received: 2020-07-08 DOI 10.19233/ASHN.2020.15

REVIEW OF THE SHARPNOSE SEVENGILL SHARK *HEPTRANCHIAS PERLO* (CHONDRICHTHYES: HEXANCHIDAE) IN THE MEDITERRANEAN: HISTORICAL AND RECENT DATA

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ABSTRACT

This paper presents a thorough literature review of the sharpnose sevengill shark Heptranchias perlo *(Bonnaterre, 1788) in the Mediterranean Sea, creating a database with information on its distribution. Moreover, it provides some biological information on a female specimen of this rare and near threatened shark, caught during experimental sampling in the Myrtoon Sea, southwestern Aegean archipelago, Greece. The aim of this study is to provide a synopsis of the existing information on the species in the Mediterranean Sea for future updates of the assessments of the species conservation status in this area.*

Key words: elasmobranchs, diet, fecundity, Mediterranean distribution

REVISIONE DELLO SQUALO MANZO *HEPTRANCHIAS PERLO* (CHONDRICHTHYES: HEXANCHIDAE) IN MEDITERRANEO: DATI STORICI E RECENTI

SINTESI

L'articolo presenta una revisione approfondita della letteratura inerente lo squalo manzo Heptranchias perlo *(Bonnaterre, 1788) nel mare Mediterraneo, creando una banca dati contenente informazioni sulla sua distribuzione. Fornisce inoltre alcune informazioni biologiche su un esemplare femmina di questa rara specie, quasi minacciata, catturato durante un campionamento sperimentale nel mare Myrtoon, arcipelago dell'Egeo sud-occidentale, in Grecia. Lo scopo di questo studio è fornire una sinossi delle informazioni esistenti sullo squalo manzo nel Mediterraneo per futuri aggiornamenti delle valutazioni dello stato di conservazione delle specie in quest'area.*

Parole chiave: elasmobranchi, dieta, fecondità, distribuzione in Mediterraneo

INTRODUCTION

The sharpnose sevengill shark *Heptranchias perlo* (Bonnaterre, 1788) is a shark species of circumglobal distribution, found in tropical and temperate seas excluding the northeast Pacific (Froese & Pauly, 2019). In the literature it is often acknowledged as a rare species, and quite a few records of its presence have been reported in Mediterranean waters (e.g., Papaconstantinou, 2014; Guallart *et al*., 2019a; 2019b and references therein).

The sharpnose sevengill shark is considered a "near threatened" species according to the IUCN red list, yet this assessment is rather old and needs to be updated (Paul & Fowler, 2003). In the Mediterranean, the species is "data deficient" (Soldo & Bariche, 2016). Indeed, information regarding its biology and population status is very scarce, making any assessment very difficult. In their analysis of data gaps in the biological knowledge concerning the Mediterranean, Dimarchopoulou *et al*. (2017) list the species under the least studied ones. Moreover, as it is considered a by-catch of deep-sea trawling fisheries (Paul & Fowler, 2003), the official capture data as presented in the FAO statistics (http://www.fao.org/fishery/statistics/global-capture-production/en; accessed 22 June 2020) are almost nonexistent. In fact, the only landing reports in the aforementioned global statistics cite 2 tons per year for the years 2008, 2009, 2010 and 2014, and are provided solely by Malta. It is a common practice in Mediterranean fisheries (especially in the bottom trawling industry) that when shark species are caught, the head, fins and internal organs are removed and discarded overboard, and quite often the body is skinned in order to facilitate its sale. Thus, it is not possible to taxonomically identify the "fish" that is landed in the fishing markets, which leads to the mislabeling of the species (Jacquet & Pauly, 2003; Bornatowski *et al*., 2013), and therefore the landings are underreported.

Due to the sporadic records of the species in Mediterranean waters, very little information exists on its biology. Apart from the work of Capapé (1980), who thoroughly studied the biology of the species in Tunisian waters, there is almost no other related information. In this work we present additional data on the presence of the species in the Myrtoon Sea, southwestern Aegean archipelago, Greece, and provide information on its fecundity, including ovarian

