. The second feeding resulted in the same reaction. On December 9, 1966 the young catfish died as it was unable to digest food.

Our research was undertaken since the data on the biological-ecological and morphological characteristics of the species *Scyliorhinus stellaris* is rather limited and even less is available on its rearing.

MATERIALS AND METHODS

During the winter of 1984 (February 27) twenty two egg capsules of the *Scyliorhinus stellaris* were collected from the southern Adriatic, in the area of the island of Lokrum. The eggs were transported to the laboratory where they were kept in a tank with a very light, constant flow of sea water. During transport, to larvae hatched. Conditions in the tank ere relatively stable. The pool bed consisted of washed sand of various conglomerations. The first day the water temperature was 13°C. It was subsequently increased to 16°C. During hatching the salinity varied from 35.6‰ to 38.8‰. The newly hatched catfish were each weighed and measured, as all the eggs. The determination was made according to the key »Ribe Jadrana« (Šoljan 1948) and »Atlante dei pesci delle coste Italiane, Leptocardi, Ciclostomi, Selachi« (Bini, 1967).

A few days after hatching we began feeding, using a meat mixture of cephalopods (squid or octopus), horse mackerel and various nonplanktonic crabs.

RESULTS OF RESEARCH IN EXPERIMENTAL BREEDING

The mean weight of the collected egg capsules was 32.50 g length 9.10 cm width and diameter 1.79 cm (Fig. 1). Our statistics on length and width are to a certain degree in agreement with the results of Bini (1967).

Twenty catfish were successfully hatched in the tank in an interval of from one to sixty days. At this point it is necessary to note that we do not known the time of egg deposition in the sea. The mean weight of empty capsules, after hatching was 8.50 g. The mean weight of newly hatched catfish was 13.06 g. and mean length 14.58 cm (Table 1).

All hatched individuals had closed eyes. The eyes opened after four to ten days, which we assume was due to the temperature of the pool water. With the increase of water temperature, the time required for the eyes to open was shortened.

The proportion of sexes we found was 60‰ males to 40‰ females, i. e. in absolute values 12 males and 18 females. Županović (1961) finds a larger proportion of females in the channel area of the middle Adriatic, i. e.

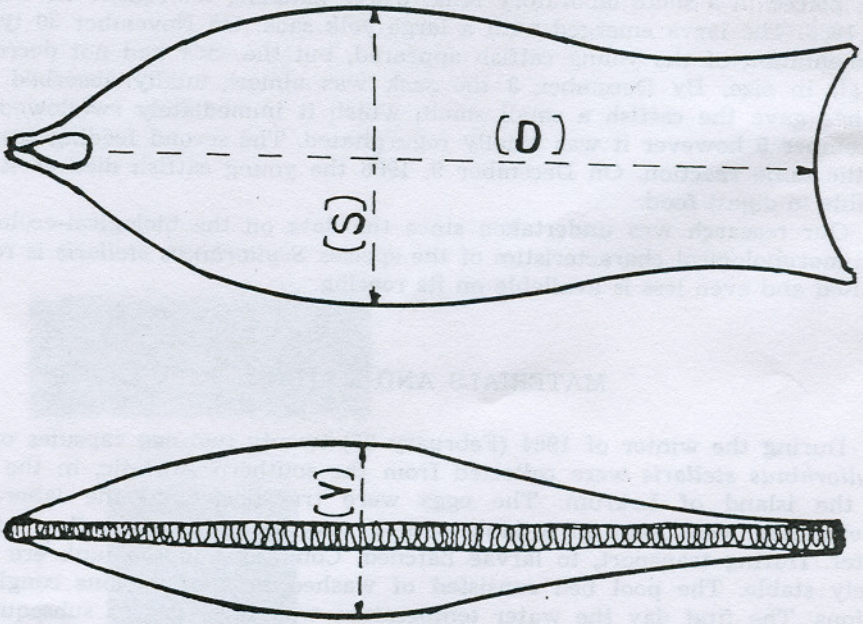

Fig. 1. Schematic representation of egg capsules of *Scyliorhinus stellaris* with dimensions: D = length, S = width, V = diameter.

