

SPREADING POTENTIAL OF AN INVADER: *RAPANA VENOSA* IN THE NORTHERN ADRIATIC SEA

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Abstract

The population of the invasive gastropod *Rapana venosa* in the Northern Adriatic Sea showed continuous mating and spawning activities from March to September and high egg case deposition rates. Reproduction occurred mainly on the artificial reefs placed along the littoral for preventing beach erosion. The large availability of *Rapana* larvae could increase the transfer risk of the alien species via ballast water towards new international destinations.

Key-words: alien species, reproduction, spreading potential, Rapana venosa, Northern Adriatic

Introduction

The Asian gastropod *Rapana venosa* (Valenciennes, 1846) is recognised as one of the most unwanted nuisance species in the world (1). This large muricid (maximum shell length > 160 mm) is a predator of bivalves of commercial interest such as oysters, mussels and clams. Consequences of its introduction result in localised depletion of bivalves stocks and side effects on benthic-pelagic coupling. *R. venosa* was responsible for unbalancing the food web of the Black Sea (2). Feeding on bivalve preys led to a decrease in food availability for some of the local bottom-feeding fish, as well as some planktivorous fish which use bivalve meroplankton as food. This gastropod is characterised by high ecological fitness, being tolerant of low salinity, water pollution and oxygen deficiency at both the adult and the larval stage (3).

The world distribution of *R. venosa* is reported by Mann *et al.* (1). In the Northern Adriatic the whelk was introduced in the 1970s and it is now distributed from Trieste to Ancona. We found high densities of the gastropod in Cesenatico (Emilia-Romagna), where the bulk of the reproductive population is clustered on the rocky artificial reefs, 300 meters from the coastline (average density: 13 ind. 100 m⁻²) (4).

In this paper we report our findings on the reproductive activity of *R. venosa* on the rocky artificial reefs off Cesenatico as an indication of the spreading potential of this alien species.

Materials and Methods

The length of *Rapana venosa* reproductive period was estimated on the basis of data obtained by local fishermen of squids, whose nets are clogged by *Rapana* egg cases. In order to assess egg cases maturation stages, on May 2001 three clusters, each bearing 20 egg cases, were collected (by scuba diving) from female whelks spawning on the support piles of a landing place in Cesenatico. The egg clusters were kept in three replicates 2 l glass jars filled with marine water taken near the collection place and maintained in observation till hatching. Egg cases morphological modifications during maturation were annotated. The experimental jars were kept on natural light conditions and water exchange was made daily checking for salinity and temperature values.

From 20/06/01 to 18/07/01 all *Rapana* egg cases laid every week on three rocky reefs (submerged surface: 115 m²) located 300 meters off the beach of Cesenatico were removed manually by SCUBA divers. Egg cases were scraped gently from the substratum using a broad knife and kept in net bags (one for each replicate); afterwards, they were separated and counted per maturation stages.

Results

The appearance of *Rapana venosa* egg cases on local fishermen's squid nets started from the end of March 2001 till the end of the fishing season (end of July 2001). We found the last egg case on the rocky reef at the end of September 2001; therefore, the spawning period lasted 5 months (water temperature range: 12-28° C).

The egg cases maturation experiment identified five stages from day 0 (collection) to day 14-21 (hatching):

- 1) day 0 = during deposition the egg case was whitish pale yellow and of gelatinous consistence.
- 2) day 1-3 = the wall case was pale yellow and eggs appeared inside as tiny whitish spots suspended in a gelatinous matrix.
- 3) day 3-7 = the wall case was deep yellow and eggs inside were well visible.
- 4) day 7-14 = the wall case lost its turgidity and colour, eggs develop in larvae with a pale grey shell.

5) day 14-21 = the wall case became very thin and of papery consistence, with evident actively black swimming larvae inside the capsule.

Considering the number of egg cases belonging to the 2nd and 3rd maturation stage (~ 7 days from spawning) collected weekly on 115 m² rocky reef, maximum average deposition occurred at the beginning of the investigation (20/6 = 2780 ± 1001 egg cases/week). A negative trend in deposition was evident (27/06 = 1895 ± 703; 05/07 = 1253 ± 560) with minimum values registered the last two weeks (12/7 = 994 ± 592 egg cases/week; 18/07 = 1121 ± 614 egg cases/week). For the entire experimental period the average weekly deposition rate was of 1340 ± 387 egg cases.

Discussion

Our results showed high reproduction activity of the gastropod *Rapana venosa*. Considering a minimum of 800 larvae produced per egg case, the minimum reproductive potential of *Rapana* on a rocky reef would be 800 x 994 (average minimum number of egg cases laid on a 115 m² rocky reef) = 795,200 larvae/week. The reproductive season of the gastropod in the area lasts about five months; rocky reef structures are lining most of the Northern Adriatic littoral (over 60% of Emilia Romagna shores are protected by rocky reef structures) (5); therefore the spreading potential of *Rapana* is extremely high. *Rapana* larvae are planktonic for a minimum of 14 to a maximum of 80 days prior to settlement and are resistant to salinity variations and other stress agents (1). The Northern Adriatic Sea is interested by an intense interoceanic shipping activity representing 26% of the national traffic, with five large international harbours: Trieste, Porto Nogaro, Venice, Chioggia, Ravenna and Ancona (6); this would increase the transfer risk of alien species, such as *Rapana venosa*, whose larvae can be transferred via ballast water towards new international destinations.

References

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