

Egg-guarding behaviour in the Antarctic bathydraconid dragonfish *Parachaenichthys charcoti*

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Abstract This paper provides the first photographic evidence of nest-guarding posture in the Antarctic bathydraconid *Parachaenichthys charcoti* in its natural habitat. Because bathydraconids are not monophyletic and *P. charcoti* is included in a different clade than *Gymnodraco acuticeps*, there is now documentation of nest guarding in all major clades of Antarctic notothenioids except for the Artedidraconidae.

Keywords Notothenioidei · South Shetland Islands · Parental care

Introduction

Charcot's dragonfish, *Parachaenichthys charcoti* Vaillant, 1906 (family Bathydraconidae), occurs in the lower Scotia Arc around South Orkney, South Shetland and Elephant Islands and tip of the Antarctic Peninsula, at a depth range of 5–400 m (Gon 1990).

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Although the behaviour of nest guarding is well known in bony fishes in general (Helfman et al. 1997), it has only recently been discovered in Antarctic fish species. Observations in situ on egg guarding in Antarctic notothenioids are limited to the harpagiferid *Harpagifer antarcticus* (Daniels 1978, 1979; White and Burren 1992), the nototheniids *Trematomus bernacchii* (Moreno 1980) and *Lepidonotothen nudifrons* (Hourigan and Radtke 1989), the channichthyids *Chaenocephalus aceratus* (Detrich et al. 2005) and *Chaenodraco wilsoni* (Kock et al. 2008), and the bathydraconid *Gymnodraco acuticeps* (Evans et al. 2005). Egg guarding and parental care have been suggested for the bathydraconid *Akarotaxis nudiceps*, based on its very low absolute fecundity (<300 eggs; La Mesa et al. 2007). It is likely that the nototheniids *L. larseni* and *T. eulepidotus* possess a similar guarding behaviour, because egg masses adhering to the spongocoels or found between sponges, respectively, have been collected as by-catch by bottom trawl (Ekau 1989; Konecki and Targett 1989). In non-Antarctic notothenioids, egg-guarding has been reported for the Patagonian nototheniid, *Patagonotothen tessellata* (Rae and Calvo 1995).

This short report provides the first evidence of nest-guarding posture in *P. charcoti* in its natural habitat. Bathydraconids are not monophyletic, and *P. charcoti* is included in a different clade than *Gymnodraco acuticeps* (Near et al. 2004). Hence, with our report, there is now documentation of nest guarding in all major clades of Antarctic notothenioids except for the Artedidraconidae.

Results and discussion

A Charcot's dragonfish guarding its nesting site was observed during scuba diving (CL) at Potter Cove, King George/25 de Mayo Island, South Shetland Islands

Fig. 1 The location of Potter Cove in the South Shetland Islands (a) with indication of the spawning site observed for *Parachaenichthys charcoti* (b)

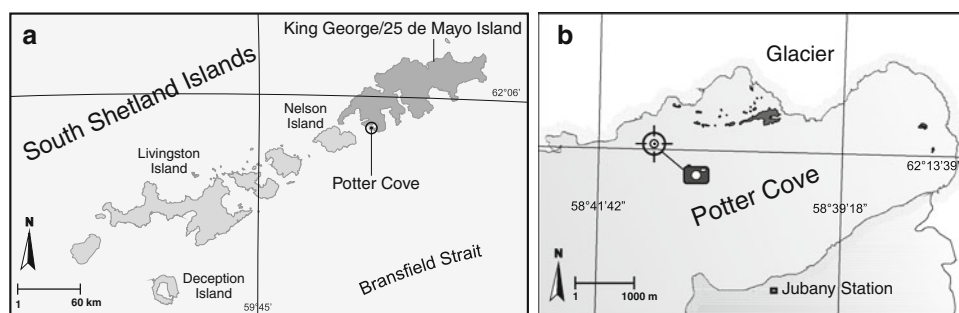
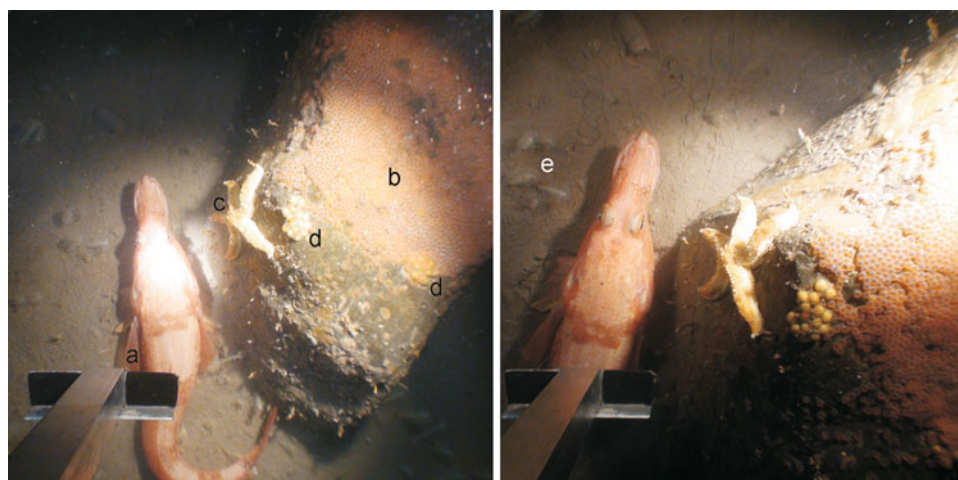


