

ANNALES

Anali za istrske in mediteranske študije
Annali di Studi istriani e mediterranee
Annals for Istrian and Mediterranean Studies
Series Historia Naturalis, 35, 2025, 2





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Series Historia Naturalis, 35, 2025, 2

ISSN 1408-533X
e-ISSN 2591-1783

UDK 5

Letnik 35, leto 2025 številka 2

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Založništvo PADRE d.o.o.

Založnika/Editori/Published by:Zgodovinsko društvo za južno Primorsko - Koper / Società storica del Litorale - Capodistria®
Inštitut IRRIS za raziskave, razvoj in strategije družbe, kulture in okolja / Institute IRRIS for Research, Development and Strategies of Society, Culture and Environment / Istituto IRRIS di ricerca, sviluppo e strategie della società, cultura e ambiente®**Sedež uredništva/Sede della redazione/
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SI-6330 Piran /Pirano, Fornače/Fornace 41, tel.: +386 5 671 2900, fax +386 5 671 2901;
e-mail: annalesSHN@nib.si, internet: www.zdjp.si

Redakcija te številke je bila zaključena 6. 12. 2025.

**Sofinancirajo/Supporto finanziario/
Financially supported by:**

Javna agencija za znanstveno-raziskovalno in inovacijsko dejavnost Republike Slovenije (ARIS)

Annales - Series Historia Naturalis izhaja dvakrat letno.**Naklada/Tiratura/Circulation:**

300 izvodov/copie/copies

Revija Annales, Series Historia Naturalis je vključena v naslednje podatkovne baze / La rivista Annales, series Historia Naturalis è inserita nei seguenti data base / Articles appearing in this journal are abstracted and indexed in: BIOSIS-Zoological Record (UK); Aquatic Sciences and Fisheries Abstracts (ASFA); Elsevier B.V.: SCOPUS (NL); Directory of Open Access Journals (DOAJ).

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received: 2025-09-06

DOI 10.19233/ASHN.2025.22

AN UNUSUAL ENCOUNTER WITH A JUVENILE KITEFIN SHARK, *DALATIAS LICHA*, IN SHALLOW COASTAL WATERS OF MONTENEGRO (ADRIATIC SEA)

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ABSTRACT

The aim of this study is to document the first confirmed report of the kitefin shark, *Dalatias licha*, in Montenegrin waters (southern Adriatic Sea). On 5 May 2025, a juvenile specimen was observed near Miločer Beach (Budva) at 10 m depth, with an in situ average temperature of approximately 20 °C, as measured by the diver's computer. The encounter was recorded on high-resolution video, which allowed for unambiguous identification based on morphological characters. The shark, estimated at less than 50 cm total length, displayed calm swimming behavior, showed no visible injuries, and exhibited characteristics consistent with juvenile individuals. This record represents the first confirmation of the species in Montenegro and the shallowest recorded depth for *D. licha*.

Key words: Mediterranean Sea, citizen science, deep-sea shark, Dalatiidae, *Dalatias licha*

INCONTRO INSOLITO CON UN GIOVANE SQUALO ZIGRINO, *DALATIAS LICHA*, IN ACQUE COSTIERE POCO PROFONDE DEL MONTENEGRO (MARE ADRIATICO)

SINTESI

Lo scopo di questo studio è documentare la prima segnalazione confermata dello squalo zigrino, *Dalatias licha*, nelle acque montenegrine (Adriatico meridionale). Il 5 maggio 2025, un esemplare giovane è stato avvistato vicino alla spiaggia di Miločer (Budva) a 10 m di profondità, con una temperatura media in situ di circa 20 °C, misurata dal computer del subacqueo. L'incontro è stato registrato con un video ad alta risoluzione, che ha permesso un'identificazione inequivocabile sulla base delle caratteristiche morfologiche. Lo squalo, della lunghezza totale stimata inferiore a 50 cm, nuotava tranquillamente, non presentava ferite visibili e mostrava caratteristiche tipiche degli esemplari giovani. Questo avvistamento rappresenta la prima conferma della presenza della specie in Montenegro e la profondità più bassa mai registrata per il *D. licha*.

