

# A NEW GRENADIER (GADIFORMES, MACROURIDAE) FROM THE MEDITERRANEAN

by

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**ABSTRACT.** - *Caelorinchus mediterraneus* is described from specimens collected in the western and central Mediterranean Sea (Catalan Sea, Ligurian Sea, Adriatic Sea) at depths between 800 and 1200 m. Previous workers had misidentified the species as *C. occa*, *C. labiatus*, or *C. vaillanti* (a synonym of *C. labiatus*). It differs from those species, in snout shape, squamation, color, and size (maximum length about 30 cm, compared to more than 40 cm), among other characters. The new species is one of the most abundant demersal fish in depths greater than 1000 m in the southern Adriatic and Catalan Seas. The widespread Atlantic species *C. caelorhincus* is the only other verified member of the genus found in the Mediterranean.

**RÉSUMÉ.** - Une espèce nouvelle de grenadier (Gadiformes, Macrouridae) de Méditerranée.

Une espèce nouvelle de grenadier, *Caelorinchus mediterraneus*, est décrite à partir de 15 spécimens récoltés en Méditerranée occidentale et centrale (mers Catalane, Ligurie et Adriatique) entre 800 et 1220 m de profondeur. Dans les travaux antérieurs, cette espèce était identifiée comme *C. occa*, *C. labiatus*, ou *C. vaillanti* (un synonyme de *C. labiatus*). Elle diffère de ses congénères par la forme de son museau, ses écailles, sa coloration et sa taille (longueur maximale : environ 30 cm, *versus* plus de 40 cm pour les autres espèces). *C. mediterraneus* est l'un des poissons les plus abondants de l'ichtyofaune démersale de l'Adriatique méridionale et de la mer Catalane, au-delà de 1000 m de profondeur. Il s'agit de la seconde espèce du genre *Caelorinchus* signalée en Méditerranée, la première étant *C. caelorhincus*.

Key words - Macrouridae - Grenadier - *Caelorinchus mediterraneus* - New species - MED - Catalan sea - Ligurian Sea - Adriatic Sea.

The many deep-water basins off the European coast of the western and central parts of the Mediterranean Sea have only recently been extensively surveyed by bottom trawls (Raimbault, 1963; Orsi and Relini, 1971; Geistdoerfer and Rannou, 1972; Allué, 1983; Allué, *et al.* 1984; Stefanescu *et al.*, 1992a, 1993). Among the grenadiers that were reported from these surveys are species of *Caelorinchus*: *C. caelorhincus* (Risso, 1810), *C. labiatus* (Koehler, 1896), *C. occa* (Goode & Bean, 1885), and *C. vaillanti* Roule, 1916. The last species is a junior synonym of *C. labiatus* (see Iwamoto 1990). *C. caelorhincus*, is widely distributed in the Atlantic and in the Mediterranean Sea; it is readily distinguished from the others by its characteristic large dermal window of the light organ between the pelvic fins, an extensively scaled underside of head, a broad, blunt, trihedral terminal snout scute, and body scales covered with fine, conical spinules arranged in an irregularly quincunx pattern. *C. labiatus* and *C. occa* are Atlantic species characterized by lacking a dermal window between the pelvic fins and by having a naked underside of head, a sharply pointed terminal snout scute, and body scales with triangular or broadly lanceolate spinules arranged in more or less parallel rows, the median row somewhat enlarged.

The current study began when the second author (NU) prepared a report on an abundant species of *Caelorinchus* that was collected during surveys of the deepest part of the southern Adriatic Sea. The first author (TI) was sent photographs of and information on the specimens to help their identification. It was immediately apparent that these specimens represented a species not previously recorded from the Mediterranean or any other ocean basin. The less acutely pointed snout, the weaker scale spinulation, and the darker overall coloration were quite unlike those features in *C. occa* or *C. labiatus*, the only other species that appeared to be similar. A perusal of the available literature reporting *Caelorinchus* specimens from the Mediterranean showed that the new species had been previously recorded from the western Mediterranean as *C. occa*, *C. labiatus*, and *C. vaillanti*. It became evident that none of those Atlantic species occur in the Mediterranean, and the only two species of the genus found there are *C. caelorhincus* and the new species.