Fig. 2 Two photographs showing the nest-guarding behaviour of *Parachaenichthys charcoti*. **a** Adult fish showing a S-shaped defense posture. **b** Mass of dragonfish eggs adhered to a rock. **c** The seastar *Diplasterias brucei*. **d** Two patches of eggs of the gastropod *Neobuccinum eatoni* adhered to the same rock. **e** The sea pen *Malacobelemnion daytoni*



(62°13'S and 58°41'W) on 20 February 2009, 13:33 h local time (Fig. 1). The finding was in the inner part of the cove, in front of the glacier, on the North coast, at 30 m depth, where water temperature was 1.5°C and salinity 34.15‰. The nest consisted of a large single layer thick mass of eggs deposited on a flat rock of about 50 cm length × 40 cm width × 30 cm high, which rested on a fine mud predominantly composed of silt and clay deposited by glacial discharge on a substrate devoid of algae (Fig. 2). Based on observations of ovaries of gravid females collected in the same site (Barrera-Oro, unpublished data, see below), we estimate that the eggs measured 3.5–4 mm in diameter. They had the typical orange-reddish colour characteristic of this species (Bellisio 1967). The minimum number of eggs in the batch, estimated by direct counting on three different photographs of good resolution, was 2000. A seastar *Diplasterias brucei* (Echinodermata, Asterozoa) and two patches of eggs of the gastropod *Neobuccinum eatoni* (Mollusca, Gastropoda) were attached to the same rock close to the fish egg mass. In agreement with the description in Brueggeman (1998), *N. eatoni* eggs occur singly or massed together, with each capsule of a light orange hemispherical shape about 8 mm in diameter, surrounded by a marginal membrane. As *D. brucei* feeds on bivalves and gastropods (Brueggeman 1998), it is likely that this asteroid would be a

potential predator on the fish or gastropod eggs. The epifauna surrounding the fish spawning site was dominated by specimens of the sea pen *Malacobelemnion daytoni* (Cnidaria, Anthozoa; Fig. 2).

A “T”-shape aluminium rod with a 10-cm metal rule in the tip, operated by the diver, allowed estimation of the total length of the guarding *P. charcoti* specimen as about 50 cm (Fig. 2). Although females reach larger sizes than males (Bellisio 1967; our own recorded data), in this species, the only external feature differentiating the sexes is the expanded abdomen of females in the pre-spawning period of the life cycle; hence, the sex of the specimen in question could not be determined.

At Potter Cove, six female Charcot's dragonfish of total length range 46.2–53 cm in stage 4 (gravid, GSI 22–30%) of gonadal development (Kock and Kellermann 1991) were collected from late December to early February intermittently during the decade 2000–2010. This information, together with the evidence on the date of nest guarding in late February documented in this study, suggests that the spawning time of the species in the southern South Shetland Islands is summer, likely in February–March.

In the presence of the diver with the hand light, the fish remained close to the nest resting on their pelvic fins and exhibiting presumed parental care behaviour (Fig. 2).

The response was similar to the S-shaped defence posture described for notothenioids as a typical reaction to a remotely operated vehicle (ROV) lights (Ekau and Gutt 1991).

A more complete study of the reproductive biology of *P. charcoti* using samples collected at Potter Cove will be the aim of a future work.

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