

# A first checklist of gobies from Crete with ten new records

by

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**ABSTRACT.** - The checklist of gobiids from Crete includes 17 species. The published data on gobies from Crete have so far been scarce. Ten species are the new findings from the present research. Two species, *Corcyrogobius liechtensteini* and *Gammogobius steinitzi*, from the north coast of Crete, represent the first finding of these species outside the north-western Mediterranean and the Adriatic Sea. It is expected that the actual gobiid biodiversity of Crete is much higher.

**RÉSUMÉ.** - Première liste des gobies de Crête dont dix nouveaux signalements.

L'inventaire des gobies présents en Crête inclut 17 espèces. Les données publiées à ce jour sur les gobies de Crête sont rares. Dix espèces sont nouvellement signalées dans la présente étude. Deux espèces, *Corcyrogobius liechtensteini* et *Gammogobius steinitzi*, capturées sur la côte nord de la Crête, sont signalées pour la première fois en dehors de la mer Adriatique et de la partie nord-ouest de la Méditerranée. Il est probable que la diversité actuelle des Gobiidae en Crête est sous-estimée.

Key words. - Gobiidae - *Corcyrogobius liechtensteini* - *Gammogobius steinitzi* - Mediterranean Sea - Crete - Checklist - New records.

The Gobiidae *sensu* Nelson (2006) is one of the largest families of marine fishes, including at least 210 genera and 1950 valid species. Gobies, which make 1/10 of all Mediterranean fish biodiversity, are by far the family among fishes in the Mediterranean with the most species (Quinard and Tomasini, 2000; Kovačić and Patzner, 2011). The increase of known gobiid diversity in the last 20 years by about 1/3 in three Mediterranean areas (the northern west part of the Mediterranean, the Adriatic Sea, the southern east part of the Mediterranean) (Kovačić and Patzner, 2011) shows that the known diversity of Gobiidae along the Mediterranean coasts is far from actual species richness. The knowledge on species presence in each of the large Mediterranean geographic areas is mostly based on rare individual records. Patterns of actual species distribution of Mediterranean gobies are therefore still unknown for most of the species, and we are still unable to provide positive conclusions on zoogeography of this family in the Mediterranean.

According to Por (1989), the Mediterranean Sea is divided in individual sub-basins, which are separated by straits and sills, and have distinctive oceanographic regimes. The Eastern Mediterranean Basin (Aegean Sea and Levantine Basin) is an oligotrophic area with low primary production and low faunal abundances (Por, 1978). The low primary production is due to the low influx of nutrients, the low mixing rate of the water column (Bethoux, 1981; Azov, 1991)

and is considered to be phosphorus limited (Krom *et al.*, 1991). The fauna is highly diverse, particularly in the coastal zone and consists of a large proportion of endemic species (Tortonese, 1985; Fredj *et al.*, 1992) as a result of the dynamic geological past of the Mediterranean (Karakassis, 2001). Low abundance and biomass are the results of the prevailing oligotrophic conditions (Karakassis and Eleftheriou, 1997).

The continental shelf of Crete is situated in the centre of the eastern Mediterranean Basin. The northern coasts of Crete are part of the Aegean Sea, the sea shallow in its largest part, with lower salinity due to the influx of the Black Sea waters. The south coasts of the Cretan Shelf are part of the Levantine Basin and are characterized by great depths, high temperatures associated with high salinity values and ultra-oligotrophic conditions. There is no published data comparing littoral benthic fauna or marine fauna in general of the north and south coasts of Crete and there are no published conclusions on the faunistic differences between the two coasts.

The published data on gobies from Crete are rare and the number of known gobiid species was low before the present study (Ahnelt, 1984; Miller, 1986; Velte, 1994; Labropoulou and Papadopoulou-Smith, 1999). The aim of the present study is to check the gobiid diversity on Crete and to contribute to the knowledge on general Mediterranean distribution of gobiid species, using fieldwork results and all other available source of data.

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## MATERIAL AND METHODS

The samples were collected during the fieldwork on Crete from 4<sup>th</sup> to 8<sup>th</sup> October 2010. All fish were collected using a hand net and anaesthetic Quinaldine during SCUBA dives. All collected specimens were killed after SCUBA dives by over-anaesthetization with Quinaldine and preserved. Moreover, the authors contacted gobiologists, other ichthyologists, and underwater photographers with diving experience from Crete (see Acknowledgements) in the attempt to find unpublished existing data on gobies from Crete. The data on used material is listed for each species in the Results. The examined material is deposited in the Prirodoslovni muzej Rijeka (PMR). Preliminary field species identifications were later rechecked in the lab on the preserved specimens. The diagnoses are minimum combination of characters that positively identify researched specimens among species of family Gobiidae in the CLOFNAM area (Miller, 1986; Ahnelt and Dorda, 2004; Kovačić, 2005 and references therein). Morphometric and meristic methods follow Miller (1988). Terminology of lateral-line system follows Sanzo (1911) and Miller (1986). Besides the collected specimens, we also considered the underwater photos shot by J. Glampedakis during 2009 and 2010 as the record of confirmed species, in cases where species could be positively identified, i.e., where coloration characters and general shape characters were sufficient for species diagnosis.

## RESULTS

During the fieldwork on Crete from 4<sup>th</sup> to 8<sup>th</sup> October 2010 ten gobiid species were collected (Fig. 1). Seven of them are first species records for Crete. Additional three

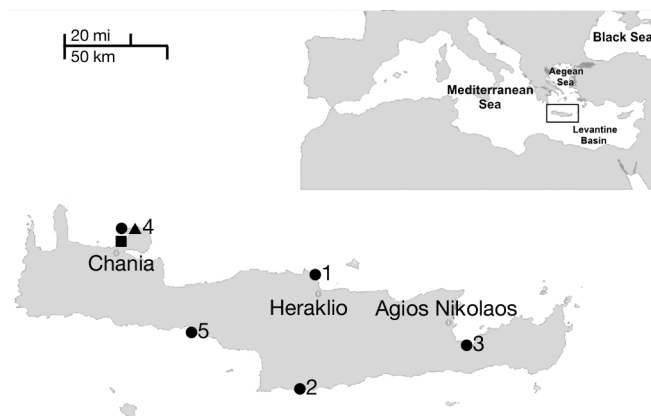


Figure 1. - Map of the Crete showing collecting localities and the new records from underwater photos: (●1) Mononaftis, Heraklio, (●2) Dytiko, Lendas, (●3) Moon Beach, Gournia, (●4) Mavromouri, Chania, (●5) Schinaria Beach, Plakias, (■) *Gobius auratus* and *Thorogobius ephippiatus*, (▲) *Gammogobius steinitzi*.

species, not previously recorded for Crete, were found on underwater photos shot by J. Glampedakis during 2009 and 2010 (Fig. 1). The checklist of gobies of Crete (Tab. I) contains the new findings from the present research and already published data.

### New records from the collected material

#### *Chromogobius zebratus* (Kolombatović, 1891)

##### Material examined

One female, 23.1 + 5.7 mm, PMR VP2485, Mononaftis, Heraklio, Crete (35°24'59"N, 25°1'7"E), 4 Oct. 2010, coll. M. Kovačić (Fig. 2); 1 juvenile of unidentified sex, 20.4 + 4.8 mm, PMR VP2493, Moon Beach, Pachia Ammos, Gournia, Crete (35°7'7"N, 25°46'48"E), 6 Oct. 2010, coll. M. Kovačić.

##### Diagnosis

(1) Suborbital papillae of lateral-line system without longitudinal row *a*; (2) anterior oculoscapular and preopercular canals present, posterior oculoscapular canal absent; (3) pelvic fins forming disc; (4) interorbital papillae absent; (5) transverse suborbital rows 7; (6) scales in lateral series 43 and 45.

##### Geographical and ecological data

This species was collected at two localities (Mononaftis and Pachia Ammos) along the north coast of Crete, the Sea of Crete. The specimens were collected from flat bottoms. At Pachia Ammos the specimen was hidden among cobbles and boulders surrounded with bedrock at the depth of 3.5 m. The specimen at Mononaftis was hidden in the patch of cobbles on sandy bottom at the depth of 12 m.

##### Remarks

*C. zebratus* is a small Mediterranean cryptobenthic gobiid species known from Cádiz Bay on Atlantic coast near the strait of Gibraltar to the Arsuz in Turkey, nearly the most eastern point of the Mediterranean Sea (Alberto and Nieto, 1993; Engin and Dalgıç, 2008). However, its findings are scattered across the northern part of the Mediterranean Sea with a large gap at the Ionian Sea and the west Aegean Sea, between the western and the eastern findings.

#### *Corcyrogobius liechtensteini* (Kolombatović, 1891)

##### Material examined

One juvenile of unidentified sex, 9.9 + 2.1 mm, PMR VP2495, Moon Beach, Pachia Ammos, Gournia, Crete (35°7'7"N, 25°46'48"E), 6 Oct. 2010, coll. M. Kovačić (Fig. 3); 1 juvenile of unidentified sex, 7.6 + 1.9 mm, PMR VP2496, Moon Beach, Pachia Ammos, Gournia, Crete (35°7'7"N, 25°46'48"E), 6 Oct. 2010, coll. M. Kovačić.

Table I. - The checklist of gobies of Crete. (+) positive records, (?) unconfirmed data.

Species	Present research	Published data	Personal communication
Positive records:			
1 <i>Aphia minuta mediterranea</i> De Buen, 1931	+ (collected 2010)	+ (Miller, 1986)	
2 <i>Chromogobius zebratus</i> (Kolombatović, 1891)	+ (collected 2010)		
3 <i>Coryrogobius liechtensteini</i> (Kolombatović, 1891)	+ (photographed 2009)		
4 <i>Gammogobius steintzi</i> Bath, 1971	+ (photographed 2010)	? (Miller, 1986)	? (observed F. Velte)
5 <i>Gobius auratus</i> Risso, 1810	+ (collected 2010)	+ (Ahnelt, 1984; Miller, 1986; Velte, 1994)	? (observed F. Velte)
6 <i>Gobius buccichi</i> Steindachner, 1870	? (observed 2010)	+ (Miller, 1986)	
7 <i>Gobius cobitis</i> Pallas, 1811	+ (collected 2010)		
8 <i>Gobius couchi</i> Miller & El-Tawil, 1974	+ (collected 2010)	+ (Miller, 1986)	? (observed F. Velte)
9 <i>Gobius cruentatus</i> Gmelin, 1789	+ (collected 2010)		
10 <i>Gobius fallax</i> Sarato, 1889	+ (collected 2010)		
11 <i>Gobius geniporus</i> Valenciennes, 1837	+ (collected 2010)	+ (Miller, 1986; Labropoulou & Papadopoulou-Smith, 1999)	? (observed F. Velte)
12 <i>Gobius niger</i> Linnaeus, 1758	+ (collected 2010)	+ (Miller, 1986)	? (observed F. Velte)
13 <i>Gobius paganellus</i> Linnaeus, 1758	+ (collected 2010)		
14 <i>Gobius vittatus</i> Vinciguerra, 1883	+ (collected 2010)		
15 <i>Millerigobius macrocephalus</i> (Kolombatović, 1891)	+ (collected 2010)		
16 <i>Pomatoschistus marmoratus</i> (Risso, 1810)	+ (collected 2010)		
17 <i>Thorogobius ephippiatus</i> (Lowe, 1839)	+ (photographed 2010)	+ (Miller, 1986)	? (observed F. Velte)
Unconfirmed data:			
? <i>Chromogobius quadrivittatus</i> (Steindachner, 1863)		? (Miller, 1986)	
? <i>Lesueurigobius friesii</i> (Malm, 1874)		? (Miller, 1986)	
? <i>Thorogobius macrolepis</i> (Kolombatović, 1891)	? (observed 2010)		
? <i>Zebrus zebrus</i> (Risso, 1826)			
? <i>Zosterisessor ophiocephalus</i> (Pallas, 1811)			? (observed F. Velte)

*Diagnosis*

(1) Suborbital papillae of lateral-line system without longitudinal row *a*; (2) anterior oculoscapular canal present, posterior oculoscapular and preopercular canals absent; (3) caudal fin rounded; (4) transverse suborbital rows 6 (last one with 1 papilla).

*Geographical and ecological data*

This species was collected on a single location (Pachia Ammos) on the north coast of Crete, the Sea of Crete. The specimens were hidden in crevices at the rough bottom with high bedrock, at the depth of 8 and 9 m.

*Remarks*

*C. liechtensteini* is a small Mediterranean cryptobenthic gobiid known from a few findings in the north-western Mediterranean and the Adriatic Sea (Ahnelt *et al.*, 1994, 1998). This is the first finding of *C. liechtensteini* outside its previously restricted distribution area.

***Gobius couchi* Miller & El-Tawil, 1974**

*Material examined*

One female, 41.2 + 10.3 mm, PMR VP2507, Schinaria Beach, Plakias, Crete (35°9'57"N, 24°25'17"E), 6 Oct. 2010, coll. M. Kovačić (Fig. 4).

*Diagnosis*

(1) Suborbital papillae of lateral-line system without longitudinal row *a*; (2) all three head canals present; (3) predorsal area scaled; (4) anterior oculoscapular canal with pore *α* at rear of orbit; (5) oculoscapular row *x*<sup>1</sup> not extending forwards to pore *β*; (6) scales in lateral series 41; (7) row *d* divided below row 3; (8) pelvic fin emarginated about 1/10 of the length; (9) pectoral fin count for both sides 16 and 17.

*Geographical and ecological data*

This species was collected on a single location (Schinaria Beach) on the south coast of Crete, the Lybian Sea. The specimen was collected from flat bottom, close to the foot of steep bedrock at the depth of 22 m. The sandy bottom was occasionally covered with scattered cobbles and poorly developed *Posidonia oceanica*.

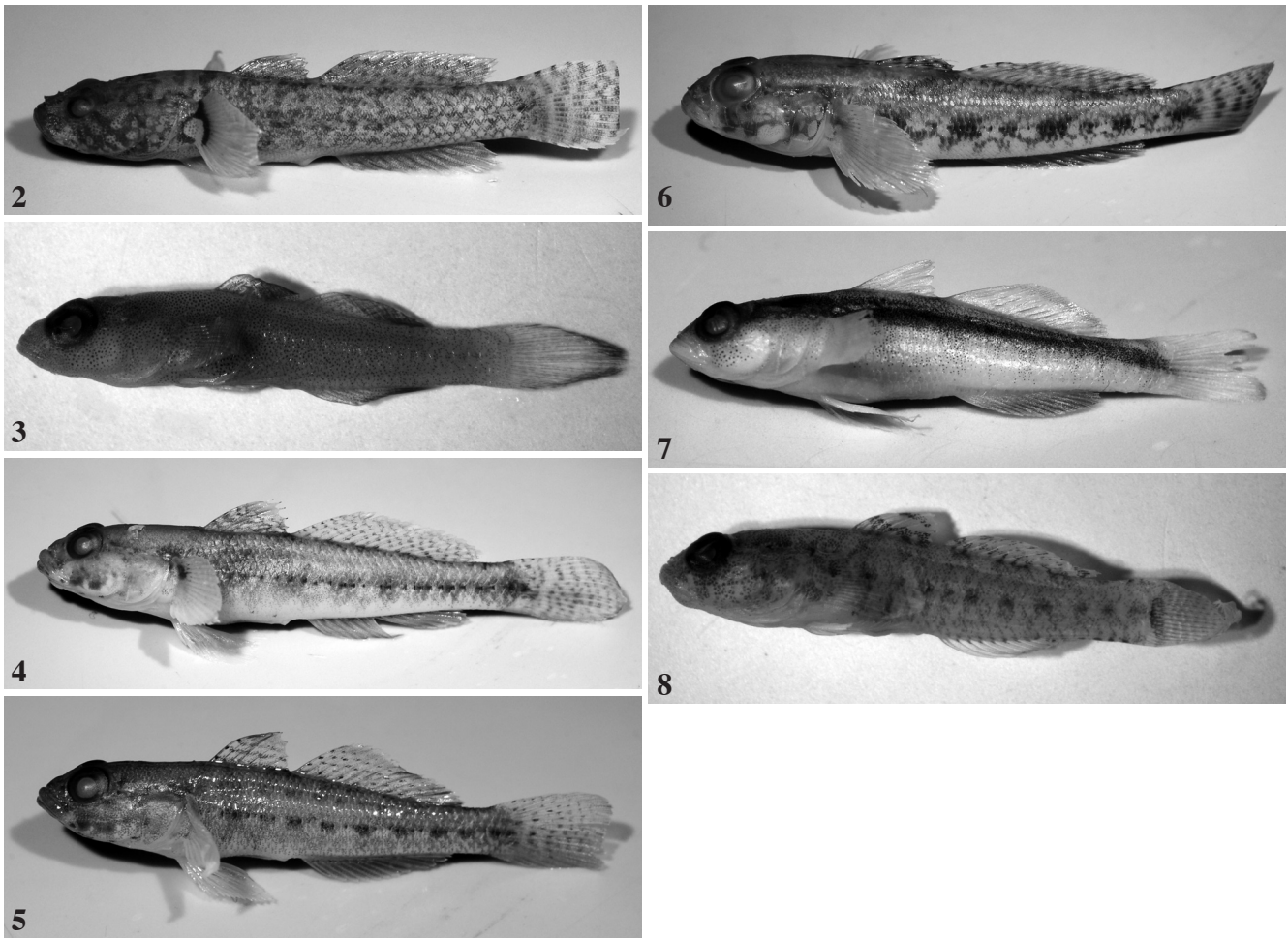


Figure 2. - *Chromogobius zebratus* (Kolombatović, 1891), preserved specimen, PMR VP2485, female, 23.1 + 5.7 mm, Mononaftis, Heraklio, Crete.

Figure 3. - *Corcyrogobius liechtensteini* (Kolombatović, 1891), PMR VP2495, juvenile of unidentified sex, 9.9+2.1 mm, Moon Beach, Pachia Ammos, Gournia, Crete.

Figure 4. - *Gobius couchi* Miller & El-Tawil, 1974, PMR VP2507, female, 41.2 + 10.3 mm, Schinaria Beach, Plakias, Crete.

Figure 5. - *Gobius fallax* Sarato, 1889, PMR VP2506, juvenile of unidentified sex, 34.8 + 6.7 mm, Schinaria Beach, Plakias, Crete.

Figure 6. - *Gobius geniporus* Valenciennes, 1837, PMR VP2489, male, 59.7 + 13.1 mm.

Figure 7. - *Gobius vittatus* Vinciguerra, 1883, PMR VP2499, female, 22.4 + 5.6 mm, Stavros, Mavromouri, Chania, Crete.

Figure 8. - *Millerigobius macrocephalus* (Kolombatović, 1891), juvenile of unidentified sex, 12.1 + 2.9 mm, PMR VP2501, Stavros, Mavromouri, Chania, Crete (Photos M. Kovačić).

#### Remarks

*G. couchi* is known from Atlantic localities in Great Britain and Ireland, and from several localities in the north and eastern Mediterranean (Liu *et al.*, 2009; Özen *et al.*, 2009; Šanda and Kovačić, 2009). However, these findings are scattered, with a large gap in the distribution between the Atlantic findings and the most western Mediterranean finding in the Ligurian Sea.

#### *Gobius fallax* Sarato, 1889

##### Material examined

Two juveniles of unidentified sex, 28.4 + 6.6 mm and 23.0 + 5.7, PMR VP2491, Dytiko, Lendas, Crete (34°55'42"N,

24°55'59"E), 5 Oct. 2010, coll. M. Kovačić; 1 juvenile of unidentified sex, 34.8 + 6.7 mm, PMR VP2506, Schinaria Beach, Plakias, Crete (35°9'57"N, 24°25'17"E), 8 Oct. 2010, coll. M. Kovačić (Fig. 5).

##### Diagnosis

(1) Suborbital papillae of lateral-line system without longitudinal row *a*; (2) all three head canals present; (3) predorsal area scaled; (4) anterior oculoscapular canal with pore  $\alpha$  at rear of orbit; (5) oculoscapular row  $x^l$  not extending forwards to pore  $\beta$ ; (6) scales in lateral series 42-44; (7) row *d* divided below row 3 or below rows 3 and 4; (8) V emarginated 1/4-1/5 of its length (vs 1/2-2/3 in *G. auratus*); (9)



preserved specimen with blotches along lateral midline (vs. *G. xanthocephalus* without blotches along lateral midline); (10) epibenthic behaviour (vs. hyperbenthic behaviour of *G. auratus*).

#### Geographical and ecological data

This species was found at two localities (Dytiko and Schinaria Beaches) on the south coast of Crete, the Lybian Sea. At Dytiko the specimen was collected from a gently sloping bottom combined of gravel, cobbles and boulders at the depth of 7 m. The specimen at Schinaria Beach was collected from a moderately sloping bottom where patches of sand were combined with bedrock covered with short tallus algae at the depth of 18 m.

#### Remarks

According to Miller (1986), *G. fallax* is known from several localities along the northern Mediterranean coast and from a single Atlantic location, Canaries. Recently it was also found in the Levant (Kovačić and Golani, 2007). *G. fallax* could be easily misidentified with two other dotted gobies from *G. auratus* species complex, *G. xanthocephalus* and the colour morph 2 of *G. auratus* (Herler et al., 2005).

#### ***Gobius geniporus* Valenciennes, 1837**

##### Material examined

Three males, 48.6 + 10.7 mm to 51.8 + 11.0 mm, PMR VP2486, Mononaftis, Heraklio, Crete (35°24'59"N, 25°1'7"E), 4 Oct. 2010, coll. M. Kovačić; 1 female, 44.8 + 10.5 mm, PMR VP2487, Mononaftis, Heraklio, Crete (35°24'59"N, 25°1'7"E), 4 Oct. 2010, coll. M. Kovačić; 2 males, 82.7 + 19.2 mm and 59.7 + 13.1 mm (Fig. 6), PMR VP2489, Dytiko, Lendas, Crete (34°55'42"N, 24°55'59"E), 5 Oct. 2010, coll. M. Kovačić; 2 males, 58.5 + 14.4 mm and 54.2 + 12.8 mm, PMR VP2494, Moon Beach, Pachia Ammos, Gournia, Crete (35°7'7"N, 25°46'48"E), 6 Oct. 2010, coll. M. Kovačić; 1 female, 66.9 + 17.2 mm and 1 male, 40.5 + 9.2 mm, PMR VP2498, Stavros, Mavromouri, Chania, Crete (35°35'16"N, 24°4'44"E), 7 Oct. 2010, coll. M. Kovačić; 1 juvenile of unidentified sex, 37.5 + 9.8 mm, PMR VP2504, Schinaria Beach, Plakias, Crete (35°9'57"N, 24°25'17"E), 8 Oct. 2010, coll. M. Kovačić.

#### Diagnosis

(1) Suborbital papillae of lateral-line system without longitudinal row *a*; (2) all three head canals present; (3) head and nape scaled; (4) anterior oculoscapular canal with pore  $\alpha$  at rear of orbit; (5) oculoscapular row  $x^l$  not extending forwards to pore  $\beta$ ; (6) more than fifty scales in lateral series; (7) pelvic disc truncate; (8) anterior-dorsal row *g* ends behind lateral end of row *o*.

#### Geographical and ecological data

This species was, together with *Gobius bucchichi* Steindachner, 1870, the most widespread goby found in Crete.

Both species were found at all five researched localities (three along the north coast of Crete, the Sea of Crete and two on the south coast of Crete, the Lybian Sea). The specimens of *G. geniporus* were observed on various bottoms: sand covered with *Caulerpa prolifera*, various combinations of mixed sandy and rocky bottoms, and on bottoms combined of gravel, cobbles and boulders. The depths varied from 7 to 22 m.

#### Remarks

*G. geniporus* is a common and moderately large Mediterranean goby previously known only along Mediterranean north coasts from the Balearic Islands to the Aegean Sea (Miller, 1986). Recently it was recorded also in the Levant (Kovačić and Golani, 2007).

#### ***Gobius vittatus* Vinciguerra, 1883**

##### Material examined

Two females, 22.4 + 5.6 mm (Fig. 7) and 21.2 + 4.8 mm, PMR VP2499, Stavros, Mavromouri, Chania, Crete (35°35'16"N, 24°4'44"E), 7 Oct. 2010, coll. M. Kovačić.

#### Diagnosis

(1) Suborbital papillae of lateral-line system without longitudinal row *a*; (2) all three head canals present; (3) predorsal area scaled; (4) anterior oculoscapular canal with pore  $\alpha$  at rear of orbit; (5) oculoscapular row  $x^l$  not extending forwards to pore  $\beta$ ; (6) scales in lateral series 34 and 36; (7) row *d* divided below row 3; (8) black longitudinal band along body and head.

#### Geographical and ecological data

This species was found on a single location (Stavros) on the north coast of Crete, the Sea of Crete. The specimens were collected from steep coralligenous bottom at 22 m depth. The species was present at patches of sand included in the bedrock with high rugosity and covered with calcareous algae.

#### Remarks

*G. vittatus* is a small epibenthic Mediterranean goby reported from the Alboran Sea to the Levant (Miller, 1986). The coloration of this species is unique among gobiid species in the CLOFNAM area (Miller, 1986), so it could be also positively identified in the habitat and proved by underwater photos. However, the other published findings are scattered along the north coast of Mediterranean (Kovačić and Arko Pijevac, 2008).

***Millerigobius macrocephalus* (Kolombatović, 1891)****Material examined**

Two juveniles of unidentified sex, 12.1 + 2.9 mm and 12.2 + 3.1 mm, PMR VP2501, Stavros, Mavromouri, Chania, Crete (35°35'16"N, 24°4'44"E), 7 Oct. 2010, coll. M. Kirinčić (Fig. 8).

**Diagnosis**

(1) Suborbital papillae of lateral-line system without longitudinal row *a*; (2) anterior oculoscapular and preopercular canals present, posterior oculoscapular canal absent; (3) pelvic fins forming disc; (4) interorbital papillae present; (5) scales in lateral series 28 in both specimens.

**Geographical and ecological data**

This species was found on a single location (Stavros) on the north coast of Crete, the Sea of Crete. The specimens were collected from the flat sandy bottoms occasionally covered with *Caulerpa prolifera*. They were hiding in a patch of cobbles at the depth of 12 m.

**Remarks**

*M. macrocephalus* is a small Mediterranean cryptobenthic gobiid known from the Mar Menor to the Levant (Bogorodsky *et al.*, 2010). However, the other published findings are scattered along the north coast of Mediterranean (Bogorodsky *et al.*, 2010).

**New records from photographed specimens*****Gammogobius steinitzi* Bath, 1971****Diagnosis**

Life coloration brownish yellow, with seven lateral vertical pale stripes, the first in front of caudal fin origin, the seventh beginning at the origin of the first dorsal fin; two more bands on predorsal area, and three bands on cheek spreading down from the eye.

**Geographical and ecological data**

The specimen was photographed (Fig. 9) at Mavromouri, Chania, Crete (35°34'43"N, 24°4'28"E) by J. Glampedakis on 26 Oct. 2009. The species was present at the entrance of a cave at the depth of 7 m.

**Remarks**

The coloration of this species is unique among Gobiidae in the CLOFNAM area (Miller, 1986; Kovačić, 1999). Submarine caves are typical habitats for this species (Miller, 1986; Kovačić, 1999). *G. steinitzi* is a small Mediterranean cryptobenthic gobiid known from a few findings in the north-western Mediterranean and the Adriatic Sea (Kovačić, 1999). The present result represents the first finding of *G. steinitzi* outside its previously restricted distribution.



Figure 9. - *Gammogobius steinitzi*, underwater photograph, Mavromouri, Chania, Crete (J. Glampedakis).

Figure 10. - *Gobius auratus*, underwater photograph, Agios Onoufrios, Chania, Crete (J. Glampedakis).

Figure 11. - *Thorogobius ephippiatus*, underwater photograph, Agios Onoufrios, Chania, Crete (J. Glampedakis).

***Gobius auratus* Risso, 1810****Diagnosis**

The life coloration is uniformly canary yellow, without rows of spots along head and body and without lateral midline blotches.

*Geographical and ecological data*

The specimen was photographed (Fig. 10) at Agios Onoufrios, Chania, Crete (35°34'39"N, 24°3'52"E) by J. Glampedakis on 14 Nov. 2010. The species was present near a cave on a rocky gravel bottom at the depth of 28 m.

*Remarks*

The uniformly yellow colour morph of *G. auratus* is one of the two colour morphs of this species according to Herler *et al.* (2005). This colour morph 1 of *G. auratus* has a uniformly yellow coloration unique among all known species of family Gobiidae in the CLOFNAM area (Miller, 1986; Herler *et al.*, 2005). The other colour morph of this species, colour morph 2, has distinct longitudinal lines of red dots on basic yellow body coloration and it is similar in appearance to *G. xanthocephalus* Zander & Heymer, 1992. The preferred behaviour of both colour morphs is hovering close to the bottom (Fig. 10), contrary to most Mediterranean benthic gobies that lie at the sea bottom (Herler *et al.*, 2005). According to Herler *et al.* (2005), the uniformly yellow colour morph of *G. auratus* was reported for the central Adriatic Sea and the western Mediterranean. The present record extends the known distribution of this morph and of *G. auratus* species. However, Miller (1986) marked on the map a record of uniformly yellow goby from Israel, using then valid name *Gobius luteus* Kolombatovići, 1891 for probably the same taxon. The other colour morph of *G. auratus*, the dotted colour morph 2, is distributed in the northern Adriatic Sea (Herler *et al.*, 2005).

***Thorogobius ephippiatus* (Lowe, 1839)***Diagnosis*

The head and body whitish with large dark brown blotches.

*Geographical and ecological data*

The specimen was photographed (Fig. 11) at Agios Onoufrios, Chania, Crete (35°34'39"N, 24°3'52"E) by J. Glampedakis on 2 May 2010. The species was found in a cave on sandy bottom at the depth of 26 m.

*Remarks*

The coloration of this species is unique among Gobiidae in the CLOFNAM area (Miller, 1986). In the Mediterranean, typical habitats for this species are submarine caves, and deep crevices, where it usually occurs lying on soft sediment (Schultz, 1975). *T. ephippiatus* is a widespread goby known from the eastern Atlantic and the north Mediterranean, with the most eastern finding in the Aegean Sea (Miller, 1986). However, these findings are scattered with a large gap in the distribution between the Atlantic findings and the most western Mediterranean finding at Corsica (Miller, 1986). The record from Crete represents the most southern Mediterranean record of this species.

**DISCUSSION**

Published data on gobies distribution around the island of Crete are scarce. Ahnelt (1984) listed the specimens from Crete among the material of *G. bucchichi* kept in the collection of Naturhistorische Museum Wien. In his checklist of gobies of the CLOFNAM area, Miller (1986) marked Crete as a confirmed distribution area for seven gobiid species, mentioning Crete as possible distributional area for another five species (Tab. I). In the checklist of marine fishes of Greece by Papakonstantinou (1988) only one gobiid species, *G. bucchichi*, was listed for Crete, based on Ahnelt (1984) data. Velte (1994) in his paper on *G. bucchichi* also listed the species distribution localities at Crete. The study of feeding habits of four fish species from Iraklion Bay by Labropoulou and Papadopoulou-Smith (1999) included one gobiid species, *Gobius niger* Linnaeus, 1758. The checklist presented in this paper increases the number of confirmed records of gobiid species found in Crete from 7 to 17 species (Tab. I). The records of *C. liechtensteini* and *G. steinitzi*, from the north coast of Crete are the first findings of these species for the Aegean Sea and for the entire eastern Mediterranean (Kovačić and Patzner, 2011).

Five more gobiid species are listed in the checklist as not confirmed (Tab. I). For three of these species, *C. quadrivittatus*, *L. friesii* and *Z. zebrus*, Crete was marked on maps as a possible distribution area by Miller (1986). F. Velte (pers. comm.) provided a list of his observations of gobies from Crete from his diving excursions in 1993–2010. The list included eight identified species. Unfortunately, these observations were accompanied by no material records (specimens or photos). Among them, *Z. ophioccephalus* remains an unconfirmed species (Tab. I). It was observed by F. Velte (pers. comm.), in the estuary area of a big creek near the Gerani bridge at the north coast of Crete, in 1998 and 1999. The last observed but unconfirmed species is *Thorogobius macrolepis* (Kolombatović, 1891). It was observed but not collected by one of the authors (MK), at Mavromouri, Chania, on 7 Oct. 2010. The specimen of *T. macrolepis* occurred in a semi cave on steep bedrock at 22 m.

There is only one comparable published checklist of gobies for islands or marine areas of similar size in the Mediterranean. Miller (1977) recorded nine gobiid species from Rhodes. However, the entire northern east part of the Mediterranean, with 40 recorded species, shows a much higher gobiid biodiversity compared to Miller (1977) and the present data, (Özen *et al.*, 2009; Šanda and Kovačić, 2009; Kovačić and Patzner, 2011). Hence, it could be expected that the actual gobiid biodiversity in Crete is much higher than the presently known 17 species. The same conclusion was given by Miller (1977) for the actual diversity of gobiid fauna from Rhodes. In addition, the soft sediment bottom, which is the habitat of many Mediterranean gobies and of



five Lessepsian gobiid species already recorded elsewhere in the south-eastern Mediterranean (Bilecenoglu *et al.*, 2008) is difficult to be explored by SCUBA diving. Therefore it is foreseeable that future search for gobies in various habitats using adequate collecting method (the beach seine for soft sediment bottom at sandy beaches and river mouths, SCUBA diving with handnet and anaesthetic at the infralittoral bottoms, trawling on deeper soft sediment bottoms) would confirm a higher diversity of gobiid species in Crete.

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