The molluscs of the intertidal algal turf in the Azores

Los moluscos del cesped algal intermareale en Azores

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ABSTRACT

The molluscan fauna of the high intertidal algal turf on the island of Pico (Azores) was studied in order to complement existing descriptions of the intertidal biota on these islands. A total of 15,275 specimens belonging to 19 species were found. Five species, the gastropods *Alvania mediolittoralis* Gofas, 1989, *Omalogyra atomus* (Philippi, 1841), *Pisinna glabrata* (Megerle von Mühlfeld, 1824) and *Skeneopsis planorbis* (Fabricius O., 1780), and the bivalve *Lasaea adansoni* (Gmelin, 1791), account for 98% of the total number of specimens, *P. glabrata* itself being responsible for 46% of all specimens.

In places where patellid limpets are absent, the algal turf extends higher in the intertidal zone. In such places, three very abundant molluscan species characterize molluscan assemblages in the algal turf: *Lasaea adansoni, Skeneopsis planorbis* and *Pisinna glabrata. Lasaeo adansoni* and *Skeneopsis planorbis* virtually disappear in the transition from algal turf to algal fronds, the only (very) abundant species being *P. glabrata* and, with less importance, *Omalogyra atomus* and *Sinezona cingulata* (Costa O. G., 1861).

RESUMEN

Se estudia la fauna malacológica del cesped algal del intermareal superior en la isla de Pico (Azores), con el fin de complementar los trabajos ya existentes sobre la biota intermareal de estas islas. Se encontraron un total de 15275 ejemplares de 19 especies distintas. Cinco, los gasterópodos *Alvania mediolittoralis* Gofas, 1989, *Omalogyra atomus* (Philippi, 1841), *Pisinna glabrata* (Megerle von Mühlfeld, 1824) y *Skeneopsis planorbis* (Fabricius O., 1780), y el bivalvo *Lasaea adansoni* (Gmelin, 1791), suman el 98% del total de ejemplares, de ellas P. glabrata representa al 46%.

En aquellos lugares donde están ausentes los patélidos, las algas se extienden hasta niveles superiores en el intermareal. En estas zonas hay tres especies de moluscos que caracterizan las asociaciones malacológicas algales: *Lasaea adansoni, Skeneopsis planorbis* y *Pisinna glabrata. Lasaea adansoni* y *Skeneopsis planorbis* desaparecen en la transición entre el cesped algal y la zona de algas frondosas. La única especie abundante aquí es P. glabrata, y en menor medida *Omalogyra atomus* y *Sinezona cingulata* (Costa O. G., 1861).

KEYWORDS: micromolluscs, intertidal, algal turf, Azores.
PALABRAS CLAVE: micromoluscos, intermareal, cesped algal, Azores.

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INTRODUCTION

Located in the middle of the northern Atlantic and therefore relatively isolated, the oceanic islands that form the Azores archipelago (36° 55' to 39° 45' N, 24° 45' to 31° 17' W) are a "live-laboratory" where patterns and processes of dispersion, colonization and speciation can be studied and ecological, evolutionary and biogeographical theories be tested.

Lajes do Pico, a small town located in the south coast of Pico island, Azores (Fig. 1), is one of the most interesting places in the littoral of the Azores, because of its very diverse marine fauna and flora. As a consequence of a number of biological studies (AZEVEDO, 1990, SANTOS, 1992; AZEVEDO, RODRIGUES, MENDIZABAL AND ARRUDA, 1995; MORTON, BRITTON AND MARTINS, 1996, 1998; ÁVILA, 1998), this area was chosen as worthy of protection to conserve biological diversity; for a detailed review see ÁVILA, ELIAS AND MEDEIROS (2000).

Rocky shores in the Azores are usually covered by an intricate mixture of small-sized species of algae forming a characteristic algal turf (HAWKINS, BURNAY, NETO, CUNHA AND MARTINS, 1990; NETO, 1992; NETO AND TITTLEY, 1995). This turf is particularly effective for a number of small animal species, protecting them from wave exposure, excessive temperatures and desiccation (AZEVEDO, 1992). CHAPMAN (1955) was the first author to study the fauna associated to this algal turf, mainly composed of *Corallina* spp. and he was surprised by the great abundance of molluscs found in a sample of 10 x 10 cm, collected at Faial Island. AZEVEDO (1992) studied the molluscan species composition, abundance, diversity, seasonal variations and the effect of differences in wave exposure on the high intertidal algal turf of the Azores, on a temporal scale at São Miguel Island. He concluded that floristic composition and biomass of the algal turf are fundamental for the molluscan communities in this particular habitat.

