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THE SYSTEMATIC STATUS OF THE EUROPEAN GOBIID
FISHES *CABOTICHTHYS SCHMIDTI* (DE BUEN) AND *GOBIUS*
ASSOI DE BUEN, WITH A NEW RECORD FROM THE
ADRIATIC SEA

INTRODUCTION

Four species of gobies (Teleostei: Gobiidae) have been regarded as characteristic inhabitants of marine areas in the Mediterranean where the sea bed is composed predominantly of nodules of calcareous algae (*Lithothamnion*, *Lithophyllum*) in depths of from 25-60 m. Further details of this type of deposit and its biota are given by DE BUEN (1940), who uses the Spanish term «cascajo» for this type of ground (in Italian, «fondo coralligeno»). The gobiids obtained exclusively from such habitats are the two diminutive species of *Odondebuenia* De Buen 1930, *O. balearica* (Pellegrin & Fage 1907) and *O. pruvoti* (Fage 1907), in which the pelvic fins are almost entirely separate, together with the monotypic *Cabotichthys schmidti* (De Buen 1930) and *Gobius assoi* De Buen 1936, in both of which the pelvic fins are incompletely united in the midline and the anterior pelvic membrane is either weakly developed or entirely absent (DE BUEN 1930, 1936, 1940). The last two forms are known only from unique holotypes, both taken in the western Mediterranean, *C. schmidti* from the Bay of Palma, Mallorca, and *G. assoi* from near Melilla on the Moroccan coast. *Odondebuenia*, however, has been found over a wide area of distribution, both species having been taken in the western Mediterranean (PELLEGRIN & FAGE, 1907; FAGE, 1907; DE BUEN, 1930, 1940) and on the Atlantic coast of Morocco (DOLLFUSS, 1955), and *O. balearica* being recorded also from the Aegean Sea (FAGE, 1918).

While examining the collection of European gobiid fishes in the Museo Civico di Storia Naturale, Genoa, the present author discovered that three specimens labelled «*Gobius minutus*. Is. Curzola (Dalmazia). Violante» (CE 32009) actually included an example of *Gobius assoi*, a

female of standard length 33.5 mm, together with one *G. niger* L. and one *G. fallax* Sarato. As well as providing a record of *G. assoi* from the Adriatic, the additional specimen of this rare species has facilitated a comparison with the description of *Cabotichthys schmidti*, in continuation

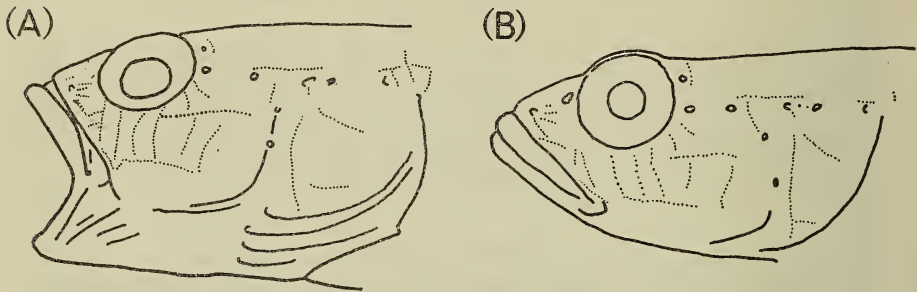


Fig. 1 - Arrangement of sensory papillae and canal-pores on head of (A) *Gobius assoi* (after DE BUEN, 1936), and (B) *Cabotichthys schmidti* (after DE BUEN, 1930).

of an earlier suggestion (MILLER, 1963) that the latter goby is in fact nothing more than a species of *Gobius*. The considerable resemblances between the two taxa include diagnostic features of special importance in the systematics of the last named genus. As well as possessing the same radial formulae (D_1 , VI; D_2 I/14; A, I/13; P, 20) and virtually identical scale counts in lateral series (*C. schmidti*, 50; *G. assoi*, 51-52), the two species have in common, among the pattern of sensory papillae on the head (fig. 1), a continuous horizontal segment in row *d*, upper origins of suborbital rows 2 and 3 close to border of orbit, anterior extension of longitudinal row *b* towards row 4, and extension of oculo scapular row x^1 to cephalic lateral line pore β . They also agree in the squamation of the nape and breast, partial separation of the pelvic fins, the relatively large eyes, and other body proportions. Important differences between the descriptions of *C. schmidti* and *G. assoi* comprise the separation in dorsal midline of occipital rows *o* in *C. schmidti* (these being united in the other species), the occurrence of scales on the opercle in *G. assoi* and their absence in *C. schmidti*, and the condition of the anterior pelvic membrane, which was stated to be very delicate in *G. assoi* and entirely lacking in *C. schmidti*. The Adriatic specimen, identified by the present author as *G. assoi*, resembles closely DE BUEN's description of this species, except that rows *o* are almost but not quite confluent (see fig. 2) and that no scales are discernable on the opercle.

