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An Eocene wrasse (Perciformes; Labridae) from Seymour Island

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Abstract: A nearly complete lower pharyngeal tooth-plate from a large (over 60 cm long) fossil wrasse (Perciformes: Labridae) was recently recovered from the middle to late Eocene La Meseta Formation on Seymour Island, Antarctic Peninsula. This find increases the number of teleosts from the Eocene of Antarctica to five taxa, and further illustrates the diversity of the ichthyofauna in the Eocene Weddellian Sea prior to wide-scale climatic change in the Southern Ocean. The fossil wrasse represents the first occurrence of this family in Antarctica, and is one of the oldest fossils of this family from the Southern Hemisphere. Wrasses are not found in Antarctic waters today, and probably became extinct during the Oligocene due to a combination of climatic change, loss of shallow-water habitat, and changes in the trophic structure of the Weddell Sea.

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Introduction

Ongoing field investigations and subsequent palaeontological study of the middle to late Eocene La Meseta Formation on Seymour Island, Antarctic Peninsula (Fig. 1), continue to produce new information about the Palaeogene marine community in the Weddell Sea prior to the onset of wide-scale cooling in the Southern Ocean.

Although the teleost assemblage from the Eocene is sparse, it nevertheless demonstrates the differences between the varied temperate ichthyofauna of the Eocene and the highly endemic post glacial ichthyofauna in present-day Antarctic waters. Notothenioid fishes dominate today's fauna and account for 53% of all fish species currently living in Antarctic waters, and comprise 65–92% of fishes captured by trawls in the coastal waters of Antarctica (Eastman & Grande 1989, Anderson 1990). Fossils collected from the La Meseta Formation, however, indicate the composition of the Eocene ichthyofauna was considerably different than it is today. Remains of clupeoids (herrings and herring-like fishes), gadoids (cods and kin), siluroids (catfishes) and the genus *Trichiurus* (cutlassfishes), demonstrate a wide taxonomic diversity (Grande & Eastman 1986, Doktor *et al.* 1988, Eastman & Grande 1991, Long 1991). The most recent addition to the Eocene ichthyofauna of Antarctica are the remains of a fossil wrasse (Labridae) (Fig. 2a) recovered from the La Meseta Formation on Seymour Island.

Seymour Island lies off the north-eastern side of the Antarctic Peninsula, almost directly south of the southern tip of South America (Fig. 1a). The four stratigraphical sequences on Seymour Island extend from the Late Cretaceous to the late Eocene (Fig. 1b) (Woodburne & Zinsmeister 1984, Sadler 1988). The uppermost of these formations, the early to late Eocene La Meseta Formation, was a shallow-water marine environment, and is composed of clays, sands, and gravels rich in vertebrate and invertebrate fossils (Woodburne & Zinsmeister 1984). The La Meseta Formation is divided into seven units within three sections (Fig. 1c) (Sadler 1988). A single yet diagnostic fragment of a fossil wrasse was collected on Seymour Island by the University of California,

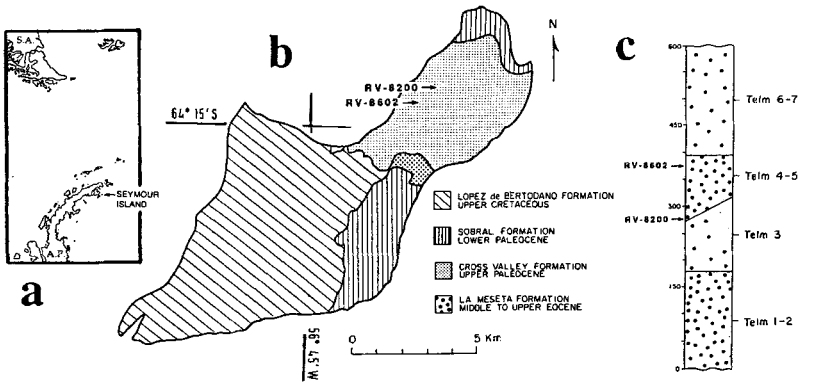


Fig. 1. Sketch maps to show **a.** the location of Seymour Island in relation to southern South America (S.A.). and the Antarctic Peninsula (A.P.), and **b.** the geology of Seymour Island showing the four major geologic formations including the La Meseta Formation and the fossil wrasse localities therin. **c.** the stratigraphical column of the La Meseta Formation showing the position of the two localities containing wrasse fossils.

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Riverside, during the 1986–87 field season. The specimen was found at MOW 8670 (field locality, U.C. Riverside), near the top of Unit Telm 5 (Sadler 1988, Long 1992). The specimen was preserved in a fine-grained pale brown to yellow brown sandstone.

Systematic paleontology

Class OSTEICHTHYES Huxley 1880

Subdivision TELEOSTEl Muller 1846

Order PERCIFORMES Bleeker 1859

Family LABRIDAE Cuvier 1817

Gen. et sp. indet.

The specimen (UCR 22340) (Fig. 2a) is a large fragment of a lower pharyngeal (throat) plate, lacking much of the left side and a small part of the right and anterior extensions. It measures 31.3 mm long at the centre and 40.2 mm wide at the posterior margin. It is almost triangular in overall shape, with the apex of the angle pointing anteriorly; the distal ends of the plate would taper off stoutly if the plate was complete. The plate consists of very dense bone, with a pavement of small (2.5–3.5 mm) flattened, round to sub-conical teeth composed of an enameloid cap over a dentine core. The teeth grow from below and are compacted together on the occlusal surface to form a relatively solid and continuous flat grinding surface. In cross section, usually three or four levels of replacement teeth are below the exposed tooth. The teeth on the plate are of uneven size and shape; the largest teeth are at the midline, and the smallest teeth are lateral to the midline. Many of the exposed central teeth are nicked and pitted, suggesting abrasion by hard objects. Individual teeth in various stages of eruption and wear can clearly be seen.

