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Some rare fishes from the Western Mediterranean Sea

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(With 4 figures and 1 plate)

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Summary

The gobiid fishes *Chromogobius quadrivittatus* and *Pomatoschistus microps,* the syngnathid *Nerophis maculatus* and the tripterygiid *Tripterygion delaisi* are reported for the first time from the western Mediterranean island of Sardinia. New records for the small gobiid *Zebrus zebrus* are given. The occurrence of *Tripterygion melanurus,* before known only from south Sardinia, and of *Chromogobius zebratus* are also reported for the northeast of Sardinia.

Zusammenfassung

Die Meergrundeln *Chromogobius quadrivittatus* und *Pomatoschistus microps,* die Seenadel *Nerophis maculatus* und der Dreiflossenschleimfisch *Tripterygion delaisi* werden erstmals für die Insel Sardinien (westliches Mittelmeer) nachgewiesen. Neue Fundorte für die kleine Grundel *Zebrus zebrus* werden ebenso dokumentiert wie der Nachweis von *Tripterygion melanurus,* bisher nur von der Südküste Sardiniens bekannt, für den Nordosten der Insel. Auf das Auftreten von *Chromogobius zebratus* im Norden Sardiniens wird hingewiesen.

In the text the abbreviation NMW is used for Naturhistorisches Museum Wien.

Introduction
(Fig. 1)

With an area of 23.813 km² Sardinia is the second largest island of the Mediterranean. Its geological structure is dominated by paleozoic granite, mesozoic calcareous rock and volcanic formations from the end of the Tertiary/ beginning of the Quaternary (PRATESI & TASSI 1973). In particular, the granite forms the northeast part of the island and there notably the coastline. Strongly clefted, partly deeply notched, there are many promontories, peninsulas and bays. Many small and tiny islands lie off it. Between the northeast of Sardinia and the south coast of Corsica they form the Maddalena Archipelago, named after its largest and only settled island Maddalena. The immediate shoreline in this part of the northeast of Sardinia is mostly hard and rocky substrate.

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On the east coast southwards much less structuring of the shoreline is visible. This is indicated by the change of the geological formations – calcareous ground, metamorphic rock and isolated basaltic formations – which dominate this part of the island. Rocky and stony parts are followed by long sandy beaches. In this region the predominance of fishes linked to hard substrate changes distinctly to those which live on sandy ground. Rivers and brooks run into the sea via small lagoons and lagoonlike habitats. Brackish water zones are formed and their salinity changes seasonally. Especially during the rainy season these lagoons often show rapidly differing salinity.

In contrast, in the north east, sandy and other soft substrate forms only short districts. Inhabitants of aufwuchs on rocks and stones are dominating there. Tidepools, gullies and crevices more or less separated at lowtide from the open water are often found.

Examination in these contrasting habitats concerned mainly small, cryptobenthic gobiid species. It particularly yielded records of four rarely found gobiids. One representative of the family Syngnathidae and two of the family Tripterygiidae are also reported the first time for Sardinia, and in particular for the northeast of this island.

All fishes, on which this study is based, were collected by HARALD AHNELT and KARIN AHNELT-GÖRNER during collecting trips for the Fish Collection of the Natural History Museum Vienna, financed in part by the Austrian Ministry of Science and Research.

Family Syngnathidae

Nerophis maculatus RAFINESQUE, 1810

Material: 1 ♂, 140.5 mm; NMW 88471; NE Sardinia, Porto Rotondo; September 25, 1988.

Diagnosis: 22 trunk- + 71 tailrings; dorsal fin extends above 8 rings (3+5); pectoral, anal, and caudal fins absent.

Both representatives of the genus *Nerophis* in the Mediterranean Sea, *N. maculatus* and *N. ophidion,* are easily distinguished from all other syngnathids of this region by the lack of pectoral, anal, and caudal fins.

