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OCCURRENCE OF RIBBON FISH (*TRACHIPTERUS TRACHYPTERUS*) IN SLOVENIAN WATERS (NORTHERN ADRIATIC SEA)

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ABSTRACT

*On 6th May 2018 a juvenile specimen of ribbon fish (*Trachipterus trachypterus*) was collected in shallow waters in Izola (Slovenia, northern Adriatic Sea). It measured 403 mm in total length and weighed 37.1 g. In stomach, fragments of seagrasses, pollen cones of pine, petals of terrestrial plant, fragments of terrestrial grass and beetles were found among food remains. The possible causes of this finding in Slovenian waters could be attributed to the ingression of southern Adriatic waters in its northern part. The specimen studied in this paper is the fifth record of this species in the Slovenian part of the Adriatic Sea. The cooperation between ichthyologists and fishermen proved to be crucial for the detection of the ribbon fish and other rare and less-known fish species, as well.*

Key words: ribbon fish, *Trachipterus trachypterus,* occurrence, diet, Adriatic Sea

PRESENZA DEL PESCE NASTRO (*TRACHIPTERUS TRACHYPTERUS*) IN ACQUE SLOVENE (ADRIATICO SETTENTRIONALE)

SINTESI

*Il 6 maggio 2018 un esemplare giovanile di pesce nastro (*Trachipterus trachypterus*) è stato trovato in acque poco profonde a Isola (Slovenia, Adriatico settentrionale). Il pesce misurava 403 mm di lunghezza totale e pesava 37,1 g. Fra i resti di cibo nello stomaco sono stati trovati frammenti di fanerogame marine, polline di pino, petali di piante terrestri, frammenti di erba terrestre e coleotteri. Le possibili cause di questo ritrovamento nelle acque slovene potrebbero essere attribuite all'entrata delle masse d'acqua dell'Adriatico meridionale nella parte settentrionale. L'esemplare studiato è il quinto ritrovamento di questa specie nella parte slovena del mare Adriatico. La collaborazione tra ittiologi e pescatori si è dimostrata fondamentale per l'individuazione del pesce nastro e di altre specie ittiche rare e meno note.*

Parole chiave: pesce nastro, *Trachipterus trachypterus*, presenza, dieta, mare Adriatico

INTRODUCTION

Despite the centennial tradition in marine research in the Gulf of Trieste, the ichthyological research in Slovenian part of the Gulf deserved considerably less attention than neighbouring areas. Only in last decades the research interest increased substantially. As a consequence, some papers were published on the occurrence of rare and less known species or otherwise neglected fish species which were recorded for the very first time by performing new approaches and non-destructive techniques in the area (Lipej *et al.,* 2005, 2007, 2008, 2009; Orlando-Bonaca & Trkov, 2016; Mavrič & Dragičević, 2018). The cooperation between fishermen and ichthyologists has also brought new insights on the fish fauna in the area.

The ribbon fish *T. trachypterus* is widely distributed in subtropical and tropical seas of the Pacific (Cortes *et al.,* 1995), in waters off Japan and New Zealand, on both sides of the Atlantic Ocean (Smith-Vaniz, 2015) and in Mediterranean Sea (Borme & Voltolina, 2006). It is an offshore fish that inhabits the mesopelagic zone (Borme & Voltolina, 2006). The ribbon fish is considered as a species with the status of least concern (Smith-Vaniz, 2015). However, *T. trachypterus* is still considered as a poorly studied fish. The majority of records are dealing with the finding of moribund or dead animals, stranded on the coast (Dulčić & Lipej, 1997; Borme & Voltolina, 2006; Farias *et al.,* 2010).

In the Adriatic Sea the ribbon fish is rarely observed or caught. Jardas (1980) mentioned 46 cases of captured ribbon fish in over 100 years long period from 1875 to 1980, while Dulčić (1996) reported about the first record of a ribbon fish larva near Stončica in eastern Adriatic Sea.

This paper deal with the new finding of the ribbon fish in Slovenian coastal waters and includes some new information on this species.

MATERIAL AND METHODS

On 6th May 2018 a specimen of ribbon fish was collected in shallow waters (< 1 m of depth) in Izola (Slovenia, northern Adriatic Sea) (Fig. 1). The specimen was put on ice and delivered to the Marine Biology Station (National Institute of Biology) in Piran. In the laboratory it was photographed with photocamera Olympus Tough 4. The specimen was then weighed with the Sartorius balance. Subsequently, morphometrical measurements and meristic counts were performed (Fig. 2). Measurements were taken to the nearest 1 mm and weight to 0.1 g. After that the specimen was dissected and internal organs were removed. The gut content was analysed under Olympus SZX16 stereomicroscope and photographed with the microscope camera Olympus DP74. The specimen is housed in the fish collection of the Marine Biology Station.

