ePublishing

ΕΘΝΙΚΟ ΚΕΝΤΡΟ ΤΕΚΜΗΡΙΩΣΗΣ
EKT
NATIONAL DOCUMENTATION CENTRE

Mediterranean Marine Science

Vol 16, No 1 (2015)

Vol 16, No 1 (2015)

First sighting of Zebrasoma flavescens (Teleostei: Acanthuridae) and Balistoides conspicillum (Teleostei: Balistidae) in the Mediterranean Sea: Two likely aquarium releases

B. WEITZMANN, L. MERCADER, E. AZZURRO

doi: 10.12681/mms.963

To cite this article:

WEITZMANN, B., MERCADER, L., & AZZURRO, E. (2014). First sighting of Zebrasoma flavescens (Teleostei: Acanthuridae) and Balistoides conspicillum (Teleostei: Balistidae) in the Mediterranean Sea: Two likely aquarium releases. *Mediterranean Marine Science*, *16*(1), 147-150. https://doi.org/10.12681/mms.963

https://epublishing.ekt.gr | **e-Publisher:** EKT | **Downloaded at:** 25/04/2025 19:56:23

Short Communication

Mediterranean Marine Science
Indexed in WoS (Web of Science, ISI Thomson) and SCOPUS
The journal is available on line at http://www.medit-mar-sc.net
DOI: http://dx.doi.org/10.12681/mms.963

First sighting of *Zebrasoma flavescens* (Teleostei: Acanthuridae) and *Balistoides conspicillum* (Teleostei: Balistidae) in the Mediterranean Sea: Two likely aquarium releases

B. WEITZMANN[1], L. MERCADER[2] and E. AZZURRO[3]

[1] Parc Natural del Montgrí, les Illes Medes i el Baix Ter, Passeig del Port s/n, 17258 L'Estartit, Catalunya, Spain
[2] Carrer Pedró 79 (2n), 17230 Palamós, Catalunya, Spain
[3] Institute for Environmental Protection and Research (ISPRA), Sts Livorno, Piazzale dei Marmi 2, 57123, Livorno, Italy

Corresponding author: eazzurr@gmail.com

Handling Editor: Argyro Zenetos

Received: 25 June 2014; Accepted: 22 October 2014; Published on line: 20 February 2015

Abstract

We hereby provide the first documented occurrence of the yellow tang *Zebrasoma flavescens* and the clown triggerfish *Balistoides conspicillum* in the Mediterranean Sea. These tropical fishes were photographed in October 2008 off Sitges (Costa Daurada, Spain: 41°13'27.09" N; 1°47'22.35" E) and in July 2012 in front of Palamós (Costa Brava, Spain: 41°50'56.19" N; 3°8'26.29" E), respectively. Their possible release from private aquaria is discussed.

Keywords: Aquarium release, Balistidae, Acanthuridae, Mediterranean, Catalan Sea, first record.

Introduction

The trade in ornamental species is emerging as an important source of introduction of exotic organisms in aquatic systems (Semmens *et al.,* 2004; Maceda-Veiga *et al.,* 2013). In the Mediterranean Sea, some 18 species are assumed to be introduced by aquarium release or are escapees. These include nine tropical fishes, representing around 2% of the total number of exotic species recorded so far in the basin as a whole (Zenetos *et al.*, 2012). We hereby document the first Mediterranean occurrence of two popular aquarium fish species: the yellow tang *Zebrasoma flavescens* (Bennett, 1828) and the clown triggerfish *Balistoides conspicillum* (Bloch & Schneider, 1801).

The yellow tang is a small tropical reef fish belonging to the family of Acanthuridae. It is a northern hemisphere Pacific species distributed from Hawaii (where it is abundant) to the Ryukyu Islands, including the Marshall Islands, Wake, Minami Tori Shima (Marcus Island), Mariana Islands, and Ogasawara Islands (Randall, 2001). Adults inhabit coral-rich areas, both in protected lagoon waters and along seaward reefs, down to 50 m depth (Lieske & Myers, 1994). They may occur singly or in groups of up to a few hundred individuals and they feed mainly on algae during the day (Atkins, 1981). Due to the aquarium trade, the total catch of *Z. flavescens* has recently approached half a million individuals per year (Williams *et al*., 2009).