N. maculatus differs from *N. ophidion* mainly by the lack of a distinct longitudinal crest on the snout (present in *N. ophidion*), shorter dorsal fin reaching over 8–9 rings (10–12 in *N. ophidion*) and coloration of many spots and dots in *N. maculatus* (name!) (plain greenish-brwon in *N. ophidion*). In *N. maculatus* the spots on head and anterior trunk are always distinct (fig. 4). This species is only known from the Mediterranean. Records from Portugal and the Azores are doubtful (DAWSON 1986). It is much lesser abundant then *N. ophidion.* Records are local and it seems that the species is present especially in the Adriatic Sea and the Western Mediterranean. As far as is kown, the finding of *N. maculatus* in North Sardinia represents the first record of this species for Sardinia (fig. 2). The habitat of this syngnathid is poorly known. DAWSON (1986) mentions for it the generalisa-

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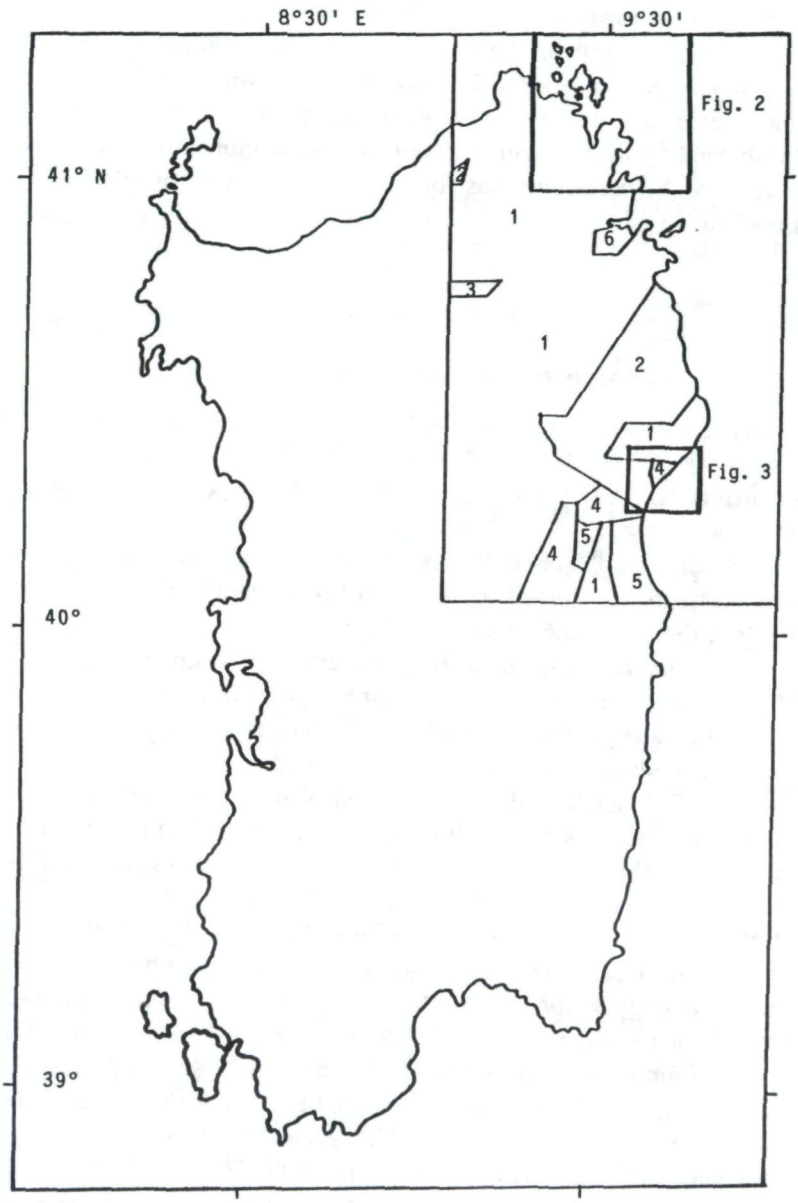

Fig. 1: The western Mediterranean island Sardinia and the geological structure of its Northeast: granite (1), metamorphic rock (2), volcanic formations (3), basaltic formations (4), compact calcareous rock (5), and recent sedimentations (6). From PRATESI & TASSI (1977), schematically, simplified.

tion "coastal waters". Similarly, BINI (1969), TORTONESE (1970) and BAUCHOT & PRAS (1980) do not give a more detailed habitat description. It seems therefore worth-while to describe the circumstances of the finding of the present specimen.

