Journal of Shellfish Research, Vol. 26, No. 3, 859–861, 2007.

THE FIRST REPORT OF *PHORONIS* SP. (PHORONIDA) IN RED ABALONE (*HALIOTIS RUFESCENS*) IN CHILE

FABIÁN AVILÉS,[1]* NICOLÁS ROZBACZYLO,[2] MARCOS GODOY[1] AND GERARDO MUÑOZ[1]
[1]*Aquagestión, Panamericana Sur 581, Puerto Montt, Chile;* [2]*Pontificia Universidad Católica de Chile, Alameda 340, Santiago Chile*

ABSTRACT Various red abalone shells (*Haliotis rufescens*) taken from Chiloé, X Region, Chile, were examined revealing an enormous amount of vermiform organisms identified as phoronides (Phylum Phoronida) belonging to the genus *Phoronis*. These individuals have an extended vermiform body not divided into segments, but its upper extreme shows a crown of tentacles shaped in a circular ring (that is the reason why they could be confused with Sabellidae polychaetes, although they do not have segmented body and lack bristles). These are found in the interior of very fragile quitinous tubes. Only *Phoronis ovalis* has been recorded in Chile found perforating the shell of Chilean abalone, *Concholepas concholepas*, in samples from the coastal rocks of Mehuin, Valdivia (Arenas 1972).

KEY WORDS: abalone, *phoronis*

INTRODUCTION

The phoronids are habitants of the marine benthos, each individual produces a chitinous tube in which one moves freely, being able to retract. Those tubes represent the exoskeleton. The phoronids can live independently, in soft bottoms like solitary individuals in vertical tubes, or perforating rocks or shells, as well as forming aggregates of numerous tubes on hard substrates. (Veitéz et al. 1987).

Most of the phoronids live in costal bottoms from the intertidal zone to 400-m depth, but they are often found close to 60-m depth. Most of the species have a wide geographic distribution (Veitéz et al. 1987).

The species *Phoronis ovalis* was described for the first time in Scotland in *Ostrea edulis* shells and described by Wright (1856). It is also cited in Sweden (Brattstrøm 1943), in Brazil (Du Bois-Reymond 1949), in the west coast of Sweden (Silén 1952), in Norway (Lönöy 1953) and New Zealand (Silén 1956).

According to Arenas, 1972, *Phoronis ovalis* lives are associated with various marine molluscs as an incrusted epibiont. Some of the host species registered are *Nucella* sp. and *Fissurella nigra*, although not as often as with *C. concholepas*, which have its habitats in mild tempered and well-oxygenated waters. The shell galleries made by *P. ovalis* in *C. concholepas* are tortuous inside, covered by the dwelling cuticle tube. It penetrates the shell mostly without a defined path, crossing the periostracum and the prismatic layer until it reaches the nacreous layer. In this last layer the galleries commonly extend without crossing it. When the amount of galleries is too high the shells present severe morphological changes. The periostracum becomes markedly wider, showing an irregular and rough surface, completely erasing the growth lines. A more recent record of *Phoronis* is given by Oliva in 2005 who describes it as being associated with *Argopecten purpuratus* shells in two of four sites studied, with a prevalence varying from 26.7% to 0.5% and mean intensities of 25.4 at 20 individuals per shell respectively.

*Corresponding author. E-mail: fabian.aviles@aquagestion.cl

MATERIAL AND METHODS

Four hundred red abalone *H. rufescens* were analyzed to determinate the presence of phoronides in shells. The specimens were obtained from an aquaculture facility in a sea-based farm in the Chiloe area, Chile (42°23′S, 73°39′W).

The shells of every abalone were examined in the farm to detect shell abnormalities associated with the presence of phoronids. All individuals were measured (total length) and the abalone that presented significant abnormalities was sampled for laboratory analyses. The shell was separated from soft tissues by cutting the adductor muscle to examine the inner and outer face of the shell being sought for abnormalities associated with phoronids infestation. Once the shell observation was finished, all the phoronids positive shells were separated and crushed to extract the individuals. The breakage of the shell was conducted using pliers, beginning from the shell margin to the apex. Once the shell was broken into several pieces, the