According to NETO (1992), the "algal turf" is divided into two distinct zones, differentiated by their species-composition and morphology. The higher part is characterized by a "dense and short tangle forming a mat, almost impossible to separate into components" whereas the lower part is composed of frondose and larger algae. We follow her designation and restrict most of this study to the upper part of the "algal turf".

The aim of this study is to incorporate the vertical distribution of micromolluscs in the general zonation pattern already described for the intertidal of the Azores.

MATERIAL AND METHODS

Between August 7 and 11, 1995, a 30 m long transect was examined on the gently sloping rocky shore of Lajes do Pico, near "Poça do Pano", in a moderately exposed site (Fig. 1). The shore' profile was drawn, following the spirit leveling method (EMERY, 1961; HAWKINS AND JONES, 1992) and all elevations were related to Chart Datum, Azores (CD), by using sea-level at the time of predicted low-tide. Tidal range in the Azores is small (less than 2 m), for which reason the transect location was carefully chosen. The selected site presents a very gentle slope and, as a result, the transect was 30 m long, a distance very seldom found in Azorean intertidal shores. This procedure minimized problems derived from the blurring effect that occurs in the zonation of organisms, when transects are made in sites with steeper slopes.

Five quadrats of 25 x 25 cm were collected at 5, 10, 20, 25 and 30 m along one transect (Fig. 2). The highly uniform species composition of the algal turf and the large area used (25 x 25 cm instead of the usual 10 x 10 cm) (BULLOCK, 1995) minimizes possible sampling problems derived from a single transect without replicates. After the littorinid zone that extended from 0 to 15 m along the transect, and the barnacle zone (10-15 m), 3 quadrats of 25 x 25 cm were scraped from the "algal turf" at 20, 25 and 30 m and the material collected (all of the