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It was found at lowtide in shallow water (8–10 cm deep) on the immediate shoreline. The shallow gully in the sand, about one and a half m^2 in size was almost completely separated from the open water by large stones. The largest of them, with a diameter of about 20 cm, projected over the water level. This stone-bank plunged only slightly at its beginning, but more and more towards the open sea. The specimen of *N. maculatus* was found at the passage from the shallow gully towards the sea.

Family Gobiidae

Chromogobius quadrivittatus (STEINDACHNER, 1893)

Material: 2 specimens, sex?, 17.3+3.8–23.4+5.8 mm; NMW 88486; NE Sardinia, Golfo di Marinella; Punta della Volpe; September 26–28, 1988.

Diagnosis: D1 VI, D2 I + 10, A I + 9, P 17–18; scales in lateral series 69–70, all cycloid.

Although this small gobiid fish is known from the Spanish Mediterranean coast as well as from the Levant coast, records of its distribution are still scattered and infrequent (MILLER 1986; AHNELT 1990).

Ch. quadrivittatus occurs in inshore waters, under stones, and in mid-tide pools (MILLER 1986). New records in the last few years from Israel (GOLANI & BEN TUVIA 1986), the Adriatic Sea, and Corsica (AHNELT 1990) suggest that this species is much more abundant than was formerly assumed.

In spite of the fact that this goby is conspicuous coloured (see plate 1 for comparison with the closely related *Ch. zebratus*) and tends not to flee by swimming but to withdraw under stones, in holes, and crevices, this species is only rarely found.

With the two specimens from the Golfo di Marinella (fig. 2) the presence of *Ch. quadrivittatus* at Sardinia is established. Both were collected on the southern part of the Punta della Volpe Peninsula in a tide pool. Especially at the immediate shoreline more or less deeper gullies and crevices in the granite, which forms this peninsula, are found. Often they are filled with gravel. Some of them form tide pools which are separated for a short time from the open water only at extreme low tide. As mentioned in the record of this species for Corsica (AHNELT 1990), *Ch. quadrivittatus* is found only in tide pools in which water conditions exist similar to the open sea. Isolation of the pool for only a short time during the tide cycle prevents extreme salinity change by rainfall or evaporation.

Chromogobius zebratus (KOLOMBATOVIĆ, 1891)

Material: 1 ♀, 33.8+7.7 mm; NMW 86083; NE Sardinia, Isola Maddalena, Cala lunga; June 2, 1987.

Diagnosis: D1 VI, D2 I + 11, A I + 10, P 15; scales in lateral series 45, all ctenoid.

