



PLANORBELLA DURYI (WETHERBY, 1879) FROM THE CRATER-LAKE ALBANO (CENTRAL ITALY)

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ABSTRACT: A rich population of *Planorbella duryi* (Wetherby) has been found in Lake Albano near Rome. It is a pulmonate aquatic snail inhabiting the zone of tropical climate, and heated artificial reservoirs outside this zone. It has migrated from its area of origin – Florida – to Africa, South America and some islands, has been introduced in a few botanical gardens in Europe, and also found a favourable habitat in a small crater-lake Albano in Italy where it is now abundant.

INTRODUCTION

Planorbella duryi (Wetherby) is a pulmonate aquatic snail of the family Planorbidae, inhabiting stagnant or slow-flowing waters, mainly small water bodies, ponds, dam-lakes as well as artificial irrigation channels, reservoirs in parks, botanical gardens, farms and greenhouses. It is often kept in aquaria. Florida is its original distribution area, but it is liable to dispersal with water plants over short and even long distances. The distribution of the species in natural habitats is now limited to the area between 35° southern and 35° northern latitude. Outside this tropical and subtropical climatic zones it has been introduced in reservoirs with heated water and lives in a few

greenhouses in Europe (FECHTER & FALKNER 1990). The first detailed report about it derives from the botanical garden in Cracow (ALEXANDROWICZ 1993).

Numerous specimens of *Planorbella duryi* (Wetherby) were found unexpectedly by the author in Lake Albano (Central Italy). This species is a dominant component of the malacocoenosis inhabiting the lake and also of the thanatocoenosis accumulated on the beach. The results presented here are the first contribution to the joint scientific project of the Polish Academy of Arts and Sciences and the University La Sapienza in Rome (ALEXANDROWICZ 2003).

STUDY AREA

Lake Albano is situated in the Italian province Lazio, about 20 km south-east of Rome. It fills a deep crater within the Latian Hills (Colli Albani) which has still preserved the distinct volcanic relief of the so-called Latian Volcano (Vulcano Laziale). The lake has an oval shape, is about 3.5 km long and 2 km wide. Its surface area is 6 km², its depth 170 m. Being relatively small, it is the deepest lake of the Italian Peninsula, and with the steepest shore. From the west, south and east the crater is surrounded by relatively high (150–250 m), very steep slopes and inward facing cliffs formed mainly of pyroclastic rocks and partly of

basaltic rocky walls, while the northern slope is more gentle and somewhat lower (CAPUTO et al. 1974).

The crater of Lake Albano is associated with the terminal phase of volcanic activity, developed as an eccentric edifice in the western part of the Latian Volcano. It is dated to the Late Quaternary (27–20 thousand years BP) and corresponds with the last glacial period: the Würm or the Vistulian (COSENTINO et al. 1993, CASTO & ZARLENGA 1996).

A narrow sandy beach spreads only on the north-western side and is about 1 km long. The sand is grey or even black, because it is composed mainly



of fine pyroclastic material with an admixture of basalt grains. Mollusc shells deposited by waves can be found on the shore around the lake, but rich mollusc thanatocoenoses occur only just above the

water level, in the lower part of the beach. They are actually accumulated along the short segment of the shore.

MATERIAL AND METHODS

In November 2002, during field work carried out on the Lake Albano, the author collected twenty samples of thanatocoenoses composed mainly of shells with an admixture of sand and gravel. They were taken on the shore along the NW part of the lake, both from places with dense accumulations of shell material and from places where shells were scattered on the surface of the beach. Samples were cleansed by washing, dried and sieved to select shells and apply the grain size analysis. The whole collection includes 15 taxa of water molluscs while the number of specimens exceeds ten thousand. Besides, shells of land snails were found.

Standard methods of malacological analysis were applied in the present study (ALEXANDROWICZ 1987,

1999). The whole material was sieved to divide it into the following fractions according to the somewhat modified Wentworth Phi scale: >8 mm ($\Phi -3$), 4–8 mm ($\Phi -2$), 2–4 mm ($\Phi -1$), 1–2 mm ($\Phi 0$), <1 mm ($\Phi +1$). The list of species, the number of specimens, as well as the quantitative relations between shells of molluscs and mineral components were established for each fraction. Shells of *Planorbella* were characterised by measurements of their diameter and height (D-H) and calculating of the related D/H index to compare the population from Lake Albano with populations from Florida, South Africa and the botanical garden in Cracow.