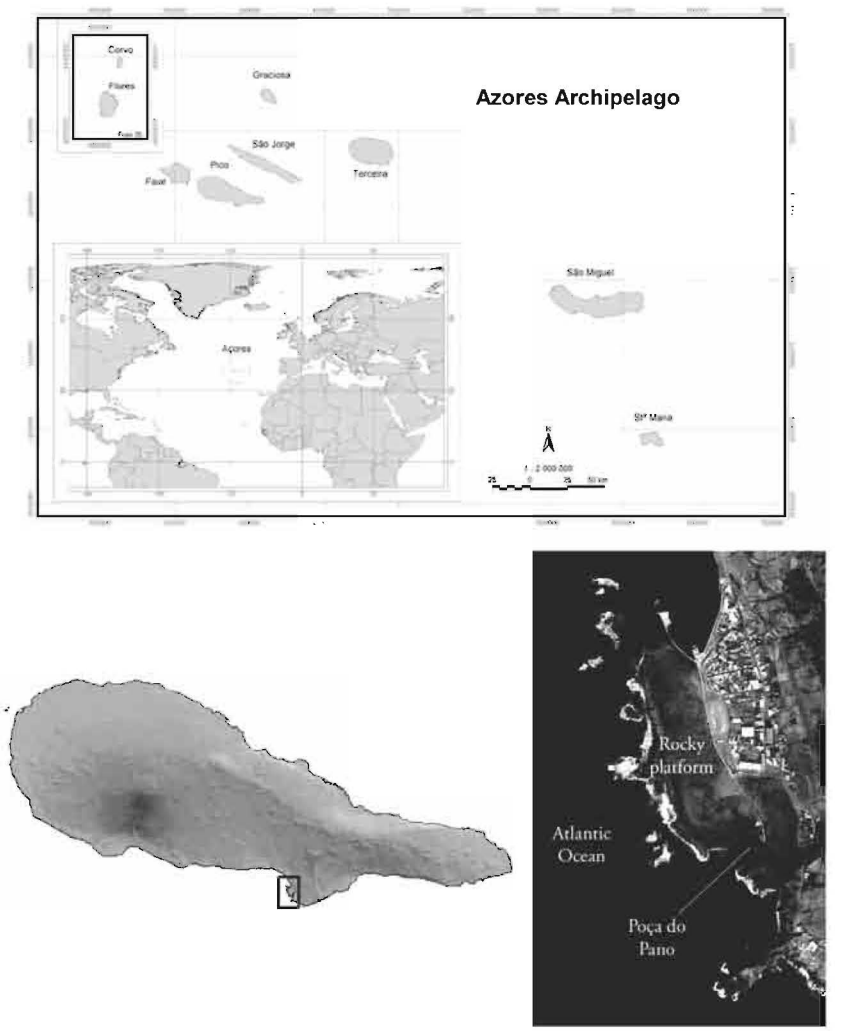


Figure 1. Azores archipelago (top), Pico island (bottom, left) and detail of location of Poça do Pano at Lajes do Pico village (Pico Island).
Figura 1. Archipiélago de las Azores (arriba), isla de Pico (abajo, izquierda) y detalle de la localización de Poça do Pano y la villa de Lajes do Pico (isla de Pico).

algae and contained sediment) put into labelled bags. In the laboratory, this material was washed several times and the animals removed from the algae. Samples were then labelled and preserved in 70% ethanol. The live-collected molluscs were sorted, identified and counted under a binocular dissecting microscope. Dominant algae were identified and algal dry weight (g) was determined for each quadrat, after drying for 48 hours at 60 °C. Abundance of molluscs was expressed as density (n/m^2) as well as n/100 g ADW (algal dry weight), where n is the number of specimens of the ith species in a quadrate.

Species authorities and synonymy of mollusc species follow the CLEMAM database.

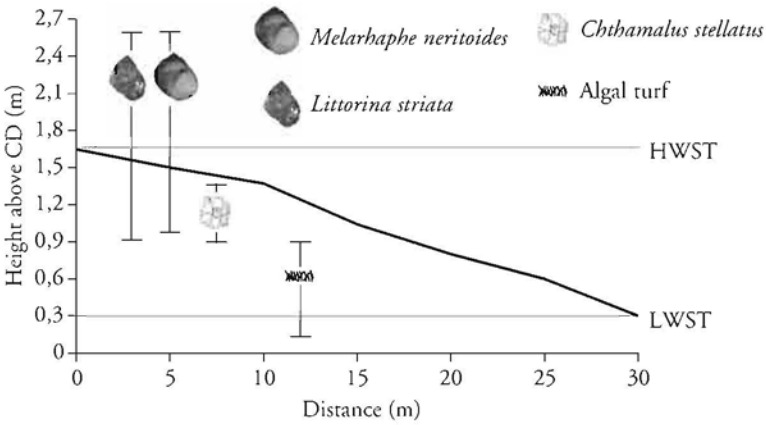


Figure 2. Transect performed at Poça do Pano (Lajes do Pico, Pico island) and vertical distribution of rocky shore organisms. HWST: mean high water level at spring tides; LWST: mean low water level at spring tides.

Figura 2. Transecto realizado en Poça do Pano (Lajes do Pico, isla de Pico) y distribución vertical de organismos de costa rocosa. HWST: nivel medio superior del agua en mareas de primavera: LWST: nivel medio inferior del agua en mareas de primavera.

RESULTS

Zonation: The "littoral fringe" is bound at the top by a littorinid zone that extends for 15 m along the transect, with a vertical range of 1.7 m, between 0.9 m and 2.6 m above chart datum. This is followed by a barnacle zone (*Chthamalus stellatus* (Poli)) with an extension of about 5 m along the transect (between 10 and 15 m), free of molluscs and with a vertical range of about 0.5 m (Fig. 2). After this, an algal turf, dominated by *Corallina officinalis* L., covers the rocky substrate entirely. No limpets were found in this zone, nor molluscs that were common elsewhere, like *Stramonita haemastoma* (Linnaeus, 1766) or *Mitra cornea* Lamarck, 1811 (HAWKINS, CORTE-REAL, PANNACCIULLI, WEBER AND BISHOP, 2000). Immediately after LWST (mean low water level at spring tides), frondose algae (mainly *Pterocladiella capillacea* (S.G. Gmelin) and *Enteromorpha muscoides* (Clem.) Cremades, in Cremades et Perez-Cirera replace the coralline turf.

