

# *Trophon geversianus* (Pallas, 1774): the first record of communal egg masses in the muricid subfamily Trophoninae (Gastropoda)

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## ABSTRACT

Reproductive strategies are thought to have played a major role in the adaptive radiation of neogastropods, but data are still lacking for important taxa, and the extent of plasticity in reproductive strategies is not well understood. Females of the Patagonian neogastropod *Trophon geversianus* are here shown for the first time to have plastic egg capsule-laying strategies. Past work has recorded only egg laying by isolated females, both in the intertidal and in the lab. New observations of egg laying in subtidal *T. geversianus* show that communal oviposition also occurs in this species, a first record of its kind for the species and for the subfamily Trophoninae. Given that communal oviposition in other species is commonly regarded as an adaptation to predation cues or changing environment, we propose this reproductive strategy in trophonines is an inducible response to environmental risk.

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## INTRODUCTION

In the course of gastropod evolution, many species have evolved reproductive adaptations related to the encapsulation of embryos in response to diverse environmental threats, such as predation (Rawling, 1994). Selective pressures such as predation can affect gastropod embryonic development, capsule morphology, and also oviposition behaviors, including effects that are phenotypically inducible responses (among others: Harasewych, 1990; Rawlings, 1990; 1994; Dumont et al., 2008; Bigatti et al., 2010; Roche et al., 2011).

Communal oviposition, which has evolved independently in many animal groups, consists of several conspecific females depositing egg capsules on a shared substrate, often resulting in large masses of eggs (D'Asaro, 1970; D'Asaro, 1991; Swanson, 2004). Adaptive explanations for this behavior include predator deterrence for embryos and facilitation of social foraging (Waldman, 1982; Dumont et al., 2008). Communal oviposition is a phylogenetically widespread behavior in gastropods (Thorson, 1940;

Giglioli, 1955; Gohar, and Eisawy, 1967; D'Asaro 1970; Bandel 1975; Soliman, 1987; D'Asaro, 1991) and is particularly well documented in the neogastropod family Muricidae, including the subfamilies Muricinae, Ocenebrinae and Rapaninae.

*Trophon geversianus* (Pallas 1774), type species of the type genus of the subfamily Trophoninae and a good representative taxon of the Magellanic malacological province, occurs, lives, and feeds, on banks of mytilid bivalves and barnacles on the rocky intertidal and subtidal zones along the Patagonian coast (Pastorino, 2005). Its egg capsules are easily identifiable in the field due to their abundance and characteristic erect, rounded form and bright yellow color. Capsules are variable in size (up to 22 mm in height) and are usually attached by the female to a hard substratum by a short and wide peduncle that rises from a common basal membrane (Zaixso, 1973; Penchaszadeh, 1976). Observations on the number of capsules from a single oviposition event range from 2 to 22 per female (Penchaszadeh, 1976). Cumplido et al. (2010) published observations on the spawning behaviour of *T. geversianus* in lab aquaria and reported no events of communal spawning. Communal oviposition has also not been reported previously for *T. geversianus* in the wild.

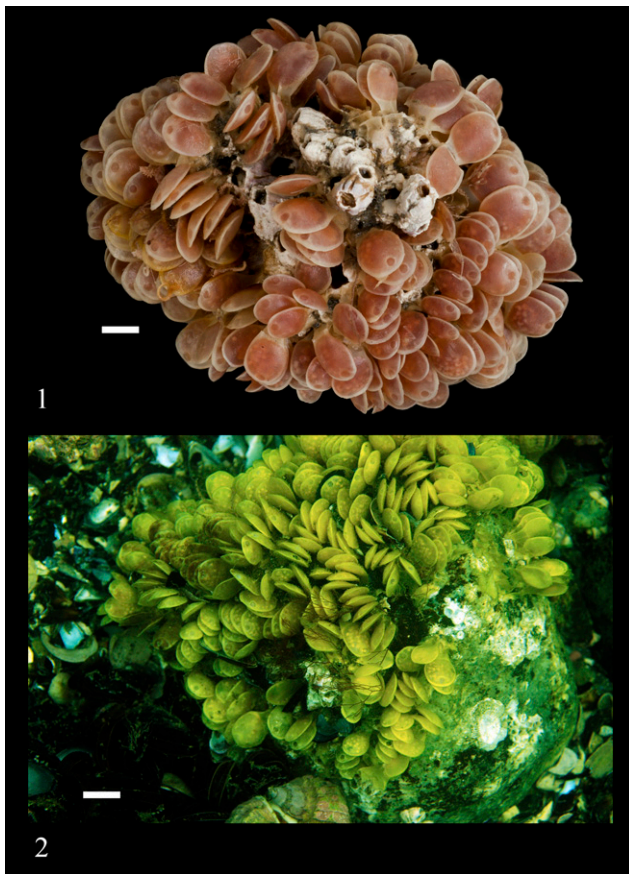
## MATERIALS AND METHODS

In this work, we report observations on communal spawning of *T. geversianus* found living at approximately 20 m depth on a mixed bottom of thick sand and pebbles near to Puerto Almanza at Beagle Channel (54°53'10.56" S, 67°42'6.55" W), Tierra del Fuego, Argentina on March 2010. One communal spawn mass, which was attached on a sub-quadrant rock about 20 cm in width, was collected by SCUBA and fixed with 5% formalin in seawater (Figure 1).

## RESULTS

Several communal spawn masses were observed deposited on rocks partially covered by barnacles. One of the

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**Figures 1, 2.** *Trophon geversianus* egg masses from Tierra del Fuego, Argentina. **1.** Subtidal communal spawn, fixed in 5% formalin in seawater. **2.** View of a subtidal communal oviposition *in situ*.

largest masses consisted of a total of 250 capsules. Each capsule had the escape aperture (mucoïd plug) oriented toward the upper exterior of the spawn mass and was attached to the substrate by its own basal membrane. The basal membrane of a capsule was never superimposed over the basal membranes of adjacent capsules. A minimum of twelve females would have been required to form a mass of 250 capsules, assuming each female produced the maximum number of capsules recorded for a single female *T. geversianus* at a single oviposition event (Zaïxo, 1973; Penchaszadeh, 1976; D'Asaro, 1991; Cumplido et al. 2010) (Figure 2).

## DISCUSSION

This study provides new information about the reproductive strategy of *T. geversianus*, which can be coded for phylogenetic analyses or used to map the evolution of reproductive strategies across Muricidae. Moreover, communal spawn masses of this type have not been observed previously at the intertidal and subtidal levels where *T. geversianus* usually occurs, indicating that females

may modify their oviposition habit in response to environmental cues.

The area where these egg capsules were collected is not exposed, is relatively quiet, and moderately shallow. No strong waves or active winds affect the coast at Puerto Almanza, which is very different from the typical intertidal conditions of the rocky shores along the Patagonian coast. Also, the substrate is a mix of free boulders, fine-grained sand, and large and immobile rocks. In this habitat, large rocks are the only suitable substrate on which to attach the capsules. This difference in environmental conditions in between intertidal and subtidal areas may explain the occurrence of communal spawning. The conditions are also favourable for gastropod predators, and it would be valuable to test whether the unusual spawning behaviour for *T. geversianus* influences reproductive success of adults.

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