RESULTS AND DISCUSSION

SHELL MORPHOLOGY AND BIOMETRICS

Shells of *Planorbella duryi* from Lake Albano are pale, pale-olive or light yellowish-brown, some of them slightly translucent. The sculpture consists of fairly well marked, dense growth striae (10–14 per 1 mm) more or less regularly developed. Faint traces of spiral lines are observed rarely, mainly on ventral parts of last whorls. The spire is usually flat and shallow; a considerable part of specimens is characterised by more or less lowered last whorl. The ventral part of the shell may be somewhat sunken; on the other hand, few specimens have a distinctly elevated spire (scalaric shells). The proportion of the mentioned types of shells in the population from Lake Albano is the following: 55–70% – shells with flat ventral side, 20–30% – shells with flat ventral side and lowered last whorl, 8–14% – shells with sunken ventral side, 2–4% – scalaric shells.

Elevated whorls have an angular external margin surrounded sometimes by a fine rib. On the opposite side, the whorls are rounded, with a wide and considerably sunken umbilicus. It is large and relatively deep, covering about 30–45% of the shell breadth and 70–80% of the shell height. The aperture is about twice higher than broad, somewhat oblique, sub-angular or even angular above and broadly rounded below (Fig. 1).

The largest shells have 4.5–5 whorls, their diameter (D) exceeds 15 mm and their height (H) is 13.8–14.3 mm, while the size of shells with 2.5–3 whorls is about 3 mm. Mean values for shells exceed-

ing 2.5 whorls are: D = 7.03 mm, H = 6.58 mm. The distribution of diameter values is somewhat asymmetrical, with the modal value 6–8 mm, reaching 30% of the population (Fig. 2). The shell shape changes with growth, mainly in juvenile specimens. Snails of a diameter of 4–7 mm are characterised by low values of the D/H index, not exceeding 1.0, while larger ones are distinctly broader than high, with the D/H index of 1.2–1.4 (Fig. 3).

The size and shape of the shells from Lake Albano may be compared to those measured and described

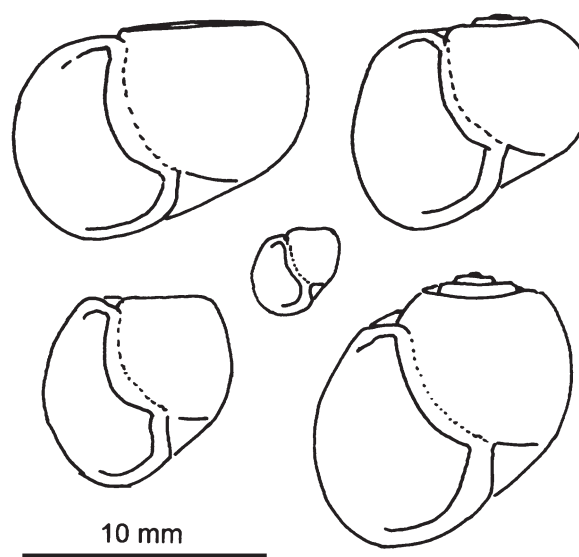


Fig. 1. *Planorbella duryi* (Wetherby) from Lake Albano



from other localities. They are especially similar to specimens from South Africa, namely to populations found in Namibia (VAN BRUGGEN 1974) as well as in Cape Town and Johannesburg (APPLETON 1977). Shells of *Planorbella duryi* from the botanical garden in Cracow are somewhat smaller (ALEXANDROWICZ 1993), while specimens from Florida are distinctly larger, but PILSBRY (1935) mentioned only the latter (Fig. 4).

Linear regression has been used to characterise relations between diameter (D) and height (H) of shells in particular populations (Fig. 5). The slope of regression lines calculated for shells from Florida (F) as well as from Namibia (N), Johannesburg (J) and Cape Town (T) is very similar. The last line has a similar course to the slightly more inclined line for the population from Cracow (C). On the other hand, the regression line for the Italian population (A-A) is distinctly steeper. It indicates that adult specimens from Lake Albano are relatively higher than specimens from other localities. It is an important biometrical feature of the described population.