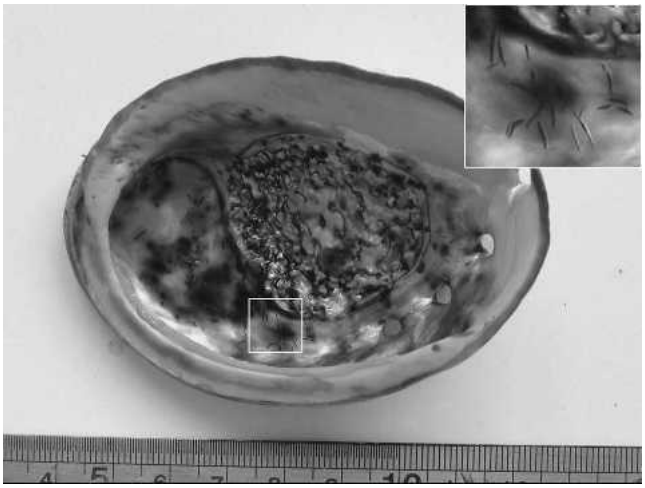

Figure 1. Inner face of *Haliotis rufescens* shell showing many *Phoronis* tubes on the surface.

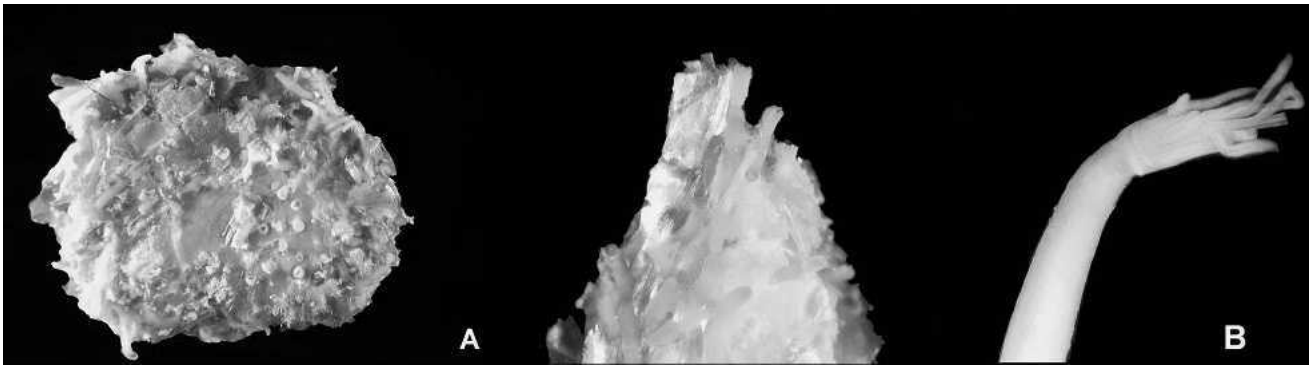

Figure 2. Light stereomicroscopic images of *Phoronis* in red abalone shells. A, *Phoronis* boring in shell fragments. B, *Phoronis* extracted from a shell fragment.

phoronids detected were carefully separated, using a nipper, and it was washed in saltwater to remove any debris.

The obtained material was observed under a Leica stereomicroscope model S6D. All the phoronides found were fixed in 5% glutaraldehyde in preparation for scanning under an electronic microscope (SEM) to identify external structures with taxonomic importance. The microscope used for SEM was the Zeiss 940 model. The taxonomic determination was carried out according to the study by Arenas (1972).

RESULTS

The average size of the examined abalones was 8.4 cm (±1.2). Only one of the 400 analyzed abalone shells showed the presence of tubules in the inner face of the shell (Fig. 1). The macroscopic and microscopic appearance of these tubes was very similar to those caused by sabellid worms (genus *Terebrasabella* or *Oriopsis*). None of the examined shells showed evidence of the presence of phoronids in the outer face. Moreover, none of the shells showed growth abnormalities or thickening.

The higher phoronides density reached in the shell was approximately 30 phoronides per square centimeter (Fig. 2A). The specimens gathered were elongated and vermiform (Figs. 2B, 3) with a yellow whitish color and the total length was approximately 1,200 μm, with a diameter from 100–200 μm. The tentacle length was approximately 600 μm with lophophore that had a slightly oval horseshoe shaped single row of tentacles (Fig 1). Figure 2A shows a *Phoronis* boring in shell fragments and Fig. 2B shows *Phoronis* extracted from a shell fragment. Figure 3 reveals images of *Phoronis* from red abalone shells

DISCUSSION AND CONCLUSION

This work constitutes the first report of the presence of phoronids of the genus *Phoronis* forming tubes, in the shell of the red abalone *Haliotis rufescens*.