In order to contribute new data on the knowledge of

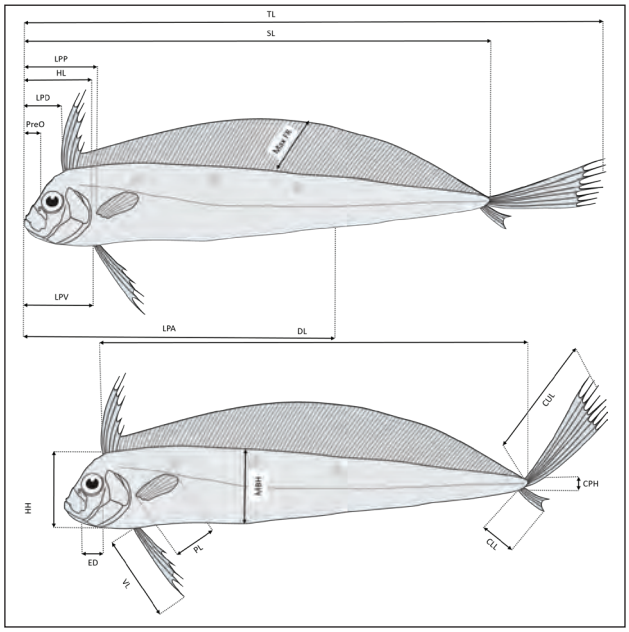

Figure 2: Biometric measurements on ribbon fish. See Table 1 for abbreviations.
Slika 2: Biometrične meritve opravljene na kosici. Glej Tabelo 1 za okrajšave.

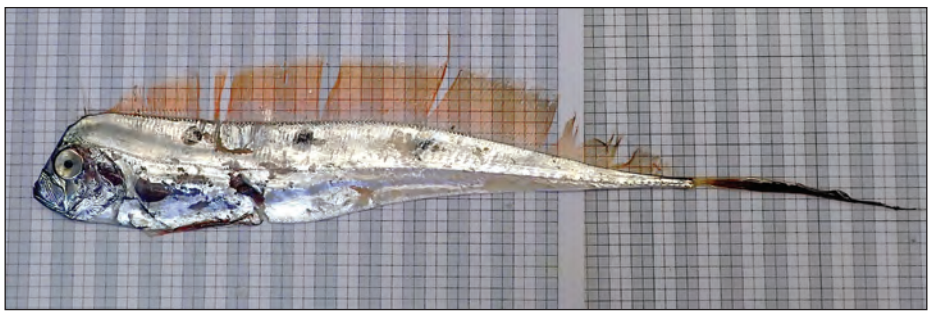

Figure 1: Specimen of the ribbon fish (TL=403 mm), found in Izola at 6th May 2018.
Slika 1: Primerek kosice iz Izole (TL=403 mm), z dne 6.5. 2018.

Tab. 1: Biometry and meristic data of the studied specimen of ribbon fish in comparison with other three specimens, previously reported in Slovenian Sea in 2004, 2006. Specimens marked with an asterisk were already published in work of Borme & Voltolina (2006).
Tab. 1: Biometrični in meristični podatki preiskanega primerka kosice v primerjavi s tremi primerki, ujetimi v slovenskem morju v letih 2004 in 2006. Podatki za primerke, označene z zvezdico, so že bili objavljeni v prispevku Borme & Voltolina (2006).

specimen		I	II*	III	IV*	V
Morphometric characters (mm)	**Abbreviation**	**6 May 2018**	**15 April 2004**	**27 Feb 2006**	**10 August 2006**	**13 April 2009**
total length	TL	403	-	1363	1033	427
standard length	SL	299	-	1282	925	346
preorbital length	PreO	9.3	5	-	23	8.1
eye horizontal diameter	ED	14.2	9	46	35	12.6
head length	HL	41.7	28	167	98	43.4
head height	HH	50.4	37	-	105	52.1
interorbital space	IOS	10.3	6	-	22	-
predorsal length	LPD	11.4	7	158	55	18.9
prepectoral lenght	LPP	40.4	29	174	99	44.3
preventral length	LPV	47.1	33	-	111	52.1
maximal body height	MBH	51.1	39	-	108	62.9
preanal length	LPA	151.5	110	-	405	186.5
caudal peduncle height	CPH	5.3	-	-	11	6.1
dorsal fin rays maximal length	MaxFR	35.3	29	-	68	31.7
dorsal fin length	DL	275.2	-	-	882	322.8
pectoral fin length	PL	16.7	7	-	33	15.1
caudal fin length (upper lobe)	CUL	105	-	-	125	82.3
caudal fin length (lower lobe)	CLL	1	-	-	1.2	-
ventral fin length	VL	58.6	46	-	0	38.7
sex		-	-	-	male	-

