First record of the cube boxfish *Ostracion cubicus* (Ostraciidae) and additional records of *Champsodon vorax* (Champsodontidae) from the Mediterranean

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Abstract

A specimen of the Indo-Pacific cube boxfish *Ostracion cubicus* and two specimens of the Indo-Pacific gaper *Champsodon vorax* were collected from off the coast of Lebanon. This constitutes the first record of the boxfish in the region and confirms the establishment of a population of the gaper in the Mediterranean.

Zusammenfassung


Résumé

Un spécimen d’*Ostracion cubicus* de l’Indo-Pacifique et deux spécimens de *Champsodon vorax* de l’Indo-Pacifique ont été collectés au large de la côte du Liban. C’est la première mention de cet Ostracion dans la région et la confirmation de l’établissement d’une population de ce Champsodon en Méditerranée.

Sommario

Un esemplare di pesce scatola *Ostracion cubicus* e due esemplari di pesci coccodrillo *Champsodon vorax*, specie originarie dell’Indo-Pacifico, sono stati raccolti lungo le coste del Libano. Questo rappresenta la prima segnalazione del pesce scatola nella regione e conferma che popolazioni di pesci coccodrillo si sono orami stabilite nel Mediterraneo.

INTRODUCTION

Boxfishes, sometimes called trunkfishes, constitute a family of bony fish characterized by having a body encased in a bony carapace (Smith 1986; Nelson 2006). This hard “box” is made up of bony hexagonal plates covering most of the head and body, with gaps only for the mouth, nostrils, gill opening, anus, caudal peduncle, and fins (Smith 1986; Randall 1983). Boxfishes have one single dorsal fin located on the posterior side of the body and no pelvic fins (Smith 1986; Randall 1983). Their bodies are covered by mucus that contains defensive ichthyotoxins (Smith 1986; Kalmanzon & Zlotkin 2000; Nelson 2006). They have a wide tropical distribution and are found throughout the Indian, Pacific and Atlantic Oceans (Nelson 2006). A total of 33 species have been described (Nelson 2006). They are protogynous hermaphrodites that form harems of 2-4 females for each male (Moyer 1979; Debelius 1998).

The cube boxfish *Ostracion cubicus* Linnaeus, is part of the subfamily Ostraciinae, which is characterized by a closed carapace, no ventral ridge and a caudal fin with 10 principal rays (Nelson 2006). This Indo-Pacific species presents a quadrangular carapace in cross section and a spineless body (Randall 1983). Ten upper and eight lower teeth are present in the jaws and very large adults develop a bump anteriorly on the snout (Randall 1983). The meristic formula of the species is the following: D, 8-9; A, 9; P, 10-11; C, 10-12; a complete description is available in Smith (1986). The species can reach about 45 cm in length and lives mainly between the surface and 50 m depth (Randall 1983; Smith 1986). Adult coloration is generally yellow or yellowish-brown with white or pale blue spots edged with black or sometimes rimmed with small black spots and fins are also yellow (Randall 1983). However, large adult males can vary from brilliant yellow to brownish-blue (Smith 1986; Debelius 1998; Taquet & Diringer 2007). According to Randall (1983), juveniles are yellow with small black spots on the head and body (Indo-
Pacific form) and white spots broadly edged with black (Red Sea form). It is a solitary species, mainly encountered patrolling on soft bottoms or close to overhangs, and feeding on invertebrates and seaweeds (Cornic 1987; Myers 1999; Debelius 1998; Taquet & Diringer 2007).

Gapers (Champsodontidae) constitute a family of small bony fishes of tropical and subtropical Indo-Pacific origin (Nelson 2006; Nemeth 1994). The first record of gapers in the Mediterranean is constituted by two specimens of the Indo-Pacific gaper Champsodon vorax Günther, recorded from Lebanon and a single specimen of the nakedband gaper Champsodon nudivittis (Ogilby) from the Mediterranean coast of Turkey (Çiçek & Bilecenoglu 2009; Bariche 2010a).

RESULTS
On 25 January 2011, a boxfish was collected from off the northern Lebanese coast, in the vicinity of the Ramkine islet (34° 29' N; 35° 45' E) (Fig. 1). The fish was speared over a rocky bottom between 15 and 17 meters depth. Photos of the fish were taken after capture and the specimen subsequently discarded. The general body shape and coloration visible in the photographs indicated that the specimen was the common Indo-Pacific cube boxfish Ostracion cubicus. The yellowish body color with scattered pale blue spots edged with a dark margin is characteristic of a subadult female (Debelius 1998; Smith 1986; Taquet & Diringer 2007). The estimated size of the fish was about 40 cm in total length (Fig. 1).

On 10 November 2010, two individuals of the Indo-Pacific gaper Champsodon vorax were collected from the coastal waters of Beirut (33°55’ N, 35°32’ E). They were both captured by a trammel net set at about 45 m over sandy-muddy bottom. The specimens were fixed in 10% buffered formalin and later preserved in 70% ethyl alcohol. They were deposited in the marine collection of the American University of Beirut (catalogue number AUBM OS3738). The two specimens were 93.7 and 81.6 mm standard length (SL). Diagnostic characteristics of the two specimens followed closely those given by Nemeth (1994) and Bariche (2010a).

DISCUSSION
Early detection of new alien species while populations are small and localized is important when studying biological invasions. First records allow scientists in neighboring countries to search for the alien species in their region and to document its movement in the new environment. These records are scientifically noteworthy and may assist more detailed studies in the future, such as the effects of the new species on the new environment, both from an ecological and economic point of view, if it becomes invasive.

The Indo-Pacific cube boxfish is here reported for
the first time in the Mediterranean Sea. Ostraciids are relatively easily recognized because of their external carapace, which gives them a typical box shape. Because of the characteristic shape, it is assumed that the species’ presence is very recent in the Mediterranean; otherwise, it would have been recorded earlier. However, the cube boxfish is not the first ostraciid ever reported in the Mediterranean, as the co-familial Tetrasomus gibbosus (Linnaeus) was recorded earlier (Spanier & Goren 1988; Golani et al. 2002). It seems that it was not able to establish a viable population as the species has not been recorded since. The genus Tetrasomus can be distinguished by having a 3-angled carapace and a ridge or spine on the dorsal midline as opposed to Ostracion, which presents a 4-angled carapace and no ridge or spine on the dorsal midline.

The native distribution of O. cubicus in the Indo-Pacific region, including the Red Sea, suggests that it has entered the Mediterranean from the Suez Canal by Lessepsian migration, as is the case with hundreds of marine organisms (e.g. Streftaris & Zenetos 2006; Galil 2008; Mavrak & Aysar 2008). The potential release from a private aquarium is also possible but seems unlikely. This assumption is based on the fact that the species is difficult to raise in a confined space because of ichthyotoxins released, resulting in the death of all fishes present, including the boxfish itself (e.g. Smith 1986; Kalmanzon & Zlotkin 2000), and for that reason also, it is not found in local aquarium shops (personal observation). The ship-transported fish via ballast water hypothesis is not excluded however. There is a need for additional records and a comparison of molecular data between regions to confirm the settlement of a population in the eastern Mediterranean Sea.

Unlike O. cubicus, the establishment of the Indo-Pacific gaper Champsodon vorax in the eastern Mediterranean is now confirmed. A 67.4 mm SL individual and another 93.0 mm SL were captured earlier from Lebanon from Batroun (34°15’N; 35°39’E) and from close to Jounieh Bay (33°59’N; 35°36’E) respectively (Bariche 2010a; Golani et al. 2002). It has also been collected so far and it is possible that it was introduced to the Mediterranean by ship ballast water or another shipping-related mechanism (e.g. Wonham et al., 2000; Galil, 2006; Coutts & Dogshun, 2007). Another possible explanation is that it crossed the Suez Canal, signifying that it is present but has not been collected so far from the Red Sea. The species can easily be misidentified and has been collected only from very few localities in the Indo-Pacific regions (Kami 1971; Nemeth 1994).

The high number of first records of Indo-Pacific species in the Mediterranean recently suggests that Lessepsian migration is most probably responsible for such occurrences (e.g. Bariche 2010a, b; Golani & Appelbaum-Golani 2010; Golani et al. 2010; Goren et al. 2010). This is most likely a clear indication of the effects of climatic change on the eastern Mediterranean environment. The widening and deepening of the Suez Canal, habitat degradation and other factors might have a role. A higher number of similar species from the Indo-Pacific might be able to establish new populations in the eastern Mediterranean, thus enlarging their distribution northwards in the coming years. The Mediterranean Sea might be witnessing the start of a new wave of introductions via the Suez Canal of a higher magnitude than previously recorded.

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