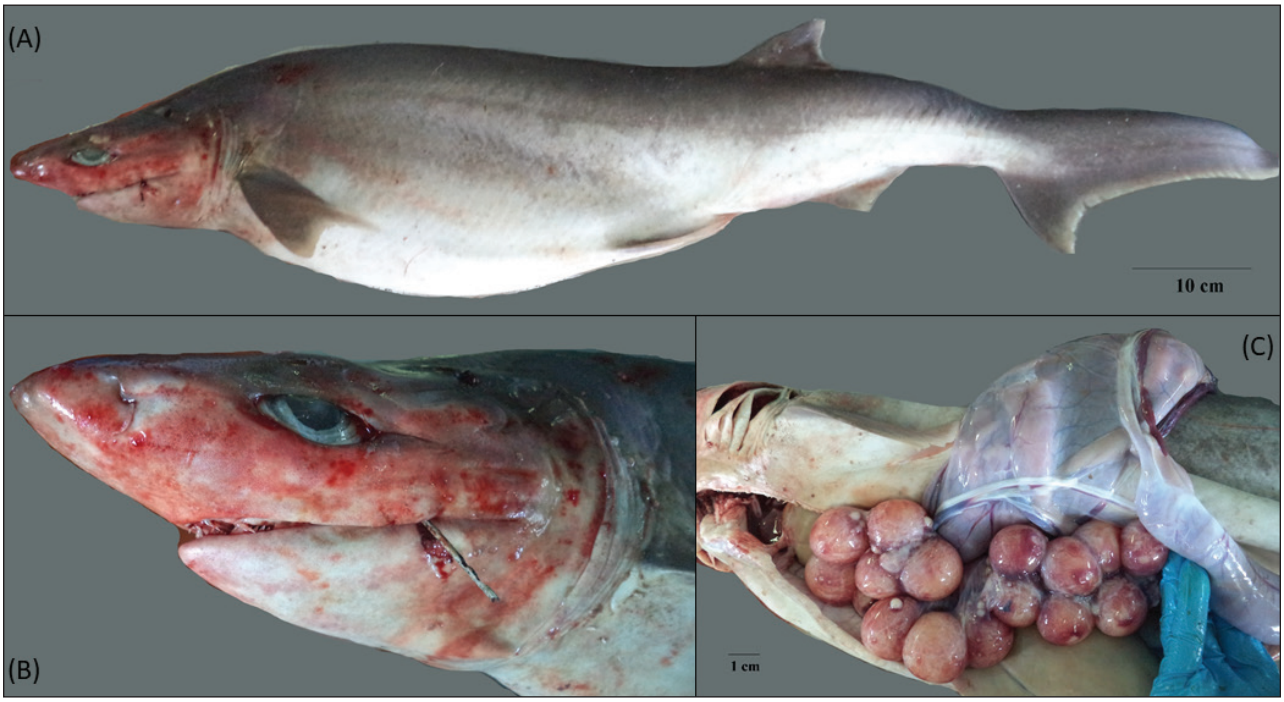

Fig. 1: (A) The female sharpnose sevengill shark *Heptranchias perlo* ***caught in the Myrtoon Sea, Greece, 4 August 2019 (scale bar = 10 cm); (B) detail of the head where the longline hook can be seen; and (C) the viscera, with eggs as seen in the ovary and the stomach of the fish (scale bar=1 cm).***
Sl. 1: (A) Samica morskega psa sedmeroškrgarja *Heptranchias perlo****, ujeta 4. avgusta 2019 v mirtonskem morju (Grčija) (merilo = 10 cm); detajl glave z vidnim parangalskim trnkom: in (C) drobovina, jajca v ovariju in želodec ribe (merilo = 1 cm).***

follicle (hereafter referred to as "egg") morphometry, and diet. Finally, a literature review is provided to summarise the records/information on the species in the Mediterranean as retrieved from literature, using as a starting point the work by Guallart *et al*. (2019a; 2019b) and elaborating further on additional data. The aim of this note is to (a) provide data on the species that could help elucidate its biology and ecology and fill in the knowledge gaps, (b) clarify the species' distributional status in the Mediterranean, and (c) provide a review-report that could be useful in future updates of the assessments of the species status in the Mediterranean.

MATERIAL AND METHODS

On 4 August 2019 a female sharpnose sevengill shark individual (Fig. 1) was caught during the experimental Mediterranean Trawl Survey sampling (MEDITS; Bertrand *et al*., 2002), conducted in the frame of the Greek National Data Collection Framework (DCF) programme, in the area of Myrtoon Sea (coordinates: 37.36833333N, 22.98027778E) at a depth of 550 m. When landed the shark was already dead and the MEDITS protocol on data recording was applied. According to this protocol (Spedicato *et al*., 2019) target species are divided into two groups, with *H. perlo* being included in the G1 list; hence, the measurements taken according to the protocol were as follows: total number of individuals, total weight and individual length, and biological parameters including sex, maturity, and individual weight. Following the identification, the fish was measured for total length with the tail in a natural position (TL; in cm) and weighed (W; in g), as well as sexed, and the horizontal and vertical mouth openings were measured (HMO and VMO, respectively; with an accuracy of 0.01 mm). After dissection the ovaries were removed, the eggs were measured (maximum egg diameter [ED], in 0.01 mm) using a digital calliper, and weighed (egg weight [OW], in g), and the stomach was kept in a deep-freezer for further examination. Finally, the liver was weighed (LO, in g). In the laboratory, stomach contents were examined, identified to the lowest possible taxon, and each prey was weighed (in 0.001 g). Based on the % weight (% WF) contribution of each prey category, the fractional trophic level (TROPH) of the species was estimated using TrophLab (Pauly *et al*., 2000). In order to assess the feeding preferences of the species, a literature review was performed. Data were extracted and tabulated, and TROPHs were estimated.

Furthermore, as the recent review of Guallart *et al*. (2019a, 2019b) on the presence of the species in the Mediterranean was missing records from the Hellenic Seas, an extensive literature review was conducted for the entire Mediterranean basin. For this purpose, the aforementioned works were used as a basis and further elaborated through GoogleSearch. The keywords of "*Heptranchias perlo*" and "Mediterranean" were used, and all the papers retrieved were examined and tabulated. In addition, a second table was created including secondary references of the species (i.e., previous and old records of the species within the papers examined, but the original references were not available to the authors).

RESULTS AND DISCUSSION

In this account, information on the biology and distribution of the sharpnose sevengill shark *Heptranchias perlo* in the Mediterranean Sea is compiled. The species is considered by-catch in the fisheries in Greece (mainly in longlines targeting tuna and swordfish, as well as in trawlers), but at times it is marketed rather than discarded (*e.g*., Damalas & Vassilopoulou, 2011). In the case of the individual examined, there were clear indications that the specimen had already been caught some time in the past, as a large hook was found in the lower jaw (Fig. 1B), like those traditionally used in longline fisheries targeting large pelagic fish (e.g., tuna, swordfish) in the country. Thus the fish had been caught and released by a professional fisher in the past, a practice that was also documented by Megalofonou *et al*. (2005) and Vassilopoulou *et al*. (2007).