The clown triggerfish is a tropical fish belonging to the family of Balistidae, and is widespread in the tropical Indo-West Pacific. The species is naturally distributed from East Africa through Indonesia to Samoa, and from southern Japan to New Caledonia (Matsuura, 2001). Adults usually occur in outer reef areas adjacent to steep drop-offs down to depths of 75 m. They feed on sea urchins, crabs and other crustaceans, molluscs, and tunicates and are popular aquarium fish with a minor importance to fisheries (Matsuura, 2001).

Methods

Both specimens were photographed and filmed with underwater cameras. Due to the unavailability of specimens for taxonomical analysis, diagnostic features used for the identification of both *Z. flavescens* and *B. conspicillum* were extracted from photographs and videos and consisted of conspicuous traits of the colour pattern and body shape. *Zebrasoma flavescens* was identified following Randall (2001; 2002) and other field guides (i.e. Allen *et al.,* 2003; Lieske & Myers, 1994; Randall, 2010). Length of the individual was estimated underwater. For *B. conspicillum*, species identification followed Matsuura (2001), Smith & Heemstra (1995) and Allen *et al.* (2003). The specimen was measured but unfortunately it was not preserved.

Results

In October 2008, a yellow tang *Z. flavescens* was observed at a depth of 6 metres in front of the town of Sitges (Costa Daurada, NE Spain, 41°13'27.09" N; 1°47'22.35" E). The sighting was made by one of the authors (BW) dur-

ing underwater visual surveys. The specimen was encountered on a rocky bottom covered by coralline algae (*Lithophyllum incrustans*) and benthic invertebrates (mainly *Aiptasia mutabilis*, *Anemonia sulcata*, *Crouania francescoi* together with the alien sponge *Paraleucilla magna*).

The individual spotted off Sitges (Fig. 1; Supplementary file 1) had the following features: deep body with a moderately protruding snout and continuous undivided dorsal and anal fins; the colour was bright yellow with a visible white scalpel (caudal spine) and a pale horizontal stripe along the middle of the bodyline. It was estimated to measure 15 cm TL.

In July 2012, a clown triggerfish, *B. conspicillum*, was encountered at a depth of 3 metres, in Cala Margarida, in front of Palamós (Costa Brava, NE Spain, 41°50'56.19" N; 3°8'26.29" E) by a recreational scuba diver. The fish was hiding in a rocky crevice characterized by benthic species typical of such habitats, including *Ellisolandia elongata*, *Halopteris scoparia*, *Dictyota dichotoma* and *Codium vermilara*. The same individual was observed in the same crevice for three consecutive days and at the end it was captured alive, using a hand net.

The individual spotted in front of Palamós (Fig. 2; Supplementary file 2) had the following features: body deep, compressed, black to yellowish in ground colour with large round white blotches on the ventral half of body and small blotches on the back, and with a white band across the snout in front of the eye; the lips and the area around the mouth were orange-yellow; the mouth was terminal. The fish measured 15.0 cm TL.

Discussion

The present findings from the Catalan Sea are the first documented occurrences of *Z. flavescens* and *B. conspicillum* in the Mediterranean. In the last few years, other exotic fish species have been documented from the Cata-

Fig. 1: *Zebrasoma flavescens* (Bennett, 1828) photographed off the coast of Sitges (Catalan Sea, Spain) on October 2008 at a depth of 6 metres. Photo: Boris Weitzmann.

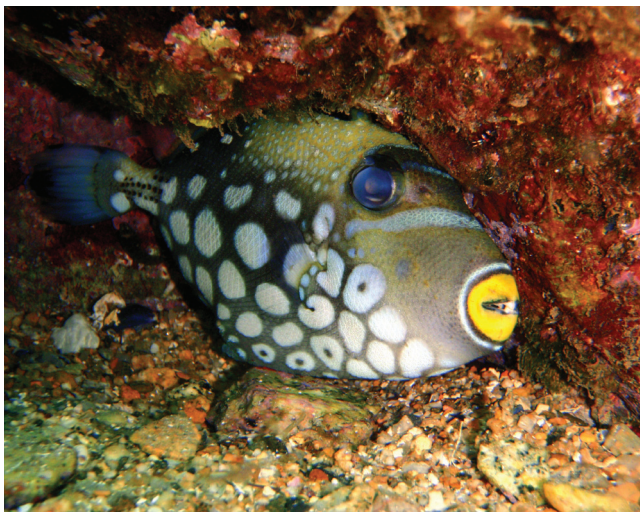

Fig. 2*: Balistoides conspicillum* (Bloch & Schneider, 1801) photographed off Palamós (Catalan Sea, Spain) on July 2012 at a depth of 3 meters. Photo: Eva Roqueta i Vilà.

lan Sea. In November 2012, one specimen of *Abudefduf saxatilis* was spotted along the coasts of Palamós by a recreational diver (Azzurro *et al.,* 2013). In December 2007, also at Palamós (Morro de Vedell creek: Cala Margarida), a single specimen of the Lessepsian *Fistularia commersonii* Ruppell, 1838, was reported by Sánchez-Tocino *et al.* (2007).

The unique colour patterns of both *Z. flavescens* and *B. conspicillum* (Allen *et al.,* 2003; Smith & Heemstra, 1995) provide acceptable confidence that the observed specimens were correctly identified, even in the absence of specific meristic and morphometric data.

As far as *Z. flavescens* is concerned, some acanthurids such as *Acanthurus coeruleus* (Schofield *et al.,* 2009), present a yellow body during the juvenile stage (Guiasu & Winterbottom, 1998) but no other surgeonfish is similarly coloured to the yellow tang during the adult stage (Randall, 2002). Also, the very closely related *Zebrasoma scopas* (Cuvier, 1928) has a darker coloration than *Z. flavescens* (Randall, 2001). Another morphological character that matches the description of *Z. flavescens* is the shape of the fins and the moderately protruding snout (e.g. Allen *et al.,* 2003; Lieske & Myers, 1994; Randall, 2010). Certainly, a closer morphological examination of the Sitges individual would have provided further details on the taxonomical identification. Moreover, in the absence of molecular analyses, cases of hybridization among these species cannot be excluded, which is often reported in the ornamental fish trade (Steinke *et al*., 2009).

The particular pattern of large white spots on the clown triggerfish has no equivalent among the other triggerfishes and can be considered as a stable taxonomic character (Matsuura, 2001). The band across the snout in front of the eye and the orange colour of the lips are also typical of this species (Smith & Heemstra, 1995; Matsuura, 2001; Allen *et al.,* 2003).

According to Wabnitz *et al.* (2003), *Z. flavescens* is one of the ten most traded species of ornamental fishes worldwide, and the number of specimens imported between 1997 and 2002 has been estimated to exceed 38,000 in the European Union. Following the criteria given by Michael (1999), the yellow tang is highly suitable for aquaria, being generally durable and hardy, with most individuals acclimatizing to a home aquarium. It is noteworthy that this species has been introduced to the Gulf of Mexico, where it occurs together with another four exotic congeners e.g. *Zebrasoma desjardinii* (Bennett 1836); *Z. veliferum* (Bloch, 1795); *Z. xanthurum* (Blyth, 1852) and *Z. scopas* (Cuvier, 1829) (Semmens *et al.,* 2004; Schofield *et al.,* 2009). *Balistoides cospicillum* is also a commonly traded ornamental fish and one of the most highly prized aquarium species because of its attractive pigmentation (Reksodihardjo-Lilley & Lilley, 2007).

Considering that both *Z. flavescens* and *B. cospicillum* are not reported to occur in the Red Sea (Golani & Bogorodsky, 2010), Lessepsian migration cannot be invoked as a suitable pathway of introduction for these species. Because of their importance as ornamental aquarium species, it is likely that these tropical fishes had been released from private aquaria.

Aquarium releases have had dramatic consequences on aquatic systems (Padilla & Williams, 2004); the lionfish (the *Pterois volitans* - *P. miles* complex) invasion along the Western Atlantic coasts is one of the most recent and spectacular examples (Whitfield *et al.,* 2002). Early identification of new invaders, together with an understanding of the vectors and pathways of introduction, are critical steps for proper management (Kolar & Lodge, 2001). When a new exotic species becomes established, its control may be very difficult, or even impossible, especially in the marine environment (Barbour *et al.,* 2011).

Most marine fishes available for sale in pet shops are exotic and some could have the potential to establish permanent populations in the Mediterranean Sea (e.g. Zammit & Schembri, 2011). This reinforces the need for more careful implementation of education programmes, regulation and monitoring of trade (Semmens *et al.*, 2004; Gertzen *et al.*, 2008). Education should be accompanied by printed information for every species sold at aquariums. In addition, a system should be established where any unwanted aquarium fish could be returned to the store, preventing potential releases into the wild. Furthermore, citizen science programmes could improve our ability to track exotic species in the wild and at the same time serve to raise public awareness (e.g. Azzurro *et al.,* 2011). Since aquarium species represent a potential and realized threat to marine communities and considering the general lack of regulation of this trade (Padilla & Williams, 2004), these proactive actions should be seriously considered by organizations committed to the protection of biodiversity and by policy-making bodies.

Acknowledgements

We are grateful to Xavier Torras and María García for the field assistance during the observation of *Zebrasoma flavescens;* Sergi Casablanca and Eva Roqueta i Vilà, for providing us the images of *Balistoides conspicillum*. We also warmly acknowledge Jack Randall of the Bishop Museum of Honolulu, for confirming the correct identification of *Z. flavescens*. Finally, Noelle Lucey provided invaluable help in the form of linguistic editing.

References

Allen, G., Steene, R., Humann., P., DeLoach, N., 2003. *Reef Fish Identification. Tropical Pacific.* New World Publications, Inc., Jacksonville, Florida and Odyssey Publications, El Cajon, California, 480 pp.

Atkins, P., 1981. Behavioral determinants of the nocturnal spacing pattern of the yellow tang *Zebrasoma flavescens* (Acanthuridae). *Pacific Science*, 35, 263-264.

Azzurro, E., Broglio, E., Maynou, F., Bariche, M., 2013. Citizen science detects the undetected: The case of *Abudefduf saxatilis* from the Mediterranean Sea. *Management of Biological Invasions*, 4 (2), 167-170.

Azzurro, E., Moschella, P., Maynou, F., 2011. Tracking signals of change in Mediterranean fish diversity based on Local Ecological Knowledge. *Plos ONE*, 6(9) e24885. doi:10.1371/journal.pone.0024885.

Barbour, A.B., Allen, M.S., Frazer, T.K., Sherman, K.D., 2011. Evaluating the potential efficacy of invasive lionfish (*Pterois volitans*) removals. *PLoS ONE*, 6(5), e19666. doi:10.1371/journal.pone.0019666

Gertzen, E., Familiar, O., Leung, B., 2008. Quantifying invasion pathways: fish introductions from the aquarium trade. *Canadian Journal of Fisheries and Aquatic Sciences*, 65(7), 1265-1273.

Golani, D., Bogorodsky, S.V., 2010. The fishes of the Red Sea–reappraisal and updated checklist. *Zootaxa*, 2463, 1-135.

Guiasu, R.C., Winterbottom, R. 1998. Yellow juvenile color pattern, diet switching and the phylogeny of the surgeonfish genus *Zebrasoma* (Percomorpha, Acanthuridae). *Bulletin of Marine Science*, 63 (2), 277-294.

Kolar, C.S., Lodge, D.M., 2001. Progress in invasion biology: predicting invaders. *Trends in Ecology & Evolution*, 16 (4), 199-204.

Lieske, E., Myers, R., 1994. *Coral reef fishes. Indo-Pacific & Caribbean including the Red Sea*. Collins Pocket Guide. Harper Collins Publishers, London, 400 pp.

Maceda-Veiga, A., Escribano-Alacid, J., de Sostoa, A., García-Berthou, E., 2013. The aquarium trade as a potential source of fish introductions in southwestern Europe. *Biological invasions*, 15 (12), 2707-2716.