Shells of *Planorbella duryi* vary in shape and correspond to two races or subspecies described by PILSBRY

(1935), both found to co-occur in particular populations. Specimens with elevated spire (scalaric shells) have been distinguished as *Planorbella duryi seminole* (Pilsbry). They are main components of the population from Namibia (VAN BRUGGEN 1974 – *Helisoma* cf. *duryi seminole*). In other South African localities (Johannesburg, Cape Town, Natal) and in Kenya shells with flat or even sunken spire dominate (APPLETON 1977, BROWN 1980). They correspond to the nominotypical race of this species – *Planorbella duryi duryi* (Wetherby).

The population from Lake Albano is composed of specimens resembling both morphological types in

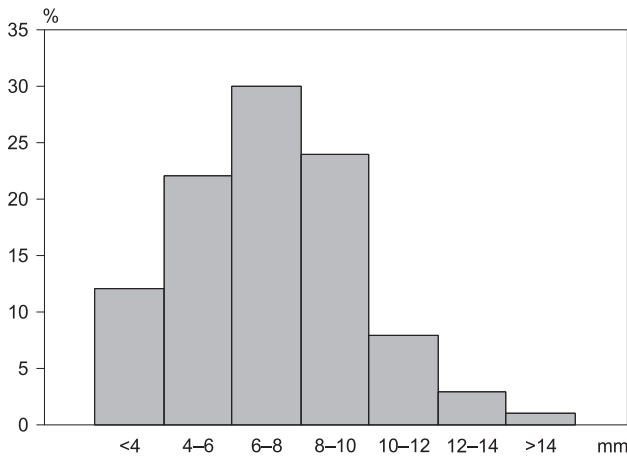


Fig. 2. Distribution of shell size (diameter) of *Planorbella duryi* from Lake Albano

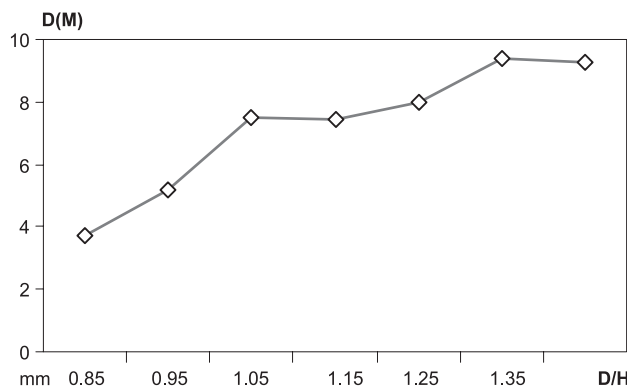


Fig. 3. Relation between size and shape of shells. D(M) – mean shell diameter, D – shell diameter, H – shell height

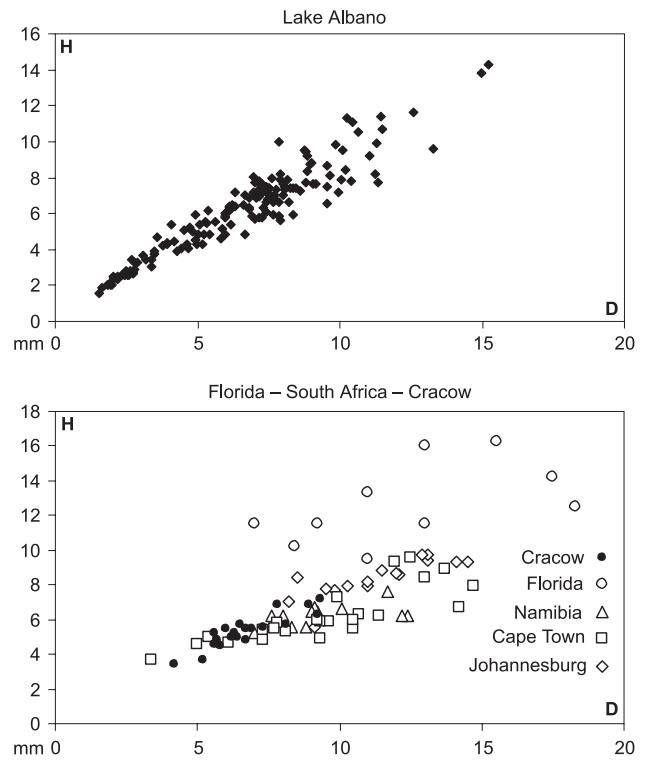


Fig. 4. Relation between shell diameter (D) and height (H) in various populations of *Planorbella duryi*