Tab. 1: Measurements taken on a female sharpnose sevengill shark** Heptranchias perlo**, caught in Myrtoon Sea, SouthWest Aegean Archipelago, Greece, August 4th 2019.
Tab. 1: Meritve, opravljene na samici morskega psa sedmeroškrgarja** Heptranchias perlo**, ujete 4. avgusta 2019 v mirtonskem morju (jugozahodno Egejsko morje, Grčija).

Measurement	Value
Total length (in cm)	114
Total weight (in g)	6730
Horizontal mouth opening (in mm)	51.99
Vertical mouth opening (in mm)	40.74
Liver weight (in g)	788
Ovary total weight (in g)	425
Number of eggs	22
Mean egg diameter (in mm) ±standard error (range)	34.30±0.58 (29.03-38.44)
Mean egg weight (in g)±standard error (range)	19.82±0.78 (11-26)

Tab. 2: Review of studies on feeding habits of the sharpnose sevengill shark *Heptranchias perlo****. LT= length type; TL=total length; LR=length range; n=number of individuals; F = frequency of occurrence, N= numerical percentage, W = percentage by weight; IRI=index of relative importance.***
Tab. 2: Pregled raziskav o prehranjevalnih navadah morskega psa sedmeroškrgarja *Heptranchias perlo****. LT= tip dolžine; TL=celotna dolžina; LR=razpon dolžine; n=število osebkov; F = frekvenca pojavljanja, N= številčni delež, W = biomasni delež; IRI=indeks relativne pomembnosti plena.***

Area	Date	LT	LR (cm)	n	Method	Main prey	contribution of prey [W or (N)]	TROPH	SE	Reference
Cuba						Fish, benthic Crustacea	-	-		Sierra *et al.* (1994) in Froese & Pauly (2019)
coast off Namibia	1980-1984					Myctophidae, Cephalopoda	-	-		Macpherson (1989)
Scilly Isles	8/1999	TL	101	1	F, N, W	Cephalopoda (*Illex coindetii*)	100 (100)	4.50	0.37	Henderson & Williams (2001)
east coast of southern Africa				10	F	Cephalopoda, fish		4.50	0.48	Bass *et al.* (1975) in Cortés (1999)
South Africa				8	F, N, W, IRI	Cephalopoda, fish	53, 47 (50, 50)	4.50	0.61	Ebert (1990)
South Africa				12	F, N, W, IRI	Cephalopoda, fish		4.50	0.61	Barnett *et al.* (2012)
Taiwan		TL	63.5-118.5	28	F, N, W, IRI	Fish (*Trichiurus lepturus, Trachurus japonicus*, Myctophidae), Crustacea (Brachyura, Macrura Reptantia), Cephalopoda	98, 1, 1 (65, 27, 8)	4.49	0.80	Ebert (1990)
Taiwan				36	F, N, W, IRI	Fish		4.50	0.80	Barnett et al. (2012)
Victoria, Australia	2-5/2003	TL	48.5-90.0	67	F, N, W, IRI	Fish (*Lepidorhynchus denticulatus, Apogonops anomalus,* Trichiuridae), Cepalopoda (*Nototodarus gouldi)*, shrimps	86.4, 12.8, 0.8 (87.2, 10.7, 2.1)	4.49	0.76	Braccini (2008)
Victoria, Australia	2-5/2003	TL	90.1-136.5	49	F, N, W, IRI	Fish (Trichiuridae, Gempylidae, *Lepidorhynchus denticulatus, Paraulopus nigripinnis,* Centrolophidae), Cepalopoda, shrimps	96.9, 2.6, 0.5 (90, 8.3, 1.7)	4.50	0.79	Braccini (2008)
Central Atlantic	4/8-17/9/1998	TL	39.0-116.0	60	F, N, W	Fish (*Heptranchias perlo,* Congridae), Cephalopoda (Octopoda)	57.5, 28.4 (45.9, 31.5)	4.34	0.67	Frentzel-Beyme & Koster (2002)
Tunisia				9	F	Fish, Crustacea, Cephalopoda		4.22	0.69	Capapé (1975a) in Cortés (1999)
Tunisia				125	F, N	Fish (*Gadiculus argenteus, Hoplostethus mediterraneus, Trachyrhynchus trachyrhynchus*), Decapoda (*Nephrops norvegicus*), Cephalopoda (*Sepietta oweniana*)	(72.1, 16.3, 11.6)	4.33	0.74	Capapé (1980)
Myrtoon Sea	4/8/2019	TL	114	1	N, W	Cephalopoda (*Octopus vulgaris, Loligo vulgaris*)	100 (100)	4.50	0.46	present study

