

## The reef-associating butterfly fish *Chaetodon austriacus* Rüppell, 1836 in the Mediterranean: The implication of behavioral plasticity for bioinvasion hazard assessment

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### Abstract

A single specimen of the blacktail butterflyfish, *Chaetodon austriacus*, one of the most common butterflyfishes in the Red Sea, was collected in the port of Ashdod, on the Mediterranean coast of Israel in August 2011. The present record demonstrates a greater than expected plasticity in habitat choice and feeding habits in a species considered an obligate corallivore. Recent records of Eritrean coral-reef associating species in the Mediterranean serve as a warning that life-history based bioinvasion risk assessment has limited predictability in cases where species have broader environmental tolerances than their native range would seem to indicate.

**Key words:** *Chaetodon austriacus*, Red Sea, Mediterranean Sea, Eritrean alien species, risk assessment

### Introduction

A single specimen of the blacktail butterflyfish, *Chaetodon austriacus* Rüppell, 1836, was collected near the port of Ashdod, on the Mediterranean coast of Israel on August 2011. Whereas most Eritrean alien fishes reported during the 20th century were categorized as opportunistic soft-bottom dwellers (Golani 1993), many of the recent aliens are coral-reef associated species: *Scarus ghobban* Forsskål, 1775 (Goren and Aronov, 2002), *Heniochus intermedius* Steindachner, 1893 (Gökoglu et al. 2003), *Cheilodipterus novemstriatus* (Rüppell, 1838) (Goren et al. 2010), *Pomacanthus imperator* (Bloch, 1787) (Golani et al. 2010) and *Chaetodon larvatus* Cuvier, 1831 (Salameh et al. 2011).

### *Chaetodon austriacus* Rüppell, 1836 (Figure 1)

*Chaetodon austriacus* Rüppell, 1836:30, Pl. 9 (Figure 1) Type locality Jeddah, Saudi Arabia, Red Sea.

### Material examined:

Mediterranean specimen: TAU P-14384, total length(TL) 120mm, standard length (SL) 99mm, Ashdod port, Israel, 31°49'10"N, 34°38'16"E, depth: 10m., leg: R. Gvili, 17 August, 2011. The fish was collected among the concrete tetrapods of the breakwater.

Red Sea specimens: TAU P- 256; SL 80 mm, TAU P-1922;1923;1924;1925;1926; 1927;1928, 2020SL 76–110mm, Eilat, northern Red Sea, leg. L. Fishelson, 1959; TAU TAU P-2842 SL 94mm, Eilat, northern Red Sea, leg. L. Fishelson, 1968.

**Diagnosis** (based on the Mediterranean specimen): A *Chaetodon* species distinguished from its congeners by the combination of the following characteristics: dorsal-fin rays XIII, 20; anal-fin rays III, 19; lateral line scales (pored) 30; lateral series 39; eleven transverse series of scales (counted down and backward from the origin of dorsal fin), three scales above lateral line and eight under the line. Scales cover

**Figure 1.** *Chaetodon austriacus* (TAU P-14384, SL 99mm) collected at Ashdod port, Israel (Photograph: Oz Rittner).



white and black parts of dorsal fin as well as black parts of anal and caudal fins. Caudal fin rounded. Body orange-yellow with dark longitudinal lines darker on upper half of body and becoming more orange ventrally (Figure 1); Chin black, two diagonal stripes on head. The anterior one broad, crossing the eye; the second, narrower, running along margin of pre-opercule.

Caudal fin with narrow yellow band and a broader transparent one at the distal end. Anal fin black, bordered anteriorly by an orange margin. Pectoral and pelvic fins yellow. Dorsal fin white, its posterior margin with dark triangle with a yellow border.

Selected proportions: SL 82% of TL; Head length 28% of SL; body depth 64% of SL; Eye diameter 29% of head length.

**Distribution:** Red Sea and Gulf of Aden (Froese and Pauly 2011). One of the most common chaetodontid fishes in the Red Sea (11.1% relative abundance, 60.2% frequency of appearance) (Khalef and Abdalla 2005).

## Discussion

Corallivorous chaetodontids are highly dependent on coral abundance in their feeding rate, their distribution and their social behaviour (Bouchon-Navaro 1980; Wrathall et al. 1992; Righton et al. 1998; Alwany et al. 2003). *Chaetodon austriacus* is a territorial obligate coral feeder favouring species of *Acropora*, *Pocillopora* and *Porites*. (Harmelin-Vivien and

Bouchon-Navaro 1981; Bouchon-Navaro 1986; Alwany et al. 2003). It inhabits the fore reef and the reef flat and its abundance is strongly correlated with habitat rugosity and complexity (Brokovich and Baranes 2005). *Chaetodon larvatus*, which was recently reported from the Mediterranean (Salameh et al. 2011) is also "an obligate corallivore" (Zekeria et al. 2002). Yet, as no hermatypic coral reefs exist in the Mediterranean, these species must have shifted to an alternative food, possibly hydroids, which are abundant on the breakwaters of Ashdod and Haifa harbors. Interestingly, in the Red Sea *C. larvatus* was found to be associated with "deteriorated reefs suffering from human impacts" (Temraz and Abou Zaid 2005). It has been observed that loss of the preferred food stemming from major events of coral bleaching such as the 1998 mass-bleaching in the Seychelles, brought about behavior changes in the obligate corallivorous butterflyfishes: from strict feeding-based territoriality to mass excursions (Samways 2005). It is suggested that whereas "obligate" feeding territoriality is maintained on healthy reefs in unstressed conditions, the loss of the preferred food during events of coral bleaching induce a behavioral switch to foraging on other food sources. The recent records of Eritrean coral-reef inhabiting fishes in the Mediterranean demonstrate a higher than expected plasticity in habitat choice and feeding habits. Such plasticity may have facilitated the colonization of the new habitats in the Mediterranean Sea by these species.

Life-history based hazard assessments have been identified as a weak link in bioinvasion risk assessment. Since life-history characteristics of alien species are commonly studied in their native range, or in the perceived donor environment, species with broader environmental tolerances than expressed in their native range, and those with “with suppressed behavioural plasticity in their native range limit the predictability of bioinvasion risk assessment.

Note: After the submission of this manuscript, we were informed (by Mr. E. Maharam, a diving club owner) on the occurrence of a population of *C. austriacus* in a rocky reef off Nahsholim (about 90 km north to Ashdod). Unfortunately, we could not obtain, so far, any specimen or picture to support this information.

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