The purpose of this paper is to describe the new species and provide distributional data and other informations on the species additional to what has previously been recorded by Ungaro *et al.* (2001b) and others under different species names.

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## MATERIAL AND METHODS

The type specimens of the new species were collected in the Adriatic Sea off the southeastern coast of Italy and the Catalan Sea off eastern Spain (Fig. 1). Specimens from the former area were captured in 1999 and 2000 during trawl surveys to investigate the bottom fauna of the deepest part of the Adriatic; detailed collection data for the surveys are provided by Ungaro *et al.* (2001a). Ungaro *et al.* (2001b) analyzed meristic and morphometric features of the new species and provided abundance and distributional information as well. Biological and distributional aspects of specimens from the Catalan Sea, some of which are here designated as type specimens, were reported on by Allué *et al.* (1983), Allué *et al.* (1984), Stefanescu *et al.* (1992a, 1992b, 1993) and Massutí *et al.* (1995).

Methods for making counts and taking measurements follow standard methods for fishes (see Hubbs and Lagler, 1958), but modified for grenadiers as described by Iwamoto (1970) and Iwamoto and Sazonov (1988). Institutional abbreviations follow Leviton *et al.* (1985) and Leviton and Gibbs (1988), with the addition of LBMB (Laboratorio Provinciale di Biologia Marina, Bari, Italy) and MSNMP (Museo Scienze Naturali di Milano).

### *CAELORINCHUS MEDITERRANEUS* N.SP.

(Figs 2-5)

*Caelorinchus* sp.: Ungaro *et al.*, 2001b: 185-190 (24 specimens, southern Adriatic Sea; about 1000-1196 m; meristic and morphometric characters analyzed).

*Coelorhynchus vaillanti*: Raimbault, 1963: 169-170, figs. 15, 16 (4 specimens; off Corsica, 720-855 m, Saint-Tropez, 435-660 m, Roussillon, 625-725 m). Orsi and Relini, 1972: 5-18, pl. 1 (middle) (1 specimen; Ligure Sea; color plate).

*Coelorhynchus occa*: Allué, 1983: 2-5, fig. 1 (4 specimens; Catalan Sea). Allué *et al.* 1984: 8-13, fig. 1.

*Coelorhynchus labiatus*: Stefanescu *et al.*, 1992a: 197-213 (156 specimens: 40 stations, Catalan Sea in 1046-2201 m) Stefanescu *et al.*, 1992b: 205-213. Massutí *et al.*, 1995: 307-330 (distribution and biology; Catalan Sea).

### Material examined

The number of specimens and range of head (HL) and total (TL) lengths (in mm) are given in parentheses following the museum catalog number.

*Holotype*. - MNHN 2001-1204 (68.0 HL, 245+ TL); Adriatic Sea, between 41°42'34"-41°44'55"N and 17°34'62"-17°43'47"E, in 1085-1159 m; 16-m otter trawl; Oct 2000.

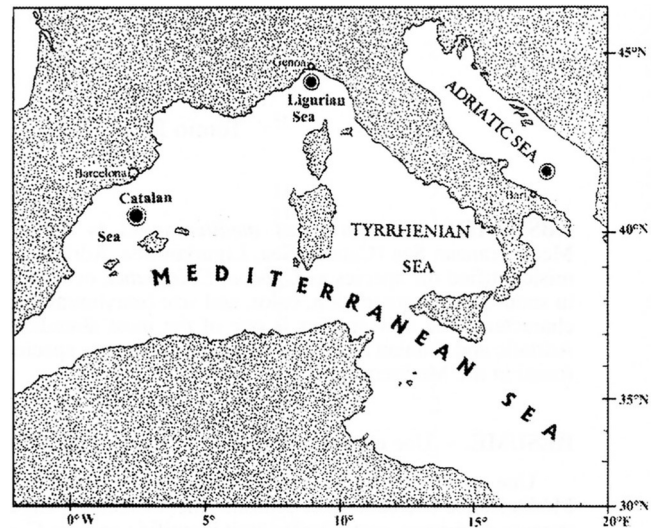


Fig. 1. - Map of the western and central Mediterranean, showing general localities of capture (circled spots) for *Caelorinchus mediterraneus* n.sp.