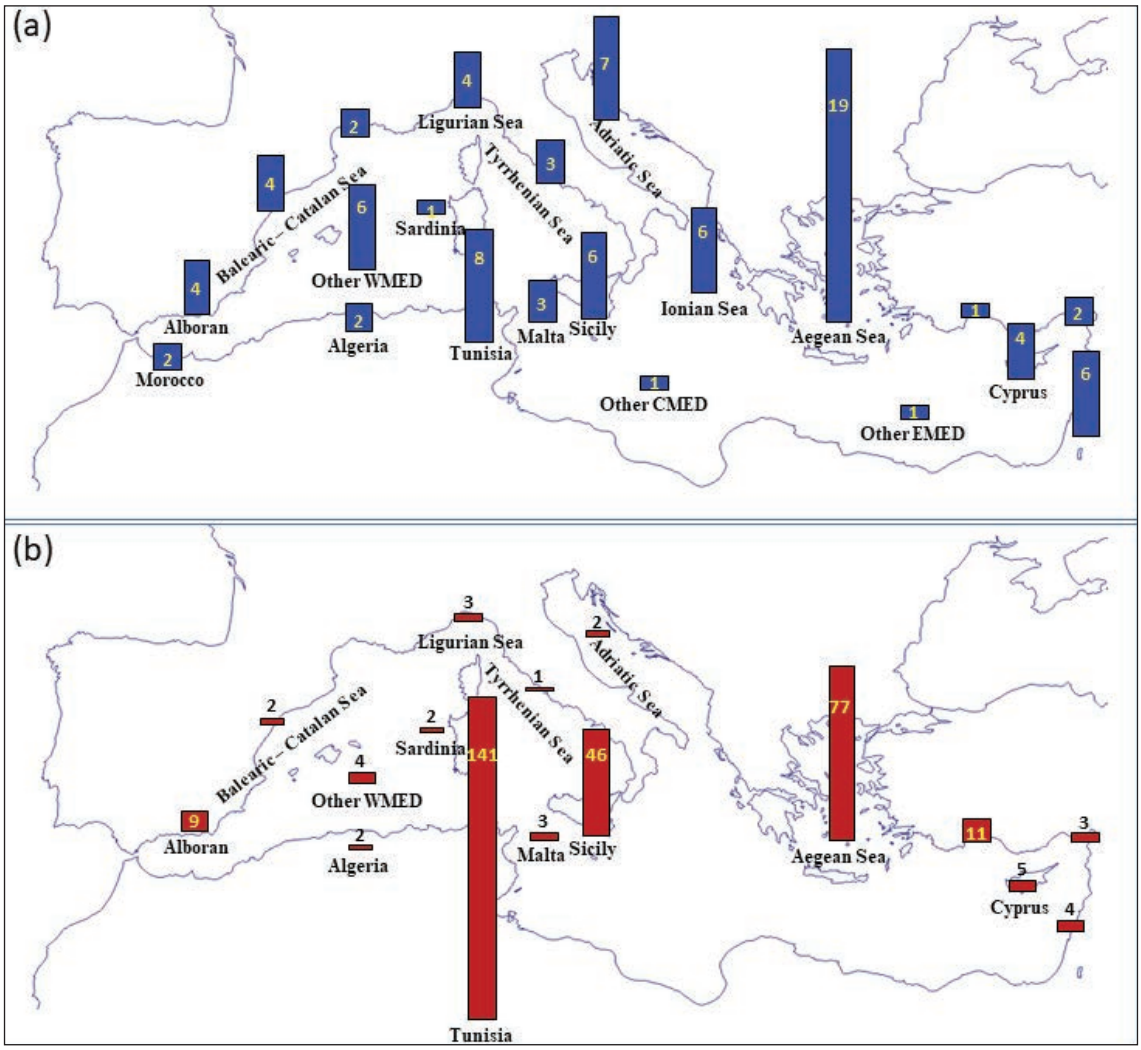

Fig. 2: The sharpnose sevengill shark *Heptranchias perlo*. ***(a) Number of publications with references to the presence of the species in the Mediterranean; and (b) number of individuals reported in the Mediterranean. For more details, see Appendix 1 & 2.***
Sl. 2: Morski pes sedmeroškrgar *Heptranchias perlo*. ***(a) Število objavljenih del, ki se nanašajo na prisotnost te vrste v Sredozemskem morju; in (b) število primerkov, o katerih so poročali v Sredozemlju. Za bolj natančne podatke glej Prilogi 1 & 2.***

Following the recommendations of Dimarchopoulou *et al*. (2017) and Karachle & Stergiou (2017), effort was made to obtain as much information possible even from a single specimen. However, the examination of only one individual allows very little potential for analysis, virtually just a presentation of morphological measurements (Tab. 1) and a limited insight into its biology. A detailed description of the morphology and anatomy of the species, as well as various aspects of its biology (e.g., morphometric relations, reproduction, feeding) is given in Capapé (1980) based on 154 specimens from Tunisian waters. To date, the work of Capapé (1980) is the only in-depth scientific account on the species in the Mediterranean, covering a wide range of biological aspects.

The sharpnose sevengill shark is a viviparous aplacental lecithotrophic species *sensu* Hamlett *et al*. (2005). According to a visual examination of the reproductive system, the specimen was a female (Fig. 1C), its maturity stage was classified under category 3b (ICES [2013] maturity scale), i.e., that of mature individual. This is also in accordance with the findings of Capapé (1980), who identified the length at maturity for the species at 93 cm for males and 105 cm for females. Overall, 22 eggs were counted and measured, exhibiting a mean diameter of 34.30±0.58 mm and a mean weight of 19.82±0.78 g. These values, even slightly underweight, are above the limit of 2.5 cm and 25 g identified by Capapé (1980) as with

important vitellogenic activity. Taking into consideration the dimensions for the characterization of the vitellogenic stage proposed by Correa de Carvalho *et al.* (2020), the female individual examined here was in intermediate vitellogenesis (stage III). In the Mediterranean Sea, the reported fecundity of the species ranges between 6 to 20 eggs (Capapé, 1980 and references therein), thus making the number of eggs reported herein the highest recorded for the species in the basin.