Based on the morphological and ecological description conducted by Arenas (1972), it is assumed that the species found in red abalone in Chiloe area correspond to *Phoronis ovalis*. This species is widely distributed over the world, and in cases with high infestation levels severe shell damage can result.

It is important to note that the prevalence of this epibiont is extremely low (0.25%) in the sample, but the infestation intensity levels are very high (up to 30 individuals per square centimeter). This data agree with that reported by Oliva in 2005 for *A. purpuratus*, and distribution pattern suggests some biological hypothesis like gregarious behavior or a very low dispersion capacity.

Because of the similarity of the shell tubules observed in this case, with those made by sabellids polychaetes, it is important to

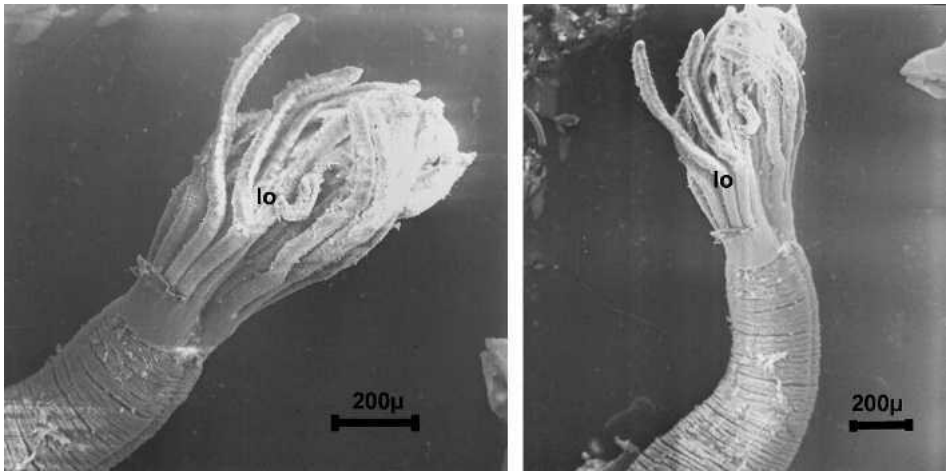

Figure 3. SEM images of *Phoronis* from red abalone shells. (Io) Iophophore.

carry out complementary analysis like shell crushing or decalcification to observe the individual parasites, thereby avoiding misidentification of the agent.

We suggest further studies to determinate the susceptibility of the abalone to *Phoronis* infestations and its potential effects on the abalone production systems.

LITERATURE CITED

Arenas, J. N. 1972. *Phoronis ovalis* in Chile. *Stud. Neotrop. Fauna Environ.* 7:113–115.

Brattstrøm, H. 1943. *Phoronis ovalis* Wright, eine für die skandinavische Fauna neue Phoronide aus dem Oresund. Lunds Univ. Aarsskr. N.F. Avd. 2. 39:1–17.

Du Bois-Reymond, Marcus E. 1949. *Phoronis ovalis* from Brazil. Bol. Inst. Oceanogr. Sao Paulo 10:1–105.

Lönöy, N. 1953. A comparative anatomical study on *Phoronis ovalis* Wright from Norwegian, Swedish and Brazilian waters. *Univ. Bergen Aarbok Naturv.* 2:1–23.

Oliva, M. & M. Sánchez. 2005. Metazoan parasites and commensals of the northern Chilean scallop Argopecten purpuratus (Lamarck, 1819) as tool for stock identification. *Fish. Res.* 71: 71–77.

Silén, L. 1952. Researches on Phoronidea of Gullmar Kiord area (west coast of Sweden). *Ark. Zool. Ser.* 2:95–140.

Silén, L. 1956. On shell burrowing Bryozoa and Phoronis from New Zealand. *Trans. Roy. Soc. New Zealand* 84:93–96.

Veitéz J., Emig C., Rodrígez Babío C. & García-Carrascosa A. 1987. Foronídeos de las costas de la Península Ibérica e Islas Baleares: sistemática, ecología, distribución y estados larvarios. Bol. Intit. Esp. Oceanogr. 4:63–78.

Wright, S. 1856. Description of two tubicular animals. Proc. R. Phys. Soc. Edinb.