Only wrasses have a lower pharyngeal plate as described above, and these are unlike pharyngeal grinding plates found in the marine teleost families Scaridae, Sparidae, Sciaenidae, and Embiotocidae. Pharyngeal plates in wrasses do not have morphologic characters that are taxonomically distinct, thus genus and species identification cannot be assigned.

Wrasses have a single lower (Fig. 2b) and paired upper tooth studded bony plates in their throat. They use these plates, powered by strong pharyngeal muscles, to crush and grind crustaceans, molluscs, and echinoderms, before swallowing (Randall 1986, Meyers 1989). Old and worn teeth on the pharyngeal plate are replaced by new ones erupting below them. I have noted discarded individual whole and fragmented pharyngeal teeth in screened and sorted matrix from RV 8200, located near the bottom of Telm 5 in section II (Fig 1c). The constant supply of new teeth on the pharyngeal plate allows for constant use throughout the life of the fish.

Pharyngeal plates are of little use in lower taxonomic identification in wrasses because of the lack of diagnostic characters. Most genera of extant wrasses attain an adult size of less than 40 cm (Randall 1986). The Seymour Island fossil wrasse was large (estimated to be from an individual over 60 cm in standard length based on comparisons to living specimens). The size of the specimen limits the number of possible taxa to those species that reach a large size range. Genera of living wrasses with species that reach lengths of 60 cm or more include *Anchichoerops, Choerodon, Bodianus, Coris, Semicossyphus, Achoerodus,* and *Cheilinus* (Scott *et al.* 1980, Eschmeyer *et al.* 1983, Randall 1986). The fossil wrasse was probably a member of a taxon very similar to, if not assignable to, the genera *Cheilinus, Achoerodus,* or *Semicossyphus.* Species in all three genera regularly reach adult sizes over 60 cm and occur in temperate areas; and all seven genera presently range into the Southern Hemisphere (Scott *et al.* 1980, Randall 1986).

Wrasses currently have a cosmopolitan distribution, with about 400 species living in tropical, sub-tropical, and temperate shallow coastal marine environments (Eschmeyer *et al.* 1983, Randall 1986). They prefer rocky subtidal habitats, and frequently live in kelp, algae, and sea grass beds in temperate areas (Eschmeyer *et al.* 1983, Randall 1986). In the Southern Hemisphere they have a circum-Antarctic distribution in temperate waters, living off the southern coasts of South America, Africa, Australia, and New Zealand (Scott *et al.* 1980, Ayling & Cox 1984, Randall 1986).

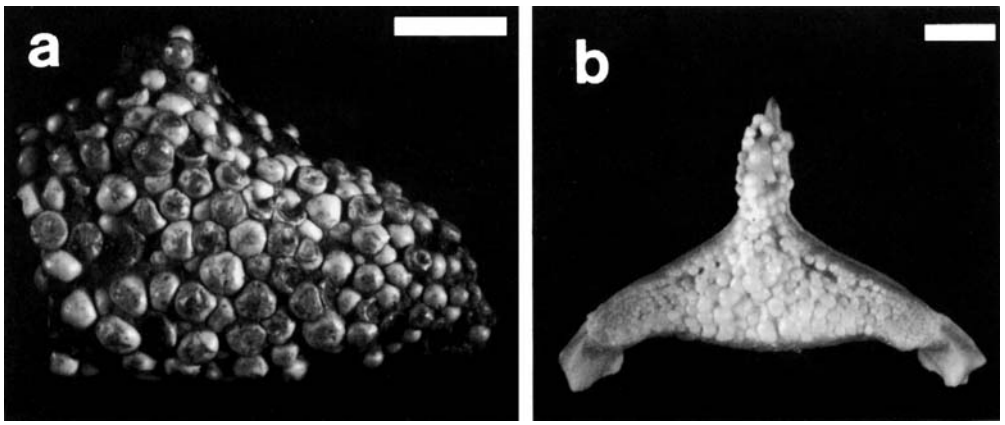


Fig. 2. a. OCR 22340, the fossil wrasse lower pharyngeal plate from RV-8602. **b.** a complete lower pharyngeal plate from an extant 65 cm sheephead wrasse (*Semicossyphus pulcher*) for comparison. The scale bar represents one centimetre.

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Wrasses are not part of the present-day Antarctic ichthyofauna. They have never been recorded from continental Antarctica or the seas around the sub-Antarctic islands, but this new fossil occurrence indicates that they were a part of the Antarctic ichthyofauna in the Eocene Weddell Sea. Fossil wrasses have been found in Miocene and Pliocene deposits in New Zealand and southern Australia (Chapman 1918, Chapman & Cudmore 1923, Pledge 1985), so the Seymour Island specimen represents one of the oldest occurrences of wrasses in the Southern Hemisphere.

The La Meseta Formation is thought to represent a temperate shallow marine environment (Woodburne & Zinsmeister 1984), the type of habitat preferred by temperate wrasses today (Randall 1986, Eschmeyer *et al* 1983). The cooling of the coastal marine environment of Antarctica during the Oligocene (Kennett & Barker 1990) was probably largely responsible for extinctions, local extirpations, and changes in the Palaeogene Antarctic ichthyofauna. Additionally, Eastman & Grande (1989) proposed that continental glaciation in Antarctica reduced the extensive shallow-water shelf environments in the Eocene Weddell Sea, limiting habitat for shallow-water fishes such as wrasses. In addition, they maintain that climatic change would also affect the trophic structure, limiting food resources for some species of fishes, and altering their biological habitat. The combination of any or all of the above factors could result in extermination of the wrasses or have forced them from the local environments of coastal Antarctica.

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