*Paratypes*. - Adriatic Sea (same data as for holotype): LBMB 2000.FM.05 (7, 51.4-62.4 HL); CAS 213887 (4, 50.5-61.2 HL, 165+-225+ TL); BMNH 2001.8.17.1-2 (2, 42.4-58.4 HL, 155+-205+ TL). USNM 365843 (2, 43.6-57.9 HL, 155+-195+ TL). MSNMP i3826 (1 spec.), and i3827 (1 spec.). Catalan Sea (off Spain): IIBP 16/1984 (1, 56.4 HL, 210+ TL) and IIBP 17/1984 (1, 49.1 HL, 185 TL); 1445-1485 m; 19 Sep. 1983. IIBP 45/1984 (1, 41.2 HL, 144+ TL); 1751-1778 m; 21 Sep. 1983. IIBP 69/1997 (51.0 HL, 175+ TL); 1743-1770 m; 21 Sep. 1983. IIBP 38/1986 (1, 35.3 HL, 112+ TL); 1600-1767 m; 23 Sep. 1983. IIBP 70/1997 (5, 32.0-48.0 mm HL, 115+-170+ mm TL); 1560-1616 m; 8 Jun. 1984. IIBP 89/1997 (2, 42.6-43.8 HL, 140+-150+ TL); 1560-1616 m; 8 Jun. 1984. IIBP 200/1997 (1, 55.4 HL, 185+ TL); 1286-1315 m; 25 Sep. 1985.

### Diagnosis

A member of the genus *Caelorinchus*, as characterized by Iwamoto (1990), subgenus *Oxygadus* (as characterized by Gilbert and Hubbs 1920), with no apparent external light organ (Group I of Iwamoto, 1990); underside of head naked; nasal fossa naked; anterolateral margin of snout not completely supported by bone; snout long, pointed, about 2.1-2.3 times in head length; interorbital scales with multiple rows of spinules; spinules of body scales reclined, in as many as 10 parallel rows, the middle row slightly enlarged; orbital margin black; oral, branchial, peritoneal, and fin membranes black.