Table 1. Length and weight of larvae of *Scyliorhinus stellaris* upon hatching with salinity and temperature of water in incubation tank.

No.	Length (cm)	Weight (gr)	T — °C	Sal. — ‰
1.	14.2	14.5	13.0	36.7
2.	14.0	13.0	13.0	36.7
3.	14.3	13.2	16.1	36.2
4.	15.1	13.8	16.0	36.2
5.	15.0	13.5	15.3	36.3
6.	14.5	13.5	16.8	37.6
7.	15.2	13.6	16.2	36.2
8.	13.8	13.1	16.2	37.2
9.	16.3	12.8	16.4	35.4
10.	15,9	12.6	16.4	36.4
11.	15.4	13.0	16.2	37.1
12.	14.8	14.0	16.2	35,6
13.	15.8	13.1	15.9	35,9
14.	15.4	13.8	16.1	35,9
15.	15.8	15.1	16.5	37.0
16.	14.6	13.1	16.3	36.6
17.	13.3	11.4	15.9	37.8
18.	13.6	13.8	15.9	37.8
19.	13.1	10.7	15.9	37.8
20.	13.0	9.7	15.9	37,8
$\bar{X}$	14.6	13.1	15.8	36,76

68.75% females. The higher percentage of males in our research is probably due to the fact that the eggs were collected in winter. Length and weight relations between the males and females during experimental rearing was also recorded. The mean length of females after 60 days was 18.85 cm and of the males 18.45 cm while the mean female weight was 27.3 g and the mean male weight was 26.6 g (Fig. 2).

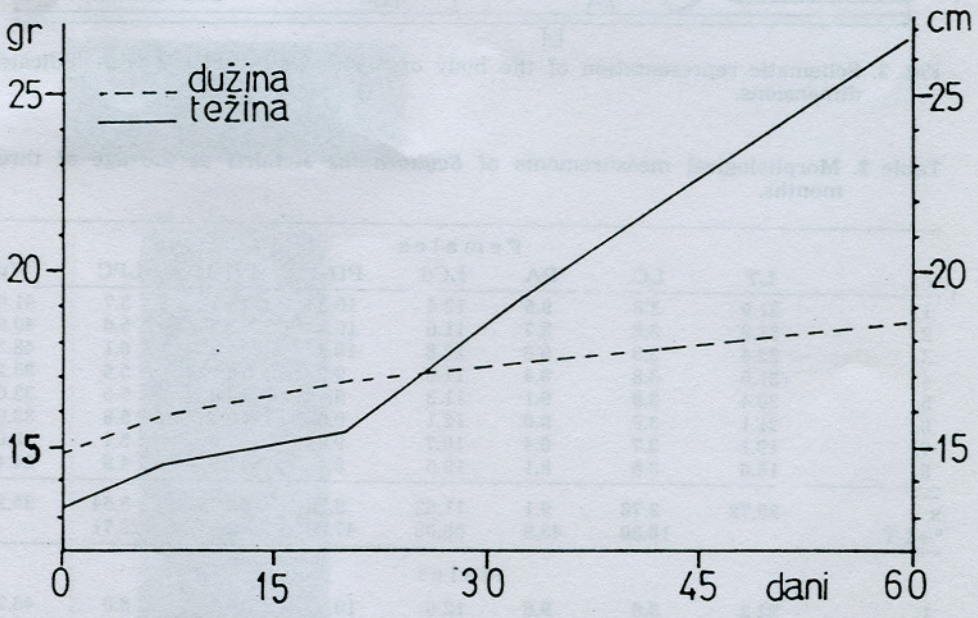

Fig. 2. Mean values of length and weight of *Scyliorhinus stellaris* during the period of feed control.

We observed minimum differences in relation of head lengths to total body length between females and males. The mean head length of males was 18.10% of the total body length, while the female head length was 18.30% of the total body length (Fig. 3 and Tab. 2).

After absorption of the yolk sack and opening of eyes, we proceeded with feeding. The food consisted of a meat mixture of cephalopods (squid or octopus), horse mackerel and various nonplanktonic crabs. The catfish rejected sardine meat in the first few days. Length and weight measurements during this time indicated that the choice of food was appropriate. The food conversion was recorded at 1.77 g.