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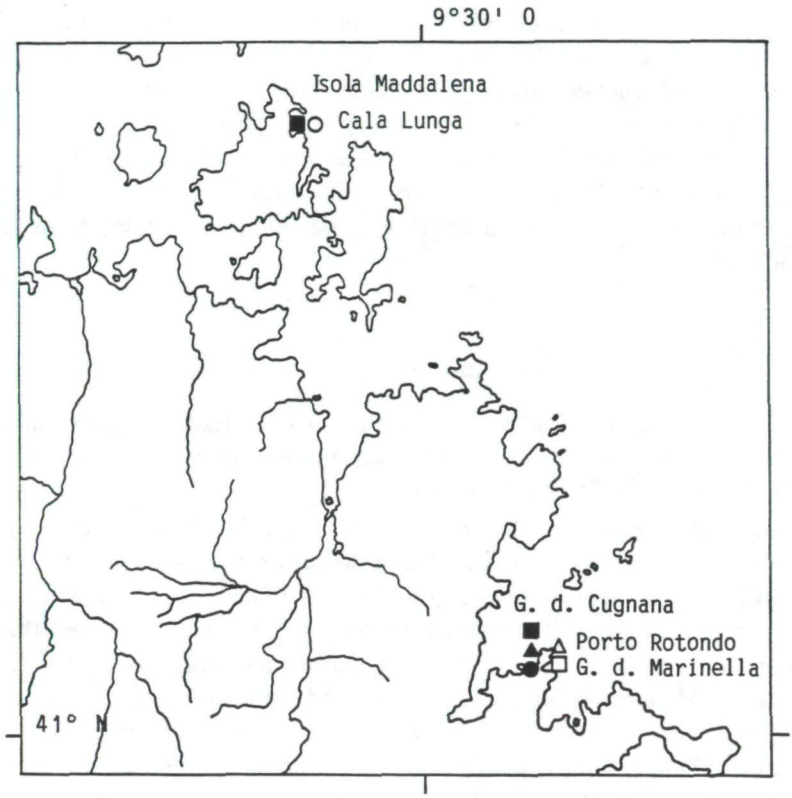

Fig. 2: The extreme NE of Sardinia with the Maddalena Archipelago. Records of *Chromogobius quadrivittatus* (□), *Ch. zebratus* (○), *Nerophis maculatus* (●), *Tripterygion delaisi* (▲), *T. melanurus* (△), and *Zebrus zebrus* (■).

Like the former species, *Chromogobius zebratus* is a cryptic, rarely found small gobiid. The habitat in which this species occurs may be the same as that preferred by *Ch. quadrivittatus,* it may inhabit also offshore coralline grounds. Habitat, food, and reproduction are little known (MILLER 1971, 1986). In the literature the entire Mediterranean Sea is stated as the distribution area of *Ch. zebratus,* but the definite recording of this species in the Western Mediterranean has only recently been achieved (AHNELT 1990).

The two closely related species *Ch. quadrivittatus* and *Ch. zebratus* are clearly distinguishable by morphological criteria (MILLER 1971). Nevertheless the coloration, which seems to be similar at the first sight, permits the easiest differenciation (plate 1). In both species the basic coloration of the body is brown, distinctly contrasted by a light band and light saddles. While one to two plain saddles at the back are typical for *Ch. quadrivittatus,* five are present in *Ch. zebratus.* In both gobiids a light band spreads over the nape, in *Ch. quadrivittatus* as far as the upper part of the pectoral fin lobe, but in *Ch. zebratus* ending at the level of the posterior opercle-fold. A dark stripe on the pectoral fin is evident in both species. In *Ch.*

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quadrivittatus this stripe is straight at its anterior border, but in *Ch. zebratus* it shows a distinct sharp bend. The marbelling of the head is more distinct in *Ch. quadrivittatus* and reaches only in this species to the branchiostegal membrane. On both sides of the head, at the lower anterior edge of the opercle, a conspicuous dark spot is visible in *Ch. quadrivittatus,* but absent in *Ch. zebratus.* The latter species is recorded for Sardinia from two localities (AHNELT 1990). In the northeast of this island it is known from only one specimen, a female, from the Isola Maddalena (fig. 2).

Pomatoschistus microps (KRØYER, 1838)

Material: 1 ♀, 35.9+7.1 mm; 3 ♂, 34.1+6.7–41.0+8.8 mm; NMW 89805; E Sardinia, Golfo di Orosei; May 12, 1975. 1 ♂, 30.2+4.7 mm; 4 ♀, 28.5+5.8–35.5+6.6 mm; NMW 89804; E Sardinia, Golfo di Orosei, Rio di Osalla; May 12, 1975.

Diagnosis: D1 VI, D2 I + 8–9, A I + 8–9, P 16–19; scales in lateral series 39–42; predorsal area, back to end of first dorsal fin base and breast naked.