### Description

*Counts*. - First dorsal fin rays II,7-9; pectoral fin rays

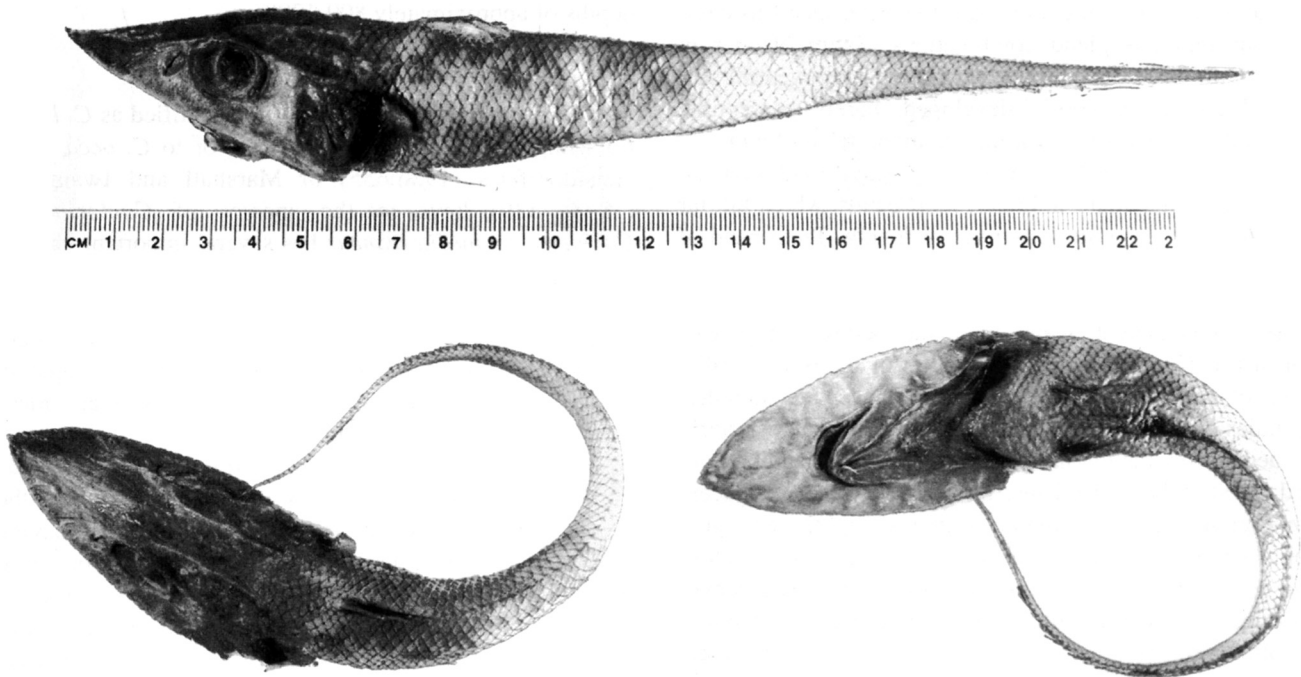


Fig. 2. - *Caelorinchus mediterraneus* n.sp., holotype, MNHN 2001-1204, from the southern Adriatic Sea. (Top) Lateral view; (bottom, left) dorsal view; (bottom, right) ventral view.

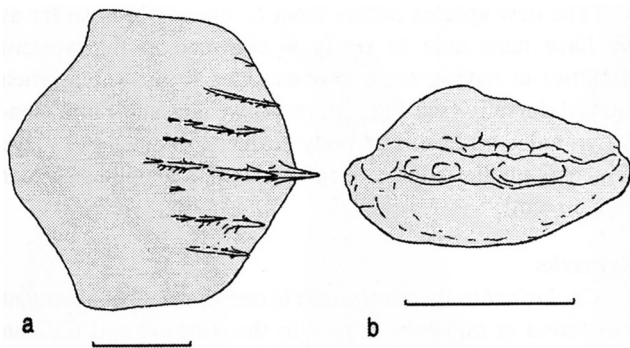


Fig. 3. - (a) Scale from below hind end of first dorsal fin of *Caelorinchus mediterraneus* n.sp. from specimen 64.6 mm HL (scale bar = 1.0 mm); (b) right sagitta otolith from specimen 55.4 mm HL (scale bar = 5.0 mm).

i16-i19; pelvic fin rays 7, rarely 8; gill rakers, first arch (inner) 2+5-7, rarely 10 total, second arch (total outer/inner) 6-7/8-9; scale rows below origin of first dorsal fin 4.5-6.5, usually 5.5, below mid-base of first dorsal 4.5-5.5, below origin of second dorsal 4.5-5.5, over distance equal to pre-dorsal length 35-40; pyloric caeca 8-11.

**Measurements** (from 29 specimens, 32.7-68.7 mm HL, 112-245 mm TL). - The following in percent of HL: snout length 43-47; preoral length 40-45; internasal width 20-23; interorbital width 21-24; orbit diameter (horizontal) 21-26; suborbital width 13-17; postorbital length 30-34; length orbit to angle of preopercle 32-36; upper jaw length 20-24;

barbel length 6-10; outer gill slit length 9-13; preanal length 132-151; body depth 41-51; interspace between first and second dorsal fins 10-16; height first dorsal fin 36-46; length pectoral fin 28-37; length outer pelvic ray 31-48. Ratio of: snout length /orbit diameter 167-209; barbel length/orbit diameter 26-43; internasal width/orbit diameter 80-104; interorbital width/orbit diameter 88-109.