The catfish is in any case a rather inactive organism. During the day the fish under observation mainly kept on the tank bottom or rarely swam about lazily. During the night they were somewhat more active when took food, and often surfaced and swam around the rim of the pool.

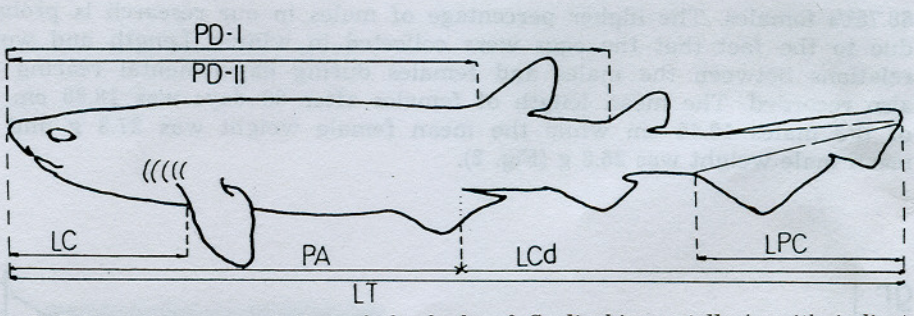

Fig. 3. Schematic representation of the body of *Scyliorhinus stellaris* with indicated dimensions.

Table 2. Morphological measurements of *Scyliorhinus stellaris* at the age of three months.

No.	LT	LC	PA	LCd	PD-I	PD-II	LPC	Wg
				Females				
1.	21.9	3.8	9.5	12.4	10.5	13.7	5.7	41.0
2.	21.3	3.8	9.7	11.6	10.2	13.5	5.6	40.8
3.	22.4	3.9	9.6	12.8	10.6	14.2	6.1	48.3
4.	21.0	3.8	9.4	11.6	9.9	13.1	5.6	33.2
5.	20.4	3.9	9.1	11.3	9.6	13.0	5.5	32.0
6.	21.1	3.9	9.0	12.1	9.9	13.4	5.8	33.0
7.	19.1	3.7	8.4	10.7	9.2	12.0	5.1	29.0
8.	18.6	3.5	8.1	10.5	8.4	11.5	4.9	24.4
$\bar{x}$	20.72	3.78	9.1	11.62	9.78	13.05	5.54	35.2
% LT		18.30	43,9	56.08	47.20	62.94	26.71	
				Males				
1.	22.2	3.8	9.6	12.6	10.8	14.2	6.0	46.2
2.	21.5	3.8	9.6	11.9	10.1	13.8	5.8	36.2
3.	21.5	3.8	9.6	11.9	10.1	13.8	5.7	38.0
4.	21.2	3.8	9.5	11.7	10.0	13.6	5.7	35.0
5.	20.7	3.7	9.2	11.5	10.0	13.5	5.7	34.8
6.	20.9	3.8	9.5	11.4	9.5	13.3	5.5	32.8
7.	19.5	3.7	8.3	11.2	9.5	12.6	5.3	29.0
8.	21.5	3.9	10.0	11.5	10.5	13.65	5.6	37.0
9.	20.3	3.7	9.2	11.1	9.5	12.9	5.5	32.0
10.	19.9	3.7	9.0	10.9	9.6	11.8	4.8	28.0
10.	19.9	3.7	9.0	10.9	9.6	12.5	5.4	29.0
11.	18.7	3.6	8.4	10.3	9.0	11.8	4.8	28.0
12.	18.0	3.2	8.6	10.0	8.3	11.2	4.7	22.5
$\bar{x}$		3.65	9.16	11.33	9.74	13.07	5.48	33.37
% LT		18.10	44.9	55.04	47.53	63.76	26.72	

CONCLUSIONS

Preliminary results of the research of some biological-ecological characteristics of the catfish (*Scyliorhinus stellaris* L.) on the basis of its rearing under laboratory conditions are presented. Conclusions are as follows:

The mean egg capsule dimension prior to hatching was 9.10 cm length, 3.56 cm width, 1.79 cm diameter and 32.50 g weight. Mean weight of empty capsules was 8.50 g. Mean length of newly hatched larvae was 14.59 cm and weight 13.06 g. Males dominated over females by 60%.

