

## BRIEF COMMUNICATION

### **From sneaker to bourgeois male: long-term observations on recognised tompot blenny *Parablennius gattorugine* individuals reveal new information on their biology**

P. Naylor<sup>1\*</sup>, T. Naylor<sup>1</sup>, L. Hammond<sup>2</sup> and D. M. P. Jacoby<sup>3</sup>

<sup>1</sup> 35 Hawthorn Park Road, Wembury, Plymouth, PL9 0DA, UK

<sup>2</sup> Cornwall College Newquay, Wildflower Lane, Trenance Gardens, Newquay, TR7 2LZ, UK

<sup>3</sup> Lancaster Environment Centre, Lancaster University, Lancaster, LA1 4YQ, UK

\* Corresponding author e-mail: paul@marinephoto.co.uk

#### **Abstract**

**The behaviour of the tompot blenny *Parablennius gattorugine* was studied by underwater observation and photography on the south-west coast of the U.K. over an 11 year period, with more than 50 individuals identified at two locations by their distinctive skin markings. Observations showed males engaging in rapid swimming behaviour when approached by a female and younger males using alternative 'sneaker' tactics before becoming 'bourgeois' territory-holders. The non-invasive recognition technique also facilitated detailed observations on territory retention (up to 7 years) and agonistic behaviours among both males and females.**

Keywords: individual recognition, photography, reproductive behaviour

The tompot blenny *Parablennius gattorugine* (L. 1758) is a common and widely distributed fish in shallow, sub-littoral rocky habitats around Europe (Wheeler, 1969; Almada *et al.*, 2001). It has a charismatic appearance and is a favourite sight for divers, but its behaviour and biology has received limited study (Dunne & Byrne, 1979; Faria *et al.*, 2010). In common with other blenny species (Westernhagen, 1983) and many shallow-water marine teleosts in general (Cody, 1993), the male guards eggs laid by females in its resident rocky crevice.

Long-term study of recognised individuals through underwater observations shows how their behaviour varies with time and, by identifying their gender, assists interpretation of their interactions.

Observations of *P. gattorugine* were made during 562 dives between 2011 and 2022 at Wembury Bay, Devon, U.K. in two small areas of algae-covered rocky reef, approximately 2 km apart. The first reef (A) is c. 2 m high and water depth at the base of the reef varies between 3 and 8 m, depending on tidal state. The second reef (B) is c. 1.5 m high with a water depth of 1.5 to 6.5 m at its base.

Dives were made at Reef A with open-circuit scuba and Reef B with either scuba or by snorkelling. Photographs were taken with Nikon SLR and Sony 'mirrorless' cameras in waterproof housings or with an Olympus amphibious compact camera. Lighting was provided by small flashguns or video lights. Care was taken when approaching and photographing *P. gattorugine* to minimise disturbance.

At least one dive was made in each month at Reef A throughout the 11 years, almost without exception, while dives at Reef B were less regular. At both reefs,

dives were more frequent in the spring and summer when *P. gattorugine* were more active and sea conditions calmer. Both reefs had several horizontal crevices and photographs were routinely taken at 6 locations occupied by male *P. gattorugine* on Reef A and at 3 locations on Reef B.

Individual *P. gattorugine* were identified with a high degree of certainty from distinctive skin markings on their heads (Naylor & Jacoby, 2016), with photographs of *P. gattorugine* taken during dives referenced against sets of photographs for recognised individuals. *P. gattorugine* individuals were confirmed as males by observing the presence of anal bulb glands on the front fin rays of the anal fin, as is typical of the males in this genus (Zander, 1975). These glands were particularly obvious in males when being wiped across the egg raft that they were guarding (Naylor & Jacoby, 2016). Individuals were confirmed as females if observed laying eggs. Findings from the observations were as follows.