**General features** (Fig. 2). - Snout broad, relatively shallow, acutely pointed in lateral view, broadly spade-shaped in dorsal view, tipped with a narrow, diamond-shaped terminal scute. Anterolateral snout margin not completely supported by bone (a broad gap between median and lateral nasal processes). Least width between nasal ridges (internasal space) about equal to least width of interorbital space. Orbit diameter 4-5 times into head length, about 1.7-2.1 times into snout length. Suborbital ridge well developed, forming sharp separation of dorsal and ventral head surfaces. Suborbital below orbit relatively steep, but ventral surfaces form shallow angle from horizontal. Subopercle produced into a narrow protruding tab at posteroventral end. Interopercle completely hidden behind preopercle. Mouth relatively small, inferior. Chin barbel short, thin. Gill membranes broadly connected across isthmus, without free posterior fold. Gill rakers usually 2 + 6 or 7 on inner series of first and second arch; epibranchial rakers flat, platelike, other rakers tuberculate. As with other members of genus, no rakers on outer part of first arch. Pyloric caeca short to moderately long and slender; between 8 and 11 caeca in 10 specimens examined. Swim bladder large, slightly bilobed

at anterior end; flocculent or foam-like substance fills cavity; four retia-gas gland combinations. Swim bladder in males with drumming muscles covering anteroventral surface. Light organ poorly developed, barely perceptible externally as a narrow black margin along front of anus.

**Dentition.** - All teeth uniformly small and conical. Those on premaxillary in broad, short bands, which fall far short of reaching posterior corner of mouth. Teeth band of lower jaw long, tapered, extending beyond corner of mouth.

**Squamation.** - Body scales fairly deciduous, head scales more adherent. Scales on dorsum below interspace of dorsal fins (Fig. 3) with about 6 to as many as 10 parallel rows of relatively weak, conical to lanceolate spinules. Spinules overlapping and deeply reclined, those posteriorly in median row having narrow transverse struts and broadened and slightly grooved anterior margin to receive adjacent overlapping spinule. Median spinules slightly enlarged; spinule rows on each side of median row sometimes short and not extending to posterior margin of scale. Scales over nape and abdomen usually with fewer spinule rows; spinules often rudimentary or absent on scales of chest, abdomen, and small scales of head. Ridges of head armed with modified, thickened scales beset with short, stout spinules. Modified scales of suborbital ridge in one or two rows, with three or four rows of small, unmodified scales between ridge scales and orbit. Underside of head completely naked. A broad naked groove on each side of median nasal ridge, the naked region in some specimens extending behind leading edge of snout. Nasal fossa broadly naked, with naked area extending ventrally to suborbital ridge.

**Fins.** - All fins moderately developed as in most members of subgenus *Oxygadus*; outer ray of pelvic fin slightly produced into slender filament extending posteriorly to base of first few rays of anal fin. Second dorsal fin weakly developed throughout its length; rays much shorter overall than opposites of well-developed anal fin.

**Color.** - Overall color brownish gray to almost swarthy in fresh specimens, medium brown to pale in some alcohol-preserved specimens; some areas at tip of snout, operculum, pectoral girdle, and pectoral fins swarthy to black. Abdomen bluish, the color not extending much forward of pelvic fin bases. Mouth, jaws, lips, gill membranes, gill-cavity lining, peritoneum, and fin membranes black; barbel pale. A prominent black orbit margin ("eye ring").

**Size.** - *Caelorinchus mediterraneus* is a medium-sized member of the genus, probably not exceeding 30 cm TL. Our largest specimen was a female of 68.7 mm HL and 245 mm TL with the tip of the tail incomplete. The specimen had large ovaries, with eggs of various sizes ranging from less than 0.5 mm to about 1.1 mm in diameter.