The pelvic fins resemble those of *G. assoi* in being joined by an anterior membrane between the spinous rays, although this is reduced to a thin membranous connection linking the bases of these rays, and the degree of union between the innermost branched rays of each fin is similar to that illustrated for *C. schmidti* (DE BUEN, 1930, fig. 7). Study of the Adriatic specimen thus suggests that the only objection to regarding *C. schmidti* as identical with *G. assoi* lies in the possible difference between them in opercular squamation. DE BUEN (1936) infers that the opercular scales in the holotype of *G. assoi* could be easily overlooked, as they may have been in *C. schmidti*. There is certainly no trace of them in the Adriatic example, even when a piece of opercular skin was mounted and examined under a monocular microscope, but it should be noted that this specimen is much smaller than either of the two holotypes involved and may not have developed such scales before capture. There is also the possibility of individual variation in this character - in a series of fifteen Adriatic *Gobius niger* (taken from a larger collection (CE 12628) also at Genoa and labelled «*Gobius geniporus*. Lagosta, Dalmazia, 1880. Violante») two examples were found to have scales in the upper anterior corner of the opercle which is usually naked in this species. Under the present circumstances, therefore, it would not appear unreasonable to unite the two species, *C. schmidti* and *G. assoi*, and to regard the occurrence of minute opercular scales in one, and their apparent absence in the other, as due to oversight or individual variation. Since there is no doubt that the species so recognised belongs to the genus *Gobius*, the correct specific name becomes *Gobius schmidti* (De Buen 1930), with *G. assoi* De Buen 1936 as a junior subjective synonym. A synonymy, redescription, and discussion of affinities for *G. schmidti* may now be given:

***Gobius schmidti* (De Buen 1930)**

Cabotia schmidti De Buen, 1930, p. 17, figs. 5-8 (type locality Bahia de Palma, Mallorca; 39° 35' N, 2° 39' E); 1931, pp. 50, 61; 1935, p. 131; Lozano y Rey, 1960, p. 38, figs. 17 and 18.

Gobius assoi De Buen, 1936, p. 237, figs. 1 & 2 (Melilla, Morocco; 35° 17' N, 2° 57' W).

Cabotichthys schmidti Whitley, 1940, p. 242 (*Cabotichthys* nom. nov., type species *Cabotia schmidti* De Buen 1930, proposed to replace *Cabotia* De Buen 1930, preoccupied among Lepidoptera).

Fagea schmidti De Buen 1940, p. 9 (*Fagea* nom. nov. proposed to replace *Cabotia* De Buen 1930, preoccupied among Lepidoptera).

Material. The following description is based chiefly on a female, standard length 33.5 mm, from the Adriatic island of Korčula

(Curzola), Yugoslavia (42°56' N, 16° 55' E), taken during the cruise of the «Violante» and now in the collection of the Museo Civico di Storia Naturale, Genoa, CE 32009 (part). Although part of the Violante material, this specimen (identified on its label as «*Gobius minutus*») is not mentioned by VINCIGUERRA (1883) in his account of the ichthyological results of the expedition. In certain places, data from the original descriptions of *Cabotia schmidti* and *Gobius assoi* have been specifically mentioned, where these differ from or augment observations on the Adriatic specimen.

General description. Body moderately elongate, laterally compressed; in standard length, depth at origin of pelvic fin 5.6, at origin of anal fin 6.1, of caudal peduncle before origin of caudal fin 10.3. In standard length, horizontal length of head (snout to upper origin of opercle) 3.55, maximum width (between upper origins of opercles) 8.0. Horizontal distance from tip of snout to origin of first dorsal fin 2.3, to origin of second dorsal fin 1.8, to anus 1.75, to origin of anal fin 1.7, to origin of pelvic fin 3.05, all in standard length. Caudal peduncle (end of anal fin base to origin of caudal fin) horizontal length 5.25, depth 1.95 in own length. In head length, snout 5.3, eye 2.45 (to 4.0 in *G. assoi*), postorbital length 1.9, cheek depth 5.3; eye and cheek direct, rest horizontal measurement. Interorbital width 13.0 in eye length. Snout much shorter than eye, with moderately oblique convex profile and narrow lateral preorbital area, somewhat wider than upper lip; anterior nostril tubular, not reaching upper lip, with oblique orifice whose posterior rim is drawn into small triangular lappet; posterior nostril pore-like. Eyes large, with very narrow interorbital space. Postorbital region with horizontal profile; dorsal axial musculature extending over cranium to behind eyes, with or without a longitudinal median furrow. Mouth oblique, jaws subequal, with posterior angle below middle of eye. Branchiostegous membrane attached along entire lateral margin of isthmus forwards from immediately anterior to pectoral origin. Tongue truncate, rounded laterally with slight median emargination.