Parole chiave: Mediterraneo, citizen science, squalo di acque profonde, Dalatiidae, *Dalatias licha*

INTRODUCTION

The kitefin shark, *Dalatias licha* (Bonnaterre, 1788) (Elasmobranchii: Squaliformes: Dalatiidae) (WoRMS Editorial Board, 2025), is a medium-sized demersal shark, reaching a maximum total length (TL) of 182 centimeters (Ebert et al., 2021; Barone et al., 2022).

D. licha is a deep-water species, occurring from 37 to at least 1800 m of depth, mainly deeper than 200 m), distributed across warm-temperate and tropical outer continental and insular shelves and upper slopes, usually on or near the bottom (Ebert et al., 2021). It is geographically distributed in the Atlantic, Indian, Pacific Ocean, as well as in the Mediterranean Sea (Compagno, 1984; De Maddalena et al., 2015; Ebert et al., 2021). Kitefin shark was also reported from the Sea of Marmara, the northernmost extension of the Mediterranean Basin (Meriç, 1995).

Studies on stomach contents of the species have been carried out in sub-basins of the Mediterranean show that this species feeds mainly on cephalopods, crustaceans, tunicates, bony fishes and also small demersal sharks, such as velvet belly lanternshark, *Etmopterus spinax* (Linnaeus, 1758), blackmouth catshark, *Galeus melastomus* Rafinesque, 1810, and *Scyliorhinus* sp., Blainville, 1816 (Kabasakal & Kabasakal, 2002; Navarro et al., 2014; Mulas et al., 2021; Bottaro et al., 2023; Calabrò et al., 2024).

The kitefin shark is an aplacental viviparous shark, and the known mating areas in the Mediterranean Sea occur in the Ligurian Sea, along the Maghreb coast and in the Tyrrhenian Sea (Capapé et al., 2008; Mulas et al., 2021; Bottaro et al., 2023). In these sub-basins, males reach sexual maturity around 70.5 cm in TL and females around 98 cm (Capapé et al., 2008; Mulas et al., 2021; Bottaro et al., 2023). The gestation period is unknown, while the litter size ranges between 3–16 pups, whose size at birth is 30–37 cm in TL (De Maddalena et al., 2015; Ebert & Dando, 2021).

Based on the captures of new-borns with unhealed umbilical scars in bottom-trawl fishery, Kabasakal and Kabasakal (2002) proposed a nursery ground of *D. licha* in the northern Aegean Sea, and this nursery ground was further supported by the occurrence of gravid females in the same region (Kabasakal, 2023). Furthermore, Ergüden et al. (2022) also proposed another nursery of the kitefin shark in the northeastern Mediterranean Sea.

Although it is generally considered rare in the Adriatic Sea (Serena et al., 2020; Soldo & Lipej, 2022), some studies suggest that it is frequently found in the deeper areas of the Southern Adriatic (Ungaro et al., 1996; Follesa et al., 2019; Dulčić & Kovačić 2020), particularly on its Italian side

(D'Onghia et al., 2015; D'Onghia et al., 2015; Carluccio et al., 2021). The species was also recorded during regional deep-sea surveys conducted in the framework of the MEDITS and FAO-AdriaMed projects (Isajlović 2012). However, documented records from the southeastern Adriatic are rare, with the species being only recently recorded in Albania (Hysolako et al., 2020; Gajić, 2025), with no records from Montenegro (Četković et al., 2024). This work reports the first confirmed record of *D. licha* in Montenegrin waters and the shallowest depth ever reported for this species, underlining the importance of the collaboration between citizen scientists and researchers.

MATERIAL AND METHODS

Data on the location, depth and water temperature were collected from the dive computer of spearfisherman Mr Dušan Vukčević. The authors were provided with two videos recorded in 4K resolution with a GoPro action camera, totaling 1 minute and 1 second. Still images of the observed kitefin shark were captured with the image software VLC Media Player. The species was identified based on morphological descriptions provided by Compagno (1984), De Maddalena et al. (2015), and Ebert et al. (2021) (Fig. 1). The geographical subarea (GSA) definition follows the GFCM (2018). The scientific name and taxonomy of the species follow the WoRMS Editorial Board (2025).