**Etymology.** - Named after the Mediterranean Sea, where the species is endemic.

**Distribution.** - Western and central Mediterranean at depths of approximately 800-1200 m.

### Comparisons

The new species would likely be identified as *C. labiatus* using Iwamoto's (1990:116) key, or to *C. occa* using Geistdoerfer's (1986:655) or Marshall and Iwamoto's (1973: 539) keys to the species of *Caelorinchus*. *Caelorinchus mediterraneus* has several important characteristics in common with those two species, including a long, relatively acuminate (in dorsal view) snout shape, underside of head naked, no large dermal window of light organ before anus, spinules on body scales arranged in parallel rows with middle row enlarged, and similar dimensions of head, fins, and body.

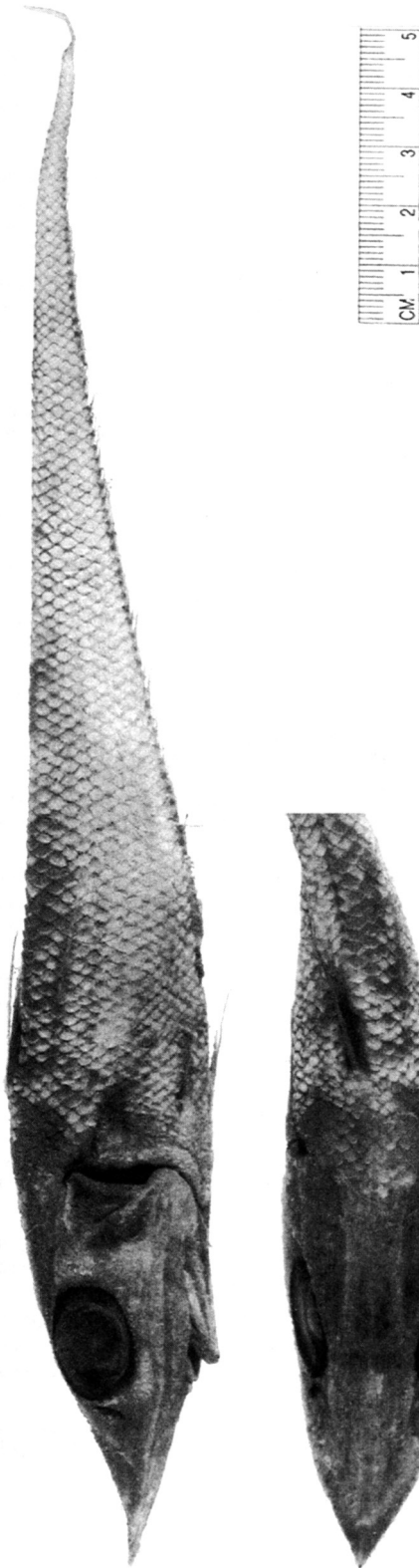
*Caelorinchus mediterraneus* differs from *C. labiatus* (an eastern Atlantic species probably not found in the Mediterranean), which also has a black eye ring, in having a broader snout with more convex sides in dorsal view (see Fig. 4), smaller orbits (21-26% HL in *C. mediterraneus* cf. 26-28% HL in *C. labiatus*) that are about equal to or slightly more than interorbital width and about 1.2-1.5 of postorbital length (compared with orbit much greater than the interorbital width and about equal to the postorbital length in *C. labiatus*), a smaller adult size (more than 40 cm in *C. labiatus*), and narrower, smaller spinules on scales.

The new species differs from *C. occa* (which so far as we have been able to verify is confined to the western Atlantic) in having more convex sides to the snout when viewed dorsally (see Fig. 5), much weaker and more slender spinules on head and body scales, a distinct black eye ring, and smaller adult size (*C. occa* attains lengths greater than 50 cm).