The diet of the sharpnose sevengill shark has been studied in various areas of its distribution, both in the Atlantic and Pacific Oceans, as well as in the Mediterranean (Tab. 2). In all studies, the prey items were the same, with fish and Cephalopoda dominating the diet of the species, although in different ratios. It is noteworthy that in the study by Frentzel-Beyme & Koster (2002), conducted at the Great Meteor Seamount, central-east Atlantic, cannibalism was recorded (Tab. 2). In the present study the stomach of the shark contained exclusively two species of Cephalopoda (one individual of *Octopus vulgaris* [60.1 % WF] and one of *Loligo vulgaris* [39.9 % W]) and the estimated TROPH was 4.50±0.46. In general, this TROPH value was estimated in the majority of the diet studies concerning the species (Tab. 2). The lowest value, however, was estimated based on the diet composition of the specimens in Tunisia (4.22±0.69 [Capapé, 1975] and 4.33±0.74 [Capapé, 1980]). These lower values should be attributed to the fact that crustaceans contributed more to the diet of the species than in other studies, where they were negligible or even not recorded. Nevertheless, all TROPH values estimated classify the species as an apex predator, a carnivore with preference for fish and cephalopods (*sensu* Stergiou & Karpouzi [2002] and Karachle & Stergiou [2017]).

Overall, the presence of *H. perlo* in the Mediterranean Sea basin has been demonstrated in more than 90 published papers (Fig. 2a; Appendix 1 & 2). Most of the publications are from the eastern and western parts of the basin (31 and 28 publications, respectively), followed by the central part (21 publications), whereas only 7 publications make reference to the species in the Adriatic (Fig. 2a; Appendix 1 & 2). However, we recognize that the scarcity of data or the absence of records related to specific areas of the basin may well indicate a lack of reports rather than an actual absence of the species. The number of specimens caught was only provided in half of the publications, with the sex reported even more rarely (Fig. 2b; Appendix 1 & 2). Moreover, cases in which the number of specimens recorded exceeded 5 individuals per report were extremely rare (N>5 in 8 publications [8.6%]), and there was only one publication (Capapé, 1980) with an extraordinary number of 120 individuals reported. Records with the highest numbers of specimens reported are from the East and Central Mediterranean, and this should be attributed to the work conducted in the Aegean Sea (e.g., Ismen *et al.*, 2007, 2009; Damalas & Vassilopoulou, 2011) and in the coasts of Tunisia (e.g., El Kamel-Moutalibi *et al.*, 2014; Rafrafi-Nouira *et al.*, 2015; Capapé *et al.*, 2018), with respect to the morphometry, the establishment of length-weight relationships, and the study of the biology of the species (Appendix 1).

In conclusion, despite the literature review, the authors of the present article strongly believe that there might exist more records of the species, mainly in unpublished/unavailable survey data. It is therefore essential for data, especially those related to species that urgently need conservation actions, and even more so those collected through public funding, to be open and available to the scientific community, so that the status of the species can be adequately assessed and conservation measures can be based on most comprehensive scientific information. It is of high priority to investigate and report biological data of species when specimens are available, in particular with those found in small numbers and species lacking such information, to fill the gaps in essential knowledge and, as a result, improve our conservation efforts.

ACKNOWLEDGEMENTS

The sample examined within this research was collected during the MEDITS action of the EU Data Collection Framework Program.

Appendix 1: List of records of** Heptranchias perlo **in the Mediterranean (literature examined by the authors; in blue references also included in Guallart et al., 2019a, b). F=female, M=male, N=number of individuals, LWR=length-weight relationship parameters, SEb=standard error of slope b, R2=correlation coefficient.
Priloga 1: Seznam zapisov o pojavljanju vrste** Heptranchias perlo **v Sredozemskem morju (pregledana literatura s strani avtorjev; v modrem so reference, ki so bile že vključene v Guallart s sod., 2019a, b). F=samica, M=samec, N=število primerkov, LWR=odnos med dolžino in težo, SEb=standardna napaka naklona b, R2=korelacijski koeficient.