ribbon fish in the area, we include data about specimens of this species, which were not included in the work of Borme & Voltolina (2006), dealing with *T. trachypterus* occurrence in the Gulf of Trieste.

RESULTS AND DISCUSSION

Morphometric and meristic data of the studied specimen are presented in Tables 1 and 2. The body is elongated and laterally compressed. Greatest depth of the body is immediately behind the short head. Body is covered with tiny silvery cuticle and scaleless. Dorsal fin is very long, extending from above the eyes to the caudal fin. Dorsal, pectoral, ventral and caudal fins are reddish. Pectoral fin is rather small with the base inserted almost horizontally. Ventral fin is very small and the anal fin absent. Colour is silvery with three dark blotches. Meristic data of the studied specimen (Tab. 2) are in agreement with the data obtained by Bini (1970), Tortonese (1975), Šoljan (1975), Jardas (1980), Palmer (1984) and Borme & Voltolina (2006).

It is well known that *T. trachypterus* and relatives are ongoing considerable morphological changes during their ontogenetic development (Jardas, 1980). Juveniles differ from adults in regards to general body shape, fin length and number and pigmentation patterns (Martin, 2015).

Tab. 2: Weight, organ weight and meristic data of the studied specimen of ribbon fish in comparison with other specimens previously reported in Slovenian waters. Remarks: * juvenile specimens, ** the number of thorns may be underestimated due to damaged tissue.
Tab. 2: Celotna masa in masa notranjih organov ter meristični podatki za preiskani primerek v primerjavi s podatki primerkov, predhodno ujetih v slovenskem morju. Opombi: *mladostni primerki, ** število trnov je zaradi poškodovanega tkiva lahko podcenjeno.

specimen	I	II	III
Weight (g)	**6 May 2018**	**15 April 2004**	**10 August 2006**
total weight	37.1	-	477.7
heart	0.04	-	0.8
stomach	4.48	1.4	22.5
empty stomach	1.06	0.6	20.9
liver	0.23	-	6.8
pyloric caeca	0.8	-	8
gonads	0.13	-	1.1
Meristic characters			
dorsal fin rays D	172	-	180
ventral fin rays V	7	5	0
pectoral fin rays	10	10	11
caudal fin rays (upper lobe)	7	-	9
caudal fin rays (inferior)	5	-	5
spines along lateral line	92**	-	94
right lower jaw (dental) teeth	4	5*	5
left lower jaw (dental) teeth	3	5*	4
vomer teeth	2	1*	1
right upper jaw (praemaxillary) teeth	4	7*	5
left upper jaw (praemaxillary) teeth	5	4*	4
gillrakers (1st branchial arch)	13	12*	13

Both specimens (Figs. 1 and 3) had 4 dorsal spots and 1 ventral spot which is typical for juveniles. Gradually the number of spots decreases with the increase of total length.

Previously, the ribbon fish was reported in the Gulf of Trieste and in the Slovenian part of the Adriatic Sea (Dulčić & Lipej, 1997; Marčeta, 1999), as well. It was found on several occasions. Borme & Voltolina (2006) mentioned 15 records in the Gulf of Trieste, with 7 of them reported after 2000. Three of them were recorded in the Slovenian part of the gulf. The first case originated from cape Ronek in February 1992, when a 1100 mm

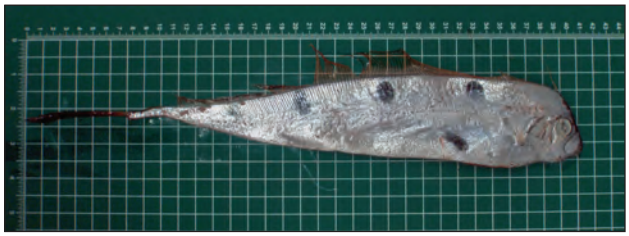

Figure 3: Specimen of the ribbon fish (TL=427 mm), caught in the Piran Bay at 13th April 2009.
Slika 3: Primerek kosice (TL=427 mm) ujet v Piranskem zalivu 13.4.2009.