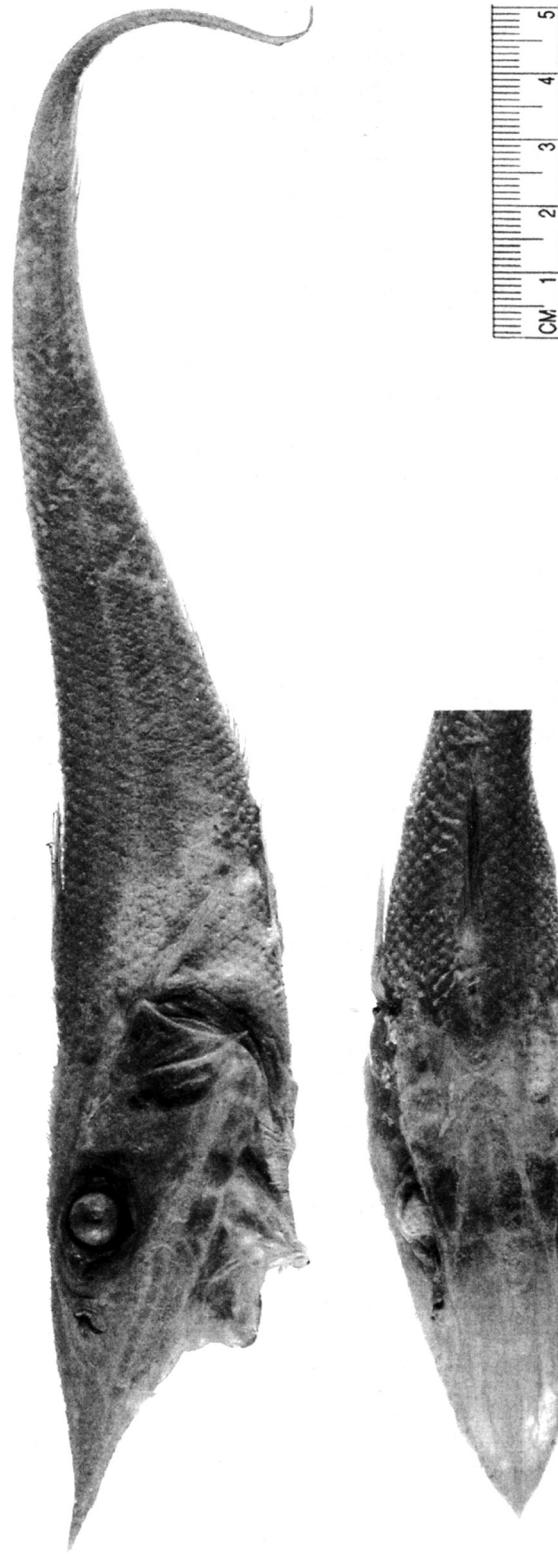
### Remarks

*Caelorinchus mediterraneus* is one of the most abundant fish found at midslope depths in the Adriatic and Catalan seas. Ungaro *et al.* (2001b) provided morphometric and meristic analyses of 24 specimens of the new species captured in the deepest part of the southern Adriatic Sea in 12 bottom trawls fished at depths of 826-1196 m. In the Catalan Sea off Spain, Stefanescu *et al.* (1992a) recorded the species (as *C. labiatus*) from depths between 1046 and 2201 m. It was among 13 species (of 31) taken in their survey that had a bathymetric distribution centered below 1000 m. Those authors also reported the capture of four other grenadier species from the Catalan Sea at depths between 960 and 2251 m: *Coryphaenoides (Chalinura) mediterraneus* (Giglioli, 1893); *C. guentheri* (Vaillant, 1888), *Nezumia aequalis* (Günther, 1878), and *Trachyrinchus trachyrinchus* (= *T. scabrus* (Rafinesque, 1810)).

Orsi and Relini (1972) recorded the new species (as *C. vaillanti*) from two specimens captured in two trawls in



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Fig. 4. - Lateral and dorsal views of *Caelorinchus labiatus* (CAS 53214, 85 mm HL).

Fig. 5. - Lateral and dorsal views of *Caelorinchus occa* (CAS-SU 9465, 77 mm HL).

the Ligurian Sea fished at depths of 720-855 m and 435-660 m. Owing to its abundance in the western and central Mediterranean, we consider it likely that *C. mediterraneus* has been captured on other occasions but not properly identified and recorded in the literature. The three localities from which we can confirm its presence suggest that the species will be found much more widely in the western and central Mediterranean where depths are appropriate.

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