

OCCURRENCE OF *Perna perna*, *Modiolus carvalhoi* (MOLLUSCA, BIVALVIA, MYTILIDAE) AND *Megabalanus coccopoma* (CRUSTACEA, CIRRIPIEDIA) OFF AREIA BRANCA, RIO GRANDE DO NORTE STATE, BRAZIL

On August 23, 2004 three species typical of southeastern Brazil were collected on the pillars of the Terminal Salineiro de Areia Branca (TERMISA).

This is an ~5,000 m²-artificial structure, located at 04°49'06" S and 37°02'43" W, distant 26 kms from Areia Branca and ca. 14 kms from the shore. This terminal was specifically built for loading salt onto ships off shore, due to the shallow depth and the coral reefs of the RN coast. The city of Areia Branca is located at the northern coast of Rio Grande do Norte State (RN), close to the Ceará State border, ca. 330 kms from Natal.

The organisms found were represented by 3 specimens of *Perna perna* at 0.5 and 3 m depth, 2 of *Megabalanus coccopoma* at 3 and 7 m, and one sole individual of *Modiolus carvalhoi* at 0.5 m.

Up to now there were no records of the mussel *Perna perna* on the northeastern and northern shores of Brazil. Its range was limited to the states of Rio Grande do Sul, Santa Catarina, Paraná, Rio de Janeiro and Espírito Santo, the limits being Praia do Cassino in Rio Grande do Sul State (RS) to the south and the Bay of Espírito Santo Bay, Vitória, Espírito Santo State (ES) to the north (Souza et al., 2004). In South America, its range is discontinuous between Espírito Santo State, Brazil, and Venezuela. In North America this bivalve was first recorded in the Gulf of Mexico, in 1990, as an exotic species introduced via ship-hull fouling and ballast water (Hicks & Tunnel, 1993). There is strong indication that this species is not endemic to Brazil and was possibly introduced from Africa through the slave trade (Souza et al., 2003; 2004; 2005).

The cirriped *Megabalanus coccopoma* was known to occur only from ES to RS states, and its distribution was well studied over the entire Brazilian coast. Although it is found in the tropical Pacific (from Mexico to Peru), it is worth noting that this species did not use to occur in tropical Brazilian waters (Young, 1994). It is considered an introduced species

in the Southeast and South coasts, with records in 1974 for Guanabara Bay, 1977 for Angra dos Reis and in 1978 for Cabo Frio (Lacombe & Monteiro, 1974; Lacombe, 1977; Lacombe & Rangel, 1978). Oliveira (1940 apud Young, 1994) did not record this species in Guanabara Bay, and neither did Luederwaldt (1929 apud Young, 1994) in São Sebastião. Young (1994) affirms that *M. coccopoma* must have colonized the Brazilian seashore between the 1930's and the 1940's. At present it is competing in the Southeast with *M. tintinnabulum*, which has a lower population density than the invading species (Silva Jr., 2002).

The bivalve *Modiolus carvalhoi* was recorded by Rios (1994) in Brazil only in the South and Southeast Regions, and does not occur in any other part of the Atlantic Ocean.

For the past 30 years the TERMISA has received ca. 12,000 tons of ballast water uploaded at Arraial do Cabo, Rio de Janeiro (RJ) State, with all the biota contained therein. Deballasting occurs at a frequency of approximately 20 days, and it is possible that *Perna perna*, *Megabalanus coccopoma* and *Modiolus carvalhoi* have reached Areia Branca in ballast water.

Perna perna has a great capacity to adapt to different environmental factors. Adults survive in salinities between 19 and 44 and in temperatures from 5 to 30°C (Hicks & Tunnel 1993). Larvae of this species tolerate temperatures between 10 and 30°C and salinities from 15 to 55 (Romero & Moreira, 1980), and may stay in the water column up to 20 days before settling (Hicks & Tunnel 1993).

Cirriped and Mytilid larvae are frequently found in water ballast samples (Gollasch et al., 2000; Olenin et al., 2000), including from the trading ship that does the Arraial do Cabo-Areia Branca route (Souza, 2000; Silva, 2001). In addition, most invasive species recorded in North America belong to groups Crustacea and Mollusca (Ruiz et al., 2000), facts which support the possibility of these organisms' introduction.

The presence of these species was recorded at low densities, with young individuals which did not present well-developed populations. It is possible that these organisms will not become established, but this is nevertheless strong evidence of organism transport from the Brazilian Southeast to the Northeast. Despite the fact that *Perna perna*, *Modiolus carvalhoi* and *Megabalanus coccopoma* are typical fouling organisms, it is likely that they were introduced via ballast water, as the ship hulls are relatively clean and the volume and frequency of ballast water discharge are very large.

Even with continual deballasting of Arraial do Cabo, RJ waters at Areia Branca, RN, no significant damages to the latter ecosystem have been observed.

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