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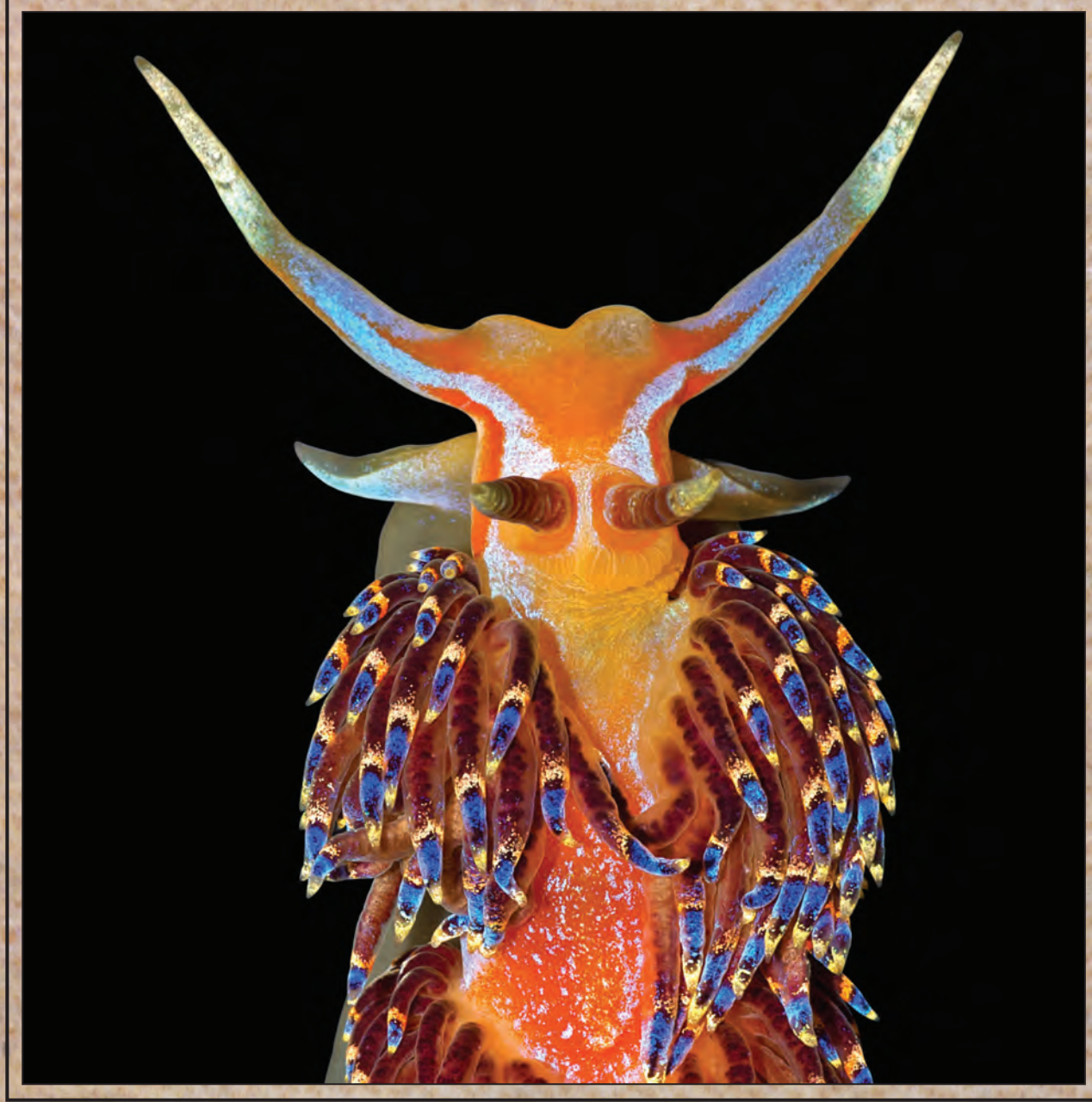

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FIRST RECORD OF ALIEN SEASLUG *GODIVA QUADRICOLOR* (BARNARD, 1927) (GASTROPODA: NUDIBRANCHIA) IN THE EASTERN ADRIATIC SEA

Mirta KUČIĆ & Leo LANČA
Mirta Kučić, Vresikovo 4, Mali Lošinj 51550, Croatia
e-mail: mirta.kucic@gmail.com

ABSTRACT

A specimen of the alien sea slug Godiva quadricolor *(Barnard, 1927) was recorded in Rovinj (Croatia, Adriatic Sea) in February 2017. It was found on a rope at 0.5 m depth in the ACI marina. This is the first record of this sea slug species in the north-eastern Adriatic Sea.*

Key words: alien sea slug**,** *Godiva quadricolor*, first record, north-eastern Adriatic Sea

PRIMO RITROVAMENTO DEL NUDIBRANCO ALIENO *GODIVA QUADRICOLOR* (BARNARD, 1927) (GASTROPODA: NUDIBRANCHIA) NELL'ADRIATICO ORIENTALE

SINTESI

Un esemplare del nudibranco alieno Godiva quadricolor *(Barnard, 1927) è stato ritrovato a Rovigno (Croazia, mare Adriatico a febbraio del 2017. Il mollusco è stato trovato su una corda, a 0,5 m di profondità nella marina ACI. Questa è il prima segnalazione di questa specie di nudibranchi nell'Adriatico nord-orientale.*

Parole chiave: nudibranco alieno, *Godiva quadricolor*, primo ritrovamento, Adriatico nord-orientale

INTRODUCTION

Recently, the nudibranchs and other sea slugs started to deserve increasing attention by malacologists. According to the last published survey of the opisthobranch fauna of the Adriatic Sea at least 223 species of seaslugs were up to date recorded, with some 163 species reported for the Croatian part (Zenetos *et al*., 2016). In the same survey authors reported 7 seaslugs as non indigenous species (NIS), one as a probably NIS and 3 cryptogenic species. However, the number of sea slug species is probably much higher (J. Prkić, *pers. comm*., unpublished data) in the Croatian part of the Adriatic Sea 265 species were up to date recorded, while in the Slovenian part 141 species were recently reported by Lipej *et al.* (2018).

MATERIAL AND METHODS

A specimen of a sea slug *Godiva quadricolor* (Barnard, 1927) (Fig. 2) was found on a rope at 0.5 m depth recorded on 16th February 2017 at Rovinj (Croatia, northern Adriatic) (Fig. 1). The specimen was delivered to lab aquarium and photographed with the camera Nikon D600. It was identified using the guide for identification of opisthobranch of Trainito & Doneddu (2014) and specialized web sites such as OPK-Opisthobranchs (Ballesteros *et al.*, 2013) and Sea Slug Forum (Australian Museum, 2010). The taxonomic nomenclature follows the nomenclature according to WoRMS (2018). The specimen was preserved in 70% alcohol solution and housed in the private malacological collection of the authors.

RESULTS AND DISCUSSION

This is the first record of *G. quadricolor* in the eastern Adriatic Sea. This is a small nudibranch species, generally 30 mm to 50 mm in total length, occasionally 70 mm. The body is slender with a long tail with the typical white band with bluish line. Oral tentacles are smooth, long and slender, whereas rhinophores are much shorter and annulated. Five groups of cerata are located on flanks, with the highest number in the first group (row). The foot is semitransparent with two parapodial tentacles in front. The head is orange. Two white bands are laterally extending from oral tentacles to rhinophores. Oral tentacles could be coloured with white, orange or blue pigments. Rhinophores are brown in the lower part and yellowish at the top. Cerata are brown at the base, while in the upper part are coloured with yellow, orange, brown or blue pigments (Barnard, 1927; Australian Museum, 2010; Ballesteros *et al*., 2012-2018).

The specimen of *G. quadricolor* was found on a fouling community on a rope at 0.5 m depth in the ACI marina in Rovinj. It was found creeping on a bryozoan *Schizobrachiella sanguinea* (Norman, 1868). The specimen measured approximately 75 mm which is a little bit longer than the reported maximum length of 70 mm. In the aquarium the specimen laid the yellow orange spawn. It was also observed while preying on the eggs of the nudibranch *Doto* cf. *coronata*.

G. quadricolor was originally described from South Africa in the Cape Province where it is widespread. It was recorded along the eastern side of the African

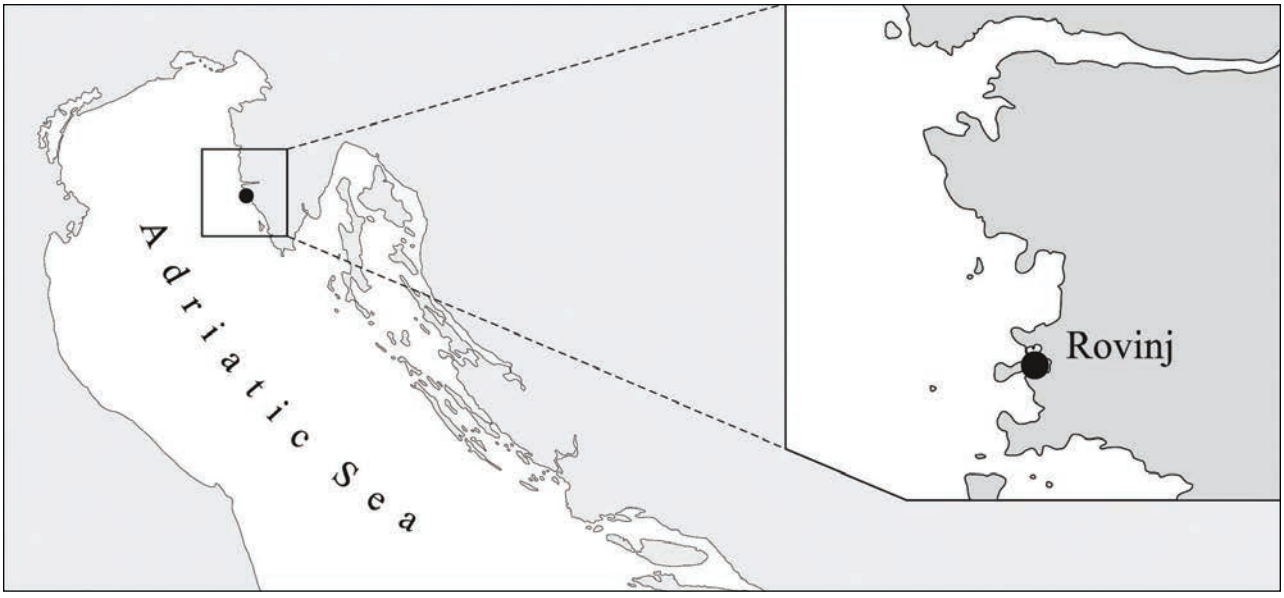

Fig. 1: Map of the studied area where the investigated specimen of** Godiva quadricolor **was collected.
Sl. 1: Zemljevid obravnavanega območja z lokacijo, kjer je bil najden primerek vrste** Godiva quadricolor**.

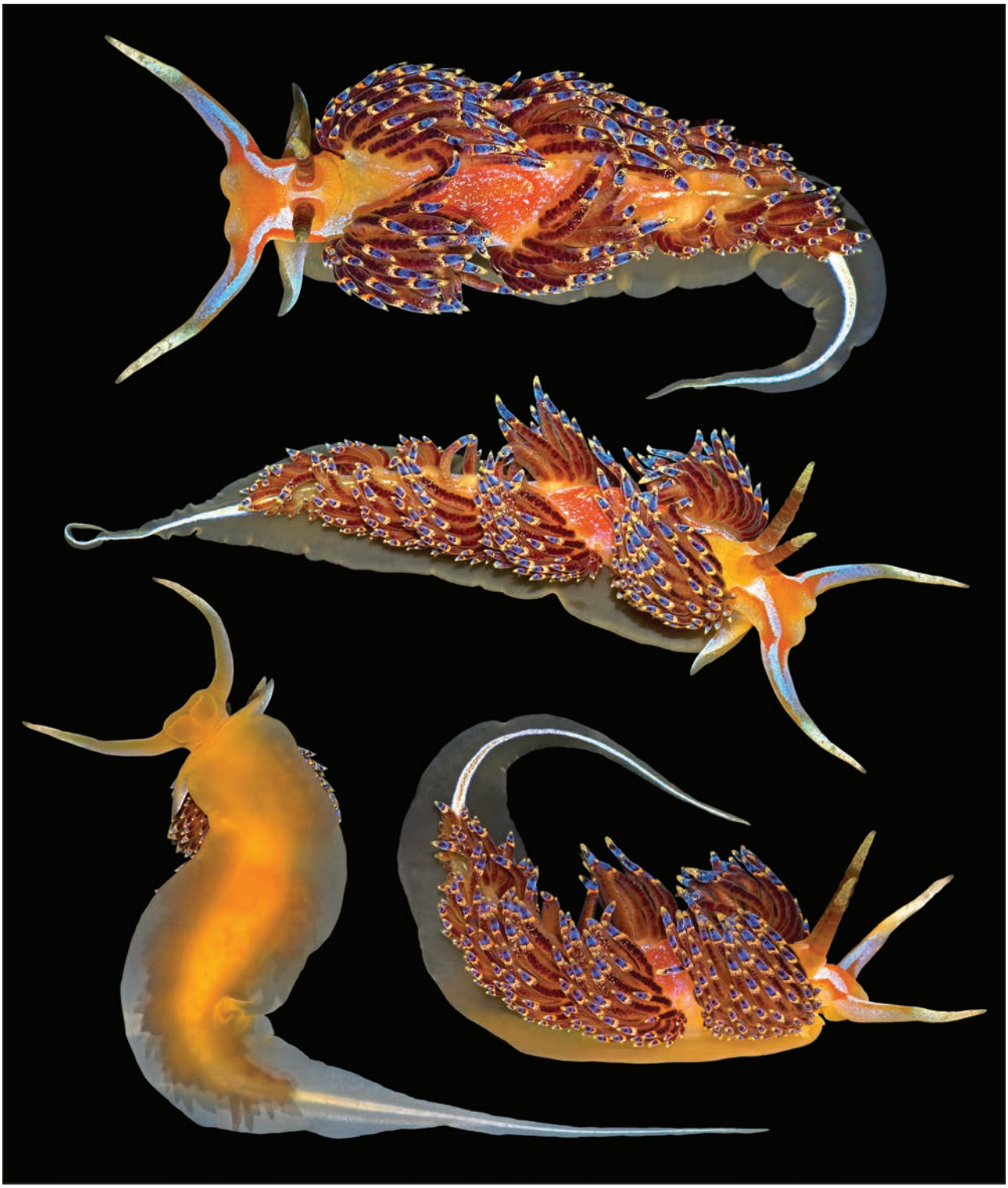

Fig. 2: Photographs of the studied specimen of *Godiva quadricolor* ***(Photo: L. Lanča).***
Sl. 2.: Fotografski posnetki primerka vrste *Godiva quadricolor* ***(Photo: L. Lanča).***

continent, north western Africa and in western Austalia (Willan, 1987, 2004). It has also been recorded in Japan, the Mariana Islands, Singapore, the Philippines, Papua New Guinea, New Caledonia, northern and western Australia and other areas (Willan, 2004). In the Mediterranean it was firstly reported in Lake Fusaro near Napoli (Cervera, 2002). Subsequently, the species was found in the lagoon Pialassa della Baiona close to Ravenna (Ioni, Rimini). Another record originated from the Fondali Noli - Bergeggi SCI in the Ligurian Sea which represented the northernmost record of the species in the Mediterranean Sea (Betti *et al*., 2015). Recently it was reported also from the lake Faro in Sicily (Furfaro *et al.*, 2018). In other Mediterranean areas it was discovered in the bay of Algeciras (Cervera *et al.,* 2010) and off the coast of France and Spain (Ballesteros *et al*., 2012-2018).

Generally, it was found intertidally or in shallow areas. In many cases it was found in coastal lagoons due to its ability to withstand oscillations in salinity (Cervera *et al.*, 2010). Furfaro *et al*. (2018) pointed out the predation on alien bryozoans such as *Amathia verticillata* (delle Chiaje, 1822) and *Bugula neritina* (Linnaeus, 1758)

According to Zenetos *et al*. (2012) in the Mediterranean the majority of alien species are mollusks (215 species), whereas in the Adriatic Sea up to date 27 species were reported. More than half of them arrived through Suez channel from Indian Ocean. The arrival of alien species is however different since maritime traffic and mariculture are considered as the main factors (Zenetos *et al*., 2016). In the Croatian part of the Adriatic Sea up to date 265 species of opisthobranchs were reported with 10 of them being aliens and additional 5 of them with doubtful zoogeographical identity (J. Prkić, *pers. comm*.). Most of the aliens were recorded also in other Adriatic countries (Zenetos *et al*., 2016). To our knowledge at least 70 species of opisthobranchs were up to date recorded from the area of Rovinj and some of them are aliens. Due to the ongoing trend of increased scientific interest for the nudibranchs and rapid increase of alien species in the Mediterranean sea a similar trend could be expected also for the Adriatic Sea.

ACKNOWLEDGMENTS

We wish to express our gratitude to our colleague Jakov Prkić for sharing with us his data, and to our friend, prof. dr. Lovrenc Lipej for his support.

PRVI ZAPIS O POJAVLJANJU TUJERODNEGA POLŽA ZAŠKRGARJA VRSTE *GODIVA QUADRICOLOR* (BARNARD, 1927) (GASTROPODA: NUDIBRANCHIA) V VZHODNEM JADRANU

Mirta KUČIĆ & Leo LANČA
Mirta Kučić, Vresikovo 4, Mali Lošinj 51550, Croatia
e-mail: mirta.kucic@gmail.com

POVZETEK

Primerek tujerodnega polža zaškrgarja vrste Godiva quadricolor *(Barnard, 1927) je bil februarja 2017 najden v Rovinju (Hrvaška, Jadransko morje). Našli so ga na vrveh na globini 0,5 m v ACI marini. Gre za prvi zapis o pojavljanju te vrste polža zaškrgarja v severovzhodnem Jadranu.*

Ključne besede: tujerodni zaškrgar, *Godiva quadricolor*, prvi zapis, severovzhodni Jadran

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FIRST RECORD OF *CERATOTHOA OXYRRHYNCHAENA* (ISOPODA: CYMOTHOIDAE) FROM TURKISH MARINE WATERS

Ahmet ÖKTENER
Deparment of Fisheries, Sheep Research Institute, Çanakkale Street 7km., Bandırma, 10200, Balıkesir, Turkey
e-mail: ahmetoktener@yahoo.com

Dilek TÜRKER
Department of Biology, Science Faculty, Balikesir University, Cagıs Campus, 10300, Balikesir, Turkey

Ali ALAŞ
Department of Biology, Education Faculty, Necmettin Erbakan University, 42090
Meram, Konya, Turkey

ABSTRACT

Ceratothoa oxyrrhynchaena *Koelbel, 1878, an ectoparasitic isopod (Cymothoidae), has been recorded for the first time in Turkish waters. The samples of* Lithognathus mormyrus *that hosted the isopod were collected with local fishing gears in the port of Babakale in the Turkish part of the Aegean Sea in 2014. The paper aims to present the morphological characters of* C. oxyrrhynchaena *with photos and drawings of the Turkish samples. These parasites are also frequently reported in aquaculture, where they can cause serious damage. Although the occurrence of* C. oxyrrhynchaena *in the Mediterranean Sea is well known, it had not been reported from Turkey previously. The present paper aims to inspire more detailed taxonomic studies about and comparisons with the cymothoid faunas of the neighbouring Mediterranean countries.*

Key words: Turkey, *Ceratothoa oxyrrhynchaena*, Isopoda, Cymothoidae

PRIMA SEGNALAZIONE DI *CERATOTHOA OXYRRHYNCHAENA* (ISOPODA: CYMOTHOIDAE) IN ACQUE MARINE DELLA TURCHIA

SINTESI

Ceratothoa oxyrrhynchaena *Koelbel, 1878, un isopode ectoparassitico (Cymothoidae), è stato trovato per la prima volta nelle acque marine della Turchia. Gli esemplari di* Lithognathus mormyrus *infestati dall'isopode sono stati raccolti con attrezzi da pesca locali nel porto di Babakale, nella parte turca del mar Egeo, nel 2014. L'articolo si propone di presentare i caratteri morfologici di* C. oxyrrhynchaena *con foto e disegni dei campioni turchi. Questi parassiti sono frequentemente riportati anche in acquacoltura, dove possono causare gravi danni. Sebbene l'occorrenza di* C. oxyrrhynchaena *nel mare Mediterraneo sia ben nota, la specie non era stata segnalata in precedenza per la Turchia. Il lavoro si propone di ispirare studi tassonomici più dettagliati e confronti con le faune di Cimotoidi dei paesi mediterranei confinanti.*

Parole chiave: Turchia, *Ceratothoa oxyrrhynchaena*, Isopoda, Cymothoidae

INTRODUCTION

Cymothoids are a family of ectoparasitic isopods found on the body, fins, or inside the buccal or branchial cavities of numerous freshwater and marine fish. They are protandrous hermaphrodites (Bariche & Trilles, 2005).

Several studies have been carried out to determine the effects of cymothoids on host fish (Fogelman *et al*., 2009; Rameshkumar & Ravichandran, 2013; Elgendy *et al*., 2018). Fogelman *et al*. (2009) investigated the effects of *Anilocra apogonae* on the five-lined cardinalfish, *Cheilodipterus quinquelineatus*. They found that the gonads of fish infested with cymothoids were smaller than those of non-infested fish, and that infested fish were inferior in weight and length to non-infested fish of the same age. Elgendy *et al*. (2018) examined the haematological and histopathological effects of *Nerocila bivittata* on *Tilapia zillii*. They determined that infested fish had lower erythrocyte, haemoglobin and haematocrit values than non-infested fish, and recorded serious histopathological damage in different sites of the body. Rameshkumar & Ravichandran (2013) discovered small pinholes in the tongues of *Carangoides malabaricus* infested by *Catoessa boscii*, and established that the increase in growth in non-infested fish was higher than in infested fish.

The World Register of Marine Species (WoRMS Editorial Board., 2018) lists thirty species within the genus Ceratothoa. Five of them (*Ceratothoa oestroides*, *Ceratothoa parallela*, *Ceratothoa italica*, *Ceratothoa steindachneri*, *Ceratothoa capri*) have also been reported from Turkish waters, but these studies include limited descriptions (Öktener & Trilles, 2004).

The present paper is the first report of *Ceratothoa oxyrrhynchaena* in Turkish waters with a description of the species' morphological characters. With the new record, the number of Ceratothoa species known in Turkey increases to six.

MATERIAL AND METHODS

Twelve samples of *Lithognathus mormyrus* (Linnaeus, 1758) (Sparidae) were collected using local fishing gears in the Turkish part of the Aegean Sea in 2014. The identification of parasites was performed mainly following Schioedte & Meinert (1883), Montalenti (1948), Trilles (1972), Horton (2000), Yamauchi (2009), Martin *et al*. (2013), and Hadfield *et al*. (2016). The parasites collected were fixed in 70% ethanol. The mouthparts and pleopods were dissected using Wild M5 stereo microscope. The dissected parts were mounted on slides in glycerine-gelatine mounting medium. The pleopods of the isopods were stained with methylene blue. The drawings of the appendages were carried out with the aid of a camera lucida (Olympus BH-DA). The photographs were taken with a Canon EOS 1100D camera attached to a microscope. The measurements were taken in millimetres (mm), using a micrometric programme (Pro-way). The scientific names of the different host species were checked with the WoRMS Editorial Board (2018). The information on the feeding habits of the specific hosts were provided according to Froese & Pauly (2017).

RESULTS AND DISCUSSIONS

This parasitological study identifies the *Ceratothoa oxyrrhynchaena* from Turkish waters.

Ceratothoa oxyrrhynchaena Koelbel, 1878 (Isopoda; Cymothoidae) (Figs. 1–5)

Host: *Lithognathus mormyrus*; Infestation site: mouth cavity; Locality: Babakale Port; Prevalence: 16.6% on *L. mormyrus*; Total parasites: 2; Dissected material: 2.

Fig. 1: *Ceratothoa oxyrrhynchaena (♀)* ***(Scale: 12.5 mm).***
Sl. 1: *Ceratothoa oxyrrhynchaena (♀)* ***(Merilo: 12,5 mm).***

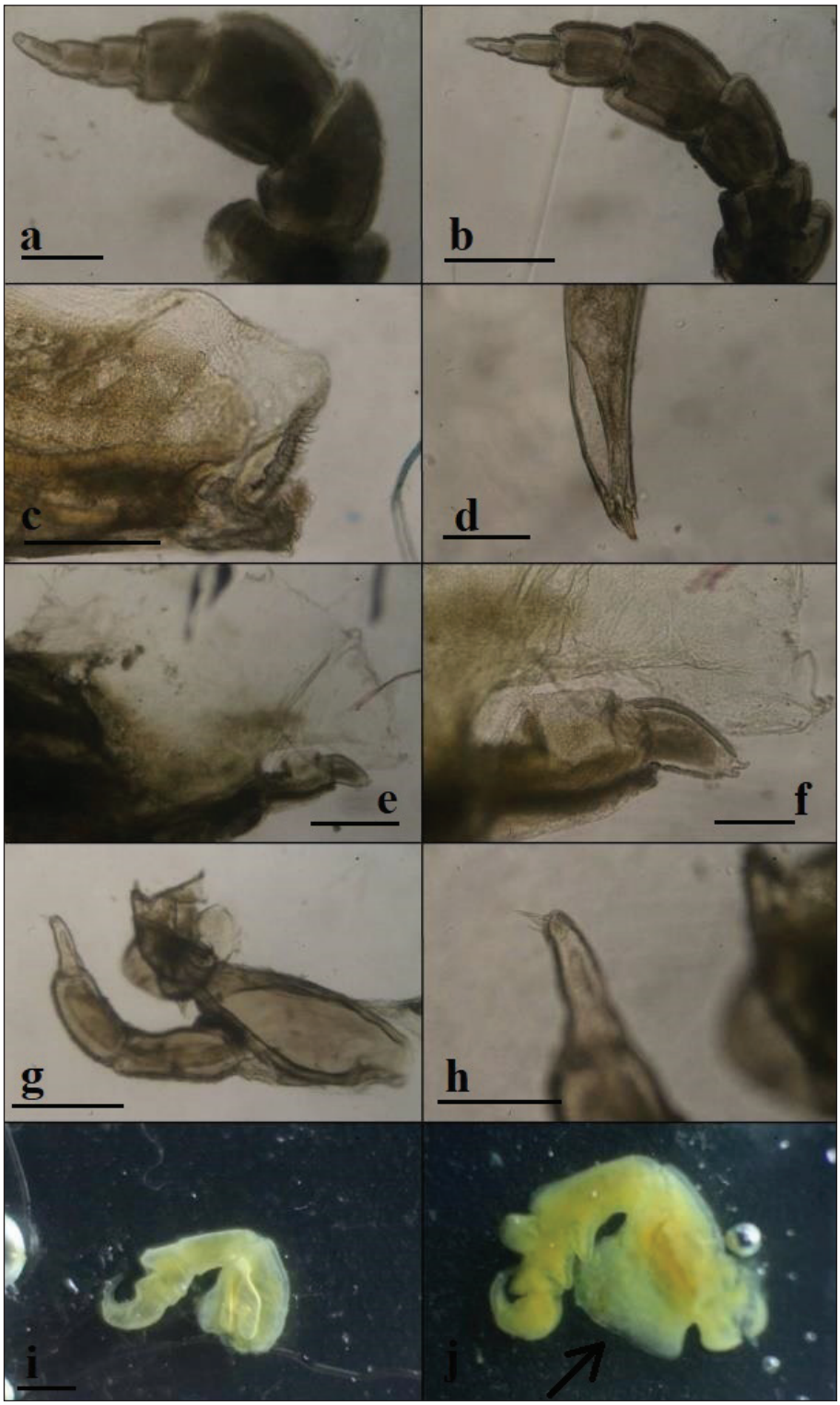

Fig. 2: *Ceratothoa oxyrrhynchaena (♀):* ***(a) antennule (0.38 mm); (b) antenna (0.48 mm); (c) maxilla (0.25 mm); (d) maxillula (0.14 mm); (e) maxilliped (0.34 mm); (f) distal of maxilliped (0.19 mm); (g) mandible (0.44 mm); (h) distal of mandible (0.30 mm); (i) 1. pereopod (1.21 mm); (j) 7. pereopod.***
Sl. 2: *Ceratothoa oxyrrhynchaena (♀):* ***(a) antenula (0,38 mm); (b) antena (0,48 mm); (c) maksila (0,25 mm); (d) maksilula (0,14 mm); (e) maksiliped (0,34 mm); (f) distalni del maksilipeda (0,19 mm); (g) mandibula (0,44 mm); (h) distalni del mandibule (0,30 mm); (i) 1. pereopod (1,21 mm); (j) 7. pereopod.***

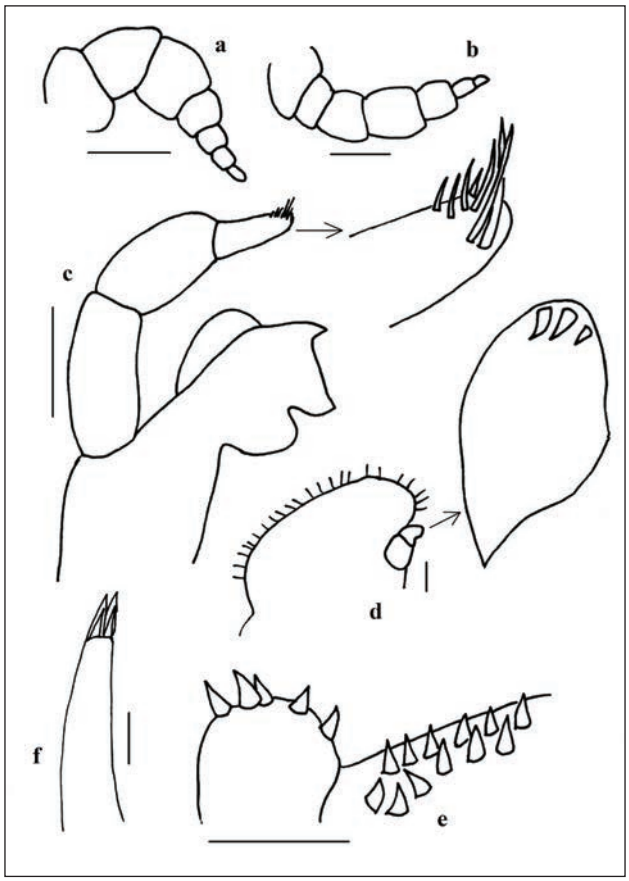

Fig. 3: *Ceratothoa oxyrrhynchaena (♀);* ***(a) antennule (0.77 mm); (b) antenna (0.48 mm); (c) mandible (0.44 mm); (d) maxilliped (0.53 mm); (e) maxilla (0.20 mm); (f) maxillula (0.15 mm).***
Sl. 3: *Ceratothoa oxyrrhynchaena (♀);* ***(a) antenula (0,77 mm); (b) antena (0,48 mm); (c) mandibula (0,44 mm); (d) maksiliped (0,53 mm); (e) maksila (0,20 mm); (f) maksilula (0,15 mm).***

Female: Body length from 22 to 25 mm. Body stout, gradual anterior-to-posterior expansion. Body about 3.5–4 times as long as wide. Eyes distinct but often hidden by antennules and antennae. Coxal plates of pereonites 1–3 inconspicuous, those of 4–7 visible in dorsal view. Pereonites 5-7 shortest, pereonites 1–4 subequal in length. Pereons 1–5 gradually increasing in width, widest at pereonite 5, narrowest at pereonite 1. All pleonites visible, first pleonite distinctly narrow, pleonites 3–5 slightly wider. Seventh pereonite curved medially, especially at its distal edge, and almost entirely covering pleonite 1 and a large part of pleonite 2, whereas the last three pleonites are completely visible. Pleotelson wider than longer, posterior margin slightly concave, its width about 2.8–3 times the length.