Molluscs: A total of 15,275 specimens belonging to 19 species were found in the intertidal algal turf at "Poça do Pano" (Lajes do Pico) (Table I and Fig. 5). Five species, the gastropods *Omalogyra atomus* (Philippi, 1841), *Skeneopsis planorbis* (Fabricius O., 1780), *Alvania mediolittoralis* Gofas, 1989 and *Pisinna glabrata* (Megerle von Mühlfeld, 1824) (=*P. punctulum*) and the bivalve *Lasaea adansoni* (Gmelin, 1791), account for 98% of the total number of specimens, *P. glabrata* itself being responsible for 46% of all specimens (Table I). No molluscs were collected in the middle of the barnacle zone. In quadrats 3 and 4, located at 20 and 25 m in the transect, three species dominated: *L. adansoni*, *S. planorbis* and *P. glabrata* (Table II). In the lowermost quadrat, located at LWST, *P. glabrata* was clearly the most abundant species, representing about 90% of all specimens in that quadrat. Species density and number of specimens/100g ADW (algal dry weight) generally decreased towards LWST, with the exception of *O. atomus* and *Sinezona cingulata* (Costa O. G., 1861) (=*Schismope fayalensis* Dautzenberg, 1889) (Figs. 3, 4).

DISCUSSION

The site studied broadly conforms to the zonation pattern described from the

Table I. Specific composition of the molluscan fauna inhabiting the intertidal algal turf and total number of specimens collected in each quadrat. Quadrats 1-5 collected at, respectively, 5, 10, 20, 25 and 30 m along transect (see Figure 2 for further details).
Tabla I. Composición específica de la fauna de moluscos del cesped algal intermareal y número total de ejemplares recogido en cada cuadrante. Cuadrantes 1-5 obtenidos a 5, 10, 20, 25 y 30 m a lo largo del transecto, respectivamente (ver la Figura 2 para más detalles).

Taxa \ Quadrats	1	2	3	4	5	Total	%
Alvania mediolittoralis Gofas, 1989	0	0	40	325	22	387	2.5
Bittium latreillii (Payraudeau, 1826)	0	0	0	1	6	7	0.0
Bothryphallus ovummuscae (Gofas, 1990)	0	0	1	0	0	1	0.0
Cardita calyculata (Linnaeus, 1758)	0	0	36	47	6	89	0.6
Cingula trifasciata (Adams J., 1798)	0	0	1	0	0	1	0.0
Gregariella semigranata (Reeve, 1858) (= *Trichomusculus semigranatus* (Reeve, 1858))	0	0	0	1	0	1	0.0
Lasaea adansoni (Gmelin, 1791)	0	0	1,811	2,417	1	4,229	27.7
Littorina striata King and Broderip, 1832	2	6	0	0	0	8	0.1
Manzonia unifasciata Dautzenberg, 1889	0	0	0	0	1	1	0.0
Melarhaphe neritoides (Linnaeus, 1758)	5	3	0	0	0	8	0.1
Odostomia sp.	0	0	0	3	0	3	0.0
Omalogyra atomus (Philippi, 1841)	0	0	96	35	156	287	1.9
Pisinna glabrata (Megerle von Mühlfeld, 1824)	0	0	1,149	4,309	1535	6,993	45.8
Rissoella cf. *diaphana* (Alder, 1848)	0	0	3	0	0	3	0.0
Runcina cf. *adriatica* Thompson, 1980	0	0	0	20	0	20	0.1
Setia subvaricosa Gofas, 1990	0	0	0	0	25	25	0.2
Setia sp.	0	0	0	2	12	14	0.1
Sinezona cingulata (Costa O. G., 1861)	0	0	2	6	78	86	0.6
Skeneopsis planorbis (O. Fabricius, 1780)	0	0	1,107	2,003	2	3,112	20.4
Total	7	9	4,246	9,169	1,844	15,275	100.0

rocky shores of the Azores by HAWKINS *ET AL.* (1990) (Caloura, São Miguel Island) and NETO AND AZEVEDO (1990) for Flores Island (see also NETO, 1992, and MORTON *ET AL.*, 1998). These authors divided the vertical zonation of the organisms into three main zones: an upper one, the splash and spray zone, dominated by littorinids, lichens and ephemeral (seasonal) algae; a middle zone located between HWST (mean high water level at spring tides) and LWST (mean low water level at spring tides), occupied by filter-feeding barnacles in its upper levels and by the algal turf in the lower levels; and the lowermost zone, characterized by the appearance of algal fronds. To this scheme, we may add now the vertical distribution of other molluscs besides the littorinids. In places where patellid limpets are absent, possibly due to human overexploitation (HAWKINS ET AL., 1990; HAWKINS ET AL., 2000), the algal turf, usually coralline dominated by *Corallina*, *Jania*, *Amphiroa* or *Haliptylon* spp. directly attached to the rocky substrate (NETO AND TITTLEY, 1995) extends higher in the intertidal zone, a situation also encountered by NETO (1992). In such places of the Azorean rocky shores, three very abundant micromolluscan species characterize and further define the algal turf located in the intertidal zone: *Lasaea adansoni*, *Skeneopsis planorbis* and *Pisinna glabrata*. In the transition from algal turf to algal fronds, *Lasaea adansoni* and *Skeneopsis planorbis* virtually disappear, the only (very) abundant species being *P. glabrata* and, with less importance, *Omalogyra atomus* and *Sinezona cingulata*.