All newly hatched larvae had closed eyes, which opened after four to ten days, depending on the water temperature. Food was accepted after their eyes opened. The statistics of food conversion indicate that the catfish readily accepts feed consisting of a meat mixture of cephalopods (squid or octopus), various nonplanktonic crabs and horse mackerel. The meat of sardines was rejected for the first few days.

Since these organisms are still in our aquarium, further research will add to the present rather poor knowledge of their sexual maturity, reproduction and spawning, as well as will the other parameters necessary for a more complete knowledge of this intersting fish.

SUMMARY

Preliminary research of some biological-ecological characteristics of the catfish (*Scyliorhinus stellaris* L. 1758) under laboratory conditions was carried out. Water temperature affects the time required for hatching and opening of the eyes. Feeding with a meat mixture of horse mackerel, sardines and cephalopods in the first month of the catfishes life proved to be satisfactory. For one gram of growth, 1.72 g of the above mentioned food was used.

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REFERENCES

Bini, G. 1967. Atlante dei pesci delle coste Italiane. I. Leptocardi, Ciclostomi, Selaci. Mondo Sammerso, Milano: 206 p.

Capapé, C. 1977. Contribution à la connaissance de la biologie des Scyliorhinides des cotes Tunisiennes. Acta Adriat., 14: 1—21.

Ford, E. 1921. A contribution to our knowledge of the life — histories of the dogfish at Plymouth. J mar. biol. Ass. U. K., 12: 468—505.

Garstang, W. 1893—95. Faunistic notes at Plymouth during 1983—94. J. mar. biol. Ass. U. K., 3 : 210—235.

Graeffe, E. 1888. Ubersicht des Golfes von Trieste. Arb. Zool. Inst. Wien u. Trieste, 7 : 445—470.

Grubišić, F. 1982. Ribe, rakovi i školjke Jadrana, »Liburnija« Rijeka : 240 p.

Jardas, I. 1979. Morphological, biological and ecological characteristics of the lesser spotted dogfish, *Scyliorhinus canicula* L., 1758, population in the Adriatic sea. Izv. Rep. Rib.-biol. Exped. »Hvar«, 4 (2—3) : 104 p.

Lo Bianco, S. 1909. Notizie biologiche riguardanti specialmente il periodo maturita sessuale degli animali del Golfo di Napoli. Mitth. Zool St. Neapel, 19 (4) : 761 p.

Mazchlanka, H. 1955. Die Proportionsänderunge beim de Ketzenhai (*Scyliorhinus canicula* und *Sc. stellaris*). Pubb. St. Zool. Napoli, 26: 12—27.

Syrski, S. 1876. Riguardo al tempo della frega animali esistenti nel mare Adritico. Trieste, 165 p.

Šoljan, T. 1948. Ribe Jadrana. Fauna i Flora Jadrana, knj. 1, Inst. oceanograf. rib. Split: 437 p.

Županović, Š. 1961a. Contribution a la connaissance de la biologie des de l'Adriatique. Acta Adriat., 9 (4): 1—84.

Županović, Š. 1961b. Analyse quantitative — qualitative des populations des poissons dans les canaux de l'Adriatique moyenne. Acta Adriat., 9 (3): 1—151.

PRILOG POZNAVANJU BIOLOGIJE MAČKE MRKULJE

(*Scyliorhinus stellaris* L., 1758)

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KRATKI SADRŽAJ

Izvršena su preliminarna istraživanja nekih biološko-ekoloških karakteristika mačke mrkluje (*Scyliorhinus stellaris* L. 1758) u laboratorijskim uvjetima. Temperatura vode utječe na vrijeme izvaljivanja i otvaranja očiju. Ishrana s miksiranim mesom šaruna, srdele i glavonožaca u prvim mjesecima života mačke mrkulje pokazala se zadovoljavajuća. Za jedan gram prirasta utrošeno je 1,72 grama navedene hrane.

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