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ABUDEFDUF CF. SAXATILIS IN THE SARONIKOS GULF, GREECE: UNAIDED INTRODUCTION OR HUMAN AIDED TRANSFER?

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ABSTRACT

One specimen of the sergeant-major fish Abudeŋduf sp., provisionally named Abudeŋduf cf. saxatilis (Linnaeus, 1758) was observed for the first time in the Saronikos Gulf, Greece in summer 2020. Its distinctive characteristics and potential mode of introduction in the Gulf, whether unaided or man induced transfer, are discussed.

Key words: *Abudeŋduf* sp., new record, Saronikos Gulf, crypto-expanding species, citizen science

ABUDEFDUF CF. SAXATILIS NEL GOLFO DI SARONICO IN GRECIA: INTRODUZIONE ACCIDENTALE O INTENZIONALE DA PARTE DELL'UOMO?

SINTESI

Un pesce appartenente al genere Abudeŋduf, provvisoriamente identificato come Abudeŋduf cf. saxatilis (Linnaeus, 1758) è stato osservato per la prima volta nel Golfo di Saronico, in Grecia, nell'estate del 2020. Nell'articolo vengono discusse le caratteristiche distintive dell'esemplare e la potenziale via di introduzione nel Golfo, sia accidentale che intenzionale da parte dell'uomo.

Parole chiave: *Abudeŋduf* sp., nuova segnalazione, Golfo di Saronico, specie in cripto-espansione, citizen science

INTRODUCTION

The Saronikos Gulf is a hot spot for alien species in Greek waters (Zenetos *et al.*, 2018) with many species introduced by vessels. Of the seven introduced species of the family Pomacentridae reported in the Mediterranean (Osca *et al.*, 2020), only two species of the genus *Abudefduf* are known from Greek waters to date. These are: *Abudefduf sexfasciatus* (Lacepède, 1801) reported from the Saronikos Gulf (Aegean Sea) (Giovos *et al.*, 2018), and *Abudefduf vaigiensis* (Quoy & Gaimard, 1825) reported from Kythira island (Ionian Sea) (Pirkenseer, 2020). Here we report on the presence of an alleged third species and discuss its potential mode of introduction.

MATERIAL AND METHODS

A collaboration agreement between the Archipelagos Institute of Marine Conservation (<https://archipelago.gr/en/>) and the Ellenic network on Aquatic Alien Species (ELNAIS: Zenetos *et al.*, 2015) in raising public awareness on marine alien species was initiated in 2015.

As a result, many new records provided by citizen scientists have filled in distribution gaps for some of the most invasive species in Greek waters or added new records in Greek waters (Miliou & Loudaros in Ragkousis *et al.*, 2020). Here we report on one new record provided by a citizen scientist (Ms. Mairi D. Aga) in September 2020. The report was accompanied by 2 photographs. Identification of the species was confirmed by the ELNAIS expert Maria Corsini-Foka.

RESULTS AND DISCUSSION

On August 23rd 2020, a single specimen of *Abudefduf* was photographed along the south coast of Salamina island (Lat 37.877240, Long. 23.442463) at 2 m depth, during a snorkeling session. The species was tentatively identified as *A. saxatilis* (Linnaeus, 1758).

Abudefduf saxatilis is a tropical and subtropical fish of Atlantic origin that has become a commonly encountered species along the Israel coasts (Tsadok *et al.*, 2015). The first occurrence of *A. saxatilis* in the Mediterranean Sea was reported by Azzurro *et al.* (2013) from Spain. Subsequent records are from Malta (Deidun & Castriota, 2014; Vella *et al.*, 2016); Turkey (Bilecenoglu, 2016); Israel (Tsadok *et al.*, 2015) Italy (Lipej *et al.*, 2019); Slovenia (Lipej *et al.*, 2019); and Libya (Osca *et al.*, 2019). For a detailed account of their Mediterranean distribution, see Lipej *et al.* (2019).

Abudefduf saxatilis has been confused in the past with *A. vaigiensis*. The meristic counts and morphometric parameters of two species overlap a lot. As illustrated in Lipej *et al.* (2019) *Abudefduf saxatilis* is morphologically distinguished from *A. vaigiensis* by the following characteristics:

- in *A. saxatilis*, the origin of the 4th vertical bar is located under the last dorsal spine, while in *A. vaigiensis* it is placed behind the spine in the soft part of the dorsal fin;
- the continuous extension of the fifth dark vertical bar from the origin of the dorsal fin to the anal fin in *A. saxatilis*, which is shorter and



Fig. 1: *Abudefduf* cf. *saxatilis* from Salamina Island. The arrow indicates the two black spots that are the distinguishing features of the species (Photo credit: Mairi D. Aga).

Sl. 1: *Abudefduf* cf. *saxatilis* iz otoka Salamina. Puščica označuje dve črni piki na repnem korenu, po katerem lahko to vrsto prepoznamo (Foto: Mairi D. Aga).

discontinued in *A. vaigiensis* and is located on the caudal peduncle;

- c. the presence of two black spots on the caudal peduncle (Fig. 1), which are absent in *A. vaigiensis*.

However, some researchers go as far as doubting the presence of consistent meristic or morphometric differences (see Deidun & Castriota, 2014; Osca *et al.*, 2019) and, therefore molecular analysis is needed to confirm the correct identification of the species. In the absence of concrete data (only photographic evidence is available) we have provisionally named our finding *Abudefduf* cf. *saxatilis* (Linnaeus, 1758).

The presence of *Abudefduf* cf. *saxatilis* in the Saronikos Gulf cannot be attributed with certainty to any particular pathway because many potential pathways/vectors could be implicated (range expansion, vessel transfer, release from an aquarium). Considering that the closest record is that of Çandarlı bay, Turkey, east Aegean Sea (Bilecenoglu, 2016), and that other alien fishes attributed to aquaria releases have been recorded recently from the Saronikos area (Giovos *et al.*, 2018; Karachle *et al.* in Bariche *et al.*, 2020), the most plausible explanation is that of release from an aquarium. This is the first record of the species in

Greek waters. If its occurrence is due to ship transfer or to an aquarium release (pathways questioned by Lipej *et al.*, 2019), it should be considered a new alien species for the area. Evans *et al.* (2020) classify *A. saxatilis* as a range expanding species (unaided introduction via the Gibraltar Strait, since there are at least three records which show an eastward progression in the Mediterranean). We provisionally classify it as crypto-expanding until molecular phylogenetic analysis shed more light.

In case it proves to be a man-induced transfer, it will be added to the list of alien species in the Mediterranean, which according to the latest update includes 666 established species (Zenetos & Galanidi, 2020).

This is yet another case evidencing the potential of citizen scientists to revealing the undetected as highlighted by Azzurro *et al.* (2013), who reported the first finding of *A. saxatilis* from Spain.

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ABUDEFDUF CF. *SAXATILIS* V ZALIVU SARONIKOS (GRČIJA): NENAMEREN ALI NAMEREN VNOS?

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POVZETEK

Primerek seržanta Abudefduf sp., ki sta ga avtorici provizorično poimenovali kot Abudefduf cf. saxatilis (Linnaeus, 1758), je bil poleti 2020 prvič opažen v zalivu Saronikos (Grčija). Avtorici razpravljata o razlikovalnih znakih in možnem načinu prihoda te vrste v zaliv v smislu namernega (antropogenega) ali nenamernega vnosa.

Ključne besede: *Abudefduf* sp., novi zapis o pojavljanju, zaliv Saronikos, prikrito razširjajoča se vrsta, ljubiteljska znanost

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