RESULTS AND DISCUSSION

On 5 May 2025, a shark was observed off Miločer Beach in the Municipality of Budva (42°15'38.6"N, 18°53'30.3"E; Montenegrin waters of the southern Adriatic Sea, GSA 18; Fig. 1) swimming over a mixed sand and gravel bottom at a depth of 10 m, with an average sea temperature about 20°C. The shark was sighted near to the sandy bottom displaying calm behaviour and normal swimming activity (Fig. 2). The following description is based on video footage of the observed shark: It can be easily distinguished from related species by its unique morphological features, including a cylindrical body, the absence of an anal fin, large eyes, large nostrils, large spiracles, and five pairs of short gill slits located anterior to the pectoral fin origin. It also has papillose thick lips and serrated lower teeth with erect, triangular, serrated cusps and distal blades. It has spineless dorsal fins, with the first dorsal fin originating behind the pectoral fin's free rear tips, with the base closer to the pectoral fin than the pelvic fin bases. The second dorsal fin is larger than the first. The lower caudal lobe is less developed than the upper lobe. It is brown to blackish in colour and juveniles

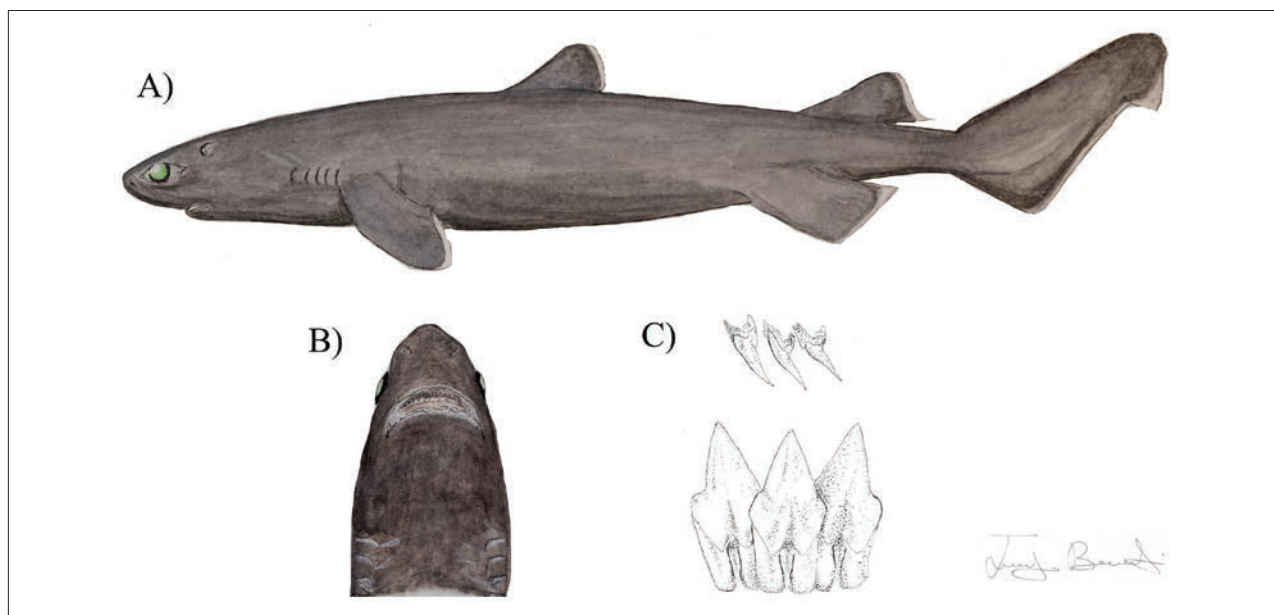


Fig. 1: Kitefin shark, *Dalatias licha* (Bonnaterre, 1788): A) lateral view, B) ventral view of the head, C) upper and lower teeth. Drawing by Jacopo Bernardi.

Sl. 1: Klinoplavuti morski pes, *Dalatias licha* (Bonnaterre, 1788): A) stranski pogled, B) trebušni pogled na glavo, C) zgornji in spodnji zobje. Risba: Jacopo Bernardi.

often show white posterior margins on their fins. The observed morphological characters are consistent with those given in Compagno (1984), De Maddalena et al. (2015) and Ebert et al. (2021), and the species is thus positively identified as *Dalatias licha* (Bonnaterre, 1788) (Fig. 2).