Antennule (Figs. 2a, 3a) composed of seven articles. Antenna (Figs. 2b, 3b) composed of eight articles, distal article very small. Antennule and antenna extending to posterior margin of eye. Mandibular palp (2g, h, 3c) with the third article distinctly shorter than others and setae on apex. Maxillula (Figs. 2d, 3f) with four terminal spines, one long and three short ones. Maxilla (Figs. 2c, 3e) with two rows of spines. Maxilla medial lobe with 4–6 spines, lateral lobe with 10–12 spines. Maxilliped (Figs. 2e, f, 3d) of ovigerous female with oostegial lobe and distal palp with 3 apically recurved spines on article 3.

Pereopods (Figs. 4a–g) gradually increasing in length, all without spines; pereopods 1–4 slightly smaller than 5–7. Expansion of merus and basis on the upper edges of the seventh pereopod distinct from that of 1–6. Pleopods gradually decreasing in length. Peduncles of pleopods 1-4 (Figs. 5a-e) bear a number of hooks ranging from 2 to 4.

Uropods extending to the margin of pleotelson. Exopod (Fig. 4h) slightly longer than endopod.

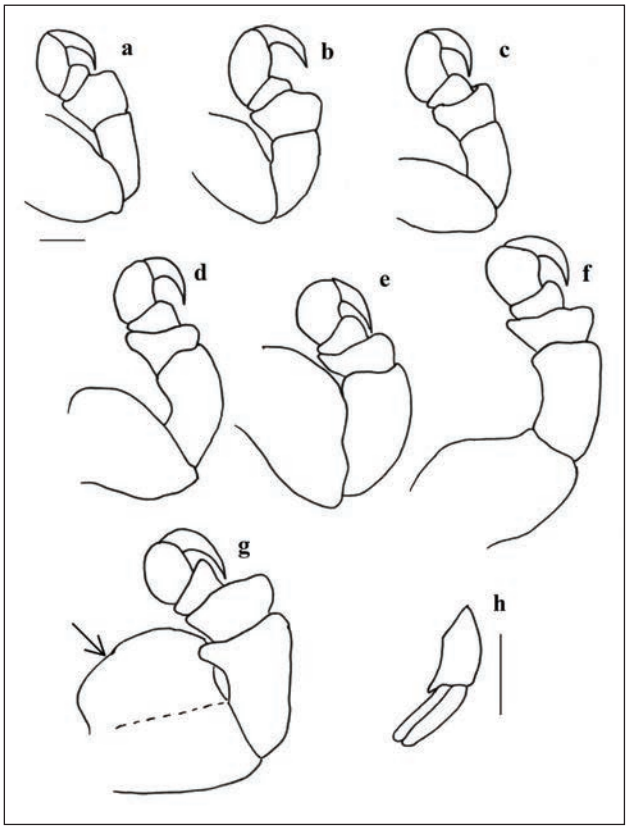

Fig. 4: *Ceratothoa oxyrrhynchaena* (♀)***: (a–g) Pereopod I–VII (0.78 mm); (h) uropod (1.66 mm).***
Sl. 4: *Ceratothoa oxyrrhynchaena* (♀)***: (a–g) Pereopodi I–VII (0,78 mm); (h) uropod (1,66 mm).***

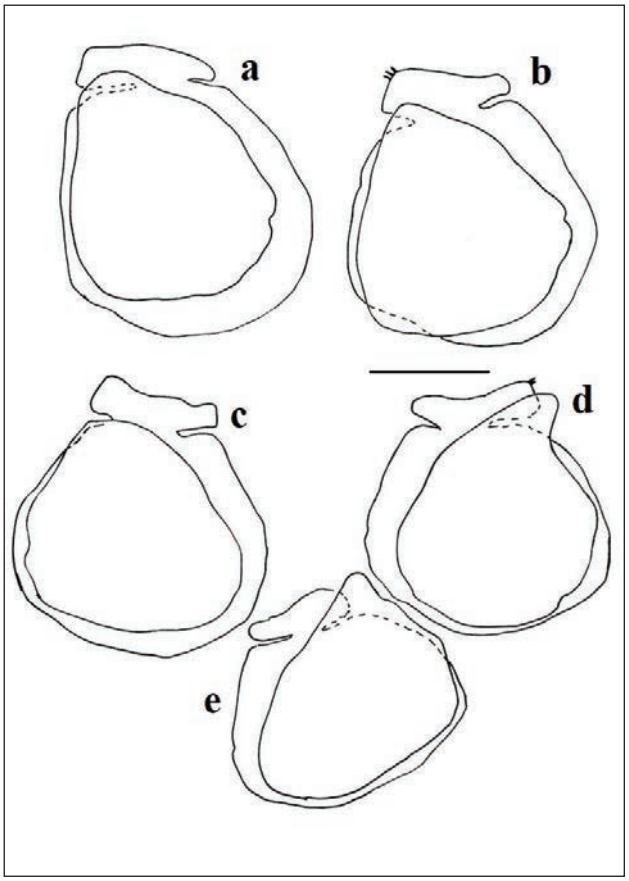

Fig. 5: *Ceratothoa oxyrrhynchaena* (♀)***: (a–e) Pleopod I–V (1.69 mm).***
Sl. 5: *Ceratothoa oxyrrhynchaena* (♀)***: (a–e) Pleopodi I–V (1,69 mm).***

Distribution: Pacific Ocean, Atlantic Ocean, Mediterranean (Trilles *et al*. (1989); Yamauchi (2009); Hadfield *et al*. (2016); Martin *et al*. (2013, 2015).

Hosts: *Boops boops* (Montalenti, 1948; Euzet & Trilles, 1961; Ramdane *et al*., 2007; Ramdane & Trilles, 2008); *Spicara maena* (Quintard-Dorques, 1966); *Spicara smaris* (Ramdane *et al*., 2007; Ramdane & Trilles, 2008); *Spicara* sp (Montalenti, 1948), *Raja asterias*, *Raja clavata*, *Scyliorhinus stellaris*, *Torpedo marmorata* (Capape & Pantoustier, 1976); *Zeus faber*, *Dentex macrophthalmus* (Trilles, 1972; Rokicki, 1985); *Dentex spariformis* (Martin *et al*., 2013); *Doederleinia berycoides* (Yamauchi, 2009; Yamauchi & Nunomura, 2010); *Lithognathus mormyrus* (Bariche & Trilles, 2005).

The hosts parasitized by *Ceratothoa oxyrrhynchaena* were classified by family characteristics: 31% of the 13 host species belonged to Sparidae; 23% to Centracanthidae; 15% to Rajidae; 31% to other families.

The hosts parasitized by *Ceratothoa oxyrrhynchaena* were classified by type of habitat: 39% of the 13 host fish species were demersal; 15% were reef-associated; 23% benthopelagic; 23% pelagic-neritic.

The hosts parasitized by *Ceratothoa oxyrrhynchaena* were classified by feeding habits: 69% of the 13 host fish species were carnivorous, 31% omnivorous.

Remarks: This species is recorded for the first time in Turkish waters. An antennule with 7 articles and an antenna with 9 articles were found in this study, as opposed to an antennule with 7 articles and an antenna with 7 articles found by Montalenti (1948), Trilles (1972), Yamauchi (2009); and an antennule with 7 articles and an antenna with 9 articles by Schioedte & Meinert (1883), Martin *et al*. (2013). The maxillula with four terminals found in this study is compatible with Trilles (1972), Montalenti (1948), Yamauchi (2009), Martin *et al*. (2013). This study shows a maxilla medial lobe with 4–6 spines and lateral lobe with 10–12 spines, as opposed to the maxilla medial lobe with 6 spines and lateral lobe with 15 spines in Montalenti, (1948); the maxilla medial lobe with 1 spine and lateral lobe with 9 spines in Trilles, (1972); the maxilla medial lobe with 8 spines and lateral lobe with 15 spines in

Yamauchi (2009); the maxilla medial lobe with 3 spines and lateral lobe with 10 spines in Martin *et al*. (2013). The third article with setae on the lateral margin of the mandible palp found in this study is compatible with Trilles (1972) and Montalenti (1948), but different from the mandible palp without spines found by Montalenti (1948), Yamauchi (2009), Martin *et al*. (2013). Three spines on article 3 of the maxilliped were found in an ovigerous female in this study, as opposed to article 3 of the maxilliped with 2 spines in a non-ovigerous female and 3 spines found in an ovigerous female by Montalenti (1948); 8 spines on article 3 of the maxilliped of a female found by Trilles (1972); 9 spines on article 3 of maxilliped of a female found by Yamauchi (2009); and 5 spines on article 3 of maxilliped in a female found by Martin *et al*. (2013). The morphological characters of *Ceratothoa oxyrrhynchaena* followed the key to the Ceratothoa as prepared by Horton (2000): "Cephalon not curved towards rostrum. Prominent merus expansion on all pereopods, most noted on pereopod VII. Very prominent expansions of the basis on pereopod VII reaching the level of propodus. Pleotelson not wider than pereonite VII, body almost triangular in shape. Cephalon deeply immersed, shoulders of pereonite I level with anterior margin of eyes." The morphological characters are compatible with Horton (2000) and other literature. Hooks were discovered on the medial part of the pleopod peduncle. This important finding distinguishes this study from other research papers.

Therefore, the *Ceratothoa oxyrrhynchaena* presented herein, together with the previously reported five species, brings the total number of species of Ceratothoa in Turkey to six.

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The authors gratefully acknowledge the following individuals for technical and facility support: Dr. Jean Paul Trilles verified *Ceratothoa* genus; Dr. Alessandro Ceragato providing literature.

PRVI ZAPIS O POJAVLJANJU ZAJEDALSKEGA RAKA ENAKONOŽCA VRSTE *CERATOTHOA OXYRRHYNCHAENA* (ISOPODA: CYMOTHOIDAE) V TURŠKIH VODAH

Ahmet ÖKTENER
Deparment of Fisheries, Sheep Research Institute, Çanakkale Street 7km., Bandırma, 10200, Balıkesir, Turkey
e-mail: ahmetoktener@yahoo.com

Dilek TÜRKER
Department of Biology, Science Faculty, Balikesir University, Cagıs Campus, 10300, Balikesir, Turkey

Ali ALAŞ
Department of Biology, Education Faculty, Necmettin Erbakan University, 42090
Meram, Konya, Turkey

POVZETEK

Ektoparazitski rak enakonožec Ceratothoa oxyrrhynchaena *Koelbel, 1878, (družina Cymothoidae) je bil prvič potrjen za turške vode. Vzorce ovčice* Lithognathus mormyrus*, na katerih je bil najden enakonožec, so lokalni ribiči ulovili v pristanišču Babakale v turškem delu Egejskega morja. Avtorji predstavljajo morfološke znake vrste* C. oxyrrhynchaena *skupaj s fotografskim gradivom in risbami. O zajedavcih te vrste pogosto poročajo iz marikultur, kjer lahko povzročijo resno škodo. Čeprav je pojavljanje vrste* C. oxyrrhynchaena *v Sredozemskem morju dobro poznano, doslej te vrste v Turčiji še niso zabeležili. S pričujočim delom želijo avtorji vzbuditi potrebo po bolj natančnih taksonomskih raziskavah in po primerjalni analizi favne zajedavcev v sosednjih sredozemskih državah.*

Ključne besede: Turčija, *Ceratothoa oxyrrhynchaena*, Isopoda, Cymothoidae

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ON THE RARE AND LESS KNOWN SHAMEFACED CRAB *CALAPPA GRANULATA* (BRACHYURA, CALAPPIDAE) IN THE NORTHERN ADRIATIC SEA

Nicola BETTOSO
ARPA FVG, via A. La Marmora 13, 34139 Trieste, Italy
e-mail: nicola.bettoso@arpa.fvg.it

Marin KIRINČIĆ
Natural History Museum, Lorenzov prolaz 1, 51000 Rijeka, Croatia

Borut MAVRIČ & Lovrenc LIPEJ
Marine Biology Station, National Institute of Biology, Fornače 41, SI-6330 Piran, Slovenia

ABSTRACT

On 1st August 2016 and 23th July 2017 two specimens of the shamefaced crab Calappa granulata *(Linnaeus, 1758) were caught in the northernmost area of the Adriatic Sea and represent the second and third official record, respectively. More recently the records of this commercial species start to be no more unusual in this northern region. It is too early to express any reliable comment regarding whether or not this species established a breeding population in this area, however we could consider its northward extension as another consequence of global warming.*

Key words: shamefaced crab, *Calappa granulata*, northern Adriatic, global warming

IL RARO E POCO CONOSCIUTO GRANCHIO MELOGRANO *CALAPPA GRANULATA* (BRACHYURA, CALAPPIDAE) NELL'ADRIATICO SETTENTRIONALE

SINTESI

Il primo agosto 2016 e il 23 luglio 2017 sono stati catturati due esemplari di granchio melograno Calappa granulata *(Linnaeus, 1758) nell'area più settentrionale del mare Adriatico e ne rappresentano rispettivamente la seconda e la terza segnalazione ufficiale. Attualmente le catture di questa specie commerciale non sembrano più inconsuete come nel passato. È ancora troppo presto per avanzare ipotesi riguardo al suo insediamento in pianta stabile su quest'area, tuttavia l'espansione verso nord di questa specie può costituire un ulteriore conseguenza del riscaldamento globale dei mari.*

Parole chiave: granchio melograno, *Calappa granulata*, Adriatico settentrionale, riscaldamento globale

INTRODUCTION

The shamefaced crab *Calappa granulata* (Linnaeus, 1758) is a sublittoral species known from the Mediterranean Sea and adjacent Atlantic Ocean from Portugal to Mauritania, including the Azores, Madeira, the Canary Islands and the Cape Verde Islands (Manning & Holthuis, 1981; Ševčić, 1990). More recent records in the Mediterranean Sea are the Gulf of Taranto (Ionian Sea) (Pastore, 1995), the Strait of Sicily (Spanò *et al*., 2004), the coastal waters of the Sea of Marmara (Artűz, 2006) and Edremit Bay (Aegean Sea) (Balkis & Kurun, 2008). In the Adriatic Sea, Stossich (1880) mentioned this species as rare in Split, Hvar, Vis and Korčula. After 110 years Ševčić (1990) confirmed the rarity of this crab in the Middle and South Adriatic where it was recorded in waters off Šibenik, Split, Dubrovnik, Sestrunje, Hvar, Korčula and Vis. The last records from the southern Adriatic arises to Ungaro *et al*. (2005) who found some individuals during trawling operations in the framework of the E.U. Project MEDITS, moreover Marković *et al*. (2017) recorded this species also in Montenegron waters in Kotor Bay and Herceg Novi Bay. On December 2010, a specimen was caught in the northern Adriatic Sea northwest off Umag, on the western coast of the Istrian Peninsula, a region substantially further North than any previous records in the Adriatic (Dulčić & Tutman, 2012). In 2016 and 2017 another two specimens were collected off Istrian Peninsula and more recently the records of this commercial species start to be no more unusual in this northern region.

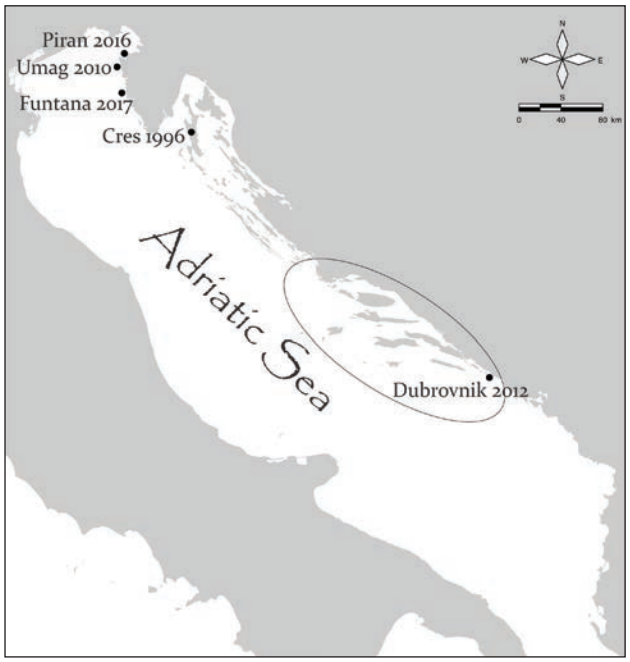

Fig. 1: Records of** Calappa granulata **in the Adriatic Sea: Piran 2016 and Funtana 2017 (the present work), Umag 2010 (Dulčić & Tutman, 2012), Cres 1996 and Dubrovnik 2012 are referred to specimens deposited in the Natural History Museum of Rijeka; the circle shows the geographic area indicated by Stossich (1880) and Ševčić (1990).
Sl. 1: Podatki o pojavljanju vrste** Calappa granulata **v Jadranskem morju: Piran 2016 in Funtana 2017 (pričujoče delo), Umag 2010 (Dulčić & Tutman, 2012), Cres 1996 in Dubrovnik 2012 pa se nanašajo na primerke v zbirki Prirodoslovnega muzeja na Reki; krogec označuje območje, ki ga navajata Stossich (1880) in Ševčić (1990).

MATERIAL AND METHODS

On 23th July 2017, a specimen of *Calappa granulata* was caught 4 Nm [nautical miles: approx. 7.4 Km] off Funtana by a trammel net at about 20 m depth on a muddy sand bottom. Previously another specimen was caught on 1st August 2016 in bottom-set gillnet 2 Nm [nautical miles: approx. 3.7 Km] off Piran (Fig. 1).

Specimens were identified following Holthuis (1987) and compared to the two other deposited in the Natural History Museum of Rijeka (Catalogue numbers: C195 and C1540). C195 was deposited on January 1996 and collected in the waters near Cres Island, whereas C1540 was sampled in July 2012 from Dubrovnik; the latter caught by trawling at 200 m depth (Fig. 1). Four investigated specimens were sexed and the following morphometric measurements were performed: Rostrum Width (RW), Carapace Width (CW), Carapace Length (CL), Posterior Margin Width (PMW), Abdomen Length (AL), Abdomen Width (AW), Dactilo-claws Length (DL), Propodium Length (PL), Cheliped Length (ChL), Cheliped Height (ChH), Cheliped Width (ChW) and 1st male Gonopod Length (G1L). Isomorphism between specimens was tested by Pearson linear correlation coefficient (PCC).

RESULTS AND DISCUSSION

Morphometric measurements of *Calappa granulata* are showed in Tab. 1 and Pearson linear correlation coefficient revealed a complete isomorphism between specimens (Tab. 2). All specimens were adult males, as well as that recorded by Dulčić & Tutman (2012). The species can reach 8 cm CL and 11 cm CW (Coudre *et al*., 2013). In the Mediterranean, it lives on sandy mud and muddy detritus at depths between 13 and 400-700 m (Manning & Holthuis, 1981; Abelló *et al*., 1988). The specimens from Piran and Funtana (Fig. 2) represent the second and third official records respectively in the northernmost area of the Adriatic Sea. Among oldest fishermen in the Istrian peninsula, they do not remember any such crabs in the past. Until now the species was not recorded in the checklists of decapod fauna in Gulf of Trieste (*sensu* Manning & Ševčić, 1982) and in the Rijeka Bay (*sensu* Zavodnik & Kovačić, 2000).

Tab. 1: Morphometric measurements of *Calappa granulata* ***(in mm).***
Tab. 1: Morfometrične meritve primerkov vrste *Calappa granulata* ***(v mm).***

Specimen	C 195	C 1540	Piran	Funtana
SEX	M	M	M	M
RW	10.6	10.1	10.6	9.9
CW	104.5	80.3	97.7	103.5
CL	77.7	59.8	73.7	77.5
PMW	33.9	28.4	28.5	34.4
AL	55.7	41.9	46.1	48.3
AW	21.3	15.3	19.9	20.4
DL	38.9	28.6	35.9	36.4
PL	69.9	54.1	60.8	67.2
CIL	58.1	45.4	53	58.8
CIH	59.1	43.2	54.8	54.9
CIW	18.1	13.2	17	17.9
G1L	27.3	20.6	25.7	25.9

It is too early to express any reliable comment regarding whether or not this species established a breeding population in the area as suggested by Dulčić & Tutman (2012). The same authors hypothesized that pelagic larvae of the shamefaced crab could be transported by currents, since the hydrodynamic characteristics of the Adriatic Sea support a hypothesis of passive transport. These records could be also explained by the effect of the Ionian water ingressions in the Adriatic (Dulčić & Grbec, 2000) and further support the decadal variability of water mass properties of the basin (Civitarese *et al.*, 2010). Nevertheless *C. granulata* shows a preference for tropical waters (Spanò *et al.*, 2004) and its northward extension could be another consequence of global warming. Thanks to palaeontological records, we know that *C. granulata* populated the Pliocene sea in correspondence to the present Po Plain (Garassino & Pasini, 2013; Pasini & Garassino, 2013), which was a wide and deep gulf much warmer than today (Marchetti *et al.*, 2017). Climate change and the impacts of commercial fishing are shifting the benthic community structure, in particular bottom trawling has caused a widespread decline of traditional exploited stocks (Bastari *et al.*, 2017) being replaced by newcomer, although shipping as a potential vector of arrival cannot be excluded (Dulčić & Tutman, 2012). In the trawling ground of the meso-Adriatic depression (Pomo pit), in fact, the previously dominant squat lobster *Munida intermedia* has been totally replaced by the newcomer *M. rutllanti*, the latter being first recorded in 2003 for Italian seas. In the same period the shrimp *Parapenaeus longirostris* became an important fisheries resource, while the traditional Norway lobster stock (*Nephrops norvegicus*) dramatically decreased, partly due to a long-lasting over-fishing (Froglia, 2017).

Tab. 2: Pearson linear correlation coefficient (PCC).
Tab. 2: Primerjava primerkov s Pearsonovim koeficientom korelacije (PCC).

PCC	C 195	C 1540	Piran
C 1540	1.00		
Piran	1.00	0.99	
Funtana	1.00	1.00	1.00

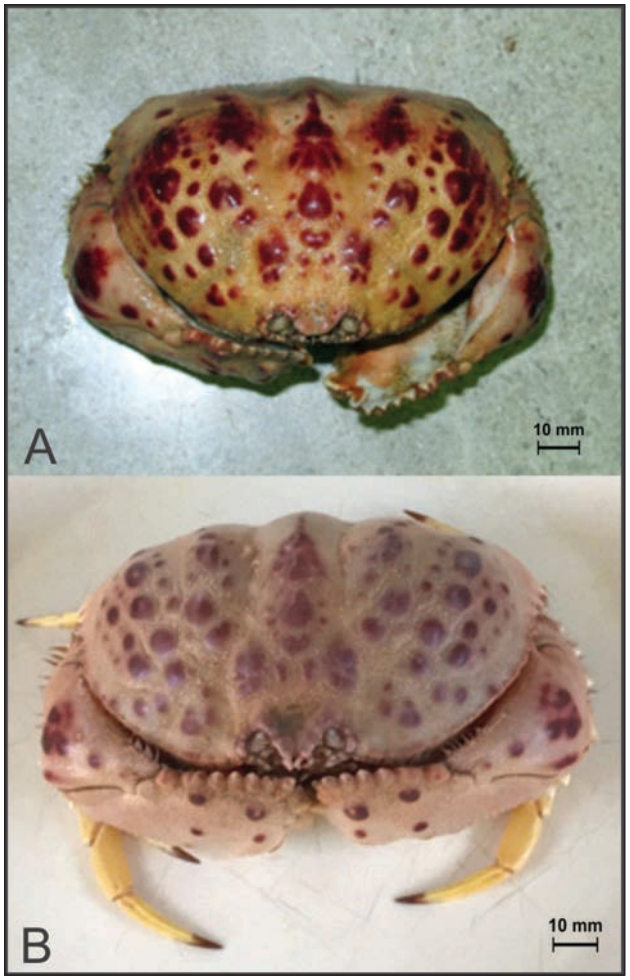

Fig. 2: *Calappa granulata* ***(Linnaeus, 1758): A specimen from Piran (CL♂ = 73.7 mm, CW♂ = 97.7 mm, Wt = 186 g). B specimen from Funtana (CL♂ = 77.5 mm, CW♂ = 103.5 mm, Wt = 195.7 g).***
Sl. 2: *Calappa granulata* ***(Linnaeus, 1758): A - Primerek iz Pirana (CL♂ = 73,7 mm, CW♂ = 97,7 mm, Wt = 186 g). B – primerek iz Funtane (CL♂ = 77,5 mm, CW♂ = 103,5 mm, Wt = 195,7 g).***

The decapod fauna of the northernmost part of the Adriatic was not given any particular scientific attention in the past in comparison with other Adriatic areas (Lipej *et al*., 2010). Only few works have been published such as the paper published by Manning & Ševčić (1982) on the decapod fauna of Piran. Additional records of decapods from the Piran area were given in older works by Stossich (1880), Graeffe (1902) and Pesta (1918). Most of the time, in fact, we get rare and/or alien fish and crabs thanks to the precious collaboration with fishermen, who experience daily work at sea. In the future *C. granulata* could become a new resource, a new stable component of the northern Adriatic fauna and/or a new competitor for other decapods species. For these reasons an establishment of a network of different groups who are somehow dealing with the biodiversity of the marine environment such as scientists, conservators, fishermen, divers, underwater photographers and others should be an important step towards the assessment of populations of *C. granulata* and other interesting and commercial newcomer species in the area (*sensu* Lipej *et al*., 2010).

ACKNOWLEDGEMENTS

We are grateful to Mario Ipsa, the oldest fisherman in Funtana, for providing us a specimen of shamefaced crab and the precious information about frequent captures of this species in the area. Thanks are due also to Alfio Perissinotti for providing photo of Funtana specimen.

O REDKI IN MANJ ZNANI VRSTI RAKOVICE *CALAPPA GRANULATA* (BRACHYURA, CALAPPIDAE) V SEVERNEM JADRANU

Nicola BETTOSO
ARPA FVG, via A. La Marmora 13, 34139 Trieste, Italy
e-mail: nicola.bettoso@arpa.fvg.it

Marin KIRINČIĆ
Natural History Museum, Lorenzov prolaz 1, 51000 Rijeka, Croatia

Borut MAVRIČ & Lovrenc LIPEJ
Marine Biology Station, National Institute of Biology, Fornače 41, SI-6330 Piran, Slovenia

POVZETEK

Dva primerka kalape Calappa granulata *(Linnaeus, 1758) sta bila ujeta 1. avgusta 2016 in 23. julija 2017 na skrajnem severu Jadrana in predstavljata drugi in tretji podatek o pojavljanju te vrste v severnem Jadranu. V zadnjih letih so podatki o pojavljanju te komercialno pomembne rakovice v Jadranu pogostejši. Za zdaj je še prezgodaj ugotavljati, ali se vrsta na tem območju že razmnožuje, vsekakor pa gre za še en primer širjenja vrst proti severu zaradi globalnega segrevanja.*

Ključne besede: kalapa, *Calappa granulata*, severni Jadran, globalno segrevanje

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THE CAPTURE OF A LARGE PREDATORY SHARK, *CARCHARHINUS PLUMBEUS* (CHONDRICHTHYES: CARCHARHINIDAE), OFF THE TUNISIAN COAST (CENTRAL MEDITERRANEAN)

Emna SOUFI-KECHAOU
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia

Khadija OUNIFI-BEN AMOR & Jamila BEN SOUISSI
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia ,Université de Tunis El Manar, Faculté des Sciences de Tunis, Laboratoire de Biodiversité, Biotechnologie et Changement Climatique, LR11ES09, 1002, Tunis, Tunisia

Mohamed Mourad BEN AMOR
Institut National des Sciences et Technologies de la Mer, port de pêche, 2025 La Goulette, Tunisia

Christian CAPAPÉ
Laboratoire d'Ichtyologie, case 104, Université de Montpellier, 34 095 Montpellier cedex 5, France
e-mail: capape@univ-montp2.fr

ABSTRACT

A large female sandbar shark Carcharhinus plumbeus *(Nardo, 1827), measuring 3 m in total length and weighing 70 kg, was caught in the waters surrounding La Galite Island and the Cani Rocks located 100 km off Tabarka, a city in northern Tunisia. The specimen of* C. plumbeus *presented in this article is probably the largest and heaviest recorded to date, on a worldwide scale. Additionally, this record constitutes the northernmost extension of the species in Tunisian waters. The specimen could have migrated from western areas, such as the Algerian coast, where the species is still commonly captured, however, migration from Tunisian southern areas, mainly the Gulf of Gabès, which is considered a nursery area for sharks, cannot be totally ruled out either.*

Key words: *Carcharhinus plumbeus*, description, distribution, expansion range, central Mediterranean

CATTURA DI UN GRANDE SQUALO PREDATORE, *CARCHARHINUS PLUMBEUS* (CHONDRICHTHYES: CARCHARHINIDAE), AL LARGO DELLA COSTA TUNISINA (MEDITERRANEO CENTRALE)

SINTESI

Una grande femmina di squalo grigio, Carcharhinus plumbeus *(Nardo, 1827), di 3 m di lunghezza e 70 kg di peso, è stata catturata nelle acque circostanti l'isola La Galita e i galitoni dell'est, 100 km al largo di Tabarca, una città della Tunisia settentrionale. L'esemplare di* C. plumbeus *presentato nell'articolo è probabilmente il più grande e il più pesante mai incontrato su scala mondiale. Questo ritrovamento costituisce l'estensione più settentrionale della specie nelle acque tunisine. L'esemplare potrebbe essere migrato dalle aree occidentali, come la costa algerina, dove la specie è ancora comunemente catturata. Tuttavia, la migrazione dalle aree meridionali tunisine, principalmente dal golfo di Gabès, che è considerata un'area di nursery per gli squali, non può venir completamente esclusa.*

Parole chiave: *Carcharhinus plumbeus*, descrizione, distribuzione, espansione, Mediterraneo centrale

INTRODUCTION

The sandbar shark *Carcharhinus plumbeus* (Nardo, 1827) is a migratory species distributed throughout the world. It is known in the Pacific and Indian Oceans, as well as on both sides of the Atlantic Ocean, where it is especially targeted (McAuley *et al*., 2007). Off the coasts of western Africa, landings of *C. plumbeus* are frequently observed in fishing sites along the coast of Senegal, intended for human consumption as fresh or dried meat (Diatta *et al*., 2008).