Until now eight species of the gobiid genus *Pomatoschistus* are reported for the Mediterranean Sea. *Pomatoschistus microps* differs from the other seven species in the following combination of characters: eyes dorsolateral, narrow interorbit, 39–52 scales in longitudinal series, breast naked, back naked at least to rear of first dorsal fin base, pelvic disc membranaceous anteriorly with crenate edge (never villose) (MILLER 1986).

P. microps is mainly known from the eastern Atlantic and the Baltic Sea. Its occurrence in the Mediterranean Sea seemed to be limited to the northern coast of the western basin (MILLER 1986). The record of the present nine specimens from Sardinia (fig. 3) extends the known area of distribution and suggests, that further records from suitable habitats in the Mediterranean Sea are to be expected. The habitat of this small goby is inshore waters, estuaries and lagoons. It enters brackish waters and is restricted to sandy or muddy grounds.

Since these nine specimens of *P. microps* are the first to be reported from Sardinia, the localities where they were found, will be briefly described.

On the east coast of Sardinia, at the northern end of the Golfo di Orosei, metamorphic ground turns to the shore between two isolated basaltic formations (fig. 1). This possibly renders the formation of long sandy beaches to the length of about seven kilometers. They form the northern part of this gulf. Here, streams and rivers do not flow directly into the Tyrrhenian Sea but discharge into more or less small lagoons. From time to time they are completely separated from the sea by sand barriers, often seen in the dry season.

Such a stream, about five kilometers south of Orosei, flows into a small lagoon which has only a narrow connection with the open sea in the middle of May (beginning of the dry season which extends far into September). *Gambusia affinis* (family Cyprinodontidae) was very abundant here, indicating that the salinity was extremely low. On sandy ground *P. microps* was also numerous. The second

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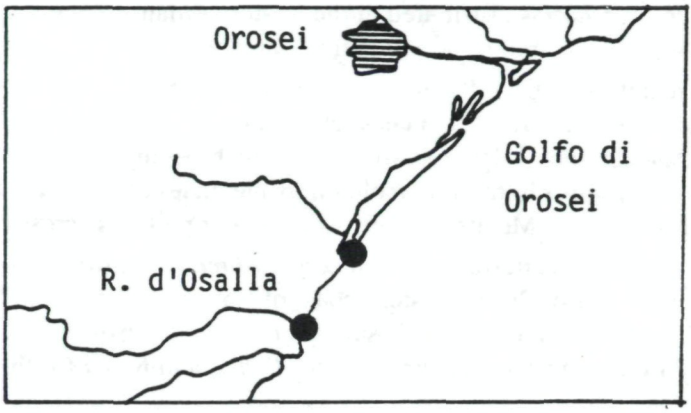

Fig. 3: The north coast of the Gulf of Orosei (E Sardinia). Records of *Pomatoschistus microps* (●).

locality is about two kilometers farther to the south. Without a distinct connection to the open sea, the Rio di Osalla flows into the Caletta di Osalla (fig. 3). This lagoonlike estuary is similar to the former one and separated from the open water by a sand barrier. Also here *P. microps* was numerous.

Zebrus zebrus (Risso, 1826)

Material: 2 specimens, juvenile, 10.7+3.5–14.6+3.4 mm; NMW 88440; NE-Sardinia, Golfo di Cugnana, Punta della Volpe; September 26–28, 1988. 1 ♀, 15.2+4.0 mm; 3 specimens, juvenile, 8.4+3.3–11.5+5.6 mm; NMW 88441; NE-Sardinia, Golfo di Cugnana, Porto Rotondo; September 22, 1988. 2 specimens, juvenile, 9.4+c–9.6+2.7 mm; NMW 88465; NE-Sardinia, Golfo di Cugnana, Porto Rotondo; September 25, 1988. 1 ♂, 18.3+3.9 mm; 10 specimens, juvenile, 8.2+2.4–14.5+3.7 mm; NMW 88472; NE-Sardinia, Golfo di Cugnana, Porto Rotondo; September 25, 1988. 2 ♀, 20.5+3.7–29.2+4.4 mm; 4 ♂, 17.5+3.5–33.7+7.1 mm; 10 specimens, juvenile, 10.5+3.3–14.5+3.7 mm NMW 88492; NE-Sardinia, Golfo di Cugnana, Punta della Volpe; September 27–28, 1988. 1 ♀, 24.4+5.3 mm; NMW 86094; NE-Sardinia, Isola Maddalena, Cala lunga; June 2, 1987.

Diagnosis: D1 VI, D2 I + 11–12, A I + 8–9, P 16–18; scales in lateral series 30–34.

Zebrus zebrus is known only from the Mediterranean Sea. It inhabits inshore waters, among algae, under stones, and in mid-tide pools. Although it is probably distributed throughout the Mediterranean, definite records are scattered (Miller 1977, 1986). Recently reported for Corsica and Sardinia (Ahnelt 1990), additional records of *Z. zebrus* for Sardinia can now be given (fig. 2). They show that in suitable habitats this species is likely to be found around all the island.

Family Tripterygiidae

Tripterygion delaisi Cadenat & Blache, 1971

Material: 1 ♀, 55.1+9.4 mm; NMW 88449; NE Sardinia, Golfo di Cugnana, Porto Rotondo; September 23, 1988.

Diagnosis: D1 III, D2 XVII, D3 11, A II + 23, P 16; scales in lateral line: 18 tubed + 22 pored.

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Tripterygion delaisi is distributed in the Eastern Atlantic from the south coast of England to Senegal and in the Mediterranean Sea.

Based mainly on the different behavior of the males, two subspecies are separated (ZANDER 1986). The males of *T. delaisi delaisi* (this subspecies is restricted to the Eastern Atlantic) swim during the breeding season in figure-eight shaped pattern upwards in the watercolumn, while males of *T. delaisi xanthosoma* (reported only from the Mediterranean) swim similar patterns across the sea bed.

In the Western Mediterranean, *T. d. xanthosoma* has until now been reported from the north coast of Sicily, western coast of Italy (from Rome to Naples) and the suthern coast of France (Banyuls-sur-Mer) (ZANDER 1986). The record of this species for Sardinia indicates the presence of *T. d. xanthosoma* for this island also (fig. 2).

Tripterygion melanurus GUICHENOT, 1845

Material: 1 ♀, 31.0+7.4 mm; 3 ♂, 29.3+5.9–36.2+7.2 mm; NMW 88450; NE Sardinia, Golfo di Cugnana, Porto Rotondo; September 23, 1988. 1 ♂, 24.2+6.6 mm; NMW 88455; NE Sardinia, Golfo di Cugnana, Porto Rotondo; September 24, 1988. 1 ♂, 20.3+3.9 mm; NMW 88496; NE Sardinia, Golfo di Marinella, Punta della Volpe; September 27–28, 1988.

Diagnosis: D1 III, D2 XIV–XV, D3 11–12, A II +22–23, P 15–17; scales in lateral line: 19–21 tubed + 22–23 pored.

This tiny tripterygiid fish differs from all other Mediterranean species of this family especially by the much more acute head profile and the distinct, protruding lips. ZANDER (1986) distinguishes two subspecies, *T. melanurus melanurus* and *T. melanurus minor,* because of the presence of a dark spot only on the dorsal caudal peduncle of the nominate form. Following this criterion, the specimens on which this work is based, have been identified als *T. m. melanurus.*

No sexual dimorphism in coloration of the body of the two sexes occurs. All year, males and females are coloured a bright orange-red. This is correlated to their preferred habitat, since they live near or even on orange-red sponges, which grow in sea caves and other dimly lit biotopes. It is of interest in this connection that some individuals have chosen to live on a rusted (red) disused iron waste-pipe (diameter about 25 cm).