Otoliths: not examined.

Teeth. Each jaw with outer row of caniniform teeth separated by band of villiform teeth from inner row of slightly smaller caniniform teeth. No lateral or upper median canine teeth. Pharyngeal teeth not examined, but in *G. assoi* reported to occur in two dorsal and a median ventral patch of pointed teeth.

F i n s . First dorsal fin VI; second dorsal fin I/14; anal fin I/13 (terminal bifid ray of second dorsal and anal fin counted as one); caudal fin (branched rays) 13; pectoral fins 20; pelvic fins I/5 + I/5. In standard length, first dorsal base 10.45, second dorsal base 3.55, anal base 4.85, caudal fin length 6.7 (for *G. assoi*; damaged in Adriatic specimen), pectoral fin length 4.15, pelvic fin length (to tip of fourth branched ray) 4.7. First dorsal fin arises opposite anterior quarter of pectoral fin, last ray just behind middle of pectoral fin. In standard length, first dorsal rays 7.0, 6.1, 6.45, 7.45, 8.0, 13.4 respectively, with third, fourth, and fifth rays reaching to origin of second dorsal fin. Interdorsal space present, total length (between last ray of first dorsal and first ray of second dorsal) 13.4 in standard length, with four-fifths occupied by posterior membrane of first dorsal fin. Second dorsal fin commences slightly in advance of anus, with last ray behind vertical of last anal ray. In standard length, second dorsal rays 8.38 (spinous), 6.7 (first branched), 7.15 (fifth branched); last ray damaged in Adriatic specimen. Posterior tip of second dorsal fin extends over halfway to vertical of caudal fin base. Anal fin commences below anterior end of second dorsal fin; last ray arises below interspace of eleventh and twelfth branched rays of second dorsal fin. In standard length, anal rays 11.95 (spinous), 9.55 (first branched), 8.15 (fourth branched), 11.55 (last). Caudal fin less than head length (in both *Cabotia schmidti* and *G. assoi*), probably rounded. Pectoral fin reaching back to below origin of second dorsal fin and above anus; uppermost pectoral rays not separated from membrane except perhaps at their tips. Pelvic fins united for about half to perhaps entire length (in *G. assoi*) of innermost (fifth) branched ray of each fin, but posterior margin of resulting pelvic disc distinctly emarginate, with fourth branched ray of each fin about one ninth longer than fifth ray and reaching anus; anterior transverse membrane of pelvic disc present but narrow and delicate, connecting bases of spinous rays (in Adriatic specimen and probably *G. assoi*); it may sometimes be absent, as noted for *C. schmidti*.

S c a l e s . Complete coverage of ctenoid scales over body; scales also present over entire predorsal and postorbital regions, pectoral lobes, and breast; reported from upper opercle in *G. assoi*. 50-53 scales in lateral series, 15-16 in transverse series (from anterior end of second dorsal fin to anal fin), about 30 in predorsal series (from origin of first

dorsal fin to anterior angle of postorbital area). Terminal scales on caudal peduncle without greatly elongate lateral ctenii.

Vertebrae: not examined.

Coloration. No record of coloration in life for *C. schmidti* or *G. assoi*; Adriatic specimen, preserved for over eighty years, is pale brown, with melanophores extending to ventral edge of body and forming blotches on the lateral midline, especially one below first dorsal fin, four below second dorsal fin, one midway along caudal peduncle, as well as short longitudinal mark across base of caudal fin; no abdominal markings. Cheeks with more or less uniformly distributed melanophores, with some ventral clear areas. Traces of dark pigment associated with sensory papillae rows of anterior dorsal series, posterior section of row x^1 , and row z . Fin coloration not determined, but darker areas in upper and lower corners of pectoral origin.

Lateral-line System (fig. 2). Terminology used is that of SANZO (1911); numbers of papillae in each row given in parentheses, where possible for left and right sides respectively.