Reference	Date	locality	depth	Sex	N	length range (in cm)		weight range (in g)		LWR				comments
						min	max	min	max	a	b	SE_b	R^2	
East Mediterranean														
Ben-Tuvia (1953)	1951-1953	Israel					250							record from a photo, length measurement in approximation
Fredj & Maurin (1987)		E Mediterranean												presence of the species (depths from 0 up to >1000 m)
Labropoulou & Papaconstantinou (2000)		N Aegean Sea												presence of the species in the area
Baino *et al.* (2001)	1994-1999	E Aegean Sea												data from MEDITS expedition (biomass index 1.4 kg/km^2)
Filiz & Mater (2002)	7/1999-3/2000	Edremit Bay, Gulbahce Bay, and Sigacik Bay, N Aegean Sea, Turkey												presence of the species in the area
Golani (2006)		Israel												list of cartilagenous species in Israeli coasts. *H. perlo* is characterised as "prevalent"
Megalofonou *et al.* (2005)	1998-2001	Greek seas			1		104							as bycatch in swordfish and albacore longlines
Öziç & Yılmaz (2006)	7/2003-3/2004	Gökova Bay, Aegean Sea												presence of the species
Saad *et al.* (2006)	2001-2004	Syrian coasts												
Ismen *et al.* (2007)	2/2005-4/2006	Saros Bay, Turkey	28-370		14	68.6	105	920	3388	0.004	2.927	0.174	0.959	
Kabasakal & Ince (2008)	15/9/2008	Kömür Cape, SW tip of Saroz Bay, Turkey		F	1		85		1700					refers to a stranded individual
Damalas & Vassilopoulou (2009, 2011)	1993-2000	Central Aegean Sea			41									research on by-catches and discards. CPUE, % weight and numbers discarded are given in the 2011 paper
Ismen *et al.* (2009)	3/2005-6/2008	Saros Bay, Turkey	5-500		18	68.6	105	920	3388	0.005	2.904		0.958	
Ismen *et al.* (2009)	3/2005-6/2008	Saros Bay, Turkey	5-500	M	5	68.6	84	920	1960	0.000	3.558		0.986	
Ismen *et al.* (2009)	3/2005-6/2008	Saros Bay, Turkey	5-500	F	13	69.2	105	1170	3388	0.008	2.786		0.957	
Damalas & Megalofonou (2012)	1998–2001	Antikithyra strait, Greece	382		1		104							
Güven *et al.* (2012)	10/2009-12/2010	Antalya Bay, Turkey	200-800		11	31.1	105.3	80.2	3560	0.002	3.080		0.998	
Papaconstantinou (2014)		Aegean Sea												review of Greek ichthyofauna
Lteif (2015)	1-8/2013	South Lebanese coasts	0-300		1		115		6000					
Lteif (2015)	1-8/2013	Central Lebanese coasts	200-400		3									

Ergüden & Bayhan (2015) in Crocetta *et al.* (2015)	27/6/2014	Mersin Bay, Turkey	601	M	1		105		3600					includes morphological measurements
Başusta (2016)	4/5/2015	NE Mediterranean (off Iskederun Gulf)	360-400	F	1		32.3		106.9					includes morphological measurements
Başusta (2016)	4/5/2015	NE Mediterranean (off Iskederun Gulf)	360-400	M	1		32.5		101.8					includes morphological measurements
Eronat & Özaydın (2014)	2008-2009	Izmir Bay and Sığacık Bay		F	1		99.6		4382					
Alkusairy & Saad (2018)	11/2014-10/2016	Syrian coasts		M		27	117							the species is overfished in the area
Alkusairy & Saad (2018)	11/2014-10/2016	Syrian coasts		F		20	124							female catches (common) mainly juveniles. The species is overfished in the area
Follesa *et al.* (2019)	2012-2015	Aegean Sea and Crete, Greece	200-800											data from MEDITS expedition (GSAs 22, 23). Frequency of occurrence is given
Follesa *et al.* (2019)	2012-2015	Cyprus	200-800											data from MEDITS expedition (GSA 25). Frequency of occurrence is given
Central Mediterranean														
Quignard & Capapé (1971)		Tunisia	400-600											from an inventory of species in Tunisian waters
Capapé (1975b)		Tunisia												presence of the species in the Tunisian waters
Capapé (1980)		Tunisia		M	36					0.016	2.502		0.963	the relationship refers to juveniles. In the paper it was provided in its linear form.
Capapé (1980)		Tunisia		M	32		118			0.429	1.178		0.995	the relationship refers to adults. In the paper it was provided in its linear form
Capapé (1980)		Tunisia		F	40					0.001	3.447		0.984	the relationship refers to juveniles. In the paper it was provided in its linear form
Capapé (1980)		Tunisia		F	12		139			0.347	2.359		0.983	the relationship refers to adults. In the paper it was provided in its linear form
Bradaï *et al.* (2002)	4/2/1999	Gulf of Gabès, Tunisia		M	1		39		138					
Bradaï *et al.* (2002)	19/1/2001	Gulf of Gabès, Tunisia	80	F	2	69.5	98	688	4000					
Bradaï *et al.* (2002)	1-2/2001	Gulf of Gabès, Tunisia		M	2		75	1252	1259					
Bradaï *et al.* (2002)	1-2/2001	Gulf of Gabès, Tunisia		F	3	69.5	98	828	4000					the dimensions of the 3rd individual were TL=815, W=1450
Bradaï *et al.* (2002)	1/3/2003	Gulf of Gabès, Tunisia		F	2	94	100		2300					
De Maddalena *et al.* (2002)	26/7/2000	Ganzirri, Mesina Strait	70	M	1		85		1610					
De Maddalena *et al.* (2002)	6/2000	Linosa and Porto Empedocle	200		5	70	80							
De Maddalena *et al.* (2002)	21/11/1989	Catania			1		95		4000					from the Catania fish market