Fig. 4: Gut content of the specimen, found in Izola at 6.5.2018 (a). A close-up of the pollen cones of pine (Pinus halepensis) (b). Scale = 5 mm.
Sl. 4: Vsebina želodca kosice z dne 6.5.2018 (a). Bližinski posnetek moških socvetij alepskega bora (Pinus halepensis) (b). Merilo = 5 mm.

ribbon fish was found stranded on the coast (Dulčić & Lipej, 1997). On 15th April 2004 a juvenile specimen, approximately 250 mm in total length was found dead in Piran. At 27th February 2006 a specimen, which was not mentioned in the work of Borme & Voltolina (2006), was caught by hand in Koper. It measured 1363 mm and weighed 3120 g. Later, in 10th August 2006, another specimen was found 2 Nm off Izola, which measured 1033 mm in total length. According to the local newspaper (Šuligoj, 2006), the fishermen of Izola caught three other specimens in summer 2006. At 13th April 2009 a 427 mm long juvenile ribbon fish was caught in the Piran Bay. The specimen, found at 6th May 2018, studied in this paper is therefore the fifth documented record of this species in the Slovenian part of the Adriatic Sea.

In the stomach the fragments of *Cymodocea nodosa* and *Zostera noltei* were found (Fig. 4). The great majority of the diet consisted of pollen cones of pine (*Pinus halepensis*). In addition, petals of terrestrial plants were found, together with numerous fragments of terrestrial grass. A tiny beetle (Coleoptera) was also found in remains. The obtained data are in agreement with the findings of the Adriatic studies published by Jardas (1980) and Borme & Voltolina (2006) who also found remains of sea grasses, beetles and many fragments of terrestrial origin in stomachs of the ribbon fish. We share the opinion of Borme & Voltolina (2006) that vegetal fragments, especially those of terrestrial origin should be probably considered as accidentally ingested.

The possible causes of the finding of *T. trachypterus* in Slovenian waters could be attributed to the ingression of southern Adriatic waters in the northern part, as already noted by many authors (Dulčić & Lipej, 1997, Dulčić *et al*., 1999). The pelagic character of these species, which can help their dispersal, is not sufficient to explain this fact. The majority of the studied specimens are juveniles which is in agreement with other records (Jardas, 1980). In fact, juveniles are more abundant and they occur more likely in near shore habitats in comparison with adults (Martin, 2015).

There are also other cases of mesopelagic and benthopelagic species, known to arrive in the shallow Gulf of Trieste. For example, there are many records of the occurrence of silver scabbardfish *Lepidopus caudatus* (Euphrasen, 1788) in the same area. The cooperation between ichthyologists and fishermen offers a great opportunity to monitor the fish fauna of the area. Interviews with local fishermen are very useful to track the presence of certain invaders and provide complementary information (Azzurro *et al*., 2018). This cooperation was crucial in discovering the occurrence of ribbon fish specimens in the area and also for the detection of other rare and less-known fish species.

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We are indebted with the fisherman who provides us with the specimen of ribbon fish. We would like to express our gratitude also to our colleague Bojan Marčeta from the Institute for fisheries in Ljubljana who provided us with the basic data of one of the studied specimen. Special thanks also to our dear friend Milijan Šiško who prepared the drawing for the manuscript.

POJAVLJANJE KOSICE (*TRACHIPTERUS TRACHYPTERUS*) V SLOVENSKEM MORJU (SEVERNI JADRAN)

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*Šestega maja 2018 je bil najden primerek kosice (*Trachipterus trachypterus*) v plitvini pri Izoli (Slovenija, severni Jadran). V dolžino je meril 403 mm in tehtal 37,1 g. V prebavilu so bili najdeni fragmenti morskih trav, moška socvetja alepskega bora, cvetovi kopenskih cvetnic, koščki kopenskih trav in hrošč. Možni razlog za pojavljanje te vrste v slovenskem delu Jadrana bi lahko bil povezan z ingresijo južnih jadranskih vodnih mas v severni Jadran. Preiskani primerek predstavlja peti primer pojavljanja te vrste v slovenskem delu Jadrana. Povezovanje med ihtiologi in ribiči se je izkazalo za ključno pri odkritju primerkov kosice in drugih redkih ter manj znanih ribjih vrst.*

Ključne besede: kosica, *Trachipterus trachypterus,* pojavljanje, prehrana

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