Most of the species found in the intertidal algal turf at Lajes do Pico do not

Table II. Density (n/m²) and number of specimens per 100 g algal dry weight (n/100g ADW) of the molluscan fauna inhabiting the intertidal algal turf at Lajes do Pico. For location of quadrats 1, 2, 3, 4 and 5, please refer to Figure 2.
Tabla II. Densida (n/m²) y número de ejemplares por 100 g de peso seco de algas (n/100g ADW) de la fauna de moluscos del cesped algal intermareal en Lajes do Pico. Para la localización de los cuadranets 1 a 5, ver la Figura 2.

	Density (n/m²)					n/100g ADW		
Taxa \ Quadrats	1	2	3	4	5	3	4	5
Alvania mediolittoralis Gofas, 1989	0	0	640	5,2	352	208	618	57
Bittium latreillii (Payraudeau, 1826)	0	0	0	16	96	0	2	16
Bothryphollus ovummuscae (Gofas, 1990)	0	0	16	0	0	5	0	0
Cordita calyculata (Linnaeus, 1758)	0	0	576	752	96	188	89	16
Cingula trifasciata (Adams J., 1798)	0	0	16	0	0	5	0	0
Rissoella cf. diaphana (Alder, 1848)	0	0	48	0	0	16	0	0
Lasaea adansoni (Gmelin, 1791)	0	0	28,976	38,672	16	9,432	4,595	3
Littorina striata King and Broderip, 1832	32	96	0	0	0	0	0	0
Manzonia unifasciata Dautzenberg, 1889	0	0	0	0	16	0	0	3
Melarhaphe neritoides (Linnaeus, 1758)	80	48	0	0	0	0	0	0
Omalogyra atomus (Philippi, 1841)	0	0	1,536	560	2,496	500	67	407
Pisinna glabrata (Megerle von Mühlfeld, 1824)	0	0	18,384	68,944	24,560	5,984	8,192	4,008
Runcina cf. adriatica Thompson, 1980	0	0	0	320	0	0	38	0
Setia subvaricosa Gofas, 1990	0	0	0	0	400	0	0	65
Setia sp.	0	0	0	32	192	0	4	31
Sinezona cingulata (Costa O. G., 1861)	0	0	32	96	1,248	10	11	204
Skeneopsis planorbis (O. Fabricius, 1780)	0	0	17,712	32,048	32	5,766	3,808	5
Gregariella semigranata (Reeve, 1858) (= *Trichomusculus semigranatus* (Reeve, 1858))	0	0	0	16	0	0	2	0

Table III. Maximum densities (n/m²) recorded for the Azores. 1: Feteira, Faial Island; 2: Piscina de Santa Cruz, Flores Island, sheltered; 3: Ponta Delgada, Flores Island, exposed; 4: Caloura, São Miguel Island, intertidal, sheltered; 5: Caloura, São Miguel Island, intertidal, exposed; 6: Caloura, São Miguel Island, infralittoral, sheltered; 7: Ilhéu de Vila Franca, São Miguel Island; 8: "Poça da Barra", Lajes do Pico, Pico Island, intertidal, sheltered; 9: "Poça do Pano", Lajes do Pico, Pico Island, intertidal, moderately exposed.
Tabla III. Densidades máximas (n/m²) encontradas en las Azores. 1: Feteira, isla de Faial; 2: Piscina de Santa Cruz, isla de Flores, protegido; 3: Ponta Delgada, isla de Flores, expuesto; 4: Caloura, isla de São Miguel, intermareal, protegido; 5: Caloura, isla de São Miguel, intermareal, expuesto; 6: Caloura, isla de São Miguel, infralitoral, protegido; 7: Ilhéu de Vila Franca, isla de São Miguel; 8: "Poça da Barra", Lajes do Pico, isla de Pico, intermareal, protegido; 9: "Poça do Pano", Lajes do Pico, isla de Pico, intermareal, moderadamente expuesto.