Matsuura, K., 2001. Balistidae. Triggerfishes. p. 3911-3928. In: *FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 6. Bony fishes part 4 (Labridae to Latimeriidae), estuarine crocodiles*. Carpenter, K.E., Niem, V. (Eds). FAO, Rome.

Michael, C., 1999. *Marine Fishes. 500-Essential-To-Know Aquarium Species*. Microcosm Ltd, 448 pp.

Padilla, D.K., Williams, S.L., 2004. Beyond ballast water: aquarium and ornamental trades as sources of invasive species in aquatic ecosystems. *Frontiers in Ecology and the Environment*, 2 (3), 131-138.

Randall, J.E., 2001. Acanthuridae. Surgeonfishes. p. 3653-3672. In: *FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 6. Bony fishes part 4 (Labridae to Latimeriidae), estuarine crocodiles*. Carpenter, K.E., Niem, V. (Eds). FAO, Rome.

Randall, J.E., 2002. *Surgeonfishes of the world*. Mutual Publishing and Bishop Museum Press, Hawai'i, Honolulu, Hawaii, 123 pp.

Randall, J.E., 2010. Shore fishes of Hawai'i. University of Hawaii Press, 234 pp.

Reksodihardjo-Lilley, G., Lilley, R., 2007. Towards a sustainable marine aquarium trade: An Indonesian perspective. *SPC Live Reef Fish Information Bulletin*, 17, 11-19.

Sanchez-Tocino, L., Hidalgo Puertas, F., Pontes, M., 2007. Primera cita de *Fistularia commersonii* Ruppell, 1838 (Osteichtyes: Fistulariidae) en aguas mediterráneas de la Península Ibérica. *Zoologica Baetica*, 18, 79-84.

Semmens, B.X., Buhle, E.R., Salomon, A.K., Pattengill-Semmens, C.V., 2004. A hotspot of non-native marine fishes: evidence for the aquarium trade as an invasion pathway. *Marine Ecology Progress Series*, 266, 239-244.

Schofield, P.J., Morris, Jr. J.A., Akins L. 2009. *Field Guide to Nonindigenous Marine Fishes of Florida*. NOAA Technical Memorandum NOS NCCOS 92, 121 pp.

Smith, M.M. Heemstra, P.C., 1995. *Smiths' sea fishes*. Southern Book Publishers, Johannesburg, 1047 pp.

Steinke, D., Zemlak, T.S., Hebert, P. D. 2009. Barcoding Nemo: DNA-based identifications for the ornamental fish trade. *PLoS one*, 4(7), e6300, doi: 10.1371/journal.pone.0006300.

Wabnitz, C., Taylor, M., Green, E., Razak, T., 2003. *From Ocean to Aquarium*. UNEP-WCMC, Cambridge, UK, 65 pp.

Whitfield, P.E., Gardner, T., Vives, S.P., Gilligan, M.R., Courtenay Jr, W.R. *et al*., 2002. Biological invasion of the Indo-Pacific lionfish *Pterois volitans* along the Atlantic coast of North America. *Marine Ecology Progress Series*, 235, 289-297.

Williams, I.D., Walsh, W.J., Claisse, J.T., Tissot, B.N., Stamoulis, K.A., 2009. Impacts of a Hawaiian marine protected area network on the abundance and fishery sustainability of the yellow tang (*Zebrasoma flavescens*). *Biological Conservation*, 142 (5), 1066-1073.

Zammit, E., Schembri, P.J., 2011. An overlooked and unexpected introduction? Occurrence of the spotted scat *Scatophagus argus* (Linnaeus, 1766) (Osteichthyes: Scatophagidae) in the Maltese Islands. *Aquatic Invasions,* 6 (Suppl 1), S79-S83.

Zenetos, A., Gofas, S., Morri, C., Rosso, A., Violanti, D. *et al.,* 2012. Alien species in the Mediterranean Sea by 2012. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part 2. Introduction trends and pathways. *Mediterranean Marine Science*, 13 (2), 328-352.