Based on the obtained video footage, the specimen showed no signs of visible injuries. The TL of the specimen is below 50 cm, showing also the fin posterior margins white, a clear diagnostic feature of juvenile individuals. In one of the frames from the available video footage, the specimen passed close to an individual of a red mullet *Mullus* sp. (Fig. 3), which further illustrates its small size. Additionally, this represents the first confirmed record of this species in the waters of Montenegro.

Given the fact that species is considered as a deep-sea species, whose abundance is highest at depths greater than 200 m (Compagno, 1984; Serena, 2005; Ebert et al., 2022), the cause of its occurrence near the coastline remains a subject of discussion. Although the location of the observation is extremely close to the shore, it is relatively far away, 2.66 nautical miles from the nearby port of Budva, which hosts several fishing vessels. Montenegrin fishing fleet is considerably smaller than most of the fleets of the other Adriatic countries and operates mostly up to 100 m depth (Joksimović et al., 2019). This is reflected in the lack of records of the deep-sea sharks in general, and most of such species are known to be present in the country's territorial waters only from the earlier scientific surveys

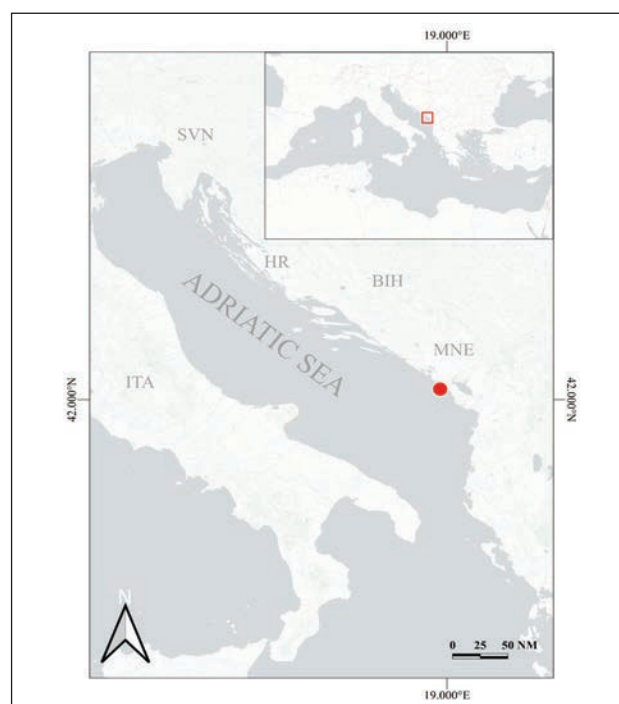


Fig. 2: Map of the Adriatic Sea, the study area in which the specimen of *Dalatias licha* was sighted is indicated by a red circle.

Sl. 2: Zemljevid Jadranskega morja. Območje raziskave, na katerem je bil opažen primerek *Dalatias licha*, je označeno z rdečim krogom.