Like the formerly described species, records of this small tripterygiid are mostly scattered. Because the second subspecies *T. m. minor* is known from the more northern neighbouring island Corsica, the occurrence of *T. m. melanurus* was not necessarily to be expected even in the north of Sardinia (fig. 2). The specimens mentioned in this paper show the presence of this subspecies even for the north of this island. *T. m. melanurus,* hitherto known for Sardinia only from the south coast, seems to be abundant on suitable coasts all round the island. In the Western Mediterranean, *T. m. melanurus* has been known so far from the north coast of Sicily, the south coast of Sardinia, the Balearic Islands and from the north African coast (ZANDER 1986). The records from North Sardinia indicate the northernmost localities of this species in the Mediterranean Sea.

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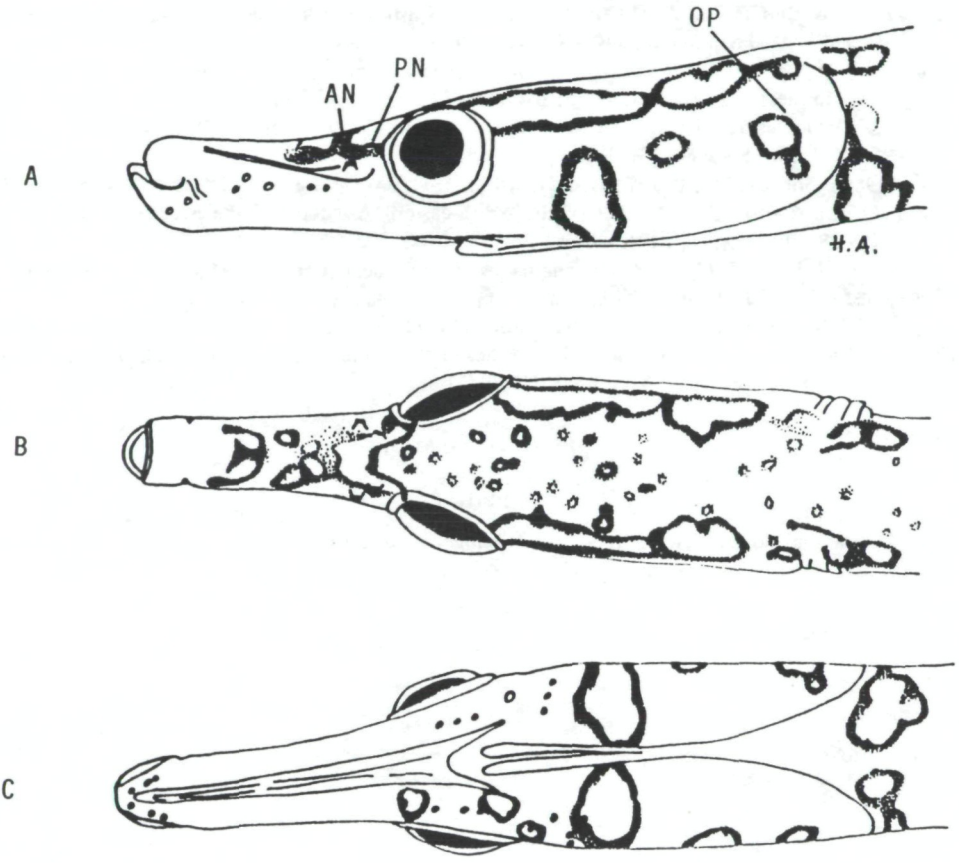

Fig. 4: Head of a male *Nerophis maculatus* (NMW 88471) with characteristic maculae. A = lateral, B = dorsal, C = ventral view; AN = anterior nostril, PN = posterior nostril, OP = opercle.

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Plate explanations

Plate 1

Lateral and dorsal views of (above) *Chromogobius quadrivittatus* (17.3+3.8 mm) and (below) *Ch. zebratus* (33.8+7.7 mm).

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