- On five occasions when female *P. gattorugine* were observed approaching a male's resident crevice before egg laying, the male made rapid, darting swimming movements around the entrance to the crevice. There is currently no information available on *P. gattorugine* courtship, and it is suggested that this represents a courtship display.
- Three individual male *P. gattorugine* were observed demonstrating potential sneaker behaviour, entering the resident crevice of a territory-holding male while a visiting female was laying eggs. On two of these occasions, the 'sneaker' exhibited fertilising-type behaviour (similar to that of resident males) close to the female and, on close inspection, was seen to have very small anal glands. Recognition of individuals showed that all three of these 'sneaker' male individuals then went on to guard eggs in resident crevices as 'conventional' or 'bourgeois' males in later years. This was the first recorded observation of 'sneaker' behaviour in *P. gattorugine* but it is consistent with the occurrence of alternative reproductive tactics in a number of blenny species including 'sneaker' behaviour within the same genus, *Parablennius parvicornis*, (reviewed by Oliveira *et al*, 2009). Sneaker behaviour has evolved in a wide variety of fish species enabling them to maximise their reproductive ability. In young fish, such as these tompot blennies, sneaker behaviour allows them to reproduce before they are sufficiently large, strong or experienced to monopolise a territory as a bourgeois male (Taborsky 2001) and it thus increases their overall lifetime fitness.
- The complex behaviour of *P. gattorugine* includes a range of interactions additional to courtship and mating. Some observed interactions were interpreted as a resident male defending his territory against an intruding male and others as rivalry between females. Further interactions involved a smaller individual approaching a larger one and rolling its body over at an angle to the seabed in a posture that appeared submissive before retreating, sometimes chased by the larger individual. These particular interactions, noted on twelve occasions on the studied reefs, variously involved two males, two females or a male and a female (with either being the larger or smaller individual). Interestingly, they all occurred between July and October, mainly outside the breeding season (March to July). Similar behaviour between *P. gattorugine* individuals has also been observed at other locations in Dorset, Devon and Cornwall, UK.

- The colour of *P. gattorugine* varies with gender and also depends on the activity of the individual at the time, particularly in females. They are typically paler and more greenish brown than the reddish brown males but tend to be paler when laying eggs and darker when interacting with potential rivals. The changes are evident over a period as short as 15 minutes.
- The accumulation of many close-up photographs of *P. gattorugine* enabled non-invasive measurement of their head tentacles, which may have a role in sexual display. The head tentacles of males are significantly longer (mean 1.16 x eye diameter, SD 0.31) than those of females (0.81 x eye diameter, SD 0.11). A particularly intriguing observation was that *P. gattorugine* at other locations in the south of the UK appear to have markedly longer head tentacles, and this warrants further detailed study.
- Continuing observations on the studied reefs has provided better data on the impressive territory retention of individual *P. gattorugine*. Based on observations of 20 males at 9 crevice locations in the two areas of reef, the average number of breeding seasons for which an individual male occupied a particular location was 2.4. Eight of these males occupied particular locations for three or more breeding seasons and one male occupied a location during a remarkable eight consecutive breeding seasons. Males occupied their territories throughout the winters between breeding seasons, although they often withdrew deep into their resident crevices and were therefore more difficult to photograph from November to January. Both studied areas of reef are exposed to the south and west, and subjected to severe wave action and large swells during stormy weather.
- Observations of 31 recognised individual female *P. gattorugine* during their 57 visits to the resident crevices of males on Reef A were consistent with the characteristic Blenniidae pattern of fractional spawning (Dunne & Byrne, 1979) and a promiscuous mating system (Neat & Lengkeek, 2009). Recognised individual females were observed laying eggs with more than one male during a breeding season and over subsequent seasons; and males hosted more than one female in a breeding season. Ten of the individually recognised female *P. gattorugine* were recorded in more than one breeding season, with one being seen over a 7 year period.

These observations show how information can be gathered on the biology of a small teleost species by combining careful observation and photography with recognition of individuals from their markings. Photographic recognition avoids the difficulties of applying conventional tagging methods to small teleosts (Beukers *et al*, 1995) and has advantages with many groups of animals including fish (Dala-Corte *et al*, 2016). In our study of *P. gattorugine* it has allowed photographic records to be examined retrospectively to collect additional information about an individual's behaviour, including changes over time. It is particularly valuable in the case of a species such as *P. gattorugine* where an individual's gender is not always immediately apparent but, once determined, can be utilised in interpreting earlier or later observations.

Information on the life events of individual fish, especially for a common and charismatic species, is also valuable in presentations and publications (Naylor 2013) for a non-specialist audience including children. These can be used to

encourage engagement with the marine environment and support for its protection.

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### **Figure caption**

Figure 1.

A and B: Individually recognised male (A) and female (B) *P. gattorugine* both observed on Reef A over a period of 7 years.

C: Resident 'bourgeois' male *P. gattorugine* (left), a visiting female (centre) and a 'sneaker' male (right) in 2017. The female is the same individual as in B.

D: Resident 'bourgeois' male *P. gattorugine* (left) and a visiting female (right) in 2022. The female is the same individual as in B and C. The male is the same individual as the 'sneaker' male in C.