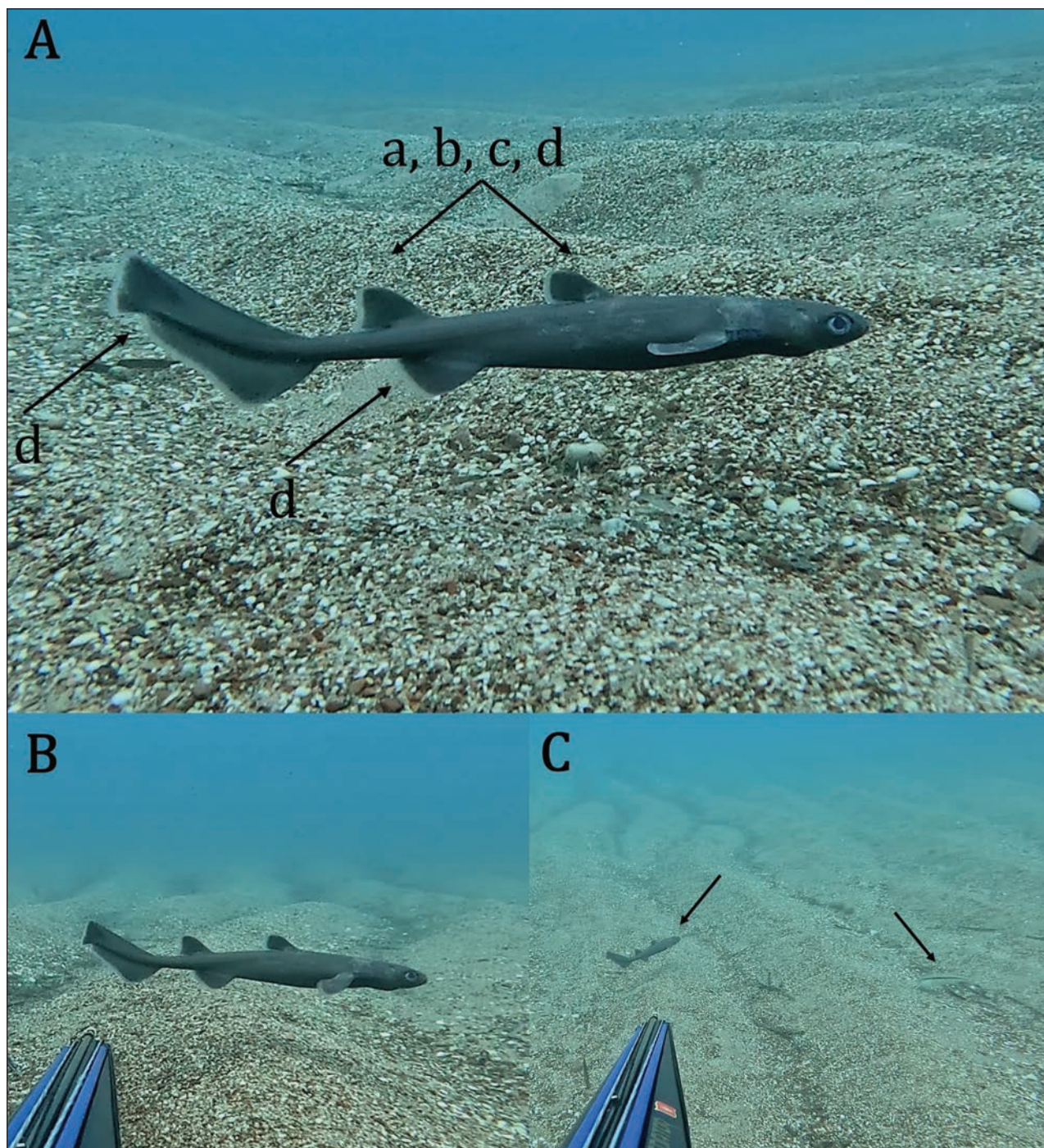


Fig. 3: A) Close lateral view of the described juvenile specimen of *Dalatias licha*, displaying taxonomic markers of the species, highlighted with arrows, such as: a) spineless dorsal fins; b) first dorsal fin originates behind free rear tip of the pectoral fin, with base closer to pectoral than pelvic fin bases; c) second dorsal fin larger; d) posterior margins of most fins are translucent (Ebert et al., 2021); B) Lateral view of the specimen; C) The specimen next to the individual of *Mullus* sp., both highlighted with arrows, showing its small size (Photo: D. Vukčević).

Sl. 3: Bližnji stranski pogled (A) na opisani mladi primerek vrste *Dalatias licha*, ki prikazuje taksonomske značilnosti vrste, označene s puščicami, kot so: a) hrbtne plavuti brez trnov; b) prva hrbtina plavut izvira za prosto zadnjo konico prsne plavuti, pri čemer je osnova bližje prsni kot trebušni plavuti; c) druga hrbtina plavut je večja; d) zadnji robovi večine plavuti so prosojni (Ebert in sod., 2021); B) Stranski pogled na primerek; C) Primerek poleg primerka vrste *Mullus* sp., oba označena s puščicami, kar kaže na njegovo majhnost (Foto: D. Vukčević).