C. plumbeus used to be reported throughout the Mediterranean, but it disappeared from the northern areas of the western Basin, most notably from the French coast (Capapé *et al*., 2000). Conversely, the species is commonly caught in southern regions, such as the coasts of Algeria (Hemida *et al*., 2002) and Tunisia (Saïdi *et al*., 2005), and nursery grounds were observed in the

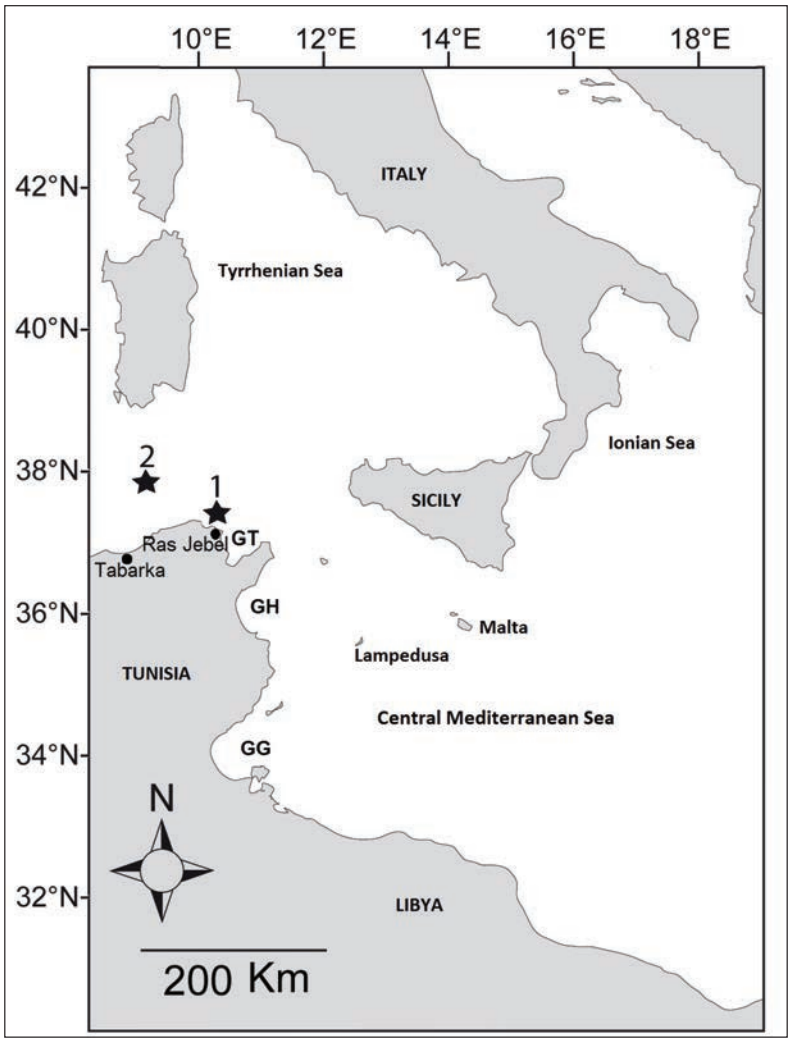

Fig. 1: Map of the central Mediterranean indicating two recent capture sites of** Carcharhinus plumbeus **off the northern Tunisian shores. 1. In the waters surrounding the Cani Rocks off Ras Jebel (Rafrafi** et al., **2015). 2. In the waters surrounding La Galite Island and the Cani Rocks off Tabarka (the present study). GT: Gulf of Tunis; GH: Gulf of Hammamet; GG: Gulf of Gabès.

Sl. 1: Zemljevid osrednjega Sredozemskega morja z označenimi lokalitetami, kjer je bil ujet sivi morski pes ob severni tunizijski obali: 1. V vodah, ki obdajajo Cani Rocks blizu Ras Jebel (Rafrafi** et al., **2015). 2. V vodah, ki obdajajo otok La Galite in Cani Rocks blizu Tabarke (pričujoče delo). GT: Tuniški zaliv; GH: Zaliv Hammamet; GG: Gabeški zaliv.

Fig. 2: The specimen of** Carcharhinus plumbeus **caught in the waters surrounding La Galite Island and the Cani Rocks off Tabarka.
Sl. 2: Primerek sivega morskega psa, ujetega v vodah, ki obdajajo otok La Galite in Cani Rocks blizu Tabarke.

latter area (Bradaï *et al*., 2005; Saïdi *et al*., 2005). Similar patterns were reported from the Adriatic Sea (Costantini & Affronte, 2003; Lipej *et al*., 2008; Dragičević *et al*., 2010) and the southern Aegean Sea, off southwestern Turkey (Bilecenoglu *et al*., 2014).

Quignard and Capapé (1971) noted that *C. plumbeus* was abundantly caught in southern Tunisian areas, such as the Gulf of Gabès, but rather rarely in northern areas, the boundary of its range being the Gulf of Tunis. However, Rafrafi-Nouira *et al*. (2015) reported the capture of 3 specimens in the waters surrounding the Cani Rocks, off the city of Ras Jebel, indicating possible migration of *C. plumbeus* towards northern areas.

Through routine monitoring of Tunisian waters, which was established several decades ago, and, concomitantly, through a collaboration with experienced fishermen knowledgeable about the fishing grounds, we were informed that during a trawling survey carried out off the northern Tunisian coast in March 2015, a large female of *C. plumbeus* had been captured. The specimen is described in the present paper, with comments regarding the real status of the species in the area.

MATERIAL AND METHODS

The large female *C. plumbeus* was captured on 15 March 2015 in the waters surrounding La Galite Island and the Cani Rocks, located 100 km off the city of Tabarka, northern Tunisia, at 37°41′729″ N and 8°91′815″ E (Fig. 1). The specimen was caught by trawl on a rocky bottom, at an approximate depth of 200 m, together with teleost species belonging to the families Sparidae and Mullidae, crustacean species, such as the striped prawn *Melicertus kerathurus* (Forskåll, 1775), and cephalopod, including the common octopus *Octopus vulgaris* Cuvier, 1797, the musky octopus *Eledone moschata* Cuvier, 1797 and the common squid *Loligo vulgaris* Lamarck, 1798.

The specimen was delivered to the fishery of Ezzahra, located in the Gulf of Tunis, where it was photographed, cut into pieces by retailers and rapidly sold out, making it impossible for us to collect any of its parts. Our observations were therefore made based on the information provided by the fishermen who caught the specimen and the available photograph (see Fig. 2).

RESULTS AND DISCUSSION

The specimen was identified as *C. plumbeus* based on some morphological traits cited by Capapé *et al*. (1979), Cadenat & Blache (1981), Garrick (1982), Branstetter (1984) and Compagno (1984), as follows: body stout, snout broadly rounded and short; first dorsal fin high, triangular, its origin over pectoral bases; pectoral fins broadly triangular, relatively long; interdorsal ridge present; colour grey to bronze on the upper surface, belly whitish.

The specimen of *C. plumbeus* presented in Figure 1 appears as a large female, and measurements carried out by fishermen confirm this impression: the specimen reached 3 m in total length (TL) and weighed 70 kg. Compagno (1984) speculated that the maximum TL for the species could be 3 m, but with no specimens available for confirmation he subsequently stated that 2,390 mm or less could be more suitable. Branstetter (1984) reported that *C. plumbeus* could reach 2,500 mm

in TL, but more commonly up to 2,200 mm. The largest specimen previously found in Tunisian waters measured 2,480 mm in TL (Capapé, 1984). Diatta *et al.* (2008) reported a capture of a female measuring 2,250 mm TL and weighing 64 kg from the coast of Senegal. Cadenat and Blache (1981) observed a female of 2,295 mm in TL, weighing 57 kg, and a pregnant female carrying near-term embryos weighing 70 kg and reaching 2,100 mm in TL. Therefore, the specimen of *C. plumbeus* presented in this article it is, to our best knowledge, the largest and heaviest ever recorded on a worldwide scale.

Capapé (1989) observed the occurrence of several species belonging to the genus *Carcharhinus* Blainville, 1816, in southern Tunisian areas and suggested that an inter- and intraspecific competition for food between the two species could not be ruled out completely. Therefore, migrations towards northern areas remain a viable hypothesis, as also corroborated by the records reported by Rafrafi-Nouira *et al.* (2015). However, these migrations cannot be explained exclusively by the pressure of interspecific competition, they are also a result of the climate change in Mediterranean waters (Francour *et al.*, 1994; Ben Raïs Lasram & Mouillot, 2009). Ounifi-Ben Amor *et al.* (2016) showed that animal species previously unknown in the area and originating from distant regions, such as the Indo-Pacific and the eastern tropical Atlantic, have been recorded in Tunisian waters for several decades.

The present specimen represents the northernmost extension of *C. plumbeus* in Tunisian waters, and this finding could also be a result of migration from eastern areas, such as the Algerian coast, where the species is still commonly captured (Hemida *et al.*, 2002). Consequently, a sustainable population of *C. plumbeus* that has successfully established along the Maghreb coast remains a viable hypothesis due to the richness and availability of prey off the northern Tunisian coast (Azouz, 1974). These patterns were confirmed by the fauna associated with the capture of this specimen. Molecular tools will have to be used to delineate the origin of this species, as in the case of the milk shark *Rhizoprionodon acutus* (Rüppell, 1837) caught in the central Mediterranean (Ben Amor *et al.*, 2016). However, a strict monitoring of *C. plumbeus* is necessary to avoid a depletion of this species in the Mediterranean, although nursery areas have been found in Tunisian waters (Bradaï *et al.*, 2005), and appear to have been discovered in the Adriatic Sea (Costantini & Affronte, 2003; Lipej *et al.*, 2008; Dragičević *et al.*, 2010) and Turkish waters (Bilecenoglu *et al.*, 2014), as well.

Carcharhinus plumbeus is considered an endangered species (Musick *et al.*, 2009), but the captures of specimens of different sizes in northern Tunisian areas indicate that the species has met conditions favourable enough to reproduce and develop, and can grow to a large size. Migrations from nearby areas, from the eastern tropical Atlantic, where the species is caught abundantly (Diatta *et al.*, 2008), and through the Strait of Gibraltar, enhance the recruitment of the species, which appears to be locally well established. The absence of similar patterns in other large Mediterranean shark species explains why these register a drastic decline, with some of them approaching risk of extinction in this sea (Ferretti *et al.*, 2008).

ULOV VELIKEGA PRIMERKA SIVEGA MORSKEGA PSA *CARCHARHINUS PLUMBEUS* (CHONDRICHTHYES: CARCHARHINIDAE) V TUNIZIJSKIH VODAH (OSREDNJE SREDOZEMSKO MORJE)

Emna SOUFI-KECHAOU
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia

Khadija OUNIFI-BEN AMOR & Jamila BEN SOUISSI
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia ,Université de Tunis El Manar, Faculté des Sciences de Tunis, Laboratoire de Biodiversité, Biotechnologie et Changement Climatique, LR11ES09, 1002, Tunis, Tunisia

Mohamed Mourad BEN AMOR
Institut National des Sciences et Technologies de la Mer, port de pêche, 2025 La Goulette, Tunisia

Christian CAPAPÉ
Laboratoire d'Ichtyologie, case 104, Université de Montpellier, 34 095 Montpellier cedex 5, France
e-mail: capape@univ-montp2.fr

POVZETEK

V vodah blizu otoka La Galite in Cani Rocks približno 100 km oddaljenih od Tabarke v severni Tuniziji je bila ujeta velika samica sivega morskega psa Carcharhinus plumbeus *(Nardo, 1827), ki je merila 3 m v dolžino in tehtala 70 kg. Avtorji domnevajo, da gre verjetno za enega največjih in najtežjih primerkov sivega morskega psa doslej ujetih na svetu. Poleg tega gre za najsevernejšo ugotovljeno lokaliteto za to vrsto v tunizijskih vodah. Primerek je lahko priplaval iz zahodnih predelov kot je npr. alžirska obala, kjer to vrsto še vedno pogosto ulovijo. Poleg tega avtorji ponujajo hipotezo, da primerek morda izvira iz južno-tunizijskih predelov, predvsem iz Gabeškega zaliva, ki je znan kot razmnoževalno okolje za sivega morskega psa.*

Ključne besede: *Carcharhinus plumbeus,* opis, razširjenost, širjenje areala, osrednje Sredozemsko morje

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ON THE PRESENCE OF A WELL-ESTABLISHED POPULATION OF *LOBOTES SURINAMENSIS* (BLOCH, 1790) IN THE CENTRAL MEDITERRANEAN SEA

Francesco TIRALONGO
Ente Fauna Marina Mediterranea, Via M. Rapisardi trav.VIII 2, 96012 Avola, Italy
Department of Biological, Geological and Environmental Sciences, University of Catania, Via Androne 81, 95124 Catania, Italy
e-mail: fra.tiralongo@hotmail.it

Giuseppina MESSINA
Department of Biological, Geological and Environmental Sciences, University of Catania, Via Androne 81, 95124 Catania, Italy

Salvatore COCO
Ente Fauna Marina Mediterranea, Via M. Rapisardi trav.VIII 2, 96012 Avola, Italy

Bianca Maria LOMBARDO
Department of Biological, Geological and Environmental Sciences, University of Catania, Via Androne 81, 95124 Catania, Italy

ABSTRACT

In the Mediterranean Sea, Lotobes surinamensis *(Bloch, 1790) is considered a rare species. Although recent records from the Mediterranean Sea showed a range expansion of this thermophilic species, these only refer to one or two specimens. During the months of September to November 2017, we recorded a considerable increase in catches of specimens from the central Mediterranean Sea. Here, we report the presence of a well-established population of* L. surinamensis *from the southern Tyrrhenian Sea with considerations about its habits, presence and the role of fishermen in monitoring the species. An additional record (10th July 2016) from the Ionian Sea (first record for the area) is also reported.*

Key words: Lobotidae, new records, Mediterranean Sea, purse seine, FADs

SULLA PRESENZA DI UNA POPOLAZIONE STABILE DI *LOBOTES SURINAMENSIS* (BLOCH, 1790) NEL MAR MEDITERRANEO CENTRALE

SINTESI

Nel mar Mediterraneo, Lobotes surinamensis *(Bloch, 1790) è considerato una specie rara. Sebbene recenti segnalazioni di questa specie nel Mediterraneo abbiano evidenziato un'espansione di questa specie termofila, queste segnalazioni si riferiscono solamente a uno o due esemplari. Tra settembre e novembre 2017 si è registrato un considerevole aumento nelle catture di esemplari nel Mediterraneo centrale. Gli autori riportano la presenza di una popolazione stabile di* L. surinamensis *nel Tirreno meridionale, con considerazioni sulle abitudini, presenza e ruolo dei pescatori nel monitoraggio della specie. Viene anche riportata un'altra segnalazione (10 luglio 2016) proveniente dallo Ionio (prima segnalazione per l'area).*

Parole chiave: Lobotidae, nuove segnalazioni, mar Mediterraneo, rete a circuizione, FADs

INTRODUCTION

In the Mediterranean Sea, the family Lobotidae, which comprises only 2 recognized species (Froese & Pauly, 2017), is represented by *Lobotes surinamensis* (Bloch, 1790), commonly known as the Atlantic tripletail. It is a marine fish of worldwide distribution in tropical and subtropical waters (although records from central and eastern Pacific need confirmation). It is a medium-sized fish, with a maximum reported standard length (SL) of 1 meter and common lengths between 40 and 80 cm. The body is laterally compressed and deep. The subtriangular head shows a concave profile in the upper part that is more pronounced in adults. The preoperculum is strongly serrated in juveniles and finely serrated in adults. The soft parts of dorsal and anal fins are large and rounded and match, in size, the caudal fin which is also rounded, giving the species the common name "tripletail". It can be found in estuaries, coastal and open waters, often floating on its side near the surface, below or in the vicinity of floating objects. While juveniles are considered epipelagic and found among floating *Sargassum* weed or artificial objects, mimicking a floating leaf to camouflage against predators, adults are bentho-pelagic and feed on small fishes and benthic crustaceans (Franks *et al.,* 2003). In adults, where floating on the side has also been recorded, this behavior seems to be used to ambush prey (Massuti & Renones, 1994). Juveniles are mottled with yellowish, brownish and black blotches, while adults can show a more uniform color, dark brown, greyish or blackish.

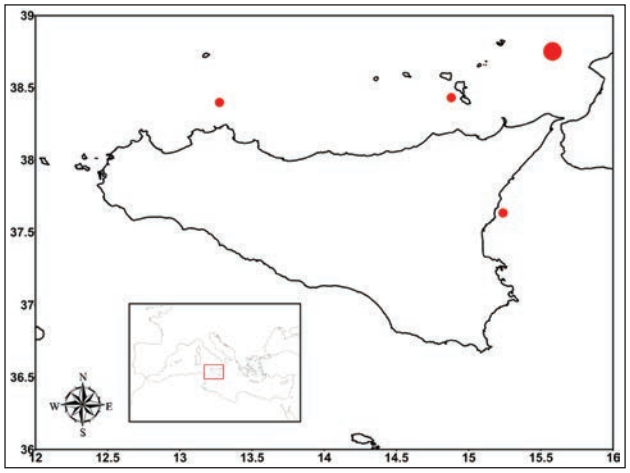

Fig. 1: New records of** Lobotes surinamensis **from the central Mediterranean Sea; small red circles indicate single records; the big red circle indicates multiple records.
Sl. 1: Novi podatki o razširjenosti vrste** Lobotes surinamensis **v Sredozemskem morju; mali rdeči krogci označujejo posamezne podatke; veliki rdeči krogec pa lokaliteto z večjim številom podatkov.

In the Mediterranean Sea, where the *L. surinamensis* was recorded for the first time in 1875 (Doderlein, 1875), the species is considered rare. However, especially in past few years, several records from the eastern and central part of the Basin showed a range expansion of this thermophilic species (Hemida *et al.,* 2003; Camilleri *et al.,* 2005; Zava *et al.,* 2007; Deidun *et al.,* 2010; Dulčić & Dragičević, 2011; Akyol & Kara, 2012; Dulčić *et al.,* 2014a; Dulčić *et al.,* 2014b; Kavadas & Bekas, 2014; Bettoso *et al.,* 2016; Bilge *et al.,* 2016; Ounifi-Ben Amor *et al.,* 2016; Tiralongo, 2016; Tunçer & Önal, 2016). These records, however, refer only to one or two specimens. Here, instead, we report a considerable number of records from the central Mediterranean Sea (Tyrrhenian Sea) and a first record from the Ionian Sea (coast of Sicily). In the Tyrrhenian area concerned by this report, the species has not been recorded since 2007 (Bilge *et al.,* 2016).

MATERIAL AND METHODS

All specimens of *L. surinamensis*, with the exception of the Ionian Sea specimen (caught with purse seine targeting *Engraulis encrasicolus*), were caught with purse seine or hand net around FADs, during the fishing season of the common dolphinfish, *Coryphaena hippurus* (from mid-August to mid-December), in the southern Tyrrhenian Sea (Fig. 1).

Data were collected through direct observation at landings and through e-mail (or Facebook Messenger) from fishermen and fishmonger involved in the project "AlienFish" of *Ente Fauna Marina Mediterranea* concerning alien and rare species in the Mediterranean Sea. The information collected for each record included: date, locality (GPS coordinate), photo and/or video, fishing gear, estimated (or measured) weight and/or total length (TL) of the specimen caught and notes.

A total of 26 fishermen who operate purse seines around FADs for the fishing of *C. hippurus* were interviewed in order to obtain additional data on the historical presence, abundance and habit of *L. surinamensis* along the Ionian and Tyrrhenian coasts of Sicily.

RESULTS AND DISCUSSION

A total of 22 specimens of *L. surinamensis* were recorded during this study: 21 were caught and recorded during the period between September and November 2017 in the Tyrrhenian Sea and a specimen on 10th July 2016 in the Ionian Sea. Eight of these specimens (2 adults and 6 juveniles) were recorded in the short period between the 7th and the 24th September 2017, 24-30 miles off the coast of Stromboli Island (area centered at 38.75°N, 15.56°E), in the area between Stromboli (Aeolian Islands) and Calabria (Vibo Valentia). Adult specimens (Fig. 2A, 2C), about 5 kg in weight, were consumed by fishermen. In the stomach of one of

Fig. 2: Specimens of** Lobotes surinamensis **caught in Tyrrhenian (A-C-D-E) and Ionian Sea (F); adult specimen of** L. surinamensis **caught on 7th September 2017 in the area between Stromboli Island (Aeolian Islands) and Vibo Valentia (Calabria) (A) and its stomach content** (Caranx crysos) **(B); adult specimen of** L. surinamensis **caught on 24th September 2017 in the same area of the specimen as in A (C); adult specimen of** Lobotes surinamensis **caught on 26th September 2017, 3 miles off the north-west coast of Vulcano Island (Aeolian Islands) (D); adult specimen of** L. surinamensis **caught on 3rd October 2017, in the area between Capo Gallo and Ustica Island (E); small specimen of** L. surinamensis **caught on 10th July 2016 at Aci Trezza (F).

Sl. 2: Primerki triplavutarice, ujeti v Tirenskem (A-C-D-E) in Jonskem morju (F); odrasel primerek, ujet 7 septembra 2017 na območju med otokom Stromboli (Eolsko otočje) in Vibo Valentio (Kalabrija) in vsebina njegovega želodca** (Caranx crysos) **(B); odrasel primerek triplavutarice ujet 24 septembra 2017 na isti lokaciji kot primerek pod A; (C) odrasel primerek, ujet 26 septembra 2017 tri milje izven severozahodne obale otoka Vulcano (Eolsko otočje)(D); odrasel primerek ujet 3 oktobra 2017 med območjem Capo Gallo in otokom Ustica (E); manjši primerek, ujet 10 julija 2016 blizu lokalitete Aci Trezza (F).

these specimens (a mature female with eggs), a small blue runner (*Caranx crysos*) was present (Fig. 2B). Fishermen describe *L. surinamensis* as a slow-swimming fish. Indeed, in some cases fish are caught with hand nets, near or below FADs, even for a large specimen (8-9 kg), filmed and caught on 2nd October 2017. Ten other specimens were caught in the same area as late as the end of November. On 26th September 2017, one adult specimen of *L. surinamensis* (Fig. 2D) was caught by purse seine, 3 miles off the north-west coast of Vulcano Island (Aeolian Islands) (38.42°N, 14.83°E), around FADs targeting *C. hippurus*. The fish was 55 cm

in total length, with a weight of about 3.5 kg, and also consumed by the fishermen. Another specimen (Fig. 2E) was caught on 3rd October 2017, in the area between Capo Gallo and Ustica Island (38.38°N, 13.37°E). The specimen was 3.2 kg in weight and was sold at the fish market.

A small specimen (20-25 cm in total length) (Fig. 2F) was caught at Aci Trezza, close to the coast (37.55°N, 15.17°E), and represents the first record of this species in the Ionian Sea.

The interviewed fishermen from the Ionian coast of Sicily did not report the presence of the species around FADs. This suggests that, unlike off the southern Tyrrhenian Sea, *L. surinamensis* appears to be rare off the Ionian coast of Sicily.

Considering the particular behavior of floating just below the surface, near or below floating objects, *L. surinamensis* is particularly easy to detect and/or catch with purse seine (or with hand net) used for the fishing of *C. hippurus* around FADs. Indeed, in this study, all the specimens from the Tyrrhenian Sea were caught around FADs. Hence the importance of this fishing method in monitoring the presence and abundance of *L. surinamensis*, although limited to the fishing period of *C. hippurus*.

Results from the current study suggest that *L. surinamensis* is currently markedly more common in the Mediterranean Sea than it has ever been. Indeed, past published records refer to, at most, two specimens in this area.

In conclusion, on the basis of the several documented records of the species, we can hypothesize the existence of a well-established population of *L. surinamensis* in the southern Tyrrhenian Sea. Most fishermen who operate in the southern Tyrrhenian Sea queried about the presence of *L. surinamensis* in the area, answered that, although they sporadically have been catching the species for the past 10 years with purse seines around FADs, the 2017 fishing season of *C. hippurus*, starting from September, saw a marked increase in catches and observations of adults and juveniles of the species. In the same area, a study on fish assemblages associated with FADs conducted between January 2000 and January 2001 failed to demonstrate the presence of *L. surinamensis* (Andaloro *et al.*, 2007) and therefore support the relatively recent colonization of the southern Tyrrhenian Sea. On the basis of these findings, we suggest the recent establishment of a self-sustaining population in the area. Because the catches of the species are connected to the seasonal fishing of *C. hippurus*, *L. surinamensis* is probably quite common in the area all year long (or at least for several months). Furthermore, the species finds a suitable habitat around FADs, in which it seems to feed mainly on pelagic fishes such as Carangidae, aggregating around FADs. Potential common preys could be *Naucrates ductor*, as reported by Zava *et al.* (2007), *Caranx crysos,* as reported in this study, and other carangid species such as juveniles of *Seriola* spp. The actual increase in abundance of the species showed in this study is probably mainly due to global warming and changes in hydrological conditions. Following the current trend, we may expect to find this species to become increasingly more common in the whole Mediterranean Sea, and could become locally commercialized in the next years. Indeed, the meat of this species is considered of high quality, and this was also confirmed by Sicilian and Calabrian fishermen who ate it and are also trying, due to the increase in catches, to persuade local fishmonger to buy and sell the fish. Further study could confirm this. A similar trend in increasing abundance of the species seems also to be present in Maltese waters, in which small shoals of juveniles were reported by fishermen to be present around FADs and other floating objects (Deidun *et al.*, 2010). The role of citizen scientists, fishermen in particular, in the monitoring of species such as *L. surinamensis*, is of great importance. Indeed, as in our case, all the records come from professional fishermen (or fishmonger).

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O NATURALIZIRANI POPULACIJI TRIPLAVUTARICE *LOBOTES SURINAMENSIS* (BLOCH, 1790) V OSREDNJEM SREDOZEMSKEM MORJU

Francesco TIRALONGO
Ente Fauna Marina Mediterranea, Via M. Rapisardi trav.VIII 2, 96012 Avola, Italy
Department of Biological, Geological and Environmental Sciences, University of Catania, Via Androne 81, 95124 Catania, Italy
e-mail: fra.tiralongo@hotmail.it

Giuseppina MESSINA
Department of Biological, Geological and Environmental Sciences, University of Catania, Via Androne 81, 95124 Catania, Italy

Salvatore COCO
Ente Fauna Marina Mediterranea, Via M. Rapisardi trav.VIII 2, 96012 Avola, Italy

Bianca Maria LOMBARDO
Department of Biological, Geological and Environmental Sciences, University of Catania, Via Androne 81, 95124 Catania, Italy

POVZETEK

Triplavutarica Lotobes surinamensis *(Bloch, 1790) je redka vrsta v Sredozemskem morju. Čeprav novejši podatki o tej toploljubni vrsti kažejo, da se njeno območje razširjenosti širi, se to navadno nanaša na posamične ali kvečjemu par primerkov. Med septembrom in novembrom 2017 smo zabeležili občuten porast primerkov te vrste v ulovih v osrednjem Sredozemskem morju. V pričujočem delu poročamo o naturalizirani populaciji te vrste v južnem Tirenskem morju, o njenih navadah, prisotnosti in vlogi ribičev pri spremljanju vrste. Poročamo tudi o pojavljanju te vrste (10 julij 2016) iz Jonskega morja, kar je sploh prvi zapis za ta del Sredozemskega morja.*

Ključne besede: Lobotidae, novi podatki, Sredozemsko morje, zaporna plavarica

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ADDITIONAL RECORD OF TRIPLETAIL *LOBOTES SURINAMENSIS* (OSTEICHTHYES: LOBOTIDAE) IN TUNISIAN WATERS (CENTRAL MEDITERRANEAN SEA)

Emna SOUFI-KECHAOU
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia

Khadija OUNIFI-BEN AMOR, Jamila BEN SOUISSI
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia ,Université de Tunis El Manar, Faculté des Sciences de Tunis, Laboratoire de Biodiversité, Biotechnologie et Changement Climatique, LR11ES09, 1002, Tunis, Tunisia

Sihem RAFRAFI-NOUIRA
Université de Carthage, Laboratoire de Bio-Surveillance de l'Environnement, Unité d'Hydrobiologie Littorale et Limnique, Faculté des Sciences, Zarzouna, 7021 Bizerte, Tunisia

Christian CAPAPÉ
Laboratoire d'Ichtyologie, case 104, Université de Montpellier, 34 095 Montpellier cedex 5, France
e-mail: capape@univ-montp2.fr

ABSTRACT

The authors report an additional record of tripletail Lobotes surinamensis *off Ras Jebel in northern Tunisia. The specimen was caught with a trammel net at a depth of 6 m, measuring 430 mm in total length and weighing 1206 g. To date, 9 specimens of this species have been recorded in Tunisian waters, with 35 records documented in the entire Mediterranean. The article comments on and discusses the distribution of the species in Tunisian waters.*

Key words: Lobotidae, *Lobotes surinamensis*, total length, population, distribution, Tunisian waters, Mediterranean Sea

NUOVO RITROVAMENTO DI LOBOTE, *LOBOTES SURINAMENSIS* (OSTEICHTHYES: LOBOTIDAE), IN ACQUE DELLA TUNISIA (MEDITERRANEO CENTRALE)

SINTESI

Gli autori riportano una nuova segnalazione del lobote, Lobotes surinamensis, *al largo di Ras Jebel nella Tunisia settentrionale. L'esemplare, catturato con un tramaglio a una profondità di 6 m, pesava 1206 grammi per una lunghezza di 430 mm. Fino ad oggi, nove esemplari di questa specie sono stati registrati nelle acque tunisine, con 35 ritrovamenti documentati in tutto il Mediterraneo. Nell'articolo viene discussa la distribuzione della specie nelle acque tunisine.*

Parole chiave: Lobotidae, *Lobotes surinamensis*, lunghezza totale, popolazione, distribuzione, acque tunisine, mare Mediterraneo

INTRODUCTION

Tripletail *Lobotes surinamensis* (Bloch, 1790) is a benthopelagic species widely distributed in the Pacific, Indian, and Atlantic Oceans (Carpenter & Robertson, 2015). In the eastern Atlantic, it is distributed from southern Portugal to Angola, including the Canary and Cape Verde Islands (Roux, 1986; Carpenter & Robertson, 2015).