(a) Cephalic canals. Anterior and posterior oculoscapular, and preopercular, canals present, with pores σ , κ , ω , α , β and ρ ; ρ^1 and ρ^2 ; and γ , δ and ϵ respectively.

(b) Sensory papillae (i) Preorbital. Median series (fig. 2 B) in five rows, posterior r^1 (4,4) and r^2 (4,3) and anterior s^1 (4,2), s^2 (6,6) and s^3 (2). Lateral series (fig. 2 A) in three parts: superior c^2 in two longitudinal rows, upper (3) and lower (4); middle with horizontal row, c_2 (4) and vertical tract of three more or less oblique rows, c^1 (18); and inferior with row c_1 (4,4).

(ii) Suborbital (fig. 2 A). No infraorbital row *a*. Six transverse suborbital rows, 1 to 6, all arising close to border of orbit (1: 13; 2: 10; 3: 8,10; 4: 13; 5: 5/8; 6: 10/15); row 1 very oblique, and inferior segment of 6 extending slightly below level of row *d*. Longitudinal row *b* (17, 14; 28 in *G. assoi*) dividing rows 5 and 6 and extending anteriorly to near upper origin of 4. Longitudinal row *d* with undivided posterior horizontal part (21) not continuous with anterior labial part (7, 5).

(iii) Preopercular-mandibular. External row *e* (52,56) and internal row *i* (37,38) continuous from pore ϵ to mental region except for usual gap opposite articular-quadrata joint. Mental row *f* present (abraded in Adriatic specimen; 8-10 in *C. schmidti*).

(iv) Oculoscapular (fig. 2 A). Anterior longitudinal row x^1 (19) long, extending from above pore β to above pore ρ^1 (Slightly short of both in *C. schmidti*). Posterior longitudinal row present (abraded in Adriatic specimen). Row z (6, 6) arising just anterior to pore γ . Row q

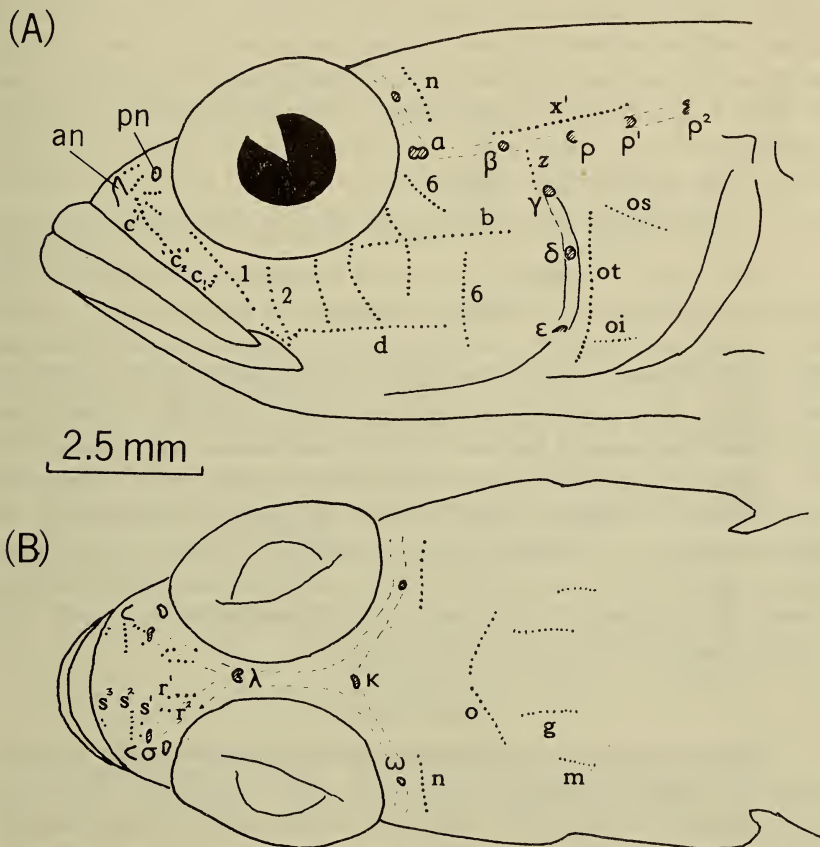


Fig. 2 - Composite diagram of sensory papillae and canal-pores on head of *Gobius schmidti*, in (A) lateral and (B) dorsal views, based chiefly on right side of Adriatic specimen; an, anterior nostril; pn, posterior nostril; canal-pores cross-hatched; other lettering as in text.