(Ćetković *et al.*, 2024). However, the possibility that the shark was caught and released by a fisherman cannot be excluded. A recent study on the movement ecology of *D. licha* documents that the species typically remains at depths of at least 100 m, although one of the tagged individuals descended to a depth of 33 m (Gandra *et al.*, 2025). In a previous report, Soto and Mincarone (2001) collected a newborn kitefin shark alive at the surface and considered this finding to be an expansion of the species' bathymetric range from 0 to 1800 m. The depths at which newborn kitefin sharks have been captured in the Mediterranean and south Atlantic raise the question of whether gravid females give birth in very shallow waters and then the newborns migrate to deep bathyal grounds, or whether encountering a newborn *D. licha* specimen at the surface was just a coincidence. Soto and Mincarone (2001) speculated that the unusual capture conditions of the South Atlantic specimen may have been caused by the kitefin shark attacking the luminous buoy of the fishing net in order to feed. If the present record of the kitefin shark was indeed free of anthropogenic influence, it would represent the shallowest depth documented for the species to date. Alternatively, the occurrence of *D. licha* in shallow waters may reflect environmental alterations in deep-water habitats, such as climate-driven deoxygenation events, which have recently been linked to the upward movement of deep-water species (Vedor *et al.*, 2021; Lipej & Mavrič, 2022; Lipej *et al.*, 2022; Kabasakal *et al.*, 2023).

Considering the facts that several previously mentioned studies contain contemporary records of *D. licha* along the Italian southwestern Adriatic coast

and that this species is only recently recorded on the opposite side of the basin, there is a possibility that its abundance is higher in the southwestern area of the Adriatic Sea. This may be supported by its absence from earlier studies conducted in the southeastern Adriatic Sea, such as the HVAR expedition, which has also covered considerable depths (Jukić-Peladić *et al.*, 2001; Ikica *et al.*, 2021). However, given that this is a poorly studied deep-sea species inhabiting areas that are neither commercially exploited, nor routinely surveyed, it is difficult to accurately assess its true distribution and population abundance in the deep-sea regions of the southern Adriatic Sea.

In conclusion, the distribution of this species in the Adriatic is probably underestimated and as demonstrated in this study, integrating research with citizen science offers a valuable approach to improving our understanding of the distribution, ecology, and biology of threatened Mediterranean elasmobranch species.

ACKNOWLEDGEMENTS

The authors are grateful to the Montenegrin spearfisherman Dušan Vukčević for reporting the observation and sharing the video footage. This work is a part of the citizen science initiative #pošaljiajkulu, conducted in Montenegro, and supported by GEF-funded project "Fisheries and Ecosystem-Based Management for the Blue Economy of the Mediterranean" (FishEBM MED), Italian Ministry of the Environment and Energy Security (MASE) and the UNEP Mediterranean Action Plan (MAP), including its Specially Protected Areas Regional Activity Centre (SPA/RAC).

NENAVADNO SREČANJE Z MLADIM PRIMERKOM KLINOPLAVUTEGA MORSKEGA PSA, *DALATIAS LICHA*, V PLITVIH OBALNIH VODAH ČRNE GORE (JADRANSKO MORJE)

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POVZETEK

Avtorji poročajo o prvem potrjenem zapisu o pojavljanju klinoplavutega morskega psa *Dalatias licha* v črnogorskih vodah (južno Jadransko morje). Petega maja 2025 je bil v bližini plaže Miločer (Budva) na globini 10 m opažen mladi primerek, pri čemer je bila povprečna temperatura na lokaliteti približno 20 °C, kot jo je izmeril potapljaški računalnik. Srečanje je bilo posneto na videozapis visoke ločljivosti, kar je omogočilo nedvoumno identifikacijo na podlagi morfoloških znakov. Morski pes, čigar skupna dolžina je bila ocenjena na manj kot 50 cm, je plaval mirno, ni kazal vidnih poškodb in je imel značilnosti, ki so značilne za mlade primerke. Gre za prvi potrjeni zapis o pojavljanju vrste v Črni gori in najnižjo zabeleženo globino za vrsto *D. licha*.

Ključne besede: Sredozemsko morje, občanska znanost, globokomorski morski pes, *Dalatiidae*, *Dalatias licha*

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