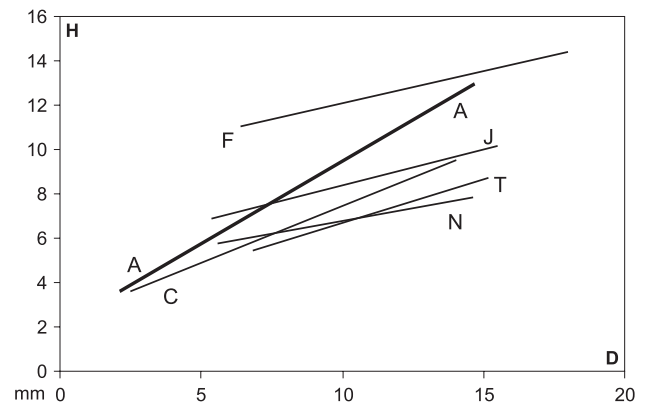


Fig. 5. Lines of linear regression characterising populations of *Planorbella duryi*. H – shell height, D – shell diameter, F – Florida, J – Johannesburg, T – Cape Town, N – Namibia, C – Cracow, A-A – Lake Albano

the following proportions: shells with sunken spire – 12%, shells with flat spire – 60%, shells with nearly flat spire and somewhat lowered last whorl – 26%, shell with elevated spire – 2%. It resembles populations composed mainly of *Planorbella duryi duryi* described from the Republic of South Africa (APPLETON 1977) as well as another, inhabiting the botanical garden in Cracow (ALEXANDROWICZ 1993).

MIGRATION ROUTES

Water molluscs disperse over short or long distances, using various means of transport, such as currents of streams and rivers during floods, birds and animals or boats and ships. They may also be brought with plants introduced to water bodies or artificial ponds in parks and botanical gardens. All these possibilities are accessible to the described species, but its spreading is limited by climatic conditions, mainly by the temperature. On the other hand, it is commonly kept in aquaria and at present may be regarded as a world-wide aquarium snail.

Planorbella duryi (Wetherby) was originally described in 1879 from Florida as *Planorbis duryi*. It occurs there in rich and differentiated populations as six subspecies, polymorphic forms or races of *Helisoma duryi* distinguished by PILSBRY (1935). Besides the nominotypical one, there are: *Helisoma duryi seminole* Pilsbry, *H. duryi normale* Pilsbry, *H. duryi intercalare* (Pilsbry), *H. duryi preglabratum* (Marshall) and *H. duryi eudiscus* Pilsbry. The mentioned species has been found in adjacent states of the USA (Texas, New Mexico and Utah).

About fifty years ago *Planorbella duryi* was introduced in Africa to be recorded by BROWN (1967), and a few years later by VAN BRUGGEN (1974) and APPLETON (1977), from five localities in the Republic of South Africa and Namibia. Their populations are less differentiated than those from Florida and only two subspecies (*H. cf. duryi seminole*, *H. duryi duryi*) have been distinguished there. The species was later found also in countries of equatorial Africa: Tanzania, Kenya and Sudan. South America and islands surrounding the Caribbean Sea are situated along the second route of migration. *Helisoma duryi* was first reported from Brasil (PARAENSE 1976) and later from Peru. It has been found also in Cuba and the Isle of Youth as well as in Martinique and Guadeloupe (PERERA et al. 1984, POINTIER 2001). Islands of Hawaii were another direction of migration. All these regions are characterised by a warm, tropical climate, completely appropriate for the mentioned snail (Fig. 6).

During the last twenty years *Planorbella duryi* was introduced in Europe. In temperate areas it can live only in reservoirs with heated water, mainly in green-

houses, among plants deriving from the tropical zone. A relatively rich population of the nominotypical subspecies was described from the botanical garden in Cracow. It is the component of an assemblage with *Melanoides tuberculata* (Müller), *Physa acuta* Draparnaud and a few other species inhabiting a basin in the main greenhouse (ALEXANDROWICZ 1993). FