

Short note/Kurze Mitteilung

First record of the clingfish *Apletodon dentatus* (Gobiesocidae) in the Adriatic Sea and a description of a simple method to collect clingfishes

Erster Nachweis des Schildfisches *Apletodon dentatus* (Gobiesocidae) in der Adria und eine Beschreibung einer simplen Fangmethode für Schildfische

Simon Brandl¹, Maximilian Wagner¹, Robert Hofrichter² & Robert A. Patzner²

¹University of Innsbruck, Technikerstr. 15, 6020 Innsbruck, Austria; s.j.brandl@gmx.de;

²University of Salzburg, Hellbrunnerstr. 34, 5020 Salzburg, Austria.

Zusammenfassung: Zwei Exemplare der Schildfischart *Apletodon dentatus* (Facciola, 1887) wurden in der Bucht von Sv. Petar auf der Insel Krk (nördliche Adria, Kroatien) gefangen. Dies ist der erste Nachweis dieser Art in der Adria. Eine einfache und effektive Methode Schildfische zu fangen, besteht darin, Teller umgekehrt auf das Substrat zu legen. Diese werden von den Schildfischen als Höhle angenommen.

Clingfishes (Gobiesocidae) are small cryptobenthic fishes, characterized by a scaleless and flattened body, an adhesive sucking disc at the ventral body surface and the absence of a swim bladder. There are currently eight species known in the Mediterranean Sea: *Apletodon dentatus* (Facciola, 1887), *Apletodon incognitus* (Hofrichter & Patzner, 1997), *Diplecogaster bimaculata* (Bonnaterre, 1788), *Gouania wildenowi* (Risso, 1810), *Lepadogaster candollei* (Risso, 1810), *Lepadogaster lepadogaster* (Bonnaterre, 1788), *Lepadogaster purpurea* (Bonnaterre, 1788) and *Opeatogenys gracilis* (Canestrini, 1864) (HOFRICHTER 1995, PATZNER & MOOSLEITNER 2003, 2010). In the Kvarner area (northern Adriatic Sea), only *G. wildenowi*, *L. candollei* and *L. lepadogaster* were found up to now (KOVAČIĆ 1997). *A. dentatus* has its main distribution around Great Britain and is a rare species on the Atlantic coasts of France, Spain and Portugal as well as in the Mediterranean Sea (HOFRICHTER & PATZNER 2000) (fig. 1).

As for many other small cryptobenthic fish-species, the knowledge of the distribution of Mediterranean gobiesocids is very poor. This is due to their small size, their hidden way of life, their perfect camouflage and also the small number of ichthyologists working on this family. As it is nearly impossible to catch clingfishes

with common methods like nets and baited traps, a simple but effective collecting method was developed.

To examine the occurrence of clingfish species, the bay Sv. Petar at the island of Krk, Croatia, (fig. 1) was chosen as it provides many different habitats, including a sandy bottom, a sea grass meadow (*Cymodocea nodosa*), a rocky slope with different kinds of brown algae and a rocky ground with pebbles and stones. To catch the clingfishes, hand-nets were used as well as a dredge to search in the sea grass in July and August 2010. Furthermore, clove-oil was used to anaesthetize fish in the field. All kinds of flat objects lying on the ground were lifted and examined to obtain an overview over the present clingfish-fauna. Furthermore, a new technique was performed: 55 common table plates of different size and colour (black and white, large and small, deep and flat) were left upside down on the substrate in different depths and habitats. Hence a small cave was formed below the plates. The plates were left underwater for 6 days with examination and catching of clingfishes every second day, resulting in a total of 495 examinations. Clingfishes were put into plastic bottles to bring them to the shore and identify the species. Identification was performed using

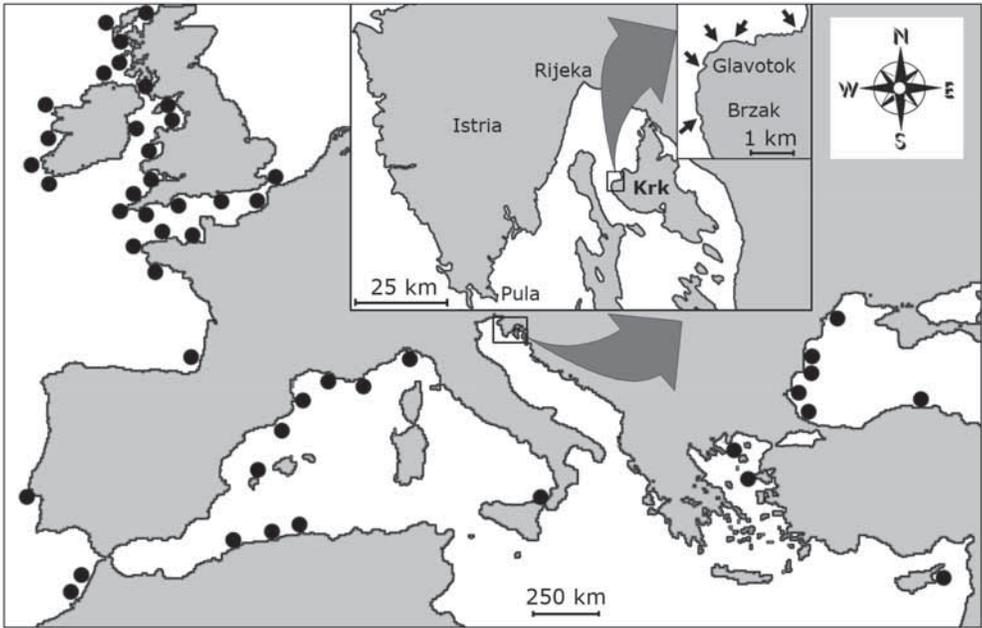


Fig. 1: Distribution of *Apletodon dentatus* (data from, GONÇALVES et al. 2002, BAT et al. 2006, HOFRICHTER unpublished). Area of investigation (insert: arrows).

Abb. 1: Verbreitung von *Apletodon dentatus* (Daten von GONÇALVES et al. 2002, BAT et al. 2006, HOFRICHTER unpubliziert). Das Untersuchungsgebiet (Einsatz, Pfeile).

morphological features and meristic data (total length, standard length, head length, head width, ventral disc length, ventral disc width, eye diameter, interorbital distance).

Sampling was done by SCUBA diving in cooperation with the dive center “Correct-Diving”, Glavotok, Krk. Samples of *Apletodon dentatus* were fixed in 96% ethanol and are stored partly at the Bavarian State Collection of Zoology (Zoologische Staatssammlung München) and partly at the Natural History Museum in Rijeka (Prirodoslovni Muzej Rijeka).

The table plates in different habitats were inhabited by *Diplecogaster bimaculata*, *Lepadogaster candollei* and in a single case probably also by *A. dentatus* (tab. 1). A total of 18 clingfishes were observed or caught during the 495 observations. Small deep plates (cup shaped, diameter 15 cm) were not settled at all. Plates of middle (25, 28 cm) and large (35 cm) size were both settled, as well as flat or deep plates without significant difference. It was clearly shown that *L. candollei* only inhabited black plates, independent of size

and shape (tab. 1). The plates were frequently occupied by different species of gobies (Gobiidae) which were also found to use the plates as a spawning substrate. Furthermore, the plates were occasionally occupied by blennies (Blenniidae).

One *A. dentatus* was caught under a flat stone in the sea grass meadow (depth 9 m) while another one was found in the rocky area with brown algae (depth 5.7 m). Both were of male sex. Before fixation they had a total length (TL) of 41 mm and 47 mm, respectively. The number of lachrymal pores was three, mandibular canals were absent and the anal papilla was visible and remarkable. Anal and dorsal fin started at the same distance from the head. There was one row of papilla on both sides of the sucking disc (fig. 2). According to HOFRICHTER (unpublished), those features as well as the meristic data that was taken after fixation clearly identifies the specimens as *Apletodon dentatus* (tab. 2).

Although the micro-habitats of the eastern Atlantic and Mediterranean clingfishes are most-

Tab. 1: Collecting success of table plates used as traps for clingfishes. Colour: black (b) and white (w), shape: deep (d) and flat (f).

Tab. 1: Fangerfolg von Tellern als Reusen für Schildfische. Farbe: schwarz (b) und weiß (w), Form: tief (d) und flach (f).

Area				Table plates			Fish		
Locality	Date	Habitat	Depth (m)	Colour	Diameter (cm)	Shape	Species	TL (mm)	Sex (m/f)
Sveti	27.07.	phytal/rock	8	b	28	d	<i>L. candollei</i>	44	f
Petar		sand/grass	13	w	25	d	<i>D. bimaculata</i>	27	f
		sea grass	9	b	35	f	<i>D. bimaculata</i>	31	m
		sand/grass	8	b	28	d	<i>D. bimaculata</i>	25.5	f
		sand/grass	8	w	25	d	<i>D. bimaculata</i>	26.5	m
		sand	8	b	35	f	<i>D. bimaculata</i>	24	f
	29.07.	phytal/rock	8	b	28	d	<i>L. candollei</i>	49	m
	sand/grass	8	b	28	d	<i>D. bimaculata</i>	28	m	
	sand/grass	8	w	25	d	<i>D. bimaculata</i>	30	m	
31.07.	phytal/rock	6	b	28	d	<i>A. dentatus?</i> *	?*	?*	
	sand	8	w	35	f	<i>D. bimaculata</i>	21	m	
Bujina	03.08.	pebbles	5	b	28	f	<i>L. candollei</i>	60	m
		sand	17	w	35	f	<i>D. bimaculata</i>	27	m
	05.08.	phytal/rock	6	b	28	d	<i>L. candollei</i>	51	f
		sand	17	w	35	f	<i>D. bimaculata</i>	28	m
	07.08.	sea grass	10	w	35	f	<i>D. bimaculata</i>	24.5	m
		sand	17	w	25	d	<i>D. bimaculata</i>	21	f
Lokva	16.08.	sea grass	10	b	35	f	<i>D. bimaculata</i>	22	m

*fish escaped

ly well known (HOFRICHTER & PATZNER 2000, GONÇALVES et al. 2002), the distribution areas of some species are not clear up to now. *A. dentatus* is a very rare species in the Mediterranean region (see fig. 1). It was recently found on the central Black Sea coast of Turkey for the first time (BAT et al. 2006). There is also only poor knowledge about the population structure of *A.*

Tab. 2: Meristic data (mm) taken on fixed individuals of two *Apletodon dentatus* caught at the island of Krk.

Tab. 2: Meristische Daten in mm gemessen an fixierten Individuen von zwei *Apletodon dentatus* gefangen bei der Insel Krk.

measurements	<i>Apletodon dentatus</i> 1	<i>Apletodon dentatus</i> 2
total length	33.6	39.3
standard length	27.8	32.9
head length	5.2	11.8
head width	9.2	8.5
ventral disc length	8.0	9.4
ventral disc width	6.6	6.2
eye diameter	2.2	2.6
interorbital distance	3.4	4.1

dentatus. Abundances of 10 to 20 specimens as they are known for *Gouania wildenowi*, *Lepadogaster candollei* or *Lepadogaster lepadogaster* (HOFRICHTER unpublished) have never been observed in the present studies, whereas GONÇALVES et al. (2002) referred about this, however, at the Atlantic coast of Portugal. Former investigations and the present study show that Mediterranean *A. dentatus* prefer to live at the boarder of rocky ground to the phytal with brown algae and also near sea grass. Further studies may show if this species is different from other Mediterranean species concerning the cumulative occurrence during its spawning season. The rare findings of this species and the possible mix-up with other species (*Apletodon incognitus*, *Diplecogaster bimaculata*) seem to be the reason for the missing evidence of *A. dentatus* in the Adriatic Sea so far and also for the very few descriptions in the literature. It is easier to find this species in the Atlantic Ocean, where *Saccorhiza polyschides*, a preferred habitat of *A. dentatus*, is common

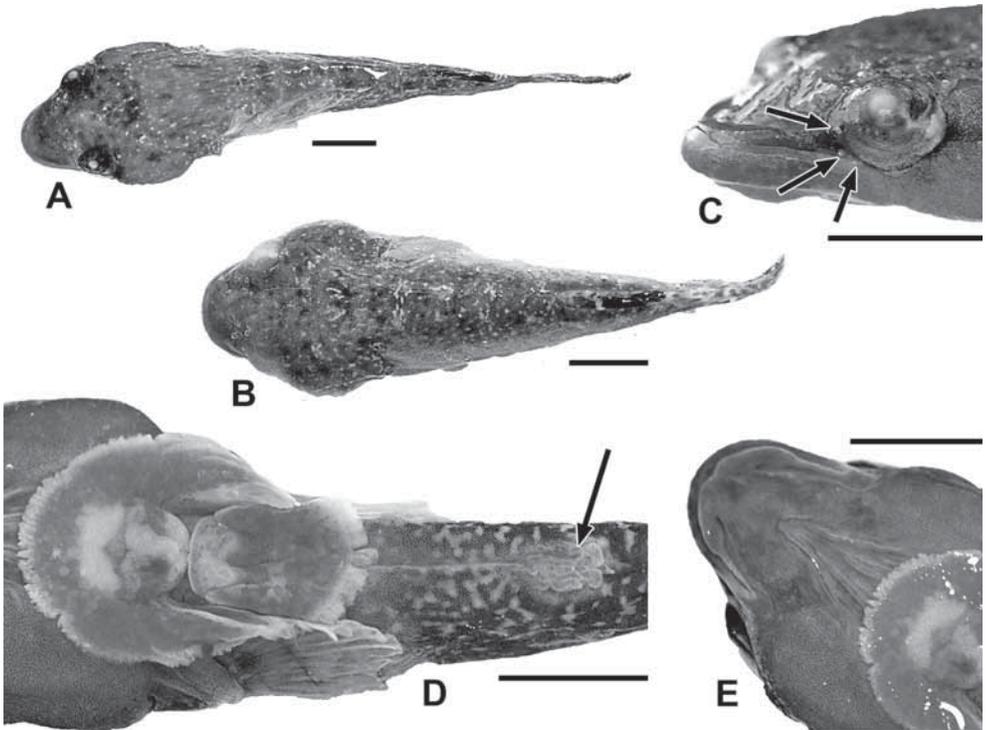


Fig. 2 A-E: *Apletodon dentatus*. **A** Male 1. **B** Male 2. **C** Three lachrymal pores (arrows). **D** Sucking disc and anal papilla (arrow). **E** Note absence of mandibular canals (all *Apletodon dentatus* 1). Bar: 5 mm each.

Abb. 2 A-E: *Apletodon dentatus*. **A** Männchen 1. **B** Männchen 2. **C** Drei Lachrymal-Poren (Pfeile). **D** Saugscheibe und Analpapille (Pfeil). **E** Man beachte das Fehlen der Mandibularkanäle (alle *Apletodon dentatus* 1). Balken: jeweils 5 mm.

(HOFRICHTER & PATZNER 2000, HOFRICHTER et al. 2000, GONÇALVES et al. 2002).

A. dentatus is not only posing questions concerning its biology but also about its taxonomic position. This applies in general for the relations between Eastern-Atlantic and Mediterranean clingfishes, which were consolidated as Lepadogastrinae by BRIGGS (unpublished). After the description of *A. incognitus* by HOFRICHTER & PATZNER (1997) two more species of *Apletodon* have been discovered: *A. wirtzi* (FRICKE 2007) and *A. barbatus* (FRICKE et al. 2010), again highlighting the scarce knowledge about this genus.

HOFRICHTER (unpublished) observed that especially *D. bimaculata* and *L. candollei* prefer anthropogenic structures with a smooth inner surface for spawning. This is probably due to their fondness for empty shells as a spawning

substrate and led to the idea to use dining plates as an imitation of empty shells and thus attract *D. bimaculata* and other clingfish species. However, the question arises, why the fishes preferred large plates over the smaller, more shell-like structure of the small cup-shaped plates. We presently lack a clear explanation for this behaviour although it seems likely that the depth of a structure is a more significant factor than the diameter, as large plates were occupied frequently.

Nevertheless, more research is needed to further elucidate the biology and ecology of *A. dentatus* and other clingfishes. Together with visual search under flat objects as well as the use of anaesthetics the described method might help to increase our knowledge about these cryptobenthic species.

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