

Aquatic Invasions Records

Records of four non-indigenous marine species, south of Koroni (Messiniakos Gulf, Peloponnese, Greece)

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Abstract

Caulerpa racemosa var. *cylindracea* (Sonder) Verlaque, Huisman and Boudouresque 2003 (Bryopsidales, Caulerpacae), *Percnon gibbesi* H. Milne Edwards, 1853 (Decapoda, Plagusiidae) and *Fistularia commersonii* Rüppell, 1838 (Syngnathiformes, Fistulariidae) are reported from the coast, south of Koroni (Messinia, Greece). *Sphyraena chrysotaenia* Klunzinger, 1884 (Perciformes, Sphyraenidae) is recorded for the first time for this region. The crab *Percnon gibbesi* is very common along the coastal stretch northeast of Kalamaki beach, while regional observations of *Caulerpa racemosa*, *Sphyraena chrysotaenia* and *Fistularia commersonii* are occasional.

Key words: Lessepsian migrant, non-indigenous species, *Caulerpa racemosa*, *Sphyraena chrysotaenia*, *Fistularia commersonii*, *Percnon gibbesi*

Introduction

Zenetos et al. (2009, 2011) list a total of 237 marine taxa (60 in the Ionian Sea) as exotic in Greek waters; 41 species represented by fish, 33 macroalgae and 31 from the subphylum Crustacea. *Caulerpa racemosa* var. *cylindracea* (Sonder) Verlaque, Huisman and Boudouresque 2003 (Bryopsidales, Caulerpacae), *Percnon gibbesi* H. Milne Edwards, 1853, (Decapoda, Plagusiidae), *Fistularia commersonii* Rüppell, 1838 (Syngnathiformes, Fistulariidae) and *Sphyraena chrysotaenia* Klunzinger, 1884 (Perciformes, Sphyraenidae) were recorded along the coast, south of Koroni (Messenia, Greece). These taxa are registered as established biota in the (eastern) Mediterranean in Zenetos et al. (2009, 2011). While both fish species are considered to be Lessepsian migrants and the macroalgae was likely introduced through shipping or the aquarium trade (overview in Klein and Verlaque 2008), the question of the introduction of the crab via larval drift into the Mediterranean remains controversial (Elkrwe et al. 2008). The eastward expansion of *Percnon gibbesi* has been summarised by Katsanevakis et al. (2011).

Research area and methods

The research area is situated along the south-eastern tip of the Messenia peninsula, south of Koroni (Peloponnese, Greece; Figure 1). The coast and adjacent area is subdivided into the tectonised Gavrovo-Pylos and Pindos nappe units, consisting primarily of pre-Neogene flysch sediments and conglomerates. An overlying, slightly dipping Plio-Pleistocene cover was deposited to the North and around Amoudi beach (Ladas et al. 2004; Pavlopoulos et al. 2010). The thinly-bedded sedimentary strata of the Pindos unit make up the highly structured reef areas adjacent to the coast (e.g. south of Memi beach), with selective erosion of softer layers. The large boulders north of Kalamaki beach represent talus weathered from the “Messinian Conglomerates” capping Mavrovouni mountain (Figure 1) and massive Flysch sandstones in an otherwise flat, sandy shallow sublittoral.

Data was obtained by observation and underwater photographic material, during repeated free-diving and snorkelling surveys in depths up to 5 m from July–August 2009–2011. Densities of *Percnon gibbesi* were estimated along transects on the coast north of Kalamaki



Figure 1. Distribution map of the alien species along the coast south of Koroni (Georeference: Appendix1); tectono-sedimentary units adapted from Ladas et al. (2004).



Figure 2. *Caulerpa racemosa* var. *cylindracea* (near shore in reef complex south of Memi beach). Photograph by C. Pirkenseer.



Figure 3. *Caulerpa racemosa* var. *cylindracea* and *Actinia cary* (near shore in reef complex south of Memi beach). Photograph by C. Pirkenseer.

beach (Figure 1). The approximate length of the upright axes of *Caulerpa racemosa* var. *cylindracea* was deduced from the number and spacing of branchlets (Figure 2 and 3) as well as general field observations.

Bryopsidales

Caulerpa racemosa variants are widely distributed in the Mediterranean (Klein and Verlaque 2008). Records of *Caulerpa racemosa* var. *cylindracea* from the south-western Pello-

ponnese include the Pylos Bay (Panayotidis and Montesanto 1994), the western Mani Peninsula (Tsirika et al. 2006) and 7 sites along the entire Messiniakos Gulf (Bardamaskos et al. 2009). *Caulerpa racemosa* var. *cylindracea* (Figure 2 and 3) was identified in the reef area south of Memi beach in narrow crevices, on a highly structured hard substrate, consisting of slightly tilted sedimentary beds (Figure 4) in approx. 1–3 m water depth. The branchlets were of clavate shape and generally distichously arranged. The length of the upright axes conforms to the lower

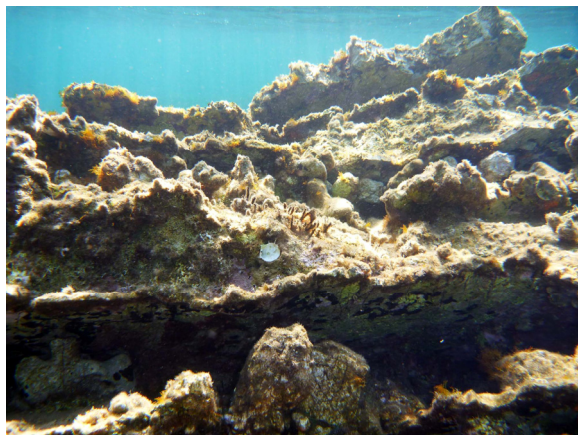


Figure 4. Highly structured reef habitat of rock slabs and crevices south of Memi beach. Photograph by C. Pirkenseer.



Figure 5. *Percnon gibbesi* feeding, south of Kalamaki beach. Photograph by C. Pirkenseer.



Figure 6. Group of *Percnon gibbesi* hiding in a crevice. Photograph by C. Pirkenseer.

end of the size range (10-190 mm for the Mediterranean) given in Verlaque et al. (2003). This species was not recorded on surrounding sand flats, amongst the *Posidonia* beds (sea grass) or other localities (e.g. near Amoudi beach or Kalamaki beach). Since abundance was very low in July/August 2011, accompanying biota (Porifera, Rhodophyta, Bryozoa, Tunicata, etc.) were largely undisturbed (see negative effect on sponge distribution in Baldacconi and Corriero 2009). A *C. racemosa* variant was sampled close to the study area by Bardamaskos et al. (2009) in 2006 and 2008 in the upper infralittoral zone, and found only occasionally in high abundances. A marked increase of abundance was recorded in deeper habitats by Tsirika et al. (2006).

Decapoda

The “nimble spray crab” *Percnon gibbesi* (Figures 5 and 6) was recorded from five localities during July and August, from 2009 to 2011. The evaluation of the observed specimens agrees with morphologic descriptions given by Relini et al. (2000). Occurrences at the south-eastern end of Tsapi beach (on large boulders), south of Kalamaki beach (on large boulders to solid rock), Agios Nikolaos beach and on the reef south of Memi beach (in crevices between sedimentary beds) were rather rare. The crab occurred in reduced numbers or was completely absent in richly structured habitats with abundant sessile biota (e.g. the reef area south of Memi beach), or where large boulders and smooth rocks occur with a dense cover of healthy algal growth (coast south of Amoudi beach; Figures 4 and 8). However, crab density (between boulders) (Figure 7) reached approx. 5–10 specimens/m² over a 500 m stretch north of Kalamaki beach. Crabs in most cases fed in pairs or larger groups; they retreated quickly into crevices when approached (Figure 6). However, it was possible to film their feeding habits (on (micro)algae) once the observer was stationary. Habitat preference, behaviour and abundance data agree with those of Sciberras and Schembri (2008) and Katsanevakis et al. (2010). *Percnon gibbesi* was first recorded from the (central) Mediterranean in 1999 (Relini et al. 2000) and in Greece on the north-eastern coast of the Messiniakos Gulf in 2004 (Thessalou-Legaki et al. 2006). Further occurrences from the south-western Peloponnese were cited non-specifically in Katsanevakis et al. (2010).



Figure 7. Medium/large-size boulder habitat northeast of Kalamaki beach, correlated with high densities of *Percnon gibbesi*. Note the near absence of larger algal growth. *Parablennius sanguinolentus* (blenny) in foreground. Photograph by C. Pirkenseer.

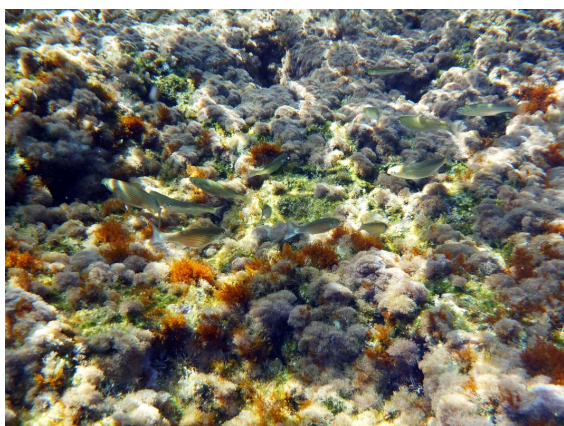


Figure 8. Healthy algal growth, south of Amoudi beach. Photograph by C. Pirkenseer.



Figure 9. Specimen of *Fistularia commersonii* in approx. 4 m depth, at the southern end of Memi beach. Photograph by C. Pirkenseer.



Figure 10. Same specimen of *Fistularia commersonii* displaying dark stripes. Photograph by C. Pirkenseer.



Figure 11. School of *Sphyræna chrysotaenia* (in shallow reef complex south of Memi beach). Photograph by C. Pirkenseer.

Syngnathiformes

A single specimen of the “bluespotted cornetfish” *Fistularia commersonii* (approximate length 80 cm; Figure 9–10) was observed over sand at approx. 4 m, at the southern end of Memi beach in August 2010. Specimen characteristics aligned with those described for *Fistularia commersonii* in Fritzsche (1976); a line of blue dots parallel to the dorsal line, a white caudal filament and lack of elongated bony plates. It differed from *Fistularia tabacaria* (ibid.) in the absence of blue spots on the snout and also being devoid of the central dorsal row of blue spots. Since the first occurrence from the Mediterranean was reported by Golani (2000) in

Israel, *Fistularia commersonii* has rapidly colonized the basin from east to west, up to the coasts of Spain, France and the Adriatic Sea (Bodilis et al. 2011 and references therein). A single specimen from the south-eastern Ionian Sea near Finikounda was collected in 2008 (Barbadamaskos et al. 2008).

Perciformes

A school of Sphyraenidae were observed close to the shore, in a highly structured reef area south of Memi beach (Figure 11) in August 2011. Specific species is unsure. Specimens in general showed characteristics of the Indo-Pacific yellowtail barracudas, *Sphyraena obtusata*, but were otherwise similar to *Sphyraena pinguis* Günther, 1874 in having single longitudinal stripes and sharply pointed posterior tips of their opercula (Doiuchi and Nakabo 2005). The authors (ibid.) synonymise the younger taxon *Sphyraena chrysotaenia* with *S. pinguis*. However, since *Sphyraena chrysotaenia* is still today listed as a valid species in online databases (WORMS, Fishbase, CIESM, DAISIE, ELNAIS) and recent Mediterranean records (e.g., Zenetos et al. 2009), a valid taxonomic status of the taxon is adapted in this paper.

A first record from Greece (Rhodes) dates to 1995 (Corsini and Economidis 1999). *Sphyraena chrysotaenia* is listed in Golani (1998) non-specifically for the western Aegean-Ionian Sea. A report of a juvenile specimen from the coast of Croatia (Pallaoro and Dulčić 2001) corroborates possible occurrences in the Ionian Sea. Sphyraenidae were not encountered during surveys around Paros and Antiparos (south-central Aegean Sea) in 2011 (Katsanevakis 2011). Rare findings may relate either to a slow north-westward expansion of the taxon (Corsini-Foka and Economidis 2007) or its usual pelagic habitat (Golani 1998). However in Kalogirou et al. (2010) *Sphyraena chrysotaenia* is classified as a “juvenile migrant” during the summer, with a strong affinity to seagrass meadows which function as nursery grounds.

Since 50% mature specimens of *Sphyraena chrysotaenia* were recorded at average lengths of 17.3 cm in males and > 19.3 cm in females by Allam et al. (2004), the encountered school of larger individuals (approximate length 20–25 cm) south of Memi beach may have represented adults (season May to October, Golani 1998) seeking spawning grounds.

Summary and Outlook

Four non-indigenous species were recorded on the coast south of Koroni (Peloponnese, Greece) during the summers of 2009–2011. Continuous and stable populations of the crab *Percnon gibbesi* were observed in high numbers where favourable habitats occurred, near Kalamaki beach. Richly structured, diverse and mostly healthy habitats of the region provide a basis for future observations of non-indigenous species and their impact on local biotic communities (e.g., Baldacconi and Corriero 2009; Sciberras and Schembri 2008). Since non-indigenous species are of rising regional economic relevance (e.g. fisheries; Golani 1998 and Lefkaditou et al. 2010), they should to be monitored long-term.

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Appendix 1. Distribution of the four non-indigenous species, along the coast south of Koroni (Messinia, Greece).

Species	<i>Caulerpa racemosa</i> var. <i>cylindracea</i>		<i>Sphyræna chrysotaenia</i>		<i>Fistularia commersonii</i>
Map No.	1		7		8
Locality	reef complex south of Memi beach		reef complex south of Memi beach		southern end of Memi beach
Habitat	crevices between rock slabs, rich vegetation and sessile biota		close to the shore between rock slabs of the reef complex, in the vicinity of <i>Posidonia</i> patches		over sand
Abundance	few		school, ca. 80 specimens		single specimen
Time	n.a.		2:44 PM		5:22 PM
Date / Period	09.08. to 22.08.2011		22.08.2011		06.08.2010
Depth (ca.)	0.2 to 1.5 m		1.0 m		4.0 m
Latitude	area around		36°46.632' N		36°46.769' N
Longitude	36°46.746' N 21°56.107' E		21°56.067' E		21°56.136' E

Species	<i>Percnon gibbesi</i>				
Map No.	2	3	4	5	6
Locality	reef complex south of Memi beach	Agios Nikolaos beach	boulders northeast of Kalamaki beach	boulders south of Kalamaki beach	eastern end of Tsapi beach
Habitat	crevices between rock slabs, rich vegetation and sessile biota	crevices between rock slabs	rounded medium-large boulders to large rocks with thin algal film	rounded large rocks with thin algal film	rounded medium-large boulders with thin algal film
Abundance	rare	few	Common up to 10 / m ²	common	few
Time	n.a.	n.a.	long-term	long-term	4:55 PM
Date / Period	09.08. to 22.08.2011	09.08.2009	July / August 2009-2011	July / August 2009-2011	21.08.2009
Depth (ca.)	ca. 1.0 m	ca. 0.5 m	0.0 to 4.0 m	0.0 to 4.0 m	4.0 m
Latitude	area around	36°46.399' N	36°44.779' N	area around	36°45.116' N
Longitude	36°46.599' N 21°56.092' E	21°55.911' E	21°54.416' E 36°44.842' N 21°54.718' E	36°44.600' N 21°54.250' E	21°51.405' E