In the Mediterranean Sea, *L. surinamensis* occurs as a rather rare and sporadically captured species, with only 32 reliable records reported from 1875 to 2015, following Bilge *et al*. (2017). Two additional specimens were recently captured, one in the Ligurian Sea (De Carlo *et al*., 2017) and another one off Agnone Bagni, a seaside station located in the eastern coast of Sicily. This second specimen, weighing 4 kg, was captured on 2 April 2017 (Sortino, *pers. comm*., 2017). *L. surinamensis* is a sluggish fish that lives alone or in pairs, floating on its side and carried by the water currents; the currents are also one of the main causes of this species' presence in the Mediterranean Sea, where 35 specimens have been reported to date, and its occurrence in the Tunis Southern Lagoon (Ounifi-Ben Amor *et al*., 2016) is probably a good instance.

In this paper, we present a third recent record reported off the northern Tunisian coast. This specimen is herein described and the capture is discussed and commented in relation with previous records of the species in Tunisian waters.

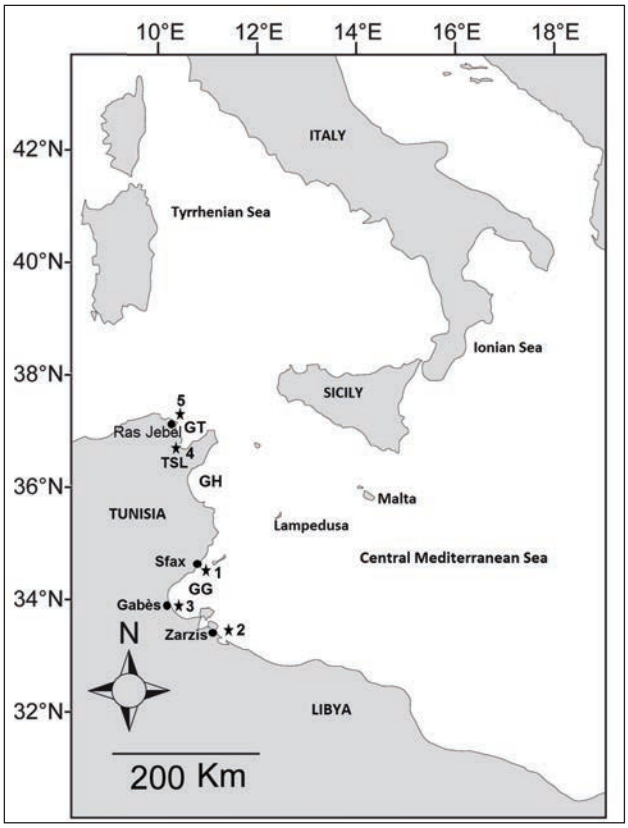

Fig. 1: Map of the central Mediterranean indicating the capture sites of** Lobotes surinamensis **off the Tunisian coast: 1. Off Sfax (Bradaï 2000), 2. Off Zarzis (Bradaï 2000), 3 Off Gabès (Bradaï** et al., **2004), 4. Tunis Southern Lagoon (Ounifi-Ben Amor** et al.**, 2016), 5. Off Ras Jebel (the present paper). GG: Gulf of Gabès, GH: Gulf of Hammamet, GT: Gulf of Tunis, TSL: Tunis Southern Lagoon.

Sl. 1: Zemljevid osrednjega Sredozemskega morja z označenimi lokalitetami, kjer so bili ujeti primerki triplavutarice ob tunizijski obali: 1. Sfax (Bradaï 2000), 2. Zarzis (Bradaï 2000), 3. Gabès (Bradaï** et al., **2004), 4. Tuniška južna laguna (Ounifi-Ben Amor** et al.**, 2016), 5. Ras Jebel (pričujoče delo). GG: Gabeški zaliv, GH: zaliv Hammamet, GT: Tuniški zaliv, TSL: Tuniška južna laguna.

MATERIAL AND METHODS

The specimen was caught on 10 April 2017 off Ras Jebel (Fig. 1), a city located in northern Tunisia (37°15'12.38" N and 10°07'05.34" E), by a trammel net at a depth of 6 m, on rocky-sandy bottom partially covered by algae, together with labrid and sparid species, and cuttlefish *Sepia officinalis* Linnaeus, 1758. The total length (TL) and other measurements were performed following Hemida *et al*. (2003) and Ounifi-Ben Amor *et al*. (2016). The specimen was fixed in 10% buffered formalin, preserved in 75% ethanol and deposited in the Ichthyological Collection of the Faculté des Sciences de Bizerte (Tunisia), catalogued under number FSB-Lobsur-01 (Fig. 2).

RESULTS AND DISCUSSION

The specimen was identified as *Lobotes surinamensis* based on a suite of characteristics, such as: body deep, compressed; head small; dorsal and anal fins long, rounded and symmetrical; pectoral fin short, rounded; mouth large; body colour grey to yellow, with dark lines radiating from the eye; posterior margin of anal fin yellow. Additionally, the morphometric measurements and meristic counts summarized in Table 1 are in complete accordance with those previously reported by Roux (1986), Hemida *et al*. (2003) and Ounifi-Ben Amor *et al.,* (2016). In southern Tunisian waters (see Fig. 1), 3 specimens were recorded off Sfax, one off Zarzis (see Fig. 1, Bradaï, 2000), and two other specimens off Gabès (Bradaï *et al.,* 2004) - six specimens in all. The two specimens found in the Tunis Southern Lagoon (Ounifi-Ben Amor *et al.,* 2016) and the one captured off Ras Jebel (present study) suggest that the species has migrated towards northern areas. The number of *L. surinamensis* captured in Tunisian waters - a total of 9 -

Tab. 1: The morphometric measurements in mm and as percentages of total length (%TL) and standard length (%SL), and meristics of the specimen of *Lobotes surinamensis* ***captured off Ras Jebel (Ref. FSB-Lob-sur-01).***
Tab. 1: Morfometrične meritve, izražene v mm in kot delež celotne dolžine (%TL) in standardne dolžine (%SL), in meristika primerka vrste *Lobotes surinamensis*, ***ujetega blizu lokalitete Ras Jebel (Ref. FSB-Lob-sur-01).***

Reference	**FSB-Lob-sur-01**		
Morphometric measurements	**mm**	**%SL**	**%TL**
Total length (TL)	430	117.8	100.0
Standard length (SL)	365	100.0	84.9
Space between tip of snout to caudal fin origin	330	90.4	76.7
Head length	120	32.9	27.9
Interorbital space	35	9.6	8.1
Space between tip of snout to dorsal fin origin	130	35.6	30.2
Space between tip of snout to pelvic fin origin	125	34.2	29.1
Space between tip of snout to anal fin origin	240	65.8	55.8
Space between snout and vent	210	57.5	48.8
Dorsal fin length	205	56.2	47.7
Pectoral fin length	18	4.9	4.2
Pelvic fin length	19	5.2	4.4
Anal fin length	80	21.9	18.6
Caudal fin length	80	21.9	18.6
Caudal fin width	55	15.1	12.8
Meristic counts			
Pelvic fin rays	I+5		
Dorsal fin rays	XII+16		
Anal fin rays	III+12		
Pectoral fin rays	13		
Caudal fin rays	18		
Total body weight (gram)	1206		

appears somewhat more important than those reported from other Mediterranean regions following Bilge *et al.* (2017). The total lengths of the specimens ranged from 162 to 550 mm, their total weights from 91.3 to 3,827 g. The presence of both small and large specimens in the area suggests that a sustainable population is probably established in Tunisian waters.

Similar patterns have been reported throughout the Mediterranean, in total agreement with Bilge *et al.* (2017), who noted that an increase in recent findings of *Lobotes surinamensis* is a consequence of the global warming of this sea (Francour *et al.,* 1994, Ben Raïs Lasram & Mouillot, 2009). Conversely, *L. surinamensis* is also reported in colder regions from the northern

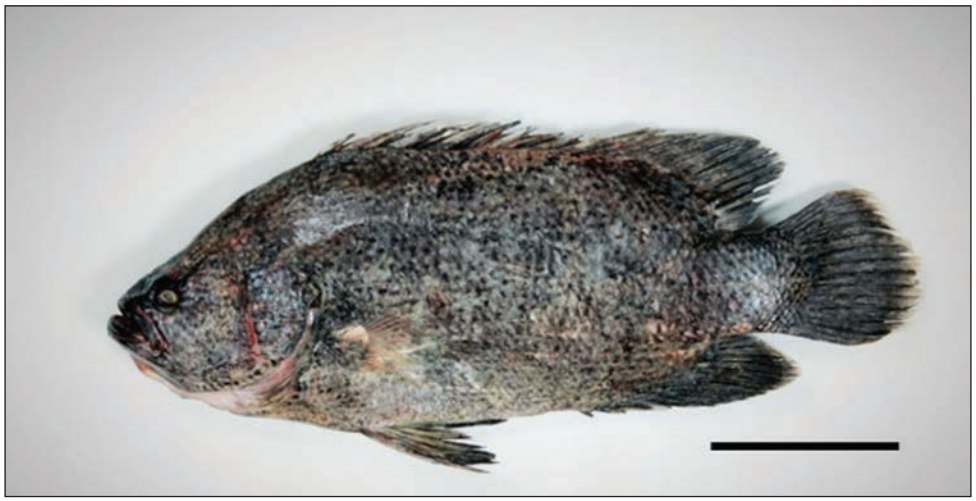

Fig. 2: Specimen of *Lobotes surinamensis* ***captured off Ras Jebel (Ref. FSB-Lob-sur-01), scale bar = 80 mm.***
Sl. 2: Primerek vrste *Lobotes surinamensis,* ***ujet blizu lokalitete Ras Jebel (Ref. FSB-Lob-sur-01), merilo = 80 mm.***

Atlantic (Robins & Ray 1968), the Adriatic Sea (Dulčić *et al.,* 2014) and the Ligurian Sea (De Rosa *et al.*, *in press*).

The captures of *L. surinamensis* appear to be more frequent in the central Mediterranean Sea (Bilge *et al.,* 2017), and the abundance of the species is corroborated by the Tunisian records reported in this paper. This suggests that the central Mediterranean is the core of *L. surinamensis* in this sea, but while such hypothesis is viable, it would require further investigation to be confirmed.

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NOVI ZAPIS O POJAVLJANJU TRIPLAVUTARICE *LOBOTES SURINAMENSIS* (OSTEICHTHYES: LOBOTIDAE) V TUNIZIJSKIH VODAH (OSREDNJE SREDOZEMSKO MORJE)

Emna SOUFI-KECHAOU
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia

Khadija OUNIFI-BEN AMOR, Jamila BEN SOUISSI
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia,Université de Tunis El Manar, Faculté des Sciences de Tunis, Laboratoire de Biodiversité, Biotechnologie et Changement Climatique, LR11ES09, 1002, Tunis, Tunisia

Sihem RAFRAFI-NOUIRA
Université de Carthage, Laboratoire de Bio-Surveillance de l'Environnement, Unité d'Hydrobiologie Littorale et Limnique, Faculté des Sciences, Zarzouna, 7021 Bizerte, Tunisia

Christian CAPAPÉ
Laboratoire d'Ichtyologie, case 104, Université de Montpellier, 34 095 Montpellier cedex 5, France
e-mail: capape@univ-montp2.fr

POVZETEK

Avtorji poročajo o novem primeru pojavljanja triplavutarice Lobotes surinamensis *v vodah blizu lokalitete Ras Jebel v severni Tuniziji. Primerek, ki je bil ujet v stoječo mrežo na globini 6 m, je meril 430 mm v dolžino in tehtal 1206 g. Do danes je znanih 9 dokumentiranih primerov pojavljanja te vrste v tunizijskih vodah in 35 v celotnem Sredozemskem morju. Avtorji nadalje razpravljajo o razširjenosti vrste v tunizijskih vodah.*

Ključne besede: Lobotidae, *Lobotes surinamensis*, celotna dolžina, populacija, razširjenost, tunizijske vode, Sredozemsko morje

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FIRST RECORD OF THE MEAGRE, *ARGYROSOMUS REGIUS* (ASSO, 1801), IN SLOVENIAN COASTAL WATERS WITH ADDITIONAL RECORDS FROM THE CROATIAN PART OF THE ADRIATIC SEA

Borut MAVRIČ
National Institute of Biology, Marine Biology Station Piran, Fornače 41, SI-6330 Piran
e-mail: Borut.Mavric@nib.si

Branko DRAGIČEVIĆ
Institute of Oceanography and Fisheries, Split, I. Meštrovića 63, 21000 Split, Croatia

ABSTRACT

One specimen of meagre, Argyrosomus regius *(Asso, 1801), was caught by trawling in the waters off Slovenia on 24th November 2016 at the depth of cca. 20 m above sandy-muddy bottom. This is the first record of this species for the Slovenian part of the Adriatic Sea. Due to the fact that there are no wild populations in the Middle and North Adriatic and that remaining wild populations in the Southern Adriatic are scarce and small, the specimen is supposed to be an escapee from one of the mariculture facilities. Additional occurrences of this species from the Croatian part of the Adriatic Sea are reported.*

Key words: meagre, *Argyrosomus regius,* Adriatic Sea, farm escapee, aquaculture

PRIMA SEGNALAZIONE DI OMBRINA BOCCADORO, *ARGYROSOMUS REGIUS* (ASSO, 1801), IN ACQUE COSTIERE SLOVENE CON ULTERIORI RITROVAMENTI NELLA PARTE CROATA DELL'ADRIATICO

SINTESI

Un esemplare di ombrina boccadoro, Argyrosomus regius *(Asso, 1801), è stato catturato con la rete a strascico nelle acque al largo della Slovenia, il 24 novembre 2016, ad una profondità di cca. 20 m, sopra il fondale sabbioso-fangoso. Si tratta del primo ritrovamento di questa specie per la parte slovena dell'Adriatico. Poiché non ci sono popolazioni allo stato selvatico nell'Adriatico centrale e settentrionale, e visto che le restanti popolazioni selvatiche nell'Adriatico meridionale sono scarse e limitate, gli autori ipotizzano che l'esemplare sia scappato da uno degli impianti di maricoltura. Vengono inoltre segnalati altri ritrovamenti di questa specie nella parte croata dell'Adriatico.*

Parole chiave: ombrina boccadoro, *Argyrosomus regius*, mare Adriatico, fuggitivo, acquacoltura

INTRODUCTION

The meagre, *Argyrosomus regius* (Asso, 1801), is a demersal, oceanodromus, *ray-finned fish of the* family Sciaenidae. It is a large top-predator, with a high trophic level (4.3) that consumes large sized and heavy preys. It feeds on a wide range of crustaceans and fish (Valero-Rodriguez *et al.,* 2015). Adults inhabit inshore and shelf waters while juveniles and subadults prefer estuaries and coastal lagoons. It mostly occurs over sandy bottoms, close to rocks, at depths from 1 - 200 m (Louisy, 2002). Original distribution of the meagre is the eastern Atlantic, from Norway to Gibraltar and Congo, including the Mediterranean and the Black Sea (Griffiths & Heemstra, 1995). It also migrated via Suez Canal to the Red Sea as an anti-Lessepian migrant (Chao & Trewavas 1990).

Fig. 1: Map of the Adriatic Sea with localities where meagre specimens were caught (black dots; numbers represent the following localities: 1- Piran, 2 – Brist, 3 – Pelješac, 4 – Zadar, 5 – Rab), with localities (Apuglia, Monfalcone, Hvar, Zadar) where the meagre is cultivated (squares) and the area (Bojana river mouth) where the last known natural population still occurs (circle).
Sl. 1: Zemljevid Jadranskega morja z območji, kjer so bili ujeti obravnavani primerki hame (črne pike; številke predstavljajo naslednja območja najdb: 1 – Piran, 2 – Brist, 3 – Pelješac, 4 – Zadar, 5 – Rab), z območji (Apulija, Monfalcone, Hvar, Zadar), kjer hame vzgajajo v marikulturah (kvadrati) in z območjem (ustje reke Bojane), kjer obstaja še zadnja znana naravna populacija te vrste (krog).

In the Adriatic Sea, the meagre was historically widespread along the eastern coast, especially in sandy and muddy shallows with turbid and fresh water influence although it was considered rare or very rare (Šoljan, 1975; Jardas 1985). Grubišić (1967) considered areas of Ulcinj (Bojana rivermouth), Omiš (Cetina rivermouth) and Neretva rivermouth as the only areas with locally abundant populations. However, at the end of 20th century the fisheries reports about the species became very scarce, with the Bojana rivermouth (Montenegro) being one of the last locations in the Adriatic Sea hosting natural/wild populations (Joksimović, 2007). Jardas *et al.* (2008) have declared it as a regionally extinct species in the Red Book of Sea Fishes of Croatia. For the Slovenian sea there are no records for this species in the available literature, such as Matjašič & Štirn (1975) and Kryštufek & Janžekovič (1999). The meagre has suffered alarming declines in other parts of the Mediterranean as well (Quéro & Vayne, 1987; Quéro, 1989; Wolff, 2000), mostly due to overexploitation and habitat degradation. On the other hand, it is considered as an emerging species in the Mediterranean aquaculture (Monfort, 2010), with the main production reported in Egypt (brackish ponds) and in Spain, France, Italy and Turkey (off-shore mariculture).

MATERIAL AND METHODS

The meagre specimen was caught by trawling in the waters off Slovenian coast on 24th November 2016 at the depth of cca. 20 m above sandy-muddy bottoms (Fig. 1). The specimen was sold at the local market, but was photographed by the fisherman previously since it was not identified (Fig. 2a). The researchers from Marine Biology Station of the National Institute of Biology were informed about the catch and were given the photographs to identify the specimen. Using the photographs, the total length of the specimen was estimated. Additionally, we managed to locate 3 records of this species caught in the wild from Croatia whose identification was also based solely on photographs of the specimens (Fig. 1).

On 26th July 2011, a specimen was caught near village of Brist (middle Adriatic, Croatia) (Fig. 2b). In summer of 2012 another specimen of meagre was collected by sportive fisherman from area of Pelješac peninsula (southern Adriatic; Croatia) (Fig. 2c) and in December 2017 one specimen was caught in waters off Zadar (middle Adriatic, Croatia). Photos of all the mentioned specimens were sent to the Institute of Oceanography and Fisheries in Split (Croatia). Beside photos, data on weight were provided directly by the fishermen for individuals from Brist and Pelješac while we estimated length of the specimen from Zadar in relation to the size of the fish container. Since we did not get the permission for publication of the photo of the Zadar specimen, this one is not shown in the paper, but is available on request.

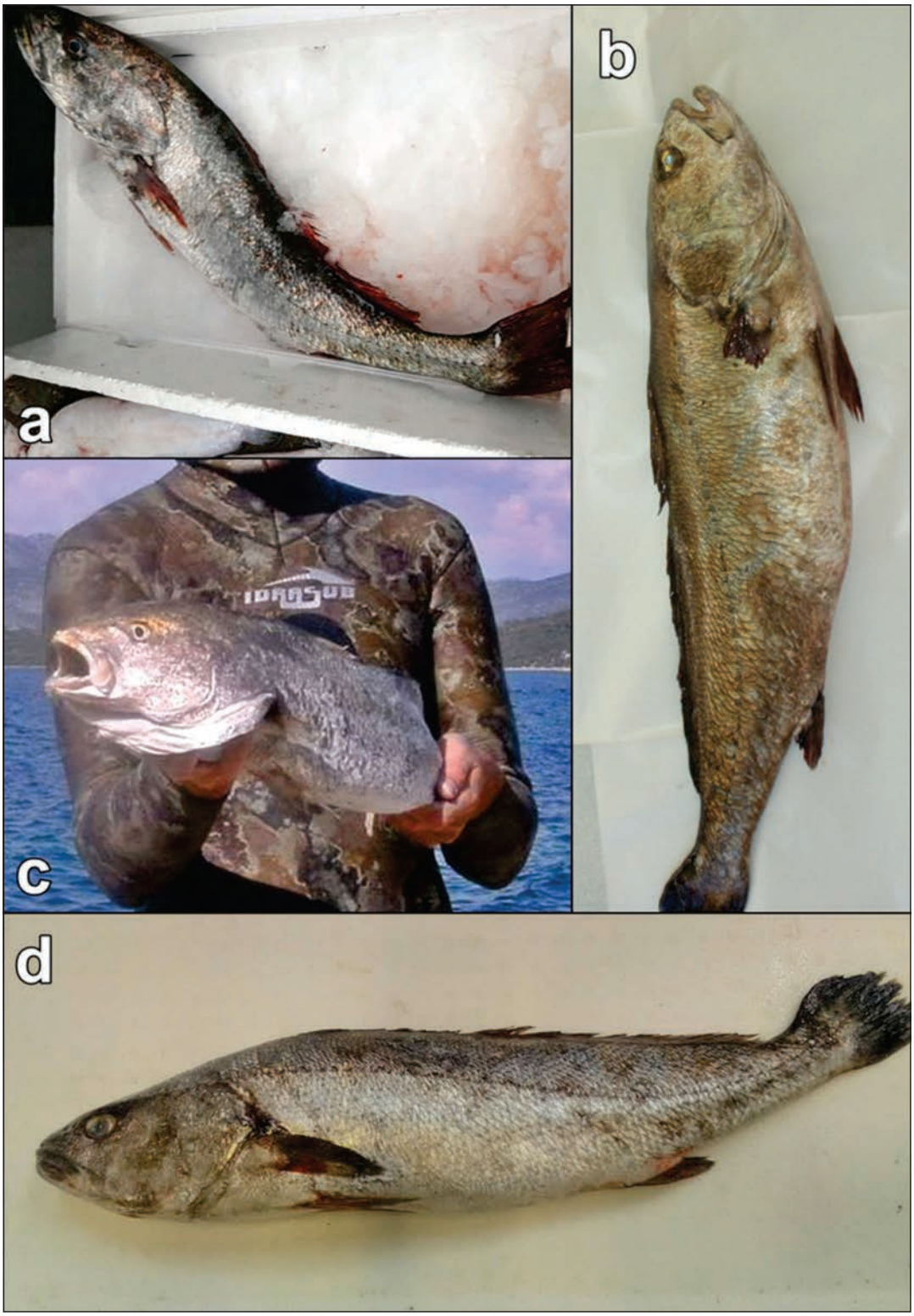

Fig. 2: Photographs of the caught meagre specimens from: a – Piran (photo: M. Buh), b – Brist (photo: Željko and Ernesto Trampa), c – Pelješac (photo: Pero Ugarković), d – Rab (photo: Šime Sušić).
Sl. 2: Fotografije ujetih primerkov hame iz: a – Pirana (foto: M. Buh), b – Brista (foto: Željko in Ernesto Trampa), c – Pelješca (foto: Pero Ugarković), d – Raba (foto: Šime Sušić).

RESULTS AND DISCUSSION

All specimens were identified as *Argyrosomus regius* based on distinctive features that could be clearly seen from the photographs provided (Fig. 2). All specimens had elongated body pearly-silver in colour with bronze hints on the dorsal part and fins of reddish colour; the second dorsal fin much longer than the first; ventral fins positioned directly below relatively short pectoral fins. Head is rather large in respect to the body with a large terminally positioned mouth of yellowish colour. The estimated total length (TL) of the specimen from Slovenia was 650 mm (Fig. 2a) while the Croatian specimen from Brist measured 740 mm TL and weighed 4.5 kg (Fig. 2b) and the specimen from Pelješac weighed 2.2 kg (Fig 2c, no data on TL). For the specimen from Zadar area, we estimated the TL ranging between 750-800 mm. According to the previously documented length-at first maturity (Gonzalez-Quiros *et al.*, 2011; Abou Shabana *et al.,* 2012) all specimens were either mature or close to its matureness.

Prior to these records, the last documented record of a wild specimen in the Adriatic Sea dates from August 2008, from the area near Neretva river mouth in Croatia (Dulčić *et al.*, 2009). This specimen was considered as an escapee from the mariculture. In Croatian waters the meagre was declared as regionally extinct species (Jardas *et al.,* 2008), although there is a small possibility that some specimens can find their way into Croatian waters from the area of Bojana river mouth (Montenegro), hosting one of the last wild populations of this species (Joksimović, 2007) in the Adriatic Sea. Since there are no wild populations in the Middle and North Adriatic and due to the fact that the only remaining wild populations in the southern Adriatic are scarce (Joksimović, 2007; Jardas *et al.,* 2008; Dulčić *et al.,* 2009), we presume that the specimen collected near Brist (Croatia) probably originated from the mariculture facilities from Mljet island which was active during 2011 when the specimen was collected. The same is probably true for the specimen from Pelješac where, beside one specimen reported herein, several other specimens were caught in summer 2012 by various fishermen (P. Ugarković, *pers. comm*).

We are also aware of a specimen caught near Ulcinj (Montenegro) in May 2016 which appeared on social network (Facebook group »More i Ribolov«) as a curiosity. Presence of farmed meagre escapees have been reported from many areas in the Mediterranean, even in areas far from meagres natural distribution, or in areas where it is considered locally absent or extinct (Mayol *et al.,* 2000; Dulčić *et al.,* 2009; Sanchez-Jerez *et al.*, 2011; Arechavala-Lopez *et al.,* 2015). There are several places in the Adriatic where the meagre is still farmed, although the production is relatively small in comparison to overall marine fish production (Kružić *et al.,* 2016; Cataudella & Spagnolo, 2011). In Croatia there are two areas where meagre is still cultured in the floating cages, the first on island Hvar and the second on islands off Zadar (Pašman, Ugljan, Dugi otok) (Kružić *et al.,* 2016). Farms from Zadar area were probably the source of meagre escapees encountered in the area. Indeed, in 2012 there were media reports of significant quantities of smaller specimens (300-700 g) of meagre being caught near Lošinj Island by the local fishermen which probably originated from fish farms in vicinity (Šuljić, 2012). In Italian part of the Adriatic Sea two areas host the meagre production, Adriatic part of Apulia and the Gulf of Trieste (Cataudella & Spagnolo, 2011).

According to geographic position, the Cà Zuliani mariculture at Monfalcone in the Gulf of Trieste seems to be the appropriate site where the Slovenian specimen originated from. In that farm, placed in the East-West canal of Monfalcone, two small cages were, at the time, devoted to the production of the meagre. The sea water in this canal is heated by the discharge water of electric plant helping to a better production of the species, known not to be prone to the temperatures below 11°C, which are common for the area during winter periods. Without the heated water discharges the production of the meagre would not be possible, as was observed in the beginning of 2017 when all specimens from the cages died due to water temperature drop, which was a direct consequence of the disrupted water discharge from the power plant (biologist and mariculture operator Walter de Walderstein, *pers. comm.*). The water temperature drops during winter time, from the site of production through the canals to the waters of the Gulf of Trieste, which would most probably prevent any possible escapees to reach the open sea. According to the interview held with Walter de Walderstein there were also no damages observed to the cages in the canal and therefore no fish are presumed to have escaped from there. According to these statements it cannot be excluded that the Slovenian specimen could originate from the distant maricultures from the Middle Adriatic, which are several hundred kilometres away from the place of capture. Meagre have a low degree of site fidelity (Toledo-Guedes *et al.,* 2009; Arechavala-Lopez *et al.,* 2016) and regularly perform seasonal migrations. Moreover, they are capable of swimming over long distances (Gonzalez-Quiros *et al.,* 2011; Morales-Nin *et al.,* 2012). Distance from Middle Adriatic mariculture facilities to the Gulf of Trieste could still be within its range and possible to overcome. According to Grubišić (1967), this species has been occurring in the northern Adriatic until the middle of the 20th century, although it was very rare. Despite this fact the meagre has so far never been recorded for the area of the Slovenian Sea according to available literature (Matjašič & Štirn, 1975; Kryštufek & Janžekovič, 1999), making the specimen reported here-in the first record for the Slovenian Sea.

Finally, although rare, occurrences of meagre in the Adriatic Sea seem to be occasional in the recent years. During the final preparation of this manuscript, we got informed about the catch of meagre from in waters off

Lopar on Rab island (10th April 2018; Croatian coast; W=1.75 kg) (Fig. 1) accompanied with a photo of the specimen (Fig. 2d) (Šime Sušić, *pers. comm.*).

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PRVI PRIMER POJAVLJANJA HAME, *ARGYROSOMUS REGIUS* (ASSO, 1801), V SLOVENSKEM OBALNEM MORJU Z DODATNIMI ZAPISI POJAVLJANJA IZ HRVAŠKEGA DELA JADRANA

Borut MAVRIČ
National Institute of Biology, Marine Biology Station Piran, Fornače 41, SI-6330 Piran

Branko DRAGIČEVIĆ
Institute of Oceanography and Fisheries, Split, I. Meštrovića 63, 21000 Split, Croatia

POVZETEK

Primerek hame, Argyrosomus regius *(Asso, 1801) so 24. novembra 2016 ujeli v pridneno vlečno mrežo na peščeno muljastem delu slovenskega morja, na globini okoli 20 m. To je prvi zapis za to vrsto v slovenskem morju. Ker v srednjem in severnem delu Jadrana ni divjih populacij hame, gre verjetno za primerek, ki je ušel iz marikulture. Avtorja v članku podajata tudi dodatna pojavljanja iz hrvaškega dela Jadrana.*

Ključne besede: hama, *Argyrosomus regius*, Jadransko morje, ubežnik, akvakultura

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ABOUT TELEOST SPECIES FROM DEEP MARINE TUNISIAN WATERS: WITH ADDITIONAL RECORDS OF SLOANE'S VIPERFISH *CHAULIODUS SLOANI* AND CONFIRMED OCCURRENCE OF BLACKFIN SORCERER *NETTASTOMA MELANURUM*

Sihem RAFRAFI-NOUIRA
Université de Carthage, Laboratoire de Bio-Surveillance de l'Environnement, Unité d'Hydrobiologie Littorale et Limnique, Faculté des Sciences, Zarzouna, 7021 Bizerte, Tunisia

Jamila BEN SOUISSI
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia ,Université de Tunis El Manar, Faculté des Sciences de Tunis, Laboratoire de Biodiversité, Biotechnologie et Changement Climatique, LR11ES09, 1002, Tunis, Tunisia

Christian CAPAPÉ
Laboratoire d'Ichtyologie, case 104, Université de Montpellier, 34 095 Montpellier cedex 5, France
e-mail: capape@univ-montp2.fr

ABSTRACT

This paper reports additional records of Sloane's viperfish Chauliodus sloani *Bloch & Schneider, 1801, and the first substantiated record of blackfin sorcerer* Nettastoma melanurum *Rafinesque, 1810, from the Tunisian coast. All specimens were collected by trawl during a commercial survey carried out in the northern area of the country. Both species were caught in deep waters, at depths between 600 and 1200 m. These captures suggest that viable populations of both species have successfully established in this region.*

Key words: Stomiatidae, Nettastomatidae, description, morphometric measurements, meristic counts, occurrence, deep waters

SPECIE DI TELEOSTEI IN ACQUE MARINE PROFONDE TUNISINE: NUOVI RITROVAMENTI DEL PESCE VIPERA *CHAULIODUS SLOANI* E PRESENZA CONFERMATA DEL PESCE SERPE CODANERA *NETTASTOMA MELANURUM*

SINTESI

L'articolo riporta nuovi ritrovamenti del pesce vipera Chauliodus sloani *Bloch & Schneider, 1801, e il primo ritrovamento documentato del pesce serpe codanera* Nettastoma melanurum *Rafinesque, 1810, al largo della costa tunisina. Tutti gli esemplari sono stati pescati con una rete a strascico, durante un'uscita a fini commerciali effettuata nell'area settentrionale del paese. Entrambe le specie sono state catturate in acque profonde, tra i 600 e i 1200 m. A seguito di queste catture gli autori ipotizzano che popolazioni vitali di entrambe le specie si sono stabilite con successo in questa regione.*

Parole chiave: Stomiatidae, Nettastomatidae, descrizione, misurazioni morfometriche, conte meristiche, ritrovamento, acque profonde

INTRODUCTION

Investigations regularly and frequently conducted in shallow coastal waters of the northern Tunisian coast and observations carried out at the fishing sites of Tabarka, Bizerte and Ras Jebel offered the opportunity to show that some changes occurred in the ichthyofauna biodiversity throughout the study area (Rafrafi-Nouira, 2016). These changes were displayed by the presence of species previously unknown in the area, consequences of internal migrations from southern Tunisian areas such as the Gulf of Gabès (Rafrafi-Nouira *et al*., 2105a, 2015b) or incoming from the eastern tropical Atlantic through the Strait of Gibraltar (Azzouz *et al*., 2010, 2011; Mansour *et al*., 2011; Rafrafi-Nouira, 2016) and the Red Sea through the Suez Canal (Rafrafi-Nouira *et al*., 2012).

Other investigations were concomitantly carried out focusing on the deep-sea areas of the same Tunisian region. Preliminary data allowed collecting species rarely observed in local fish markets, among them Sloane's viperfish *Chauliodus sloani* Schneider, 1801 and the blackfin sorcerer *Nettastoma melanurum* Rafinesque, 1810. The occurrence of *C. sloani* in Tunisian waters was confirmed by Ben Amor *et al*. (2017), and in the present paper, we provide additional records of the species. *N. melanurum* was reported in the area by Bradaï *et al*. (2004), however no specimen was available for confirmation; the present capture of the specimens allowed us to give a short description of the species and comment on the distribution of the species in the region and in the Mediterranean Sea in general.

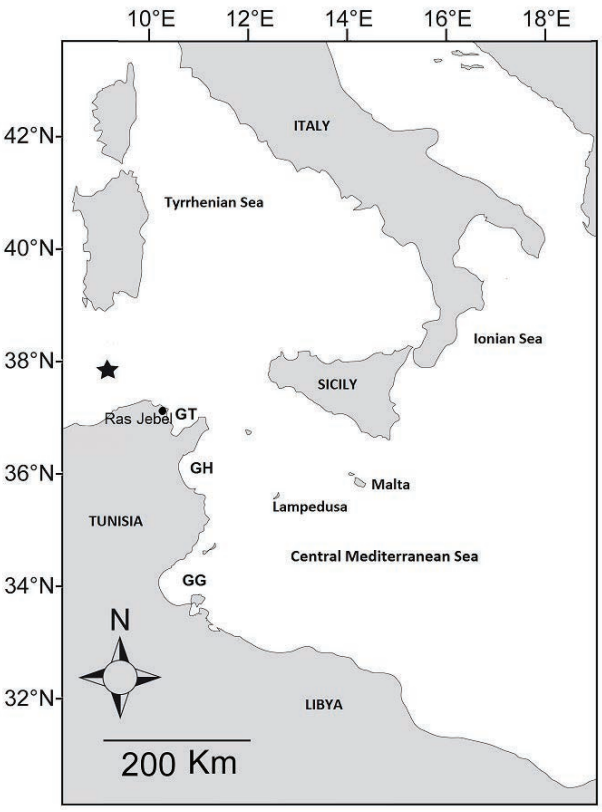

Fig. 1: Map of the Mediterranean Sea showing Tunisia and indicating the capture site [black star] of the specimens of *Chauliodus sloani* ***and*** *Nettastoma melanurum* ***in the northern region.***
Sl. 1: Zemljevid Sredozemskega morja z označeno lokaliteto ob severnem predelu Tunizije [črna zvezda], kjer so bili ujeti primerki vrst *Chauliodus sloani* ***in*** *Nettastoma melanurum***.**

MATERIAL AND METHODS

On 4 December 2017, 3 specimens of *Chauliodus sloani* and 8 specimens of *Nettastoma melanurum* were captured by benthic trawl, off Bizerte, in northern Tunisia, at depths between 600 and 1200 m, on soft bottom, at 37°43'33.92" N and 8°45'06.32" E (Fig. 1). They were collected together with other species inhabiting deep marine waters, such as the rabbitfish *Chimera monstrosa* Linnaeus, 1758, the blackspot grenadier *Coelorhynchus caelorhynchus* (Risso, 1810), the hake *Merluccius merluccius* (Linnaeus, 1758), *Hoplostethus mediterraneus* Cuvier, 1829 and the Atlantic horse-mackerel *Trachurus trachurus* (Linnaeus, 1758), as well as two unidentified cephalopod species.

Fresh specimens were measured for total length (TL), standard length (SL) and all morphometric characters to the nearest millimetre, and weighed to the nearest gram. Two specimens of *C. sloani* and 3 specimens of *N. melanurum* were fixed in 10% buffered formaldehyde, preserved in 75% ethanol, and deposited in the Ichthyological Collection of Faculté des Sciences de Bizerte (Tunisia) under catalogue numbers FSB-Chau-slo-01and FSB-Chau-slo-02, for *C. sloani*, respectively, and FSB-Net-mel-01, FSB-Net-mel-02 and FSB-Net-mel-03, for *N. melanurum*, respectively.

RESULTS AND DISCUSSION

Chauliodus sloani is considered a rare species in the Mediterranean Sea, probably because it lives in deep areas, poorly exploited by fishing gears, has no commercial value, and is generally captured as by-catch and then discarded at sea (Tortonese, 1970). The occurrence of *C. sloani* in Tunisian marine waters was reported by Ben Amor *et al*. (2017) based on specimens caught in the northern region.

The three collected specimens measured 168, 117 and 100 mm in TL, respectively, and weighed 5.9, 1.9 and 1.6 g, respectively (Fig. 2). They were identified as *C. sloani* based on a combination of general morphological features, morphometric measurements, meristic counts (see Tab. 1), and colour, which are in total agreement

Tab. 1: Morphometric measurements in mm and as percentages of total length (TL %), meristic counts and weights recorded in the specimens of *Chauliodus sloani* ***from the northern Tunisian region.***
Tab. 1: Morfometrične meritve, izražene v milimetrih in kot delež celotne dolžine (TL %), meristika ter teže primerkov morskega gada *Chauliodus sloani* ***iz severnega dela Tunizije.***

References	**FSB-Chau-slo-01**		**FSB-Chau-slo-02**	
Morphometric measurements	**mm**	**% TL**	**mm**	**% TL**
Total length (TL)	168	100.0	108.7	100.0
Standard length (SL)	160	95.2	100.6	92.5
Head length	24	14.3	22	20.2
Eye diameter	4.3	2.6	3	2.8
Preorbital length	6.8	4.0	3.5	3.2
Predorsal length	36	21.4	25	23.0
Preanal length	133	79.2	71.4	65.7
Dorsal fin base	10	6.0	6	5.5
Anal fin base	15	8.9	12.6	11.6
Meristic counts				
Dorsal fin rays	6		6	
Anal fin rays	10		10	
Pectoral fin rays	12		12	
Pelvic fin rays	7		7	
Caudal fin rays	11		11	
Number of teeth in upper jaw	8		8	
Number of teeth in lower jaw	14		14	
Total body weight (g)	5.9		1.6	

Fig. 2: Specimens of *Chauliodus sloani* ***from the northern Tunisian region; scale bar = 40 mm.***
Sl. 2: Primerki vrste *Chauliodus sloani* ***iz severnega predela Tunizije; merilo = 40 mm.***

Fig. 3: Specimen of** Chauliodus sloani **from the northern Tunisian region, captured [white arrow] by a squid belonging to the genus** Histiotheutis **Orbigny, 1841; scale bar = 100 mm.
Sl. 3: Primerek vrste** Chauliodus sloani **iz severnega predela Tunizije, ki ga je ujel ligenj iz rodu** Histiotheutis **Orbigny, 1841; merilo = 100 mm.

with Tortonese (1970), Gibbs (1984), Dalyan & Eryilmaz (2008) and Ben Amor *et al.* (2017). These 3 specimens constitute additional records of the species that confirm its occurrence in local marine waters, where it does not appear as rare as it was previously stated (Bradaï, 2000; Bradaï *et al.*, 2004). They probably were juvenile specimens, the species reaching more than 300 mm in standard length (Gibbs, 1984). *C. sloani* is a top predator feeding on teleost species exclusively (Battaglia *et al.*, 2018). Conversely, it could constitute prey for cephalopod, as in Fig. 3, which shows a specimen captured by a squid probably belonging to the genus *Histiotheutis*, Orbigny, 1841.

Nettastoma melanurum is known as a bathypelagic species widely distributed on either side of the Atlantic Ocean. Off the eastern Atlantic coast, *N. melanurum* occurs from Portugal to the Gulf of Guinea, and off the western Atlantic coast from the northern Gulf of Mexico and east Florida through the Caribbean to the Guianas (Saldanha, 1986). The species is also reported in the western Mediterranean, as a deep-sea species distributed between 415 and 1598 m (Porcu *et al.*, 2013). It is also known in the eastern Mediterranean, off the coast of Egypt (Farrag, 2016), and in the Levant Basin (Basusta *et al.*, 2002). The reproductive biology of the species is well known from the specimens collected off the southern coast of Sardinia, in the central Mediterranean Sea (Porcu *et al.*, 2013).

Bradaï (2000) and Bradaï *et al.* (2004) reported the occurrence of *N. melanurum* in Tunisian waters, however, no description was provided of the species nor details on its capture. Therefore, in this note, we present the first substantiated records of *N. melanurum* in the area. A total of 8 specimens were studied, ranging between 460 and 630 mm in TL, and between 46.6 g and 142 g in total body weight. Following Porcu *et al.* (2013) for the specimens from the Sardinian coast, the size at sexual maturity is 535 mm in females and 505 mm TL in males, while the maximum TL in the specimens under study was 753 mm for females and 668 mm TL for males. Additionally, Porcu et *al.* (2013) noted that the smallest mature female and mature male were 420 mm and 446 mm long, respectively. Such patterns suggest that the sampled specimens were probably adults (Tab. 2).

The specimens were identified via the combination of following characters (Fig. 4): body very elongate, scaleless, and compressed posteriorly. Head long, anterior nostril tubular, jaws elongate, teeth in bands on jaws and vomer (Fig. 5). Dorsal anal and caudal fins confluent, well developed, dorsal fin origin over gill opening (Fig. 6). Brownish dorsally, belly pale whitish brown; posterior part of dorsal and anal fins with a

Tab. 2: Morphometric measurements in mm and as percentages of total length (TL %), meristic counts and weights recorded in the specimens of Nettastoma melanurum ***from the northern Tunisian region.***
Tab. 2: Morfometrične meritve, izražene v milimetrih in kot delež celotne dolžine (TL %), meristika ter teže primerkov vrste Nettastoma melanurum ***iz severnega dela Tunizije.***

References	FSB-Net-mel-01		FSB-Net-mel-02		FSB-Net-mel-03	
Measurements	mm	% TL	mm	% TL	mm	% TL
Total length	570	100.0	585	100.0	623	100.0
Preanal length	240	42.1	230	39.3	250	40.1
Predorsal length	85	14.9	78	13.3	83	13.3
Dorsal fin length	485	85.1	510	87.2	545	87.5
Anal fin length	327	57.4	350	59.8	375	60.2
Body depth	30	5.3	26	4.4	26	4.2
Head length	85	14.9	78	13.3	81	13.0
Eye diameter	10	1.8	6	1.0	9	1.4
Preorbital length	33	5.8	31	5.3	32	5.1
Interorbital length	3	0.5	4	0.7	4.5	0.7
Length of upper jaw	46	8.1	43	7.4	47	7.5
Length of lower jaw	44	7.7	41	7.0	43	6.9
Counts						
Number of pores in linea lateralis	48		48		48	
Number of pre-branchial pores	9		9		9	
Number of temporal pores	3		3		3	
Total body weight in gram	129.1		91.3		116.6	

Fig. 4: Specimen of *Nettastoma melanurum* ***from the northern Tunisian region (ref. FSB-Net-mel 01); scale bar = 50 mm.***
Sl. 4: Primerek vrste *Nettastoma melanurum* ***iz severnega predela Tunizije (ref. FSB-Net-mel 01); merilo = 50 mm.***

Fig 5: Head of a specimen of *Nettastoma melanurum* ***from the northern Tunisian region (ref. FSB-Net-mel 01); scale bar = 20 mm.***
Sl. 5: Glava primerka vrste *Nettastoma melanurum* ***iz severnega predela Tunizije (ref. FSB-Net-mel 01); merilo = 20 mm.***

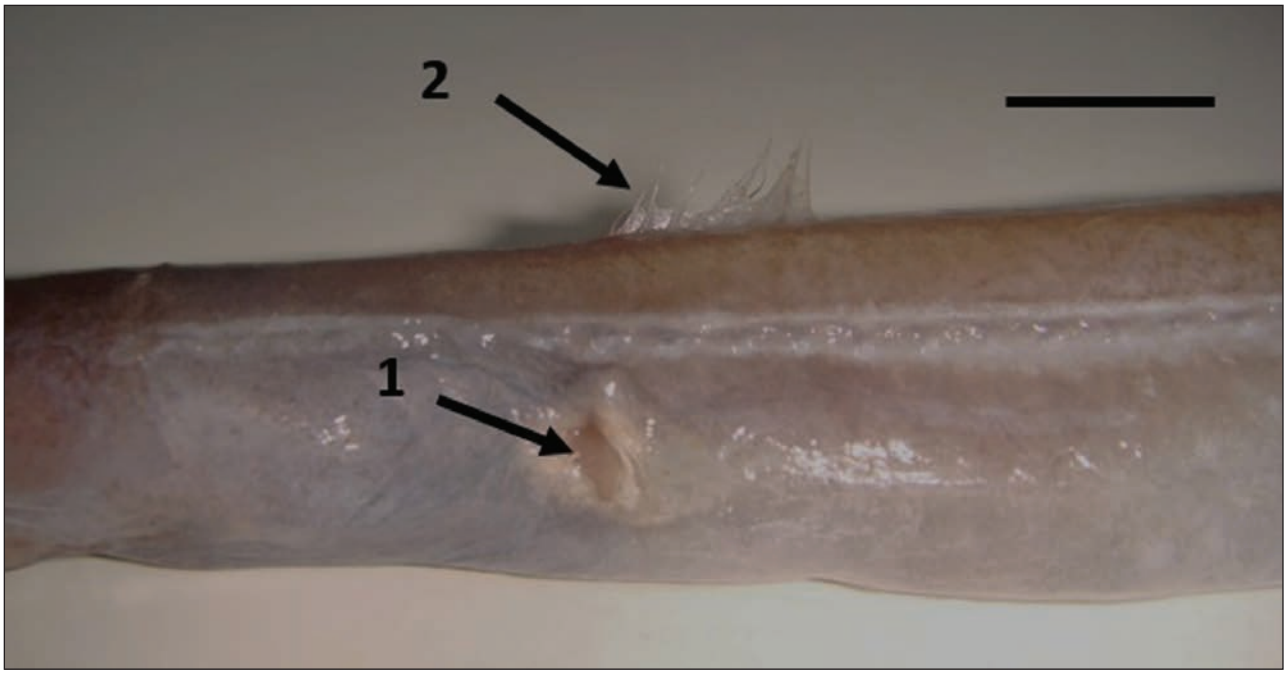

Fig. 6: Specimen of *Nettastoma melanurum* ***with indicated gill opening (1) and the beginning of dorsal fin (2) (ref. FSB-Net-mel 01); scale bar = 20 mm.***
Sl. 6: Primerek vrste *Nettastoma melanurum* ***z označenimi škržnimi režami (1) in začetkom hrbtne plavuti (2) (ref. FSB-Net-mel 01); merilo = 20 mm.***

black margin. It appears that description, measruments and percentage of TL (% TL) are in total agreement with Saldanha (1986) and Basusta *et al*. (2002), who provided morphological characters allowing to distinguish *N. melanurum* from other species occurring in the Mediterranean., among them the main character being the position of the gill opening over the beginning of the first dorsal fin.

Since the findings of *C. sloani* and *N. melanurum* confirm the occurrence of the two species in Tunisian marine waters, these should be included in the local ichthyofauna. *C. sloani* and *N. melanurum* inhabit deep-sea areas poorly exploited by commercial vessels and fishing gears. Additionally, they are of low economic interest and generally discarded at sea after capture; such patterns explain their relative rarity in the area. However, the number of specimens collected for both species suggests that viable populations have established in the area, but further records are needed to confirm this well-reasoned hypothesis.

O RIBAH KOSTNICAH IZ GLOBOMORSKEGA OKOLJA OB TUNIZIJI: NOVI PODATKI O VRSTI *CHAULIODUS SLOANI* IN POTRJEN ZAPIS O VRSTI *NETTASTOMA MELANURUM*

Sihem RAFRAFI-NOUIRA
Université de Carthage, Laboratoire de Bio-Surveillance de l'Environnement, Unité d'Hydrobiologie Littorale et Limnique, Faculté des Sciences, Zarzouna, 7021 Bizerte, Tunisia

Jamila BEN SOUISSI
Université de Carthage, Institut National Agronomique de Tunisie, 43 avenue Charles Nicolle, 1082-Tunis-Mahrajène,Tunisia ,Université de Tunis El Manar, Faculté des Sciences de Tunis, Laboratoire de Biodiversité, Biotechnologie et Changement Climatique, LR11ES09, 1002, Tunis, Tunisia

Christian CAPAPÉ
Laboratoire d'Ichtyologie, case 104, Université de Montpellier, 34 095 Montpellier cedex 5, France
e-mail: capape@univ-montp2.fr

POVZETEK

Avtorji poročajo o novih podatkih o pojavljanju morskega gada Chauliodus sloani *Bloch & Schneider, 1801, in prvem zapisu o pojavljanju vrste* Nettastoma melanurum *Rafinesque, 1810, iz voda ob tunizijski obali. Vsi primerki so bili ujeti v povlečno mrežo pri komercialnem ribolovu v severnem delu države. Obe vrsti sta bili ujeti v velikih globinah med 600 in 1200 m. Ti podatki kažejo, da sta se v regiji ustalili viabilni populaciji obeh vrst.*

Ključne besede: Stomiatidae, Nettastomatidae, opis, morfometrične meritve, meristika, pojavljanje, globokomorsko okolje

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LE ORCHIDACEAE DEL COMUNE CITTÀ DI CAPODISTRIA (SLOVENIA)

Amelio PEZZETTA
Via Monte Peralba 34 - 34149 Trieste
e-mail: fonterossi@libero.it

SINTESI

Il territorio del Comune città di Capodistria (Koper, Slovenia) copre una superfice di 311 Kmq e va dal mare Adriatico sino ai Monti della Vena in cui raggiunge la quota di 1028 metri s.l.m. (monte Taiano). Nel complesso esso è caratterizzato da una grande eterogeneità ambientale che consente lo sviluppo di associazioni vegetali molto diverse tra loro. Nel presente lavoro, tenendo conto di ricerche dirette, fonti bibliografiche e segnalazioni inedite è riportata e discussa una check-list aggiornata di tutte le Orchidaceae comprendente 54 taxa, di cui 5 ibridi. Inoltre è stata fatta anche l'analisi corologica che evidenzia la prevalenza dell'elemento eurasiatico seguito da quello mediterraneo. Nel complesso l'insieme dei taxa presenti sono tipici di un ambito fitogeografico di transizione.

Parole chiave: Capodistria, Orchidaceae, check-list, contingenti floristici

THE ORCHIDACEAE OF THE CITY MUNICIPALITY OF KOPER (SLOVENIA)

ABSTRACT

The territory of the City Municipality of Koper covers the surface of 311 sq km and goes from the Adriatic Sea to the Čičarija mountainous region, where it reaches the altitude of 1028 meters on Mount Slavnik. Overall, it is characterized by a great environmental heterogeneity that allows the development of very different plant associations. In the present work, we reported an updated check-list of Orchidaceae recorded in the area, comprising 54 taxa, of which 5 are hybrids. The check-list includes unpublished field observations and literature records taking into account direct research, bibliographic sources and unpublished reports. Furthermore, a chorological spectrum was built which highlights the prevalence of the Eurasian elements followed by the Mediterranean. Overall, the set of taxa present are typical of a transitional phytogeographical area.

Key words: Koper, Orchidaceae, check-list, floristic composition

INTRODUZIONE

La famiglia delle Orchidaceae Juss. è la più ricca del mondo vegetale dopo le *Asteraceae*, essendo costituita da circa 27.800 specie ripartite in 880 generi (Givnish *et al.,* 2016). Essa ha colonizzato con successo quasi ogni bioma terrestre, ma raggiunge la maggiore abbondanza e diversificazione nelle zone tropicali. In Europa e nel bacino mediterraneo sono segnalati oltre 600 taxa (Delforge, 2016). Nella Repubblica di Slovenia sono segnalati 79 taxa ripartiti tra specie e sottospecie (Dolinar, 2015a). Tali piante incontrano molti appassionati e studiosi poichè generalmente per la loro varietà e bellezza suscitano immagini esotiche, sono caratterizzte da una biologia complessa e assumono forme tipiche.

La finalità del presente saggio è di compilare una checklist comprendente le specie, le sottospecie e gli ibridi della famiglia delle Orchidaceae presenti nell'area d'indagine, attraverso l'esame degli studi noti in letteratura, le ricerche sul campo dell'autore e le informazioni fornite da appassionati e studiosi.

Allo stato attuale non è stato pubblicato nessun lavoro monografico specifico sulle orchidee spontanee dell'area di studio, nonostante i numerosi studi.

Le ricerche floristiche di una certa importanza nell'ambito in considerazione e nei comuni adiacenti dell'Istria slovena iniziarono con il farmacista veneziano J.H. Zanichelli (1662-1729) che vi erborizzò nel 1722 e nel 1725. Nella prima metà del XIX secolo gli studi botanici proseguirono soprattutto con F. G. Bartling, B. Biasoletto e M. de Tommasini. Nella seconda metà del secolo continuò a operarvi Tommasini cui si affiancarono: A. Loser, C. Marchesetti ed E. Pospichal. Verso la fine del secolo Stefani pubblicò uno studio riguardante la flora del Comune di Pirano.

Dopo questo periodo inziale di ricerche, gli studi botanici subirono un rallentamento, riprendendo vigore nella seconda metà del XX secolo con T. Wraber cui in seguito si affiancarono altri studiosi tra i quali M. Kaligarič e N. Jogan. A Kaligarič (1991a), in particolare si deve il merito di aver pubblicato il primo importante studio monografico sulle orchidee dell'Istria slovena che ovviamente comprende numerose segnalazioni riguardanti il capodistriano. Poi sono seguite altre pubblicazioni e gli studi monografici riportati in bibliografia che hanno incrementato le conoscenze orchidologiche esistenti.

Inquadramento dell'area di studio

Capodistria (in sloveno Koper) è uno dei quattro comuni del litorale sloveno situato nell'Istria nord-occidentale i cui confini amministrativi sono costituiti dal mare Adriatico, l'Italia, la Croazia e i comuni di Erpelle-Cosina (Hrpelje-Kozina), Ancarano (Ankaran), Isola d'Istria (Izola) e Pirano (Piran).

La superfice di tutto il territorio comunale copre circa 311 Kmq mentre la popolazione residente è di oltre 54000 abitanti. Di questi, circa 25000 abitanti vivono nella città di Capodistria che è posta su un'antica isola costiera congiunta alla terraferma con due dighe e territori in passato appartenenti a saline ora bonificate. Il resto della popolazione è ripartita negli insediamenti circostanti. La densità media è di circa 173 abitanti per Kmq. Se si considera che circa il 46% della popolazione è concentrato nel capoluogo, la densità media nel resto del Comune è inferiore a 100 abitanti per Kmq, un valore numerico basso che nel complesso è molto vicino a quello della Repubblica di Slovenia e di tutta la penisola istriana. Da diversi decenni il Comune di Koper-Capodistria è interessato da una dinamica migratoria che sta portando allo spopolamento delle aree interne e all'espansione della fascia costiera. Le principali alture dell'ambito d'indagine sono i seguenti: Golich (Golič), 890 m; Monte Caucizze (Kavčič), 882 m; Lipenico (Lipnik), 804 m; Coinico (Kojnik), 802 m; Monte dei Carpini (Gaber); Monte dei Tigli (Lime); Colle (Breg), 595 m. I più importanti corsi d'acqua che l'attraversano sono: il Dragogna (Dragonja), il Rio Ospo (Osp), il Risano (Rižana) e il Torrente Cornalunga (Badaševica).

La geologia

Il territorio comunale di Capodistria occupa circa 1/10 della penisola istriana che è consuetudine ripartirla nelle seguenti tre subregioni: Istria bianca, Istria grigia e Istria rossa (Sacco, 1924; Alberi, 1997; Pericin, 2001; Pezzeta, 2013). Esso si può collocare nell'ambito dell'Istria bianca e dell'Istria grigia.

L'Istria bianca, occupa la porzione settentrionale della penisola ed è formata da un altopiano carsico e da vari rilievi che si susseguono da San Servolo (Socerb) al Monte Maggiore (M. Učka). A tale ambito appartengono l'Istria montana (Cumin 1927) e la Cicceria (Čičarija). L'Istria grigia si estende dal Golfo di Trieste alla Valle dell'Arsa ed è costituita da colline composte da rocce e terreni marnoso-arenacei d'origine eocenica che non superano l'altitudine di 600 metri.

Il paesaggio capodistriano è in genere collinare con brevi zone pianeggianti o leggermente ondulate e nei suoi confini settentrionali è costituito da ambiti montuosi in cui si raggiungono le maggiori altitudini. La parte sud-occidentale collinare è composta da terreni marnoso-arenacei (flysch) che si estendono dal mare al ciglione carsico mentre quelle settentrionale e orientale da rocce calcaree. Nelle valli del Risano e dell'Ospo, nei pressi di altri torrenti e lungo la fascia costiera si osservano sedimenti fini e terreni alluvionali di origine recente.

Il clima

Le condizioni climatiche dell'area nel complesso abbastanza variabili, sono condizionate dalla posizione geografica, dalle differenze di altitudine, dall'esposizione ai venti dominanti e dalla distanza dal mare. L'Istria

per la sua particolare posizione geografica funge da ponte di collegamento naturale tra le penisole italiana e balcanica e, tra gli ambiti continentale centro-europeo e mediterraneo. A causa di ciò dal punto di vista climatico può essere definita come un'area di transizione con valori dei parametri termopluviometrici nel complesso molto variabili.

I venti dominanti che interessano l'intera penisola e le sue propaggini settentrionali sono la bora, lo scirocco, il libeccio, il levante, il ponente e il maestrale. Altri meno frequenti giungono da diversi quadranti mentre alcuni locali tra cui le brezze, sono causati dalle escursioni termiche diurne e da fattori topografici di dettaglio.

Il territorio capodistriano, come visto si estende dal livello del mare sino alla vetta del Monte Taiano (Slavnik) e di conseguenza a causa delle differenze d'altitudine, dalla distanza dal mare e da altri fattori, l'andamento dei parametri climatici cambia da località a località come dimostrano i dati ricavati dalle pubblicazioni consultate e da un sito internet (Gams, 1990; Ogrin, 1995; Gorlato, 1997; Globevnik *et al*., 2001, Kaligarič *et al*., 2006; https://it.climate-data.org/location/59382/).

Nella città di Capodistria la temperatura media annua è di 14,4 °C, mentre le precipitazioni oscillano attorno a 1056 mm (https://it.climate-data.org/location/59382/). Le temperature medie più alte si registrano a luglio e si aggirano attorno a 23,5 °C. A loro volta le temperature più basse si osservano a gennaio con 5,6 °C. Allontanandosi dalla costa verso l'entroterra la temperatura media diminuisce sino a un massimo di circa 3 °C (Simič & Pucer, 2001). In particolare a Kubed, la temperatura media annua è di circa 11,7 °C, quella del mese più freddo (gennaio) di circa 2,9 °C e quella del mese più caldo (luglio) è di 20,8 °C. Nella Cicceria, la temperatura media annua è di 11,6 °C, quella del mese più freddo (gennaio) 3,2 °C e quella del mese più caldo (luglio) 20,1 °C (Globevnik *et al.,* 2001). Lungo le valli fluviali, invece, si registrano forti inversioni termiche rispetto alle adiacenti aree collinari con frequenti gelate e brine notturne (Ogrin, 1995).

A loro volta le precipitazioni oscillano da oltre 1000 mm nella città di Capodistria a circa 2200 mm sul Monte Taiano (Globevnik *et al.,* 2001). La stagione più piovosa è l'autunno, mentre nel periodo estivo si registrano i valori minimi. Le precipitazioni mensili raggiungono il valore massimo nel mese di novembre con 117 mm e quello minimo a luglio con 69 mm (https://it.climate-data.org/location/59382/). La vasta gamma di valori che temperature e precipitazioni assumono nell'ambito di studio ha portato all'individuazione di varie tipologie climatiche. Infatti, Ogrin (1995) tenendo conto dell'altitudine e di altri fattori individua nell'Istria slovena cinque diversi tipi di clima.

Aspetti botanici vegetazionali e fitogeografici

L'influsso combinato degli elementi del paesaggio, le sue vicende storico-geologiche, l'andamento climatico e la pressione antropica attuale e del passato si riflettono sulla flora, la vegetazione e le sue particolarità fitogeografiche. A causa delle dinamiche migratorie, delle diverse destinazioni d'uso del suolo e dell'abbandono delle pratiche agro-pastorali tradizionali, l'aspetto del paesaggio capodistriano si sta trasformando.