(abraded in Adriatic specimen, but 5 in *G. assoi*). Transverse row *tr* not found. Row *y* (abraded), descending from x^2 behind pore ρ^2 . Axillary rows (*as* and *las*) present but abraded in Adriatic specimen; two *as* and one *las* shown in *G. assoi*.

(v) Opercular (fig. 2 A). Transverse row *ot* (24; 30 in *C. schmidti*); other rows abraded in Adriatic specimen but superior longi-

tudinal row *os* and inferior longitudinal row *oi* are oblique and horizontal respectively in *G. assoi*.

(vi) Anterior dorsal (Occipital) (fig. 2 B). Anterior transverse row *n* (9) behind pore ω . Longitudinal row *g* (10,12) not reaching row *o* (10,10) which arises more laterally than anterior end of *g* and runs to dorsal midline, where it is only slightly separated from (or confluent with, in *G. assoi*) with fellow row of opposite side. Longitudinal rows *m* (10 in *G. assoi*) and *h* (longer than *g* in *G. assoi*) abraded in Adriatic specimen.

(vii) Interorbital. Absent.

(viii) Trunk, and (ix) Caudal, abraded in Adriatic specimen.

B i o l o g y . Nothing is recorded concerning the habitat of this species at Korčula in the Adriatic. As mentioned above, both *C. schmidti* and *G. assoi* are known to occur on « cascajo » grounds of coralline algae, the type specimens having been taken at depths of 25-35 and 40 m. respectively. The geographical range of *Gobius schmidti* is now known to include the western basin of the Mediterranean, and the Adriatic. To judge from the distribution (summarised earlier) of *Odondebuena balearica* and *O. pruvoti*, which inhabit the same environment as the present species, *G. schmidti* may be expected to occur in the Mauretanian region of the north-est Atlantic as well as in the eastern Mediterranean. The largest of the three recorded specimens, attributed here to *G. schmidti*, is 65 mm in total length.

AFFINITIES

The presence of (i) anterior and posterior oculoscapular and preopercular cephalic lateral-line canals, and their compliment of pores as listed above, (ii) at least four median preorbital rows of sensory papillae, (iii) four entire transverse suborbital rows followed by two divided by longitudinal row *b*, (iv) separation of row *z* from *b*, *6* from *e*, and *g* from *n*, and (v) scales on the nape (predorsal and postorbital areas), all show that the species under discussion must be placed in the genus *Gobius*, as defined by DE BUEN (1931) and the present author (unpublished). In the possession of (i) an undivided horizontal section of row *d*, (ii) anterior suborbital rows 2 and 3 arising near the orbit, (iii) an emarginate pelvic disc, and (iv) fifty or more scales in lateral series, *Gobius schmidti* resembles most closely, among the European species of the genus, *G. cruentatus* Gmelin (as DE BUEN remarked in 1936) and *G.*

geniporus C. & V. The occurrence of a long row x^1 extending to pore β serves to separate both *G. schmidti* and *G. cruentatus* from *G. geniporus*, in which x^1 terminates anteriorly well before the vertical of pore β (see SANZO, 1911, figs. 26, 27, 29 & 30), while *G. schmidti* can be easily differentiated from *G. cruentatus* by the absence in the former of scales on the posterior region of the cheek (before preopercular canal) and of a more or less well developed anterior pelvic membrane. Furthermore, *G. cruentatus* has only a slightly emarginate pelvic disc, and a relatively smaller eye than *G. schmidti*. However, this comparison between species belongs to a larger problem of classification and phyletic relationships in the European gobies which the author hopes to discuss in a future publication.

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SUMMARY

The status of *Cabotichthys schmidti* (De Buen 1930) and *Gobius assoi* De Buen 1936 (Teleostei: Gobiidae) is discussed and the conclusion reached that these two taxa are identical, with the valid name becoming *Gobius schmidti* (De Buen 1930). A new record of this species from the Adriatic (Korčula) is given, together with a redescription and a brief account of its affinities within the genus *Gobius* L.

RIASSUNTO

Viene discusso lo stato di *Cabotichthys schmidti* (De Buen 1930) e *Gobius assoi* De Buen 1936 (Teleostei: Gobiidae) e si conclude che questi due taxa sono identici, rimanendo come nome valido *Gobius schmidti* (De Buen 1930). Viene fatta una nuova segnalazione di questa specie in Adriatico (Korčula), insieme con una nuova descrizione e un breve resoconto delle sue affinità nell'ambito del genere *Gobius* L.