	Chapman, 1955	Neto and Azevedo, 1990	Azevedo, 1991	Bullock, 1995	Ávila, 1998	This work
Alvania mediolittoralis		64 (2)	14 (4)	54,400 (7)	160 (8)	5,200 (9)
Lasaea adansoni	12,200 (1)	17,888 (3)	724 (4)	1,674,400 (7)	1,088 (8)	38,672 (9)
Omalogyra atomus			68,046 (6)		16 (8)	2,496 (9)
Pisinna glabrata			5,975 (4)	104,100 (7)	32 (8)	68,944 (9)
Skeneopsis planorbis	2,000 (1)		4,304 (5)	129,400 (7)	16 (8)	32,048 (9)

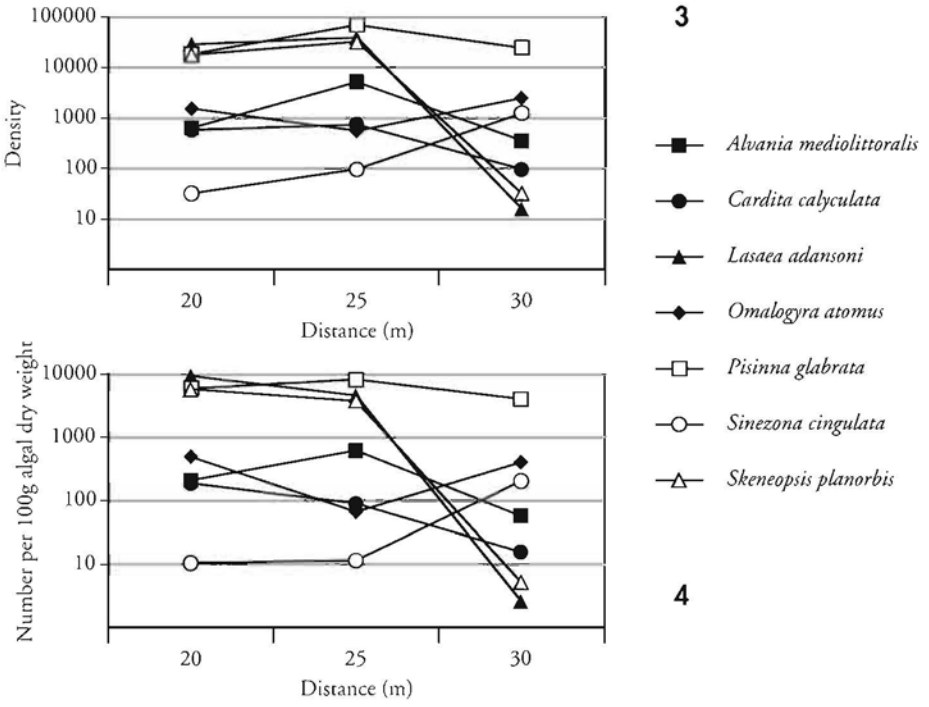
Table IV. Geographical ranges of the most abundant molluscan species inhabiting the intertidal algal turf at Lajes do Pico (see ÁVILA, 2000 and references therein). np: non-planktottophic type of development (it includes direct development and lecithotrophic development); br: brooding.
Tabla IV. Distribución geográfica de las especies de moluscos más abundantes en el cesped algal intermareal de Lajes do Pico (ver ÁVILA, 2000 y las referencias allí citadas). np: desarrollo no planctotrófico (incluyendo desarrollos directo y lecitotrófico); br: desarrollo planctotrófico.

Species	Type of development	Geographical ronge
Alvania medialittoralis	np	Azores, Madeira
Omalogyra atomus	np	Scandinavia, British Isles, Bay of Biscay, Portugal, Mediterranean, Azores, Madeira, Canary Islands, Cape Verde and Ascensian Island
Skeneopsis planorbis	np	Scandinavia, British Isles, Bay of Biscay, Portugal, Mediterranean, Azores, Madeira, Canary Islands and Caribbean
Pisinna glabrata	np	Azores, Canary Islands and Mediterranean
Lasaea adansoni	br	Scandinavia, British Isles, Bay of Biscay, Portugal, Mediterranean, Azores, Madeira, Canary Islands, Cape Verde, Ascension Island, Saint Helena and Caribbean