D'Onghia *et al.* (2003); Politou *et al.* (2003); Mytilineou *et al.* (2005)	9/1999, 4/2000, 7/2000, 9/2000	East Ionian Sea, Greece	388-501											first record from the Ionian Sea, caught in low abundances
Schembri *et al.* (2003)		Malta												review of Matese ichthyofauna
Bradaï *et al.* (2006)		Gulf of Gabès Tunisia												
Gristina *et al.* (2006)	autumn of 1997-1998	Strait of Sicily	290-350											mean standardised catch rates for the species per sampling area and year is provided
Capezzuto *et al.* (2010); Maiorano *et al.* (2010)	1985-2008	NW Ionian Sea	322-345											review of fish caught in trawling surveys form 1985 to 2008
Scacco *et al.* (2010)	2000-2002	Portopalo di Capopassero (SE Sicily)		M	8									used for caudal fin shape analyses
Scacco *et al.* (2010)	2000-2002	Portopalo di Capopassero (SE Sicily)		F	6									used for caudal fin shape analyses
Dimech *et al.* (2012)	1/6/2007	Malta	517-671											biomass (kg/km^2) is given
Ragonese *et al.* (2013)	1994-2009	Central Mediterranean												the authors describe the species as "rare in Malta and Tunisia, common in the other zones; sold at the market"
El Kamel-Moutalibi *et al.* (2014)	21/5/2014	Eskerkis Bank, Tunisia	150-300	M	1		70		1000					includes morphological measurements
El Kamel-Moutalibi *et al.* (2014)	21/5/2014	Eskerkis Bank, Tunisia	150-300	F	1		79		1280					includes morphological measurements
El Kamel-Moutalibi *et al.* (2014)	1/4/2007	Tunisian waters		M	1		81		3000					
El Kamel-Moutalibi *et al.* (2014)	15/7/2008	Tunisian waters		F	1		110		5000					
Papaconstantinou (2014)		Ionian Sea												review of Greek ichthyofauna
Rafrafi-Nouira *et al.* (2015)	25/9/2014	Cani Rocks, Tunisia	56	F	1		99							includes morphological measurements
Capapé *et al.* (2018)	24/11/2015	Island of Zembra, Tunisia	150	M	2	74	84	1300	1735					includes morphological measurements
Capapé *et al.* (2018)	24/11/2015	Island of Zembra, Tunisia	150	F	2	72	112	1150	2255					includes morphological measurements
Capapé *et al.* (2018)	2/8/2018	off Bizerte, Tunisia	130-140	M	1		72		1130					includes morphological measurements
Capapé *et al.* (2018)	2/8/2018	off Bizerte, Tunisia	130-140	F	1		70		1092					includes morphological measurements
Follesa *et al.* (2019)	2012-2015	Central Mediterranean (Sicily, South Italy, Ionian Sea)	200-800											data from MEDITS expedition (GSAs 16, 19, 20). Frequency of occurrence is given
Adriatic Sea														
Fredj & Maurin (1987)		Adriatic Sea												presence of the species (depths from 0 up to >1000 m)
Jukic-Peladic *et al.* (2001); Ferretti *et al.* (2013)	1948	Adriatic Sea			2									inventory of species caught in scientific surveys

Soldo (2006)		Adriatic Sea												the author states "often caught as bycatch in trawls and by deep bottom longlines, but their current status in the Adriatic is unknown"
Lipej & Dulčić (2010)		Adriatic Sea												checklist of the fishes in the Adriatic
Follesa *et al.* (2019)	2012-2015	South Adriatic	200-800											data from MEDITS expedition (GSA 18). Frequency of occurrence is given
West Mediterranean														
Tortonese (1969)		S. Margherita, Ligurian Sea												a medium-sized specimen from the market of S. Margherita (Eastern Riviera)
Fredj & Maurin (1987)		W Mediterranean												presence of the species (depths from 0 up to >1000 m)
Gil de Sola Simarro (1994)	1991-1992	Alboran Sea	200-500		5									overall weight 21050 g
Lloris *et al.* (1998)	1995	Iberian Mediterranean	423-433		1									data from MEDITS expedition
Baino *et al.* (2001)	1994-1999	Morocco, Spain and France												data from MEDITS expedition (biomass index 0.7 kg/km^2)
Baino *et al.* (2001)	1994-1999	Tyrrhenian, Corsica, Sardinia and Sicily												data from MEDITS expedition (biomass index 3.9 kg/km^2)
Storai (2004)		Livorno		M	1		98							based on musem material
Storai (2004)		Livorno		F	2									based on musem material
Serena & Relini (2006)	1985-2004	Northern Tuscany												data from GRUND surveys
Serena & Relini (2006)	1994-2004	W Mediterranean												data from MEDITS surveys (it includes all Mediterranean, not specifying the area H. perlo was caught)
Dufur *et al.* (2007)		Port Cross and Corsica												presence of the species in an MPA
Mullas *et al.* (2011)	2008-2010	Sardenia	600		3									during experimental trawl surveys (MEDITS and GRUND)
Bonomo *et al.* (2011)	1906-1963	Milazzo, Sicily												catches in tuna traps
Ordines *et al.* (2011)	3/2003, 2/2004	Algeria	300-505		2									only the presence of 2 individuals is being reported
Mendoza *et al.* (2014)	2006-2011	SE Spain, W Mediterranean												presentation of a vulnerability index
Marongiu *et al.* (2017)	1994-2015	Sardenia	273-336		1		80.5							data from MEDITS expedition
Agnetta *et al.* (2019)	spring 2005	Gulfs of Castellammare, Termini Imerese, Sant'Agata and Patti			24									fished to be used for stable isotope analyses. Average lengths are given
Guallart *et al.* (2019b)	26/6/2019	Ibiza channel, Balearic Sea		F	1		64.3							includes morphological measurements
Guallart *et al.* (2019a)	24/2/2018	Balearic Sea	650	F	1		79.6		1590					
references that could not be allocated to a specific Mediterranean Area														
Vassilopoulou *et al.* (2007)		Greek Seas												presented in a list of totally discarded species
Peristeraki & Megalofonou (2007)		Greek Seas												presence of the species in the Greek Seas
Thessalou-Legaki & Legakis (2005)		Greek Seas												presence of the species in the Greek Seas, with notes on the Greek legislation related to the species

Appendix 2: List of records of *Heptranchias perlo* ***in the Mediterranean, based on secondary references (literature not available to the authors). F=female, M=male, N=number of individuals.***
Priloga 2: Seznam zapisov o pojavljanju vrste *Heptranchias perlo* ***v Sredozemskem morju, ki temeljijo na sekundarnih referencah (literatura, ki ni bila dostopna avtorjem). F=samica, M=samec, N=število osebkov.***

main Reference	secondary Reference	date	locality	Sex	N
East Mediterranean					
Athanasiou & Boulos (1964)	Capapé (1980)		Lebanon		
Demetropoulos & Neocleous (1969)	Hadjichristophorou (2006)		Famagusta Bay and Morphou Bay, Cyprus		
Cihangir *et al.* (2002)	Çoker & Akyol (2014)		Bay of Magusa, East Cyprus		
Erhard (1858)	Papaconstantinou (2014)		Aegean Sea		
Heldreich (1978)	Papaconstantinou (2014)		Aegean Sea		
Carus (1893)	Papaconstantinou (2014)		Aegean Sea		
Bertrand *et al.* (2000)	Papaconstantinou (2014)		Aegean Sea		
BOLD	Guallart *et al.* (2019a,b)	2009	off Cyprus		5
Central Mediterranean					
BOLD	Guallart *et al.* (2019a,b)	2007	Malta	M	2
BOLD	Guallart *et al.* (2019a,b)	2008	NW Ionian Sea	M	1
Adriatic Sea					
Soljan (1963)	Capapé (1980)		N Adriatic (former Yugoslavia)		
West Mediterranean					
Moreau (1881)	Capapé (1980), Guallart *et al.* (2019a)		Nice, Sete		
LoBianco (1909)	Guallart *et al.* (2019a)		off Naples		
Gibert (1913)	Guallart *et al.* (2019a,b)		Catalonia, Spain		
Lozano Rey (1928)	Guallart *et al.* (2019a,b)	1915	Motril, Alboran		1
Dieuzeide *et al.* (1953)	Capapé (1980)		Morocco		
Capapé (1975)	Capapé (1980)		Morocco		
Capapé (1977)	Capapé (1980), Guallart *et al.* (2019a)		Toulon, France		
Barrull & Mate (2002)	Guallart *et al.* (2019a,b)	2000	Alboran		1
Hemida (2005)	Guallart *et al.* (2019a,b)		Algeria		
Bearez *et al.* (2017)	Guallart *et al.* (2019a,b)		Gulf of Lions		
Ramirez (2017)	Guallart *et al.* (2019a)	1995, 2002	Alboran (GSA01)		2
BOLD	Guallart *et al.* (2019a)		Mazzara de Vallo	F	1
BOLD	Guallart *et al.* (2019a)	2009	off Sardinia	F	2
references that could not be allocated to a specific Mediterranean Area					
Doderlein (1881)	Papaconstantinou (2014)		Greek seas		
Apostolidis (1883, 1907)	Papaconstantinou (2014)		Greek seas		
Hoffman & Jordan (1892)	Papaconstantinou (2014)		Greek seas		
Belloc (1948)	Papaconstantinou (2014)		Greek seas		
Tortonese (1956)	Guallart *et al.* (2019a)		Italian waters		
Bini (1960; 1965; 1967)	Papaconstantinou (2014)		Greek seas		
Ondrias (1971)	Capapé (1980), Papaconstantinou (2014)		Greek seas		
Boeseman (1973; 1984)	Papaconstantinou (2014)		Greek seas		
Economidis (1973)	Capapé (1980), Papaconstantinou (2014)		Greek seas		
Fisher *et al.* (1987)	Papaconstantinou (2014)		Greek seas		
diNatale (1998)	Guallart *et al.* (2019a)		Italian waters		
Machias *et al.* (2001)	Papaconstantinou (2014)		Greek seas		
Legakis & Maragou (2009)	Papaconstantinou (2014)		Greek seas		

PREGLED O POJAVLJANJU MORSKEGA PSA SEDMEROŠKRGARJA *HEPTRANCHIAS PERLO* (CHONDRICHTHYES: HEXANCHIDAE) V SREDOZEMLJU: ZGODOVINSKI IN RECENTNI PODATKI

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POVZETEK

Avtorji poročajo o pojavljanju morskega psa sedmeroškrgarja Heptranchias perlo *(Bonnaterre, 1788) v Sredozemskem morju na podlagi celovitega pregleda literature, ki je bil osnova za pripravo podatkovne baze o razširjenosti te vrste. Poleg tega v delu omenjajo biološke podatke o samici te redke vrste na robu ogroženosti, ki je bila ujeta v okviru eksperimentalnega vzorčenja v mirtonskem morju (jugozahodno Egejsko otočje, Grčija). Namen tega prispevka je podati povzetek o razpoložljivih podatkih o tej vrsti v Sredozemskem morju, ki bo služil za prihodnja dopolnjevanja ocen glede ohranitvenega statusa vrste v bazenu.*

Ključne besede: hrustančnice, prehrana, plodnost, sredozemska razširjenost

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