La fascia costiera sino a circa 40-50 anni fa, era una zona d'intensa produzione orto-viti-frutticola; nelle zone di flysch più alte prevalevano l'agricoltura e l'allevamento mentre nelle aree carsiche ci si dedicava soprattutto all'allevamento (Ogrin, 1991). Molte aree interne furono disboscate per ottenere terreni agricoli e prati-pascolo.

L'espansione delle infrastrutture stradali e delle aree urbanizzate lungo la fascia costiera ha portato alla riduzione degli spazi naturali e dei terreni agricoli. Gran parte del territorio locale che in un recente passato era utilizzato per pratiche agro-pastorali è stato completamente abbandonato. Su tali ambiti ora incolti si osserva la ripresa dei processi di riforestazione, l'espansione di formazioni vegetali arboreo-arbustive e la riduzione dei terreni un tempo destinati a pascoli e praterie (Ogrin, 1991; Kaligarič & Čarni, 1991; Kaligarič *et al.*, 2006; Ivajnšič *et al.*, 2013). Dal XIX secolo, diverse aree carsiche furono interessate da opere di rimboschimento artificiale a pino nero austriaco (*Pinus nigra* Arnold) che in seguito, con un processo che continua tuttora, iniziò ad espandersi spontaneamente anche nei territori contigui. Eseguendo un transetto che va dalla costa sino alle vette della Cicceria, nel complesso si osservano: varie tipologie forestali disposte a mosaico tra i centri abitati, le case sparse, i terreni coltivati e i prati da sfalcio; prati-pascolo secondari; formazioni arboreo-arbustive che lentamente si diffondono sui prati-pascolo abbandonati; associazioni tipiche di ambienti glaericoli e rupestri; pinete artificiali di rimboschimento a pino nero; formazioni vegetali pioniere di rupi e pietraie; associazioni vegetali sinantropiche rinvenibili presso i centri abitati, le abitazioni sparse, i campi coltivati, i terreni incolti e i bordi stradali.

Nelle zone litoranee non intaccate dalle infrastrutture portuali, stradali, turistiche e urbanistiche tra cui le foci del Risano e degli altri corsi d'acqua attecchiscono formazioni vegetali tipiche di ambienti salmastri. La loro composizione floristica è in relazione con il tipo di substrato, l'influenza delle maree e il grado di salinità delle acque. In tali ambiti è presente la riserva naturale di Val Stagnon (Škocjanski zatok), caratterizzata da un ecomosaico complesso formato da secche, barene, canneti, paludi, prati umidi, cespuglieti e terreni agricoli abbandonati.

Sulle rupi soleggiate esposte a sud e riparate dalla bora situate presso Osp, Črni Kal e Podpeč sono presenti esemplari di leccio ed altre entità inquadrabili nell'associazione *Orno-Quercetum-ilicis* Horvatić (Wraber, 1968; Kaligarič, 1991a). Essa è diffusa lungo le coste orientali adriatico-ioniche dalla Grecia sino al Golfo di Trieste

ove raggiunge il limite settentrionale di distribuzione geografica (Poldini *et al.*, 1980). Il corteggio floristico delle stazioni dell'area comprende: *Acer monspessulanus* L., *Fraxinus ornus* L., *Laurus nobilis* L., *Lonicera etrusca* Santi, *Phyllirea latifolia* L., *Pistacia terebinthus* L., *Quercus ilex* L., etc.

Nelle aree carsiche disboscate è largamente diffusa un'associazione zoogena conseguente alla lunga attività di pascolo esercitata nei secoli passati: *Carici-humilis-Centauretum rupestris* Horvatić 31. Alla sua composizione concorrono: *Bromus erectus* Huds., *Carex humilis* Leys, *C. caryophyllea* Latourr. *Centaurea rupestris* L., *Crocus reticulatus* Stev. ex Adam, *Fritillaria oreintalis* Adam. *Gentiana tergestina* (Beck) Fritsch, *Iris Illyrica* Tomm., *Muscari botryoides* (L.) Mill., *Potentilla tommasiniana* F. W. Schultz, *Pulsatilla montana* (Hoppe) Rchb., etc (Poldini *et al.,* 1980, Kaligarič 1991a).

Su piccole superfici di suoli situate ai margini dei ciglioni carsici e dei monti della Cicceria, a elevata pendenza, esposte alla bora e povere di nutrienti si sviluppa l'associazione *Genisto sericae-Seslerietum juncifoliae* Poldini 80 formata da: *Allium ochroleucum* W. K., *Amelanchier ovalis* Med., *Artemisia alba* Turra, *Athamantha turbith* (L.) Brot., *Daphne alpina* L., *Genista sericea* Wulf., *Ruta divaricata* Ten. *Satureja montana* L. subsp. *variegata* (Host) P. W. Ball, *Scorzonera austriaca* Willd., *Seseli gouanii* Koch, *Sesleria juncifolia* Suffr., *Trinia glauca* (L.) Dum, ecc. (Poldini, 1989; Kaligarič, 1997). Negli ambiti più soleggiati e termofili delle aree carsiche disboscate è diffusa l'associazione *Chrysopogono-Centaureetum cristatae* Ferlan et Giacomini 1955 em. Poldini 1988 alla cui composizione concorrono: *Alyssum montanum* L., *Botryochloa ischaemum* (L.) Keng, *Bromus squarrosus* L., *Catapodium rigidum* (L.) C.E. Hubb, *Centaurea cristata* Bartl., *Chrysopogon grillus* (L.) Trin., *Cleistogenes serotina* (L.) Keng, *Lactuca viminea* (L.) J. & K. Presl, *Sedum. album* L., S. *sexangulare* L., etc. (Kaligarič, 1997).

Sui suoli più evoluti si rinvengono altre associazioni tipiche dei prati-pascolo tra cui il *Danthonio-Scorzoneretum villosae Horvat &* Horvatić (56) 58 alla cui composizione essenzialmente concorrono: *Agrostis tenuis* Sibth., *Betonica officinalis* L. subsp. *serotina* (Host) Murb., *Centaurea weldeniana* Rchb, *Danthonia alpina* Vest, *Festuca rupicola* Heuff., *Knautia illyrica* Beck, *Leucanthemum liburnicum* (Horvatič) Horvatič, *Plantago media* L., *Salvia bertoloni* Vis., *Scorzonera villosa* Scop., etc. (Poldini, 1989; Kaligarič, 1991a, 1997). In accordo con Kaligarič (1997) si è posta in sinonimia con il *Danthonio-Scorzoneretum villosae l'associazione Bromo-Chrysopogonetum-Grylli* Horvat 1960 segnalata sui terreni marnoso-arenacei disboscati non utilizzati per le attività agricole che sono presenti nell'area (Kaligarič, 1991a).

Sui pascoli abbandonati si nota un progressivo incespugliamento che lentamente porterà alla diffusione del bosco misto carsico submediterraneo che con la sua principale associazione: l'*Ostryo-Quercetum pubescentis (*Ht.) Trinajstič 74, riacquisisce gli antichi terreni perduti con la deforestazione. Esso ora si rinviene in diverse parti, sia sui terreni calcarei sia su quelli marnoso-arenacei delle quote più basse. Gli alberi e gli arbusti dominanti che lo costituiscono sono: *Acer monspessulanum* L., *Cornus sanguinea* L., *C. mas* L., *Cotinus coggygria* Scop., *Fraxinus ornus* L., *Ligustrum vulgare* L., *Ostrya carpinifolia* Scop., *Prunus mahaleb* L., *P. spinosa* L. e *Quercus pubescens* Willd.

Un'altra associazione boschiva tipica dei terreni flischoidi e calcarei più profondi è il *Seslerio-Quercetum petraeae* (Poldini 64 n.n.) Poldini 82 caratterizzato da varie specie quercine con prevalenza della roverella nelle aree più calde e soleggiate e dal rovere in quelle più ombrose (Kaligarič, 1991; Ogrin, 1991).

Sui pendii soleggiati della Cicceria posti circa tra 600 e 900 m d'altitudine si trova il *Seslerio-Ostryetum* Ht. et Horvatič 50 (Kaligarič, 1991a), un'associazione che Poldini (1989) pone in sinonimia con *l'Ostryo-Quercetum pubescentis*. In realtà il Seslerio-Ostrieto rappresenta una forma dell'Ostrio-Querceto degradato dall'attività umana, che assume l'aspetto di una boscaglia in cui nello strato arboreo domina *Ostrya carpinifolia* e in quell'erbaceo *Sesleria juncifolia* Suffr.

Alle altitudini maggiori, in particolare sui pendii ombrosi della Cicceria, le pendici del Monte Taiano e del Kojnik si sviluppa il bosco climax caratterizzato dall'associazione *Seslerio autumnalis-Fagetum* M.Wraber ex Borhidi 1963 che Poldini (1989) considera una variante litoranea della faggeta termofila a *Ostrya carpinifolia* Scop. Alla sua composizione concorrono: *Allium ursinum* L., *Aquilegia nigricans* Baumg, *Fagus sylvatica* L., *Ilex aquifolium* L., *Lathyrus venetus* (Mill.) Wohlf., *Polygonatum multiflorum* (L.) All., *Primula vulgaris* Huds., *Sesleria autumnalis* (Scop.) F. W. Schultz, etc.

Nelle doline con una certa profondità si sviluppano formazioni vegetali azonali tipiche di ambienti continentali freschi con *Galanthus nivalis* L., *Carpinus betulus* L., *Corylus avellana* L., *Primula vulgaris* Huds., *Anemone nemorosa* L., *Anemone ranunculoides* L., *Corydalis cava* (L.) Schweigg & Koerte, *Helleborus multifidus* Vis. subsp. *istriacus* (Schiffn.) Merxm. & Podl. e altri taxa.

Alla composizione vegetale delle associazioni presenti sul territorio in esame concorre un elevato numero di taxa di cui l'ammontare esatto non è del tutto conosciuto. Per avere un'idea abbastanza vicina alla realtà si farà riferimento all'atlante di Jogan *et al.* (2001) che ripartiscono la Repubblica di Slovenia in 176 aree di base o quadranti definiti da una rete a gradini con la superfice di circa 140 Kmq ciascuno. Il territorio capodistriano (in certi casi, insieme a parte di altri comuni confinanti) è compreso nei quadranti indicati con le seguenti sigle: 0348, 0349, 0447, 0448 e 0449. Dala consultazione dell'Atlante lo scrivente ha rilevato che nei quadranti sopra considerati sono presenti circa 1578

taxa, un valore numerico che potrebbe essere molto vicino al corteggio floristico dell'area d'indagine. Tale dato dimostra che il capodistriano è caratterizzato da un'elevata biodiversità vegetale.

Per quanto riguarda le considerazioni fitogeografiche, innanzitutto va fatto presente che allo stato attuale esiste lo spettro corologico circostanziato della flora locale solo per i quadranti 0448/1 e 0448/2 che comprendono il Comune di Ankaran-Ancarano e parte di quello di Koper-Capodistria (Glasnović & Jogan 2009). Esso ripartisce l'insieme di 874 taxa presenti in 18 corotipi ed evidenzia la prevalenza di quello Mediterraneo con 204 taxa che è seguito dall'Europeo con 106, Eurasiatico con 96, Avventizio con 73, Paleotemperato con 66 e poi tutti gli altri con valori inferiori. Riferendosi a una realtà territoriale che non comprende aree interne con altre tipologie floro-vegetazionali, i dati e le considerazioni di cui sopra non possono essere estesi a tutto il capodistriano. Di conseguenza considerazioni fitogeografiche più attendibili si possono ottenere tenendo conto di altri studi di carattere generale riguardanti la flora istriana e il litorale sloveno.

Secondo Pezzetta (2013), la flora istriana è costituita da 2910 taxa appartenenti a 43 diversi tipi corologici. Il corotipo più rappresentato è l'Eurimediterraneo con 412 taxa ed è seguito dai corotipi Eurasiatico con 261 taxa, Stenomediterraneo con 224, Europeo con 185, Eurosiberiano con 150, etc. Tale configurazione areale affonda le radici nelle vicende geologiche passate e nella posizione geografica dell'Istria di regione ponte tra le penisole italiana e balcanica e l'ambito continentale centro-europeo. Altri studiosi evidenziano come l'Istria dal punto di vista fitogeografico è un ambito di transizione. Tra essi Šugar (1984) che considera l'Istria, un ambito di transizione tra le regioni eumediterranea e submediterranea. Poldini (1997) a sua volta fa presente che il Carso e l'Istria: "*costituiscono un raccordo fra il settore alpico e quello dinarico della provincia illirica e un'interfaccia fra la regione mediterránea (provincia adriatica) e la regione eurosibirica-nordamericana (provincia illirica). L'intreccio fra i gradienti floristico ed ecologico spiega l'elevata biodiversità di questi territori*". Wraber (1969) e Kaligarič (1991a) considerano l'Istria slovena appartenente alla regione fitogeografica submediterranea.

MATERIALI E METODI

L'elenco floristico comprende le specie, le sottospecie e gli ibridi mentre non sono state prese in considerazione le varietà cromatiche e morfologiche. Esso è stato realizzato tenendo conto delle ricerche sul campo dell'autore, dei dati ricavati dalle consultazioni bibliografiche e delle segnalazioni riguardanti i seguenti quadranti dell'atlante della flora slovena: 0348, 0349, 0447, 0448 e 0449 (Jogan, 2001; Ravnik, 2002). Nell'elenco non sono riportate le antiche segnalazioni storiche di specie non ritrovate recentemente. In tale sede sono state inserite in bibliografia le pubblicazioni che vanno dal saggio di Kaligarič (1991a) all'attualità.

Le prime osservazioni dello scrivente iniziarono circa trenta anni fa attorno a Popecchio (Podpeč) e poi furono estese ad altre località del capodistriano. Le stazioni in cui lo stesso ha fatto dei ritrovamenti sono contrassegnate dai loro nomi con l'aggiunta del punto esclamativo. Accanto ad ogni taxon sono riportati: il tipo corologico, gli autori che l'hanno segnalato, le località di presenza ed eventuali osservazioni sul rango tassonomico.

Per la nomenclatura si è seguita quella adottata nel recente volume del GIROS (2016) mentre per le specie non riportate in tale testo Delforge (2016). Per l'assegnazione dei tipi corologici si è tenuto conto di quanto riportato in Pignatti (1982), Pezzetta (2011) e Delforge (2016).

RISULTATI E DISCUSSIONE

Elenco floristico

Nell'elenco al fine di evitare troppe ripetizioni, sono state utilizzare delle sigle costituite da lettere maiuscole che si riferiscono agli autori delle segnalazioni. Esse hanno il seguente significato: AX: Kaligarič 1991a; AY: Kaligarič 1991b; BX: Kaligarič 1997; BX: Liverani 1997; BY: Starmühler 1998; CY, Jogan 2001; DX: Pericin 2001; DY: Ravnik 2002; EX: Romolini 2002; EY: Starmühler 2003; EY: Lipovšek *et al*. 2006; FY: Starmühler 2007; GX: Glasnović & Jogan 2009; GY: Kaligarič & Otopal 2012; HX: Rottensteiner 2013; HY: Dolinar & Jogan 2014; IX: Pezzetta 2014; IY: Dolinar 2015a; LX: Dolinar 2015b; LY: Kocjan *et al*. 2015; MX: Cenc & Paušič 2016; MY: Paušič *et al*. 2016; NX: Dolinar & Dal Col 2017; NY: Rottensteiner 2017; OX: Paušič informazione personale; OY: Vidmar informazione personale.

1. *Anacamptis coriophora* (L.) R.M. Bateman, Pridgeon & M.W. Chase subsp. *fragrans* (Pollini) R.M. Bateman, Pridgeon & M.W. Chase – Eurimediterraneo. (AX, BY, CY, DY, GX, IX, NY, OX). Stazioni di rinvenimento: Belvedur!, Brezovica!, Butari!, Koper (Capodistria), Galantiči!, Gračišče, Gradin!, Hrvatini!, Hrvoji!, Koštabona!, Marezige!, Merišče, Pisari, Podpeč!, Rakitovec, Risano (Rižana), Sv. Anton!, Socverb, Sočerga!, Škofije, Topolovec!, Truške!.
2. *Anacamptis laxiflora (*Lam.) R.M. Bateman, Pridgeon & M.W. Chase – Eurimediterraneo. (AX, CY, DY, HY, IX, IY, NY, OX, OY). Stazioni di rinvenimento: Brezovica, Butari!, Koper (Capodistria), Dekani, Gračišče, Hrastovlje!, Kubed, Lukini, Maršiči, Movraž, Osp, Podpeč!, Pregara, Semić, Sirči!, Sočerga!, Župančiči.
3. *Anacamptis morio* subsp. (*morio* L.) R.M. Bateman, Pridgeon & M.W. Chase – Europeo-Cau-

casico. (AX, BY, CY, DY, EX, EY, FY GY, IX, IY, LY, OX). Stazioni di rinvenimento: Bezovica!, Butari!, Brezovica, Koper (Capodistria), Črnotiče, Čičarija (Cicceria), Črni Kal!, Dekani, Galantiči!, Gračišče!, Gradin!, Hrastovlje!, Kastelec, Koštabona !, Krkavče!, Kubed!, Maršiči, *Merišče*, Movraž!, Ocizla!, Osp, Podgorje!, Poletiči!, Pomjan!, Podpeč!, Predloka!, Pregara!, Rakitovec!, Rižana!, Sirči, Smokvica, Škofije, Socerb, Sočerga!, Sv. Anton!, Šmarje!, Tinjan!, Topolovec!, Zazid!, Župančiči.

4. *Anacamptis papilionacea* (L.) R.M. Bateman, Pridgeon & M.W. Chase – Eurimediterraneo. (AX, CY, IX, IY, MX, OX). Stazioni di rinvenimento: Podpeč!, Sv. Anton.
5. *Anacamptis pyramidalis* (L.) Rich. subsp. *pyramidalis* – Eurimediterraneo. (AX, BY, CY; DY, EX, GX, IX, IY, NY, OX). Stazioni di rinvenimento: Abitanti!, Belvedur!, Bezovica!, Butari!, Koper (Capodistria)!, Črnotiče, Čičarija (Cicceria)!, Dekani, Galantiči!, Gračišče!, Hrastovlje!, Hrvoji!, Koštabona!, Krkavče!, Kubed!, Marezige!, Pičan!, Pisari!, Podpeč!, Pregara!, Puče!, Rakitovec!, Sirči!, Socerb, Sočerga!, Sv. Anton!, Škofije, Šmarje, Tinjan, Topolovec!, Truške!, Tuljaki!, Zazid!
6. *Cephalanthera damasonium* (Mill.) Druce – Eurimediterraneo. (AX, CY, DY, IX, IY, OX, QY). Stazioni di rinvenimento: Butari!, Koper (Capodistria), Čičarija (Cicceria)!, Gradin!, Gračišče!, Monte Taiano, Pičan, Podpeč!, Praproče, Pregara!, Rakitovec, Socerb, Truške.
7. *Cephalanthera longifolia* (L.) Fritsch – Eurasiatico. (AX, CY, DY, FY GX, HX, IX, IY, OX). Stazioni di rinvenimento: Abitanti!, Butari!, Koper (Capodistria), Čičarija (Cicceria)!, Gračišče, Kavčič, Kubed!, Monte Taiano, Osp, Poletiči!, Podpeč!, Škofije, Sirči!, Socerb, Sočerga!
8. *Cephalanthera rubra* (L.) Rich. – Eurasiatico (AX, CY; IX, IY). Stazione di rinvenimento: Podpeč!
9. *Coeloglossum viride* (L.) Hartm. – Circumboreale. (AX, CY, IX, IY). Stazioni di rinvenimento: Čičarija (Cicceria)!, Monte Taiano, Podpeč!
10. *Dactylorhiza maculata* (L.) Soó subsp. *fuchsii* (Druce) Hyl. – Eurasiatico. (CY, IX, IY). Stazioni di rinvenimento: Čičarija (Cicceria)!, Slavnik (M. Taiano)!, Podpeč!, Socerb, Sočerga.
11. *Dactylorhiza sambucina* (L.) Soó – Europeo. (AX, CY, DY, FY IX, IYQQH). Stazioni di rinvenimento: Čičarija (Cicceria)!, Kavčice, Lipnik, Monte Taiano, Podgorje.
12. *Epipactis atrorubens* (Hoffm.) Besser – Europeo. (BX, CY, IX, IY, OX). Stazioni di rinvenimento: Čičarija (Cicceria)!, Hrastovlje!, Monte Taiano!, Podpeč!, Rakitovec, Socerb, Zazid!
13. *Epipactis exilis* P. Delforge (sin. *E. persica* subsp. *gracilis* (B. Baumann & H. Baumann) W. Rossi – Sud-Est-Europeo. (PY). Stazioni di rinvenimento: Podpeč!
14. *Epipactis helleborine* subsp. *helleborine* (L.) Crantz – Paleotemperato. (AX, CY, DY, EY, IX, IY, OX). Stazioni di rinvenimento: Brezovica!, Čičarija (Cicceria)!, Črni Kal!, Gračišće!, Kastelec , Monte Taiano, Osp, Podpeč!, Rakitovec, Zazid!. Sono state ricondotte al taxon tutte le segnalazioni di *E. helleborine* subsp. *latina* W. Rossi & E. Klein.
15. *Epipactis microphylla* (Ehrh.) Sw. – Europeo-Caucasico (AX, CY; IX, IX, IY, OX). Stazioni di rinvenimento: Brezovica, Krkavče, Monte Taiano, Podpeč!, Puče, Socerb, Sočerga, Zazid!
16. *Epipactis muelleri* Godfery – Centro-Europeo. (CY; EY, IX, IY, OX, QY). Stazioni di rinvenimento: Brezovica, Jelarji, Podpeč!
17. *Epipactis palustris* (L.) Crantz – Circumboreale. (CY; DY, IX, IY). Stazioni di rinvenimento: Podpeč!, Sočerga.
18. *Goodyera repens* (L.) R. Br. – Circumboreale. (AX, CY; QH). Stazione di rinvenimento: Čičarija (Cicceria).
19. *Gymnadenia conopsea* (L.) R. Br. in W.T. Aiton susbp. *conopsea* – Eurasiatico. (AX, BY, CY; IX, IY, OX). Stazioni di rinvenimento: Abitanti!, Brezovica!, Capodistria, Čičarija (Cicceria)!, Galantiči!, Golič, Gračišče, Gradin!, Hrvoji!, Kavčice, Kojnik, Koštabona!, Merišče, Monte Taiano, Pisari!, Pomjan!, Podpeč!, Pregara!, Rakitovec!, Socerb, Škofije, Šmarje!, Topolovec!, Tuljaki!, Zazid.
20. *Gymnadenia odoratissima* (L.) Rich. – Europeo. (AX, CY; QH). Stazioni di rinvenimento:, Brezovica, Gradin!, Osp, Pomjan, Topolovec!, Truške.
21. *Himantoglossum adriaticum* H. Baumann – Eurimediterraneo. (AX, CY; DY, FY GX, IX, IY, OX, QY). Stazioni di rinvenimento:, Belvedur!, Bezovica!, Brezovica!, Koper (Capodistria), Čičarija (Cicceria)!, Črnotiče, Galantiči!, Gračišče!, Gradin!, Hrastovlje!, Hrvoji!, Kastelec, Krkavče!, Kubed!, Merišće, Movraž!, Podgorje, Podpeč!, Predloka!, Pregara!, Puče!, Rižana, Socerb, Sočerga!, Škofije, Šmarje!, Tinjan, Topolovec!, Tuljaki!, Vanganel!, Zazid!
22. *Limodorum abortivum* (L.) Sw. – Eurimediterraneo. (AX, CY; DY, EX, EY,, FY IX, IY, OX, QY). Stazioni di rinvenimento: Abitanti, Brezovica!, Butari!, Koper (Capodistria), Galantiči, Gračišče, Kojnik, Kubed, Merišče, Movraž, Osp, Podgorje, Pomjan, Podpeč!, Praproče, Sočerga!, Škofije, Truške, Vanganel!, Zazid!
23. *Listera cordata* (L.) R. Br. – Circumboreale. (CY; OX). Stazione di rinvenimento: Praproče.
24. *Listera ovata* (L.) R. Br. – Eurasiatico. (AX, CY; DY, IX, IY, OX, QY). Stazioni di rinvenimento: Brezovica!, Brič, Koper (Capodistria), Čičarija

(Cicceria)!, Galantiči, Gračišče, Gradin!, Movraž, Podpeč, Socerb, Zazid!

25. *Neotinea tridentata* (Scop.) R.M. Bateman, Pridgeon & M.W. Chase – Eurimediterraneo. (AX, CY; DY, EX, EY,, FY IX, IY, LY,, OX, QY). Stazioni di rinvenimento: Abitanti!, Belvedur!, Bezovica!, Brezovica!, Butari!, Koper (Capodistria), Čičarija (Cicceria)!, Črnotiče, Črni Kal!, Galantiči!, Gračišče!, Gradin!, Hrastovlje!, Hrvoji!, Koštabona!, Kubed!, Ocizla, Osp, Pomjan!, Podgorje, Podpeč!, Predloka!, Pregara, Rakitovec!, Sirči!, Socerb, Sočerga!, Sv. Anton!, Škofije, Šmarje!, Topolovec!, Zazid! Župančiči.
26. *Neotinea ustulata* (L.) R.M. Bateman, Pridgeon & M. W. Chase – Europeo-Caucasico. (AX, BY, CY; DY, EX, IX, IY, LY, OX). Stazioni di rinvenimento: Bezovica, Brezovica, Cicceria!, Črnotiče, Hrastovlje!, Hrvoji!, Krkavče, Slavnik (Monte Taiano)!, Podpeč!, Praproče, Rakitovec!, Škofije, Socerb, Sočerga, Zazid.
27. *Neottia nidus-avis* (L.) Rich. – Eurasiatico. (AX, CY; IX, IY, OX). Stazioni di rinvenimento: Čičarija (Cicceria)!, Slavnik (Monte Taiano), Podpeč!, Rakitovec, Sočerb, Sočerga.
28. *Ophrys apifera* Huds. – Eurimediterraneo. (AX, CY; DY, FY GX, IX, IY, NX, NY, OX, QY). Stazioni di rinvenimento: Abitanti!, Bezovica!, Butari!, Koper (Capodistria), Črni Kal!, Dekani! Galantiči!, Gračišče!, Hrastovlje!, Hrvatini, Jelarji, Koštabona!, Krkavče!, Kojnik, Kubed!, Merišče, Movraž!, Pisari!, Podgorje, Podpeč!, Praproče, Pregara Puče!, Rakitovec!, Rižana!, Socerb, Sočerga!, Sv. Anton, Škofije, Tuljaki, Truške!
29. *Ophrys bertolonii* subsp. *bertolonii* Moretti – Appennino-Balcanico. (GY, OX). Stazione di rinvenimento: Podpeč!
30. *Ophrys holosericea* (Burm. f.) Greuter subsp. *holosericea*. – Eurimediterraneo. (DY, GX, IY, QY). Stazioni di rinvenimento: Plavje, Pregara, Škofije, Truške.
31. *Ophrys holosericea* (Burm. f.) Greuter subsp. *serotina* (Rolli ex H. F. Paulus) Kreutz .– Subendemico. (OX). Stazione di rinvenimento: Kubed, Sočerga, Sv. Anton, Zazid.
32. *Ophrys holosericea* (Burm. f.) Greuter subsp. *tetraloniae* (W.P. Teschner) Kreutz – Appennino-Balcanico (DY, IX, IY, LX, OX). Stazioni di rinvenimento: Belvedur!, Brežec, Gračišče, Gradin!, Hrastovlje!, Koštabona!, Maršiči, Pisari, Podpeč!, Pregara, Rižana, Sočerga!, Truške, Tuljaki!, Zazid!. Il taxon ha in Istria il suo *locus classicus*.
33. *Ophrys holosericea* (Burm. f.) Greuter *subsp. untchjii (*M. Schulze) Kreutz – Subendemico. (IX, IY, QY). Stazioni di rinvenimento: Abitanti!, Butari!, Gračišče, Gradin!, Koštabona!, Krkavče!, Maršiči, Pisari, Plavje, Podpeč!, Pregara!, Škofije, Zazid!, *Župančiči*.
34. *Ophrys illyrica* S. Hertel & K. Hertel – Appennino-Balcanico. (MY). Stazioni di rinvenimento: Pregara!, Sočerga. L'osservazione del taxon a Pregara fatta il 24 maggio 2017 è la seconda segnalazione per la Slovenia.
35. *Ophrys incubacea* Bianca subsp. *incubacea* – Stenomediterraneo. (CY, DY, IY, QY). Stazioni di rinvenimento: Koper (Capodistria), Gračišče, Gradin, Krkavče, Merišče, Sočerga.
36. *Ophrys insectifera* L. – Europeo. (AX, CY, DY, EX, IX, IY, QY). Stazioni di rinvenimento: Abitanti, Belvedur!, Gradin!, Podpeč!, Topolovec!, Truške, Tuljaki!
37. *Ophrys sphegodes* subsp. *sphegodes* Mill. – Eurimediterraneo. (AX, CY, DY, EX, IX, IY, LX, NY, OX). Stazioni di rinvenimento: Abitanti!, Bezovica!, Brežec, Koper (Capodistria), Dekani, Galantiči!, Golaš, Gologorica!, Gračišče!, Gradin!, Hrastovlje!, Koštabona!, Krkavče, Marezige!, Pisari!, Podpeč!, Pregara, Puče, Sočerga!, Šmarje!, Tinjan, Zazid!.
38. *Ophrys sphegodes* subsp. *tommasinii (*Vis.) Soó – Appennino-Balcanico. (AX, DY, IY, LX,). Stazioni di rinvenimento: Abitanti, Koper (Capodistria), Gradin, Krkavče, Marezige.
39. *Ophrys sulcata*. Devillers-Tersch. & P. Devillers – Mediterraneo-Occidentale. (AX, AY, CY, DY, EX, IX, IY, OX). Stazioni di rinvenimento: Podpeč!, Zazid!. Segnalata da Kaligarič (1991b), Jogan (2001) e Ravnik (2002) come *O. fusca* Link. Secondo Romolini (2002) la specie va assegnata a *O. funerea* Viv. Il taxon in Istria raggiunge il limite orientale di distribuzione geografica.
40. *Orchis mascula* L. subsp. *speciosa* (Mutel) – Centro-Europeo. (CY, DY, IX, IY, LY,). Stazioni di rinvenimento: Brezovica, Čičarija (Cicceria)!, Gračišče, Slavnik (Monte Taiano), Pomjan!, Podpeč!, Pregara!, Sirči!, Sočerga, Topolovec!
41. *Orchis militaris* L. – Eurasiatico. (AX, CY, DY, EX, IX, IY, QY). Stazioni di rinvenimento: Abitanti!, Brezovica!, Koper (Capodistria), Gračišče, Gradin!, Podpeč!, Pregara, Socerb, Tinjan, Topolovec!
42. *Orchis pallens* L. – Europeo-Caucasico. Stazioni di rinvenimento: Brezovica.
43. *Orchis purpurea* Huds. – Eurasiatico. (AX, BY, CY, DX, DY, EX, EY,, GX, HX, IX, IY, LY,). Stazioni di rinvenimento: Belvedur, Bezovica!, Butari!, Koper (Capodistria), *Čičarija* (Cicceria)!, Črnotiče, Črni Kal!, Dekani!, Galantiči!, Gračišče!, Gradin!, Hrastovlje!, Koštabona!, Krkavče!, Kubed!, Marezige, Merišče, Poletiči!, Pomjan, Podpeč!, Praproče!, Predloka!, Pregara, Puče!, Rakitovec!, Rižana!, Socerb, Sočerga!, Sv. Anton!, Škofije, Šmarje!, Tinjan!, Tuljaki!, Vanganel, Zazid!, Župančiči.

44. *Orchis simia* Lam. – Eurimediterraneo. (AX, CY, EY,, GX, IX, IY). Stazioni di rinvenimento: Brezovica, Capodistria, Osp, Podpeč!, Škofije.
45. *Platanthera bifolia* (L.) Rchb. subsp. *bifolia* – Paleotemperato. (AX, CY, DY, IX, IY, OX, QY). Stazioni di rinvenimento: Abitanti!, Butari!, Brič, Koper (Capodistria), Čičarija (Cicceria)!, Gračišče, Gradin!, Hrastovlje!, Koštabona!, Kubed, Pisari!, Pomjan!, Podpeč!, Puče!, Škofije, Socerb, Sočerga, Sv. Anton, Tuljaki!.
46. *Platanthera chlorantha* (Custer) Rchb. – Eurosiberiano. (AX, CY, DY, IX, IY, UX). Stazioni di rinvenimento: Capodistria, Cicceria!, Dekani, Podpeč!, Rakitovec, Zazid.
47. *Serapias vomeracea* (Burm.f.) Briq. subsp. *vomeracea* – Eurimediterraneo. (CY, DY, GX, IX, IY, NY, UX, QY). Stazioni di rinvenimento: Belvedur!, Butari!, Capodistria, Galantiči!, Gračišče, Hrvatini, Hrvoji!, Krkavče, Koštabona!, Podpeč!, Sočerga!, Topolovec!, Truške!.
48. *Spiranthes spiralis* (L.) Chevall. – Europeo-Caucasico. (AX, CY, DY, IX, IY, NY. OY). Stazioni di rinvenimento: Gračišče, Plavje, Podpeč!, Pregara.
49. *Traunsteinera globosa* (L.) Rchb. – Orof. Sud-Europeo. (AX, CY, DY, IX, IY, UX). Stazioni di rinvenimento: Kavčice, Lipnik, Monte Taiano!, Rakitovec.

Ibridi

1. *Anacamptis* x *alata* (Fleury) H. Kretzschmar, Eccarius & H. Dietr. (*A. laxiflora* x *A. morio*). (IX). Stazioni di rinvenimento: Podpeč!.
2. *Anacamptis* x *laniccae* H. Kretzschmar, Eccarius & H. Dietr. (*A. morio* x *A. pyramidalis*). (IX). Stazioni di rinvenimento: Podpeč!.
3. *Epipactis* x *capellonensis* B. Baumann & H. Baumann (*E. atrorubens x E. helleborine)*. (IX). Stazione di rinvenimento: Podpeč!.
4. *Neotinea* x *dietrichiana* (Bogenh.) H. Kretzschmar, Eccarius & H. Dietr. (*N. tridentata* x *N. ustulata)*. (AX, IX, IY). Stazioni di rinvenimento: Monte Taiano, Podpeč!.
5. *Orchis* x *hybrida* (Lindl.) Boenn. ex Rchb. (*O. militaris* x *O. purpurea)*.(IX). Stazione di rinvenimento: Podpeč!.

Nell'elenco floristico sono riportati 49 taxa infragenerici. Al loro insieme si aggiungono 5 ibridi e pertanto il numero complessivo dei taxa presenti è di 54 a dimostrazione dell'importanza del patrimonio orchidologico dell'ambito di studio. Infatti non considerando gli ibridi, nel Comune città di Capodistria:

- sono segnalate oltre il 59 % delle Orchidaceae della penisola istriana che ammonta a 82 taxa ripartiti tra specie e sottospecie (Pezzetta, in attesa di pubblicazione) e il 62% di quelle di tutta la Repubblica di Slovenia;

- si registra la maggior presenza di Orchidaceae tra tutti i Comuni della penisola istriana.

L'elenco non riporta entità nuove mentre comprende molte segnalazioni e stazioni inedite che contribuiscono ad allargare l'areale di diffusione dei singoli taxa. In particolare le stazioni inedite sono le seguenti: Bezovica, Hrvoji e Predloka.

Le ricerche sul campo dello scrivente non hanno portato al ritrovamento di *Ophrys incubacea* e *O. tommasinii* la cui presenza nel territorio in esame, nonostante le segnalazioni bibliografiche, è ritenuta dubbia da vari ricercatori sloveni (Kosec & Paušič, *in verbis*).

Le varie entità si ripartiscono in 16 generi tra cui il più rappresentato è il genere *Ophrys* con 12 taxa. Seguono i generi: *Epipactis* con 6 taxa, *Orchis* e *Anacamptis* con 5, *Cephalanthera* con 3 e poi gli altri con valori inferiori.

Le specie segnalate in più località e quindi più diffuse sono: *Anacamptis morio (*40), *Orchis purpurea* (*36)*, *Anacamptis pyramidalis* (33), *Neotinea tridentata* (33), *Ophrys apifera* (31), *Himanthoglossum adriaticum (31)*, *Gymnadenia conopsea (25)*, *Anacamptis coriophora* subsp. *fragrans* (22), *Ophrys sphegodes* (22), *Limodorum abortivum* (20), *Platanthera bifolia* (19), *Anacamptis laxiflora* (17), *Cephalanthera longifolia* (15), *Neotinea ustulata* (15), *Ophrys holosericea* subsp. *tetraloniae* (15), *Op. untchjii* (14), *Cephalanthera damasonium* (13), *Serapias vomeracea* (13), *Listera ovata* (11), *Epipactis helleborine* subsp. *helleborine* (10), *Orchis mascula* subsp. *speciosa* (10), *O. militaris* (10), *Epipactis microphylla* (8), *E. atrorubens* (7), *Ophrys insectifera* (7), *Platanthera chlorantha* (6) e *Orchis simia* (5).[1]

A loro volta le specie che nel capodistriano sono da considerarsi rare poiché segnalate in poche località e di conseguenza anche più vulnerabili (Swartz *et al*., 2009; Fantinato *et al*., 2017), sono le seguenti: *Anacamptis papilionacea*, *Cephalanthera rubra*, *Epipactis exilis, E. palustris Goodyera repens*, *Listera cordata, Ophrys bertolonii*, *O. illyrica* e *Orchis pallens*.

Un taxon non riportato nell'elenco floristico, in precedenza segnalato da vari studiosi è *Epipactis helleborine* subsp. *latina* W. Rossi & E. Klein. Ad avviso di Rossi (2002) esso appartiene a un gruppo di sottospecie di *E. helleborine* tipico di ambienti aridi e soleggiati. Secondo Bongiorni *et al.* (2014) deve considerarsi a tutti gli effetti *Epipactis helleborine* subsp. *helleborine* con caratteri morfologici mutati a causa di una maggiore esposizione alla luce solare. Delforge (2016) a sua volta lo pone in sinonimia con *E. tremolsi*.

Come visto, un taxon dal rango tassonomico discusso riportato nell'elenco floristico è *Ophrys sulcata* che in passato è stato segnalato come *Ophrys fusca* e O. *funerea*. Delforge (2016) considera O. *fusca* presente

1 Tra parentesi è riportato il numero di località in cui sono presenti i vari taxa.

solo in alcuni ambiti del Mediterraneo occidentale: il Maghreb, penisola iberica e la costa mediterranea della Francia sino al dipartimento del Var. Le denominazioni di *Ophrys funerea* e *O. sulcata*, a loro volta sono la conseguenza di opinioni diverse tra l'altro molto comuni tra gli esperti di Orchidaceae. In tale sede, tenendo conto delle descrizioni dei vari taxa fatte da Delforge (2016), di quanto riportato in Dolinar (2015a) e di altre segnalazioni riguardanti la parte croata della penisola istriana, si è deciso di adottare il binomio *Ophrys sulcata*.

Un gruppo molto controverso è quello di *Ophrys holosericea* che nel territorio in esame è rappresentato da quattro taxa: *Ophrys holosericea* subps. *holosericea*, *O. holosericea* subsp. *serotina, O. holosericea* subsp. *tetraloniae*, e *O. holosericea* subsp. *untchjii*.

In generale ad avviso di Del Prete (1982) *O. holosericea* ha subito uno smembramento in entità di dubbio valore tassonomico, un processo che dall'epoca in cui furono fatte tali considerazioni, si è ulteriormente incrementato. Secondo Rossi (2001) il taxon dal punto di vista

Tab. 1: Località dove sono segnalate le Orchidaceae nel Comune città di Capodistria.
Tab. 1: Lokalitete, na katerih so bile ugotovljene vrste kukavičevk na območju občine Koper.

Località	Taxa totali	N° ibridi	Località	Taxa Totali	N° ibridi
Abitanti	12		Slavnik/M. Taiano	14	1
Belvedur	8		Movraž	6	
Bezovica	8		Ocizla	2	
Brežec	2		Osp	8	
Brezovica	17		Pisari	8	
Brič	2		Plavje	3	
Butari	13		Podgorje	6	
Koper/Capodistria	21		Poletiči	3	
Čičarija/Cicceria	20		Pomjan	8	
Črnotiče	6		Podpeč/Popecchio	43	5
Črni Kal	5		Praproče	6	
Dekani	7		Predloka	4	
Galantiči	12		Pregara	17	
Golič	1		Puče	7	
Gračišče	23		Rakitovec	14	
Gradin	17		Rižana	4	
Hrastovlje	12		Sirči	6	
Hrvatini	3		Smokvica	1	
Hrvoji	7		Sočerb	18	
Jelarji	2		Sočerga	23	
Kastelec	3		Sv. Anton	9	
Kavčič	1		Škofije	15	
Kavčice	3		Šmarje	7	
Kojnik	3		Tinjan	6	
Koštabona	12		Topolovec	11	
Krkavče	12		Truške	10	
Kubed	11		Tuljaki	8	
Lipnik	2		Vanganel	3	
Lukini	1		Zazid	18	
Maršiči	4		Župančiči	5	
Merišče	6				

Tab. 2: Corotipi delle Orchidaceae capodistriane.
Tab. 2: Horotipi kukavičevk na ozemlju koprske občine.

Elementi geografici	Numero taxa	%
Endemico e Subendemico	**2**	
Subendemico	2	
Mediterraneo	**15**	**30,61**
Eurimediterraneo	13	
Stenomediterraneo	1	
Mediterraneo-Occidentale	1	
Eurasiatico	**16**	**32,65**
Eurasiatico *s.s.*	8	
Europeo-Caucasico	5	
Eurosiberiano	1	
Paleotemperato	2	
Nordico	**4**	**8,16**
Circumboreale	4	
Europeo	**12**	**24,5**
Europeo *s.s.*	4	
Centro-Europeo	2	
Orofita Sud-Europeo	1	
Appennino-Balcanico	4	
Sud-Est-Europeo	1	
Totale	**49**	**100**

sistematico e geografico è di difficile delimitazione. Hertel & Hertel (2002), considerano presenti in tutto il territorio della penisola istriana quattro varietà di *O. holosericea*: le prime tre indicate genericamente come Tipo1, Tipo 2 e Tipo 3 e la quarta come *Ophrys tetraloniae*. Perazza & Lorenz (2013) nell'ambito dell'Italia Nord-Orientale attribuiscono alla specie nominale gli individui a fiori grandi, alla subsp. *untchjii* quelli a fiori medi con diverse colorature del perigonio e alla subsp. *tetraloniae* quelli con fiori piccoli e a fioritura più tardiva (giugno inoltrato).

All'interno del gruppo è molto discusso il rango tassonomico di *Ophrys serotina*. Romolini & Souche (2012) considerano sinonimi *O. serotina* e *O. tetraloniae*. Secondo Delforge (2016) essi costituiscono due taxa diversi che sostanzialmente differiscono per il colore e grandezza della cavità stigmatica e, la lunghezza e larghezza dei petali. Inoltre a suo avviso: 1) *O. serotina* è endemica dell›Italia Centrale, principalmente Abruzzo e Lazio Meridionale; 2) *O. tetraloniae* è presente in Istria, Dalmazia Centrale e Veneto. Paulus (2014) sostiene che *Ophrys serotina* è presente anche nell'Italia meridionale. Inoltre aggiunge che in Istria il taxon include *Ophrys untchjii* che potrebbe rappresentare una varietà locale caratterizzata da piante con un'alta percentuale di sepali di colore verde. Alla luce di tali tesi, tutte le segnalazioni di *Ophrys serotina*, *O. tetraloniae* e *O. untchjii* andrebbero riviste e approfondite.

I vari taxa sono segnalati in 61 località diverse del Comune città di Capodistria (Tab. 1). Questi dati dimostrano che le orchidacee sono ampiamente diffuse in tutto il capodistriano. L'area più ricca è costituita dai dintorni di Popecchio (Podpeč) con 43 taxa. La Tabella 2 evidenzia che le Orchidaceae presenti nel capodistriano si ripartiscono in 14 tipi corologici raggruppati in 5 elementi geografici tra cui il dominante è l›elemento eurasiatico con 16 taxa. Esso è seguito dagli elementi: mediterraneo con 15 taxa, europeo con 12, nordico con 4 ed endemico con 2 taxa.

I corotipi in cui si registra la maggior presenza di specie sono: l'Eurimediterraneo (13), l'Eurasiatico (8) e l'Europeo-Caucasico (5). Nel complesso dominano i taxa appartenenti a corotipi caratteristici di aree geografiche temperate e temperato-fresche a conferma che il territorio capodistriano è un ambito di transizione climatica e fitogeografica.

Nel territorio in esame *Ophrys bertolonii* raggiunge il limite settentrionale di distribuzione geografica un importante dato che accresce la sua importanza fitogeografica. Tale specie insieme con altre del genere *Ohprys* si rinviene in un prato da sfalcio e potrà persistervi sino a quando le attività umane manterranno un moderato disturbo che assicurerà la conservazione dell'habitat (Kaligarič & Otopal, 2012; Slaviero *et al.*, 2016).

CONCLUSIONI

L'alto numero di Orchidacee presenti nel capodistriano è un indicatore della grande qualità e integrità ambientale dell'ambito di studio. Tuttavia lo sviluppo dell'edilizia residenziale lungo la fascia costiera, dell'agricoltura intensiva e delle infrastrutture stradali, industriali, turistiche e commerciali tende a ridurre gli spazi idonei per la sopravvivenza. Anche le trasformazioni territoriali che seguono l'abbandono delle forme tradizionali di attività agro-pastorali incidono sul patrimonio orchidologico poiché portano a trasformazioni floro-vegetazionali cui possono seguire: la scomparsa delle orchidacee tipiche dei prati-pascolo e la maggiore diffusione di quelle di ambiti boschivi e cespugliosi.

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KUKAVIČEVKE KOPRSKE OBČINE

Amelio PEZZETTA
Via Monte Peralba 34 - 34149 Trieste
e-mail: fonterossi@libero.it

POVZETEK

Območje občine Koper pokriva površino 311 km² in se razteza od Jadranskega morja do Čičarije, kjer na Slavniku doseže nadmorsko višino 1028 m. Zanj je značilna velika okoljska raznolikost, ki omogoča razvoj zelo različnih tipov vegetacije. Avtor je na podlagi terenskih vzorčenj, pregleda strokovne literature in neobjavljenih podatkov izdelal dopolnjen seznam vrst kukavičevk, ki šteje 55 vrst in 5 križancev, in razpravljal o ugotovitvah. Poleg tega je pripravil horološko analizo, ki je pokazala, da prevladujejo evrazijski elementi, ki jim sledijo sredozemski. Floro kukavičevk v koprski občini bi lahko označili s fitogeografskega vidika kot prehodno.

Ključne besede: Koper, Orchidaceae, popis vrst, floristična analiza

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OCENE IN POROČILA

RECENSIONI E RELAZIONI

REVIEWS AND REPORTS

Book review: POLŽI ZAŠKRGARJI SLOVENSKEGA MORJA
authors: Lovrenc Lipej, Domen Trkov, Borut Mavrič
National Institute of Biology, Marine Biology Station Piran, 2018, 299 pp.
ISBN 978-961-93486-7-3. Paperback: 25 € (orders: information@mbss.org)

Well, at the beginning I can just say: "Wow, they did it again. Another one...". There is a lot to like about this book. As a teacher in marine science at the university I always try to find a good scientific (and popular) book with lot of nice photos of Adriatic (or Mediterranean) species that will be useful for my students. Now I find another one. The significance of biological stations (like Marine Biology Station Piran) is perhaps best appreciated when you have worked and researched at the seaside. The authors of this book emphasise the role of Piran Biological Station in this respect, which opens up a full range of possibilities for research and also teaching. I have to admit that I envy them. Quite a lot.

The sea slugs (Opisthobranchia) have shifted from mechanical to chemical defence; some are herbivores, some use their food to harness solar energy, others are predators that gain stinging cells and poisonous compounds from their food. This book records and illustrates over 140 species of the opisthobranch fauna of Slovenian Sea. The majority of the species in the book are nudibranchs, but there is also a good coverage of the other major orders (like Anaspidea). The book contains 5 main chapters about Opisthobranchia, including a small chapter about Marine Biology Station Piran. Following the introduction, the chapters are grouped into sections, first few about taxonomy, morphology and ecology of Opisthobranchia, than with the chapter on biodiversity of Opisthobranchia in Slovenian part of the Adriatic Sea, following the overview of opisthobranch species from Slovenian Sea. The book ends with a Literature and extensive Index sections. The Introduction sets a nice framework with some necessary definitions about these marine animals. First come general characteristics of the Opisthobranchia and next, characteristics by which sea slugs differ from other similar marine organisms. Then a broad, panoramic view of sea slugs orders from Slovenian Sea, from the primitive to the more advanced, is presented, including both the more abundant and some remote ones of special interest. The authors wrote about marine animals they knew well, and, in most chapters, provided a excellent reference list of previous work and studies in that field.

This richly illustrated book presents the diversity of opisthobranch sea slugs. By integrating aspects of morphology, ecology and behaviour, it describes how each group copes with problems of defence, locomotion, nutrition and reproduction. The text, in which scientific terms are accompanied by parallel common ones, is accompanied by 51 illustrations, about 480 illustrations and photos in colour and more than 150 maps of species findings. Finally, the illustrations and colour photos are stunning and beautiful.

The book covers another aspect, namely that marine biology is necessarily international. Accordingly, the authors perfectly describe the possible new species, invasive ones, touching the intrinsic relationships of a global research community, yielding a plethora of questions on marine ecosystems. People interested in the field of marine invertebrate research can easily identify with the stories told here. This book is not only directed towards marine scientists, but also targets the general public, particularly those readers with interests in the marine life and marine ecology. Detailed references and an extensive index immensely expand the horizon of the book.

I highly recommend this book. This excellent book is not only full of beautiful photographs, but full of information as well. It covers basic classification of sea slugs and then goes on to discuss many areas of biology and natural history, including how and what they eat, defence, reproduction, colour etc. This is a valuable addition to your 'sea slug library' filling in the many areas of opisthobranch biology which are missing, or tantalisingly brief, in most nudibranch colour faunal guides. This comprehensive, insightful portrait of sea slugs will appeal to marine biologists, zoology lecturers and

students, biology teachers, field-school instructors, nature reserve wardens and especially amateur naturalists. Outing yourself as a marine biologist almost invariably elicits a lament about the state of the world's oceans (or seas) from those around you. This book provides the foundation for any more insightful response about the beauty of marine life. It will inject a fresh breeze into my course on marine biodiversity in the Mediterranean Sea.

Petar Kružić
Department of Biology, Faculty of Science,
University of Zagreb, Zagreb, Croatia

Book review: ATLAS PTICA ISTRE
avtorja: Gordan Lukač & Roberto Stelko
Natura histrica, 2016, 167 str.

Pred kratkim mi je v roke prišla lično izdelana monografija o pticah Istre. Knjige sem se zelo razveselil, saj ne poznam veliko monografskih del o naravni dediščini istrskega polotoka, še posebej pa ne o pticah. Po mojem mnenju je namreč polotok Istra obljubljena dežela za ornitologe. Gre za prehodni pas med celinskim, submediteranskim in mediteranskim okoljem, poleg tega pa se nadmorska višina od morske obale na zahodu do kraškega roba proti vzhodu postopno zvišuje. Še posebej markantna je planota Čičarija, ki v sebi skriva še mnoga neodkrita čudesa narave, in masiv Učke s planinskimi vrhovi krepko nad 1000 m nadmorske višine. Pestra množica različnih habitatnih tipov, ki se pojavlja v pretežno naravnem in deloma ruralnem okolju, nudi gnezditvene niše za mnoge vrste ptic. Ne nazadnje dajejo pečat polotoku tudi reke kot so Dragonja, Mirna in Raša, ki so si urezale strugo v flišnato zaledje in ustvarile posebna življenjska okolja.

V uvodnem delu avtorja razlagata, kako je do nastanka atlasa prišlo, podajata zgodovinski pregled raziskovanja ptic na istrskem polotoku in opisujeta ekološke danosti. Sledi poglavje o metodologiji, kjer izvemo katere kriterije za opredelitev razširjenosti vrst, sezonskega statusa in statusa gnezdilk sta uporabljala. V največji meri se avtorja naslanjata na obdobje rednega popisovanja ptic med leti 1985 do 2005, kjer sta popisovala vrste na kvadrantih 10 x 10 km. Opravila sta skoraj 3000 terenskih popisov ptic na obravnavanem območju na 52 kvadrantih. Na podlagi lastnih opazovanj in objavljenih literaturnih podatkov sta zabeležila 325 ptičjih vrst, od katerih jih za 300 prikazujeta zemljevide razširjenosti.

Osrednji in največji del ornitološkega atlasa predstavljajo podatki o vrstah, ugotovljenih na hrvaškem delu istrskega polotoka. Velika večina vrst je predstavljena z lično fotografijo in zemljevidom razširjenosti z označe-

nimi kvadranti, kjer vrsta prezimuje, gnezdi ali pa se pojavlja na preletu. V pripadajočem popisu avtorja razpravljata o statusu vrste v Istri in podajata natančnejše podatke, kjer je bila vrsta ugotovljena.

Sledi poglavje, ki obravnava bogastvo in raznolikost istrske ornitofavne, kjer avtorja razpravljata o redkih in ogroženih pticah, »vročih točkah« istrske ornitofavne in še o marsičem. Tako izvemo, da je bila leta 2014 na ustju reke Mirne opažena bengalska čigra (*Thalasseus bengalensis*), na masivu Učke pa so recimo obročkali vrste kot sta npr. mušja listnica (*Phylloscopus inornatus*) in konopeljščica (*Carduelis citrinella*).

Sicer pa je med 325 ugotovljenimi vrstami 142 gnezdilk, 51 je preletnikov, 57 je prezimovalk, 58 pa je vrst, ki so bile doslej ugotovljene le v enem ali največ treh primerih. Največje število vrst so popisali v močvirju Palud, kjer so popisali 213 vrst, in v Nacionalnem parku Brijuni, kjer je bilo ugotovljeno 162 vrst ptic. Tudi planinsko okolje Učke je s 111 ugotovljenimi vrstami bogato okolje. Za primerjavo naj recimo citiram podatek iz omenjenega atlasa, da je bilo v porečju Mirne, ki pokriva razmeroma veliko površino (več kvadrantov), doslej ugotovljenih 252 vrst ptic.

In kaj pomenijo te številke, če jih recimo primerjamo s Krajinskim parkom Sečoveljske soline, ki dejansko meji na Hrvaško? Doslej je bilo v Sečoveljskih solinah ugotovljeno 303 vrst ptic (Iztok Škornik, *osebno sporočilo*), v kvadrantu, ki meji na soline pa sta avtorja popisala »le« 99 vrst ptic. Prepričan sem, da bi vsaj v mejnem območju s solinami gotovo lahko potrdili navzočnost večjega števila ptic.

Ornitološki atlas ptic Istre je pomembno ornitološko delo, ki bo zapolnilo vrzel o celovitem pregledu ptic Istre. Obenem atlas dokazuje, da je polotok Istra (v tem primeru se to sicer nanaša na hrvaški del) sredozemski biser, ki ga krasi izjemno biodiverziteta in v veliki meri še vedno dobro ohranjeno naravno okolje. Če bi že moral poiskati kakšno pomanjkljivost, bi v tem oziru omenil ravno Sečoveljske soline, kjer se mi zdi, da bi s sodelovanjem s slovenskimi ornitologi avtorja gotovo pridobila še več podatkov o pojavljanju ptic.

Atlas istrskih ptic je torej pomembno delo, ki je postavilo temeljni kamen k popisovanju istrske ornitofavne za naprej, ki ga bodo hrvaški ornitologi (gotovo pa tudi slovenski, italijanski in drugi) odslej lahko redno dopolnjevali s svojimi podatki. Zato si po mojem mnenju lahko obetamo, da bo druga, izpopolnjena izdaja ugledala luč sveta že v kratkem. Avtorjema glede tega iskreno čestitam, saj sta opravila izjemno delo, čestitke pa si za voljo in pripravljenost k nastanku tega dela zasluži tudi javna ustanova Natura histrica, v kateri so očitno prepoznali pomen natisa publikacije te vrste.

Lovrenc Lipej
Morska biološka postaja,
Nacionalni inštitut za biologijo

OBLETNICE

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SEDEMDESET LET PROFESORICE ALENKE MALEJ

Sl. 1: Prof. dr. Alenka Malej predava leta 2012 na mediteranski poletni šoli v Atenah (finančna podpora fundacije Latsakis).

Prof. dr. Alenka Malej, vodilna slovenska morska ekologinja, praznuje sedemdeset let ustvarjalnega življenja. Rodila se je v Ljubljani, šolala pa večinoma v Kopru. Že v osnovni šoli in gimnaziji jo je navduševalo naravoslovje in seveda morje, zato tudi študij biologije ni bilo naključje. Po diplomi na Oddelku za biologijo Biotehniške fakultete Univerze v Ljubljani se je leta 1972 kot mlada raziskovalka zaposlila na Morski biološki postaji takratnega Inštituta za biologijo Univerze v Ljubljani, kjer se je posvetila raziskavam mrežnega zooplanktona Tržaškega zaliva v povezavi z onesnaževanjem. Iz te tematike je leta 1977 tudi magistrirala pod mentorstvom prof. dr. Jožeta Štirna na Biotehniški fakulteti Univerze v Ljubljani. Kmalu jo je pritegnil množični pojav mesečinke (*Pelagia noctiluca*) in ji odprl vstop v področje raziskav meduz, ki so še danes njeno najbolj priljubljeno in glavno raziskovalno področje. Jubilantka se je vseskozi zavedala, da je uspeh na področju ekologije morja povezan z udeležbo na raziskovalnih ekspedicijah. Že zelo zgodaj se je pričela udeleževati transjadranskih ekspedicij z raziskovalno ladjo Andrija Mohorovičić Hidrografskega inštituta jugoslovanske vojne mornarice od Jonskega morja do Tržaškega zaliva. Tu se je stkalo strokovno in osebno prijateljstvo med mnogimi morskimi raziskovalci različnih profilov, ki se je odražalo v publikaciji skupnih znanstvenih del. Tak je primer njene strokovne povezave z dr. Adamom Benovićem, takratnim direktorjem Biološkega inštituta JAZU v Dubrovniku. Leta 1984 je doktorirala na Univerzi v Zagrebu z disertacijo o produkcijskih in biokemijskih značilnostih zooplanktona v severnem Jadranu pod mentorstvom prof. dr. Adama Benovića z Biološkega Inštituta v Dubrovniku, s katerim je nato uspešno sodelovala do njegove prerane smrti. Na žalost so tovrstna obsežna raziskovanja Jadrana, prva po avstrijsko-italijanskih ekspedicijah pred prvo svetovno vojno, po letu 1990 zamrla. Jubilantka je sodeloval tudi v britanski ekspediciji v vzhodnem Atlantiku, argentinski v Guelfu Nuevu, izraelski v Akabskem zalivu (Rdeče morje), turški v vzhodnem Sredozemlju in francoski v ustju reke Rhone. Še danes se redno udeležuje terenskih raziskav na Mljetu.

Po opravljenem doktoratu je s finančno podporo Evropske skupnosti (EEC grant) odšla v mednarodno znani Laboratorij za morsko biologijo Združenega kraljestva v Plymouthu (Anglija), kjer je, pod vodstvom prof. P. Harrisa, raziskovala ekskrecijo amonija pri planktonskem rakcu *Calanus helgolandicus* in rezultat je bil, po vsej verjetnosti, prvi visoko citirani članek raziskovalcev piranske Morske biološke postaje. Drugi njen, skupaj z A. Benovićem, M. Specchijem in S. Fondo-Umani, zgodnji pomemben dosežek v znanosti o morju predstavlja članek o biomasi jadranskega mrežnega zooplanktona v reviji Marine Biology leta 1984. Leta 1995 je organizirala, skupaj z T.C. Maloneom, L.W. Hardingom in R. Turnerjem z Univerze v Marylandu in N. Smodlako s Centra za raziskovanje morja Inštituta Rudjer Bošković v Rovinju, odmevno mednarodno znanstveno posvetovanje o Obalnih ekosistemih s primerjavo med ameriškim Zalivom Chesapeake in severnim Jadranom, kar je nato leta 1999 vodilo k izdaji knjige pri uglednem Ameriškem geofizikalnem združenju (AGU) z naslovom Ecosytems at the land-sea margin Drainage basin to coastal sea. Njena ljubezen do raziskovanja meduz je v zadnjem obdobju prispevala k publikaciji več odličnih znanstvenih člankov objavljenih v mednarodno zelo odmevnih revijah: Bioscience, Proceedings of the National Academy of Sciences of the United States of America in Frontiers of Ecology and Environment. Veliko je tudi predavala na tujih univerzah in inštitutih. Profesorica A. Malej je za svoje uspešno raziskovalno delo že leta 1989 prejela nagrado Sklada Borisa Kidriča, leta 2000 priznanje ambasador Republike Slovenije v znanosti, 2012 pa veliko nagrado Miroslava Zeia.

Profesorica A. Malej se je v svojem raziskovalnem delu vseskozi zavedala pomena mednarodnega sodelovanja. Tako je že v osemdesetih letih vodila projekte pretežno v okviru UNEP in IAEA, po osamosvojitvi pa je sodelovala in vodila več uspešnih evropskih projektov, med katerimi izstopajo predvsem "Produkcija in akumulacija labilne organske snovi v Jadranskem morju" - PALOMA (1995-98), "Biofiltracija v akvakulturi: evaluacija trne podlage v razvoju marikulture" - BIOFAQs (2000-2003), "Morska biodiverziteta in delovanje ekosistema" - MarBEF (2004-9), Ekosistemski pristop k trajnostni akvakulturi" - ECASA (2005-9), "Južna evropska morja: določitev in modeliranje ekosistemskih sprememb" - SESAME (2009-13) in "Raziskovanje morskega okolja v južnih evropskih morjih s poudarkom na pravnih vidikih" - PERSEUS (2012-16).

Odločilno je prispevala k podpisu sporazuma o sodelovanju med Univerzo Pierre et Marie Curie iz Pariza in Nacionalnim inštitutom za biologijo, za kar je prejela častno medaljo te univerze. Vseskozi je vodila razne nacionalne (ARRS) raziskovalne projekte oz. programe, med katerimi izstopa dolgoletno vodenje programa ARRS »Raziskave obalnega morja«. Kot predstavnica področja biologije je bila več let članica znanstvene komisije za naravoslovje in matematiko (NAMA) v ARRS.

Sl. 2: Leta 2012 ob potomcu drevesa, ki je preživelo atomsko eksplozijo v Hirošimi (v okviru dvostranskega znanstvenega sodelovanja z Japonsko). S podporo Slovenske nacionalne komisije za UNESCO, Univerze v Ljubljani in Botaničnega vrta Univerze v Ljubljani so leta 2014 potomce teh dreves posadili tudi v Ljubljani.

Seznam njenih ekspertnih dejavnosti je obsežen. Aktivno je sodelovala kot ekspert v najrazličnejših mednarodnih komisijah, med katerimi izstopa delovanje na področju morskih raziskav in prenosu tega znanja v prakso: Agencija za okolje ZN (UNEP), Regional Seas Programme (MAP), Ministrska konferenca o trajnostnem razvoju v sredozemskem prostoru (MED 21), Italijansko-jugoslovanska komisija za zaščito Jadrana (1985-91), Observatorija severnega Jadrana (1986-95). V obdobju po osamosvojitvi Slovenije (1991-95) je pomembno prispevala k včlanjenju novonastale države v mednarodne organizacije: Medvladno oceanografsko komisijo (IOC), Sredozemski akcijski načrt UNEP (MAP), Mednarodno komisijo za znanstveno raziskovanje Sredozemskega morja (CIESM). Doma je v povezavi z mednarodnim delovanjem prevzela vrsto funkcij: predsednica nacionalnega odbora IOC, nacionalna koordinatorka programa MED POL UNEP, zastopnica Slovenije v Evropski mreži morskih raziskovalnih postaj (MARS), članica Nacionalne komisije UNESCO in predsednica njenega Naravoslovnega odbora, direktorica Operativnega centra Slovenija Mednarodnega inštituta za oceane na MBP NIB. Danes je članica slovenske komisije korporacije L'Oreal za ženske v znanosti in pa mednarodna sodnica in ocenjevalka projektov v multidisciplinarnem programu FIRST®LEGO®League, ki mladim omogoča, da se vsako leto posvetijo raziskovanju v okviru določene teme (letošnja Živa voda – kroženje vode).

V devetdesetih letih prejšnjega stoletja je prevzela vodenje Morske biološke postaje Nacionalnega inštituta za biologijo in jo uspešno vodila do 2009. S tem je tudi neposredno sodelovala v mukotrpni izgradnji nove stavbe postaje v letih 2001-2006, ko so bile razmere za delo težavne.

Dr. Alenka Malej je bila leta 2003 izvoljena v naziv redne profesorice za področje Ekologije na Univerzi v Ljubljani. Kot uspešna raziskovalka je prenašala svoje znanje iz morskih ved na študente univerz v Ljubljani, Kopru in Novi Gorici. Danes predava Ekologijo morja na Fakulteti za pomorstvo in promet Univerze v Ljubljani in Morske ekološke procese na medfakultetnem doktorskem študiju Varstva okolja na Univerzi v Ljubljani. Bila je mentorica in somentorica 14 diplomantom, 14 magistrantom in 8 doktorantom. Njen zadnji, Martin Vodopivec, je prav lani doktoriral s področja modeliranja populacijske dinamike uhatega klobučnjaka.

Več kot štirideset let znanstvenega in visokošolskega pedagoškega dela je dolga doba, ki je v tem kratkem zapisu ne morem zajeti v celoti. Njeno znanstveno in pedagoško delo pušča trajno sled v slovenski znanosti o morju, saj ni bilo skoraj nobenega dogodka, kjer ni sodelovala ali bila vsaj omenjena. Tako je lani pomembno prispevala k realizaciji odmevnega Evropskega morskega biološkega simpozija v Piranu. Profesorica Alenka Malej je kljub upokojitvi še vedno znanstveno dejavna, trenutno v obsežnem projektu COST »Ocean governance for sustainability«. Zato ji v imenu vse »slovenske morske srenje« želim trdnega zdravja in še mnogo znanstvenih uspehov.

Jadran Faganeli
Dolgoletni sodelavec in kolega
Morska biološka postaja, Nacionalni inštitut
za biologijo

NAVODILA AVTORJEM

1. Revija ANNALES (*Anali za istrske in mediteranske študije* Series historia naturalis) objavlja **izvirne znanstvene** in **pregledne članke** z naravoslovnimi vsebinami, ki obravnavajo posebnosti različnih podpodročij sredozemskega naravoslovja: morska biologija in ekologija, ihtiologija, geologija s paleontologijo, krasoslovje, oljkarstvo, biodiverziteta Slovenije, varstvo narave, onesnaževanje in varstvo okolja, fizična geografija Istre in Mediterana idr. Vključujejo pa tudi **krajše** znanstvene prispevke o zaključenih raziskovanjih., ki se nanašajo na omenjeno področje.

2. Sprejemamo članke v angleškem, slovenskem in italijanskem jeziku. Avtorji morajo zagotoviti jezikovno neoporečnost besedil, uredništvo pa ima pravico članke dodatno jezikovno lektorirati.

3. Članki naj obsegajo do 48.000 znakov brez presledkov oz. 2 avtorski poli besedila. Članek je mogoče oddati na e-naslov annales@mbss.org (zaželjeno) ali na elektronskem nosilcu (CD) po pošti na naslov uredništva.

Avtor ob oddaji članka zagotavlja, da članek še ni bil objavljen in se obvezuje, da ga ne bo objavil drugje.

4. Naslovna stran članka naj vsebuje naslov članka, ime in priimek avtorja (avtorjev), ime in naslov inštitucije, kjer je (so) avtor(ji) zaposlen(i) oz. domači naslov in naslovom elektronske pošte (samo prvi oz. korespondenčni avtor).

5. Članek mora vsebovati **povzetek** in **izvleček.** Izvleček je krajši (cca. 10 vrstic) od povzetka (cca. 30 vrstic).

V *izvlečku* na kratko opišemo namen, metode dela in rezultate. Izvleček naj ne vsebuje komentarjev in priporočil.

Povzetek vsebuje opis namena in metod dela ter povzame analizo oziroma interpretacijo rezultatov. V povzetku ne sme biti ničesar, česar glavno besedilo ne vsebuje. V povzetku se avtor ne sklicuje na slike, tabele in reference, ki so v članku.

6. Avtorji naj pod izvleček članka pripišejo ustrezne **ključne besede** (največ 6). Zaželjeni so tudi angleški (ali slovenski) prevodi izvlečka, povzetka, ključnih besed, podnapisov k slikovnemu in tabelarnemu gradivu. V nasprotnem primeru bo za prevode poskrbelo uredništvo.

7. Glavni del besedila naj vključuje sledeča poglavja: Uvod, Material in metode, Rezultati, Razprava ali Rezultati in razprava, Zaključki (ali Sklepi), Zahvala (če avtor želi), Literatura. Dele besedila je možno oblikovati v podpoglavja (npr. Pregled dosedanjih objav v Uvodu, Opis območja raziskav v Material in metode). Podpisi k slikam so priloženi posebej za poglavjem Literatura.

8. Tabele avtor priravi posebej na ločenih straneh v programu Word, tako kot rokopis, jih zaporedno oštevilči in opremi z naslovom – kratkim opisom. V glavnem delu besedila se sklicuje na tabele tako, da jih na ustreznem mestu označi z npr. "(Tab. 1)".

9. Slikovno gradivo (grafi, zemljevidi, fotografije, table) avtor posreduje v ločenih datotekah (jpeg, tiff) z najmanj 300 dpi resolucije pri želeni velikosti. Največja velikost slikovnega gradiva je 17x20 cm. Vsa potrebna dovoljenja za objavo slikovnega gradiva (v skladu z Zakonom o avtorski in sorodnih pravicah) priskrbi avtor sam in jih predloži uredništvu pred objavo članka. Slike je potrebno tudi podnasloviti in zaporedno oštevilčiti (glej točko 7). V glavnem delu besedila se avtor sklicuje na slike tako, da jih na ustreznem mestu označi z npr. "(Sl. 1)".

10. Bibliografske opombe, s čimer mislimo na **citat** – torej sklicevanje na druge publikacije, sestavljajo naslednji podatki v oklepaju: *avtor* in *leto izida*; npr. (Novak, 2007). Če sta dva avtorja, se izpišeta oba (Novak & Kranjc, 2001), če so trije ali več pa se izpiše samo prvi, ki mu sledi okrajšava *et al*. (Novak *et al*., 1999). Več citatov je med seboj ločenih s podpičjem in si sledijo kronološko - z naraščajočo letnico izdaje, npr. (Novak *et al*., 1999; Adamič, 2001; Kranjc & Zupan, 2007). Osebno informacijo (ustno, pisno) izpišemo prav tako v oklepaju z navedbo kratice imena in priimka posredovalca informacije, za vejico pa dodamo "osebno sporočilo", npr. (J. Novak, *osebno sporočilo*).

11. Celotni **bibliografski podatki** so navedeni v poglavju Literatura v abecednem vrstnem redu. Pri tem avtor navede izključno dela, ki jih je v članku citiral. Če ima isti avtor več bibliografskih podatkov, se najprej kronološko izpišejo tisti, kjer je edini avtor, sledijo dela v soavtorstavu še z enim avtorjem in dela v soavtorstvu z več avtorji. Imena revij, v katerih so izšla citirana dela, se izpišejo okrajašano (splošno priznane okrajšave revij). Članki, ki še niso bili publicirani, se lahko citirajo le, če so bili dokončno sprejeti v tisk, pri čemer se na koncu bibliografskega podatka doda beseda "v tisku". Člankov, ki so šele bili poslani v recenzijo, se ne sme citirati.

Primeri navajanje različnih tipov bibliografskih podatkov:

članki v revijah:

Klock, J.-H., A. Wieland, R. Seifert & W. Michaelis (2007): Extracellular polymeric substances (EPS) from cyanobacterial mats: characterisation and isolation method optimisation. Mar. Biol., 152, 1077-1085.

Knjige in druge neserijske publikacije (poročila, diplomska dela, doktorske disertacije):

Wheeler, A. (1969): The fishes of the British Isles and North-West Europe. McMillan, London, 613 p.

Poglavje v knjigi:
McEachran, J. D. & C. Capapé (1984): Myliobatidae. In: Whitehead, P. J. P., M. L. Bauchot, J.-C. Hureau, J. Nielsen & E. Tortonese (eds.): Fishes of the North-eastern Atlantic and the Mediterranean, Vol. 1. Unesco, Paris, pp. 205-209.

12. Drugo: latinski izrazi kot npr. *in vivo*, *in situ*, *e.g.*, *i.e.*, ter rodovna (*Myliobatis* sp.) in vrstna (*Myliobatis aquila*) imena se izpišejo v fontu italic. Kadarkoli je možno, se uporabljajo enote iz sistema SI (Système international d'unités).

13. Prvi odtis člankov uredništvo pošlje avtorjem v **korekturo.** Avtorji so dolžni popravljeno gradivo vrniti v enem tednu. Besedilo popravljamo s korekturnimi znamenji, ki jih najdemo na koncu Slovenskega pravopisa (2001), Ljubljana, ZRC SAZU, 24–25.

Širjenje obsega besedila ob korekturah ni dovoljeno. Druge korekture opravi uredništvo.

14. Za dodatna pojasnila v zvezi z objavo člankov je uredništvo na voljo.

UREDNIŠTVO

ISTRUZIONI PER GLI AUTORI

1. La rivista ANNALES (*Annali per gli studi istriani e mediterranei*, Series historia naturalis) pubblica **articoli scientifici originali** e **compendii** dai contenuti scientifici relativi ai vari settori della storia naturale e pertinenti l'area geografica del Mediterraneo: biologia marina, ecologia, ittiologia, geologia, paleontologia, carsologia, olivicoltura, biodiversità della Slovenia, tutela della natura, inquinamento e tutela dell'ambiente, geografia fisica dell'Istria e del Mediterraneo ecc. La rivista pubblica anche articoli scientifici **brevi** relativi a ricerche concluse pertinenti a tali settori.

2. La Redazione accetta articoli in lingua inglese, slovena e italiana. Gli autori devono garantire l'ineccepibilità linguistica dei testi, la Redazione si riserva il diritto di una revisione linguistica.

3. Gli articoli devono essere di lunghezza non superiore alle 48.000 battute senza spazi, ovvero 2 fogli d'autore. Possono venir recapitati all'indirizzo di posta elettronica annales@mbss.org (preferibilmente) oppure su supporto elettronico (CD) per posta ordinaria all'indirizzo della Redazione.

L'autore garantirà l'originalità dell'articolo e si impegnerà a non pubblicarlo altrove.

4. Ogni articolo deve essere corredato da: **titolo**, nome e cognome dell'autore (autori), denominazione ed indirizzo dell'ente di appartenenza o, in alternativa, l'indirizzo di casa, nonché l'indirizzo di posta elettronica (solo del primo autore o dell'autore di corrispondenza).

5. I contributi devono essere corredati da un **riassunto** e da una **sintesi**. Quest'ultima sarà più breve (cca. 10 righe) del riassunto (cca 30 righe).

Nella *sintesi* si descriveranno brevemente lo scopo, i metodi e i risultati delle ricerche. La sintesi non deve contenere commenti e segnalazioni.

Il *riassunto* riporterà in maniera sintetica lo scopo, i metodi delle ricerche e l'analisi ossia l'interpretazione dei risultati. Il riassunto non deve riferirsi alle tabelle, figure e alla bibliografia contenuta nell'articolo.

6. Gli autori sono tenuti ad indicare le **parole chiave** adeguate (massimo 6). Sono auspicabili anche le traduzioni in inglese (o sloveno) della sintesi, del riassunto, delle parole chiave, delle didascalie e delle tabelle. In caso contrario, vi provvederà la Redazione.

7. Il testo principale deve essere strutturato nei seguenti capitoli: Introduzione, Materiali e metodi, Risultati, Discussione o Risultati e discussione, Conclusioni, Ringraziamenti (se necessari), Bibliografia. Il testo può essere strutturato in sottocapitoli (ad es. sottocapitolo Rassegna delle pubblicazioni nell'Introduzione; sottocapitolo Descrizione dell'area di ricerca nel capitolo Materiali e metodi). Le didascalie devono essere presentate separatamente, a seguito del capitolo Bibliografia.

8. Le tabelle saranno preparate in forma elettronica come il manoscritto (formato Word) e allegate in fogli separati alla fine del testo. Gli autori sono pregati di contrassegnare ogni tabella con un numero e il titolo ossia una breve descrizione. Nel testo la tabella viene richiamata come segue: (Tab. 1).

9. Il materiale grafico (grafici, carte geografiche, fotografie, tavole) va preparato in formato elettronico (jpeg o tiff) e consegnato in file separati, con una definizione di 300 dpi alla grandezza desiderata, purché non ecceda i 17x20 cm. Prima della pubblicazione, l'autore provvederà a fornire alla Redazione tutte le autorizzazioni richieste per la riproduzione del materiale grafico (in virtù della Legge sui diritti d'autore). Tutto il materiale grafico deve essere accompagnato da didascalie (vedi punto 7) e numerato.. Nel testo i grafici vengono richiamati come segue: (ad es. Fig. 1).

10. I riferimenti bibliografici (citazioni) richiamano un'altra pubblicazione (articolo). La nota bibliografica, riportata nel testo, deve contenere i seguenti dati tra parentesi: *cognome dell'autore*, *anno di pubblicazione*, ad es. (Novak, 2007). Se gli autori sono due, verranno indicati entrambi (Novak & Kranjc, 2001), nel caso di tre o più autori verrà indicato soltanto il primo, seguito dall'abbreviazione *et al.* (Novak *et al.,* 1999). Vari riferimenti bibliografici in una stessa nota vanno divisi dal punto e virgola e segnalati in ordine cronologico, ad. es. (Novak *et al.*, 1999; Adamič, 2001; Kranjc & Zupan, 2007). La testimonianza (orale, scritta) verrà indicata tra parentesi con l'abbreviazione del nome e con il cognome di chi l'ha trasmessa, seguiti dalla virgola e la dicitura "informazione personale", ad es. (J. Novak, *informazione personale*).

11. La bibliografia completa va inserita in ordine alfabetico nel capitolo Bibliografia. L'autore indicherà esclusivamente i lavori e le edizioni citati nell'articolo. Se si citano più lavori dello stesso autore, verranno indicati prima in ordine cronologico i lavori in cui l'autore appare solo, poi quelli in cui l'autore compare assieme ad un secondo coautore, seguiti infine da quelli in cui egli compare tra più coautori. I nomi delle riviste in cui sono pubblicati i lavori citati saranno indicati nella forma abbreviata (abbreviazioni ufficialmente riconosciute). Gli articoli inediti si possono citare soltanto se sono in corso di pubblicazione, facendo loro seguire la dicitura "in corso di pubblicazione". Gli articoli, non ancora recensiti non possono essere citati.

Esempio di lavoro bibliografico:

Articoli in riviste:

Klock, J.-H., A. Wieland, R. Seifert & W. Michaelis (2007): Extracellular polymeric substances (EPS) from cyanobacterial mats: characterisation and isolation method optimisation. Mar. Biol., 152, 1077-1085.

Libri ed altre pubblicazioni non periodiche (relazioni, tesi di laurea, dissertazioni di dottorato):

Wheeler, A. (1969): The fishes of the British Isles and North-West Europe. McMillan, London, 613 p.

Capitoli di libro:

McEachran, J. D. & C. Capapé (1984): Myliobatidae. In: Whitehead, P. J. P., M. L. Bauchot, J.-C. Hureau, J. Nielsen & E. Tortonese (eds.): Fishes of the North-eastern Atlantic and the Mediterranean, Vol. 1. Unesco, Paris, pp. 205-209.

12. Altro: Le espressioni latine come ad es. *in vivo*, *in situ*, *e.g.*, *i.e.*, i nomi dei generi famiglie (*Myliobatis* sp.) e delle specie (*Myliobatis aquila*) si scrivono con il carattere italic. Quando possibile saranno utilizzate le unità del sistema SI (*Système international d'unités*).

13. Gli autori ricevono le **prime bozze** di stampa per la revisione. Le bozze corrette vanno quindi rispedite entro una settimana alla Redazione. In questa fase, i testi corretti con segni adeguati (indicazioni in merito si trovano alla fine della pubblicazione "Slovenski pravopis" (2001), Ljubljana, ZRC SAZU, 24-25, non possono essere più ampliati. La revisione delle bozze è svolta dalla Redazione.

14. La Redazione rimane a disposizione per eventuali chiarimenti.

LA REDAZIONE

INSTRUCTIONS TO AUTHORS

1. The journal ANNALES (*Annals for Istrian and Mediterranean Studies,* Series historia naturalis) publishes **original scientific** and **review articles** in the field of natural studies related to the specifics of various subfields of Mediterranean natural studies: marine biology and ecology, ichthyology, geology with paleontology, karst studies, olive growing, biodiversity of Slovenia, nature protection, pollution and environmental protection, physical geography of Istria and the Mediterranean, etc. It also publishes **short** scientific papers on completed research projects related to the above-mentioned subfields.

2. The articles submitted can be written in the English, Slovene or Italian language. The authors should ensure that their contributions meet acceptable standards of language, while the editorial board has the right to have them language edited.

3. The articles should be no longer than 48,000 characters (spaces excluded) or 32 typewritten double-spaced pages. They can be submitted via e-mail annales@mbss.org (preferably) or regular mail, with the electronic data carrier (CD) sent to the address of the editorial board.

Submission of the article implies that it reports original unpublished work and that it will not be published elsewhere.

4. The **title page** should include the title of the article, the name and surname of the author(s), their affiliation (institutional name and address) or home address, and e-mail address (of the first author or the corresponding author only).

5. The article should contain the **summary** and the **abstract,** with the former (c. 30 lines) being longer than the latter (c. 10 lines).

The *abstract* contains a brief description of the aim of the article, methods of work and results. It should contain no comments and recommendations.

The *summary* contains the description of the aim of the article and methods of work and a brief analysis or interpretation of results. It can contain only the information that appears in the text as well. It should contain no reference to figures, table and citations published in the main text.

6. Beneath the abstract, the author(s) should supply appropriate **keywords** (max 6) and, if possible, the English (or Slovene) translation of the abstract, summary, keywords, and captions to figures and tables. If unprovided, the translation will be provided by the editorial board.

7. The **main text** should include the following chapters: Introduction, Material and Methods, Results, Discussion or Results and Discussion, Conclusion, Acknowledgement (not obligatory), References. Individual parts of the text can form a sub-chapter (e.g. Survey of Previous Studies under Introduction; Description of Research Area under Material and Methods). Captions to figures should appear on a separate page beneath References.

8. Each **table** should be submitted on a separate page in Word programme (just like the main text). It should be numbered consecutively and supplied with the title – brief description. When referring to the tables in the main text, use the following style: (Tab. 1).

9. Illustrative matter (diagrams, maps, photographs, plates) should be submitted as separate files (in jpeg or tiff format) and saved at a minimum resolution of 300 dpi per size preferred, with the maximum possible publication size being 17x20 cm. Prior to publication, the author(s) should obtain all necessary authorizations (as stipulated by the Copyright and Related Rights Act) for the publication of the illustrative matter and submit them to the editorial board. All figures should be captioned and numbered consecutively (cf. Item 7). When referring to the figures in the main text, use the following style: (Fig. 1).

10. **Bibliographic notes** or **citations** – i.e. references to other articles or publications – should contain the following data: *author* and *year of publication,* e.g. (Novak, 2007). If there are two authors, include both surnames (Novak & Kranjc, 2001); if there are more than two authors, include the surname of the first author followed by a comma and the abbreviation *et al.* (Novak *et al.*, 1999). If there is more than one reference, separate them by a semicolon and list them in ascending chronological order, e.g. (Novak *et al.*, 1999; Adamič, 2001; Kranjc & Zupan, 2007). When citing information obtained through personal communication (oral, written), provide the initial letter of the name and full surname of the informant followed by a comma and the phrase *personal communication,* e.g. (J. Novak, *personal communication*).

11. The entire list of **bibliographic data** should be published under References in alphabetical order. The author(s) should list only the works cited in the article. If you are listing several works by the same author with some of them written in co-authorship, first list those written by the author him/herself, then those written in co-authorship with another author, and finally those written in co-authorship with more than one author, with the entries listed in chronological order. The names of journals in which the works cited were published should be abbreviated (cf. list of official journal abbreviations). Unpublished articles can be cited only if they have been

approved for publication, which should be indicated by adding the phrase *in press* to the end of the relevant bibliography entry.

Some examples of how to cite different types of bibliographical data:

Articles published in serial publications:

Klock, J.-H., A. Wieland, R. Seifert & W. Michaelis (2007): Extracellular polymeric substances (EPS) from cyanobacterial mats: characterisation and isolation method optimisation. Mar. Biol., 152, 1077-1085.

Books and other non-serial publications (reports, diploma theses, doctoral dissertation):

Wheeler, A. (1969): The fishes of the British Isles and North-West Europe. McMillan, London, 613 p.

Chapters published in a book:

McEachran, J. D. & C. Capapé (1984): Myliobatidae. In: Whitehead, P. J. P., M. L. Bauchot, J.-C. Hureau, J. Nielsen & E. Tortonese (eds.): Fishes of the North-eastern Atlantic and the Mediterranean, Vol. 1. Unesco, Paris, pp. 205-209.

12. Miscellaneous: Latin phrases such as *in vivo*, *in situ*, *e.g.*, *i.e.*, and names of genera (*Myliobatis* sp.) and species (*Myliobatis aquila*) should be written in italics. Whenever possible, use the SI units (Système international d'unités).

13. The authors are sent the **first page proofs**. They should be returned to the editorial board within a week. When reading the proofs, the authors should use the correction signs listed at the end of the book Slovenski pravopis (2001), Ljubljana, ZRC SAZU, 24–25.

It is not allowed to lengthen the text during proof-reading. Second proof-reading is done by the editorial board.

14. For additional information regarding article publication contact the editorial board.

EDITORIAL BOARD

KAZALO K SLIKAM NA OVITKU

SLIKA NA NASLOVNICI:
Znani raziskovalec polžev zaškrgarjev T. E. Thompson je zapisal, da so *»zaškrgarji med mehkužci to, kar so orhideje med semenkami in metulji med členonožci«*. Pisani barvni vzorci teh morskih polžev pritegnejo številne podvodne fotografe. Na sliki je vrsta *Godiva quadricolor*. (Foto: L. Lanča)
Sl. 1: V zadnjih desetletjih smo priča vse pogostejšemu pojavljanju tujerodnih vrst v severnem Jadranu. Tokrat raziskovalci poročajo o najdbi izjemno barvitega gološkrgarja v rovinjski marini. (Foto: L. Lanča)
Sl. 2: Eden izmed najpogostejših polžev gološkrgarjev (Nudibranchia) v Jadranskem morju je vrsta *Thuridilla hopei*. Čeprav gre za zelo majhen primerek, ga brez težav prepoznamo zaradi kombinacije črne, modre in rumene barve. (Foto: B. Mavrič)
Sl. 3: Med 141 vrstami polžev zaškrgarjev, ki se pojavljajo v slovenskem delu Jadrana, je tudi manj znana vrsta *Catriona maua*. Doslej je bila v Sredozemskem morju najdena le na nekaj lokalitetah. (Foto: D. Trkov)
Sl. 4: Med polže zaškrgarje prištevamo tudi morske zajčke. Pikasti morski zajček (*Aplysia punctata*) je pogosta vrsta, še posebej na morskih travnikih. (Foto: B. Mavrič)
Sl. 5: Nekateri polži zaškrgarji se v svojem okolju zelo dobro prikrivajo. To velja tudi za tilodino *Tylodina perversa*, ki s svojim živo rumenim barvnim vzorcem zelo dobro posnema spužvo žveplenjačo (*Aplysina aerophoba*), s katero se prehranjuje. (Foto: B. Mavrič)
Sl. 6: Oranžno-beli barvni vzorec je med polži gološkrgarji razmeroma pogost. Značilen je tudi za vrsto *Berghia verrucicornis,* ki je plenilec morskih vetrnic. (Foto: B. Mavrič)
Sl. 7: Za večino polžev zaškrgarjev je značilna izredna barvitost in nenavadne oblike, kar privablja podvodne fotografe. Pestrost barvnih vzorcev in kombinacij je tako raznolika, da bi zagotovo lahko bila navdih za oblikovalce tekstilnih izdelkov. Na sliki vrsta *Diaphorodoris papillata*. (Foto: B. Mavrič)
Sl. 8: Med tujerodnimi vrstami je veliko polžev zaškrgarjev. Pojavljajo se predvsem v pristaniščih, najdemo pa jih tudi v obrežnih mokriščih, še posebej lagunah. Na sliki je tujerodna vrsta *Cuthona perca* iz Škocjanskega zatoka (Koper). (Foto: B. Mavrič)

INDEX TO IMAGES ON THE COVER

FRONT COVER:
The famous malacologist T. E. Thompson once said that *"the opisthobranchs are to Mollusca what the orchids are to the angiosperms or the butterflies to arthropods."* The colourful patterns of these snails attract many underwater photographers. Depicted here is the alien sea slug species *Godiva quadricolor.* (Photo: L. Lanča)
Fig. 1: Over the last decades, we have witnessed frequent occurrences of non-indigenous species in the northern Adriatic Sea. The latest report is of a finding of the vividly coloured nudibranch *Godiva quadricolor* in Rovinj. (Photo: L. Lanča)
Fig. 2: One of the commonest nudibranchs in the Adriatic Sea is certainly *Thuridilla hopei*. Although the depicted specimen is a rather small one, it can easily be recognized by its black, yellow and blue colour pattern. (Photo: B. Mavrič)
Fig. 3: Among the 141 species of opisthobranchs recorded to date in Slovene waters there is also a lesser-known species, *Catriona maua*, so far reported in only a few localities in the Mediterranean Sea. (Photo: D. Trkov)
Fig. 4: The opisthobranchs also include sea hares. The spotted sea hare (*Aplysia punctata*) is a common species, inhabiting seagrass meadows. (Photo: B. Mavrič)
Fig. 5: Some opisthobranchs are masters of camouflage. The vivid yellow pigmentation of *Tylodina perversa* perfectly matches the colour of the sponge *Aplysina aerophoba*, its favourite prey. (Photo: B. Mavrič)
Fig. 6: The orange-white colour pattern is rather common among nudibranchs. It is also typical of *Berghia verrucicornis,* a sea slug preying on sea anemones. (Photo: B. Mavrič)
Fig. 7: The great majority of opisthobranchs are characterized by bright colouration and peculiar shapes, which attract underwater photographers. The range of colour patterns and combinations is so diverse that it could certainly inspire textile designers. Depicted here is the nudibranch *Diaphorodoris papillata*. (Photo: B. Mavrič)
Fig. 8: Alien species in the Adriatic Sea include many opisthobranchs, which are mainly found in harbours, but occurring in coastal wetlands, too, especially lagoons. This is a picture of the alien nudibranch *Cuthona perca* from the coastal lagoon of Škocjanski zatok (Koper, Slovenia). (Photo: B. Mavrič)