extend their distribution to the sublittoral. ÁVILA (2003) has established the molluscan vertical distribution between 3 and 30 m depths for the Azorean rocky shores covered by algal fronds. He found that the endemic rissoids *Alvania angioyi* van Aartsen, 1982, *Manzonia unifasciata* (Dautzenberg, 1889) and *Rissoa guernei* Dautzenberg, 1889, the also endemic trochid *Gibbula delgadensis* Nordsieck, 1982, the Macaronesian *Anachis avaroides* Nordsieck, 1975 and the small bivalve *Parvicardium vroomi* van Aartsen, Menkhorst and Gittenberger, 1984 were only abundant in shallow water (3 to 5-6 m), whereas *Alvania sleursi* (Amati, 1987) was especially abundant below 20 m depth. *Bittium latreillii* (Payraudeau, 1826), *Tricolia pullus azorica* (Dautzenberg, 1889) and *Jujubinus pseudogravinae* Nordsieck, 1973 were found in large numbers along the whole depth-range, albeit slightly more abundant in the lower levels (ÁVILA, 2003). Thus, as expected because of the different spatial architecture of algae, there is a marked difference between the molluscan species composition of the algal turf and that present in algal fronds. In fact, none of the most abundant molluscan species of the algal turf is present in high numbers in algal fronds. The total number of specimens of *Alvania mediolittoralis, Lasaea adansoni, Omalogyra atomus, Pisinna glabrata* and *Skeneopsis planorbis* collected in 51 quadrats (50 x 50 cm) between 3 and 30 m depth, was only 73 individuals, corresponding to about 0.20% of all specimens collected (ÁVILA, 2003). The only species that apparently extends its vertical distribution from the lower levels of the intertidal algal turf down to the shallow sublittoral algal fronds (2-3 m depth) is the minute *Omalogyra atomus*, which is the most abundant species at 2-3 m depth throughout the year (AZEVEDO, 1991). However, this species is very uncommon at greater depths (ÁVILA, 2003). The abundances of the algal-turf associated molluscan fauna found at Lajes do Pico are in the range of those found by other authors for other islands of the archipelago, being intermediate between the very high densities found by BULLOCK (1995) in a very sheltered place (Ilhéu de Vila Franca, São Miguel Island) and the densities found by NETO AND AZEVEDO (1990) and AZEVEDO (1991) (see Table III).

Some species found in the quadrats are accidental (e.g. *Botryphallus* and *Cingula*) which live under intertidal boulders and not in algal turf.

It is noteworthy that 4 out of the 5 most abundant molluscan species in the intertidal of the Azores (the minute *Skeneopsis planorbis* and *Omalogyra atomus*,



Figures 3, 4. Abundance of the molluscs collected in the algal turf at "Poça do Pano" (Lajes do Pico, Pico island). 3: n/m^2; 4: n/100 g ADW. ADW: algal dry weight.
Figuras 3, 4. Abundancia de moluscos recogidos en el cesped algal en "Poça do Pano" (Lajes do Pico, isla de Pico). 3: n/m^2; 4: n/100 g ADW. ADW: peso seco de algas.

the rissoid *Alvania mediollitoralis* and the anabathrid *Pisinna glabrata*) all have a non-planktotrophic type of development (ÁVILA, 2000). This type of development is usually associated with a restricted geographical range (SCHELTEMA, 1978; JABLONSKI, 1986), which clearly is not the case (with the exception of *A. mediolittoralis*) (see Table IV). Perhaps the small size of these gastropod species is an advantage for dispersal, as well as their location in the intertidal, therefore having higher possibilities of rafting.

CONCLUSIONS

In the studied algal turf located between the barnacle zone (above) and the frondose algae (below), three species of molluscs are very common: *Lasaea adansoni*, *Skeneopsis planorbis* and *Pisinna glabrata*. In the transition from algal turf to frondose algae, *Lasaea adansoni* and *Skeneopsis planorbis* virtually disappear, the only (very) abundant species being *P. glabrata* and, with less importance, *Omalogyra atomus* and *Sinezona cingulata*.

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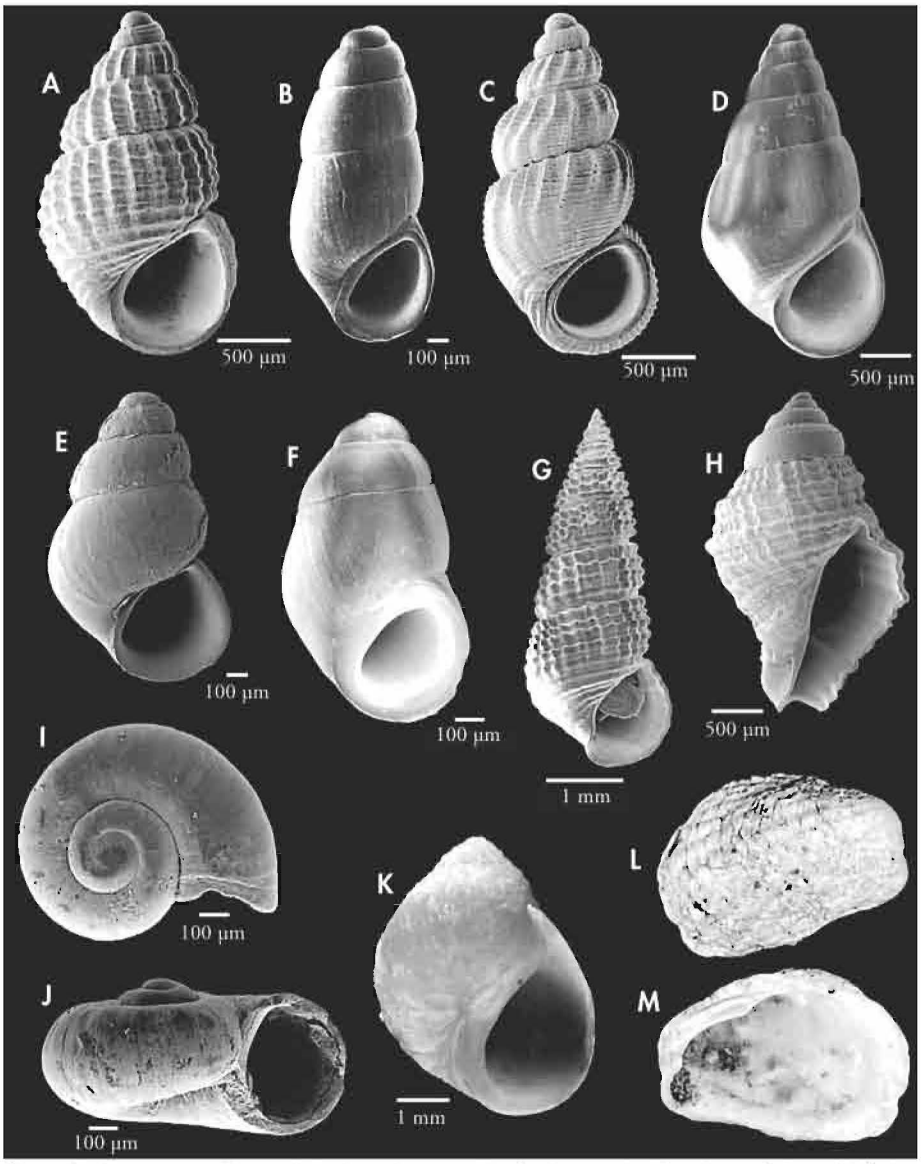

Figure 5. Common molluscs of the intertidal zone in the Azores. A: *Alvania mediolittoralis* Gofas, 1989; B: *Bothryphallus ovummuscae* (Gofas, 1990); C: *Manzonia unifasciata* Dautzenberg, 1889; D: *Cingula trifasciata* (Adams J., 1798); E: *Setia subvaricosa* Gofas, 1990; F: *Pisinna glabrata* (Megerle von Mühlfeld, 1824); G: *Bittium latreillii* (Payraudeau, 1826); H: *Stramonita haemastoma* (Linnaeus, 1766); I, J: *Skeneopsis planorbis* (O. Fabricius, 1780; K: *Melarhaphe neritoides* (Linnaeus, 1758); L, M: *Cardita calyculata* (Linnaeus, 1758).

Figura 5. Moluscos comunes en la zona intermareal de las Azores. A: Alvania mediolittoralis *Gofas, 1989; B:* Bothryphallus ovummuscae *(Gofas, 1990); C:* Manzonia unifasciata *Dautzenberg, 1889; D:* Cingula trifasciata *(Adams J., 1798); E:* Setia subvaricosa *Gofas, 1990; F:* Pisinna glabrata *(Megerle von Mühlfeld, 1824); G:* Bittium latreillii *(Payraudeau, 1826); H:* Stramonita haemastoma *(Linnaeus, 1766); I, J:* Skeneopsis planorbis *(O. Fabricius, 1780; K:* Melarhaphe neritoides *(Linnaeus, 1758); L, M:* Cardita calyculata *(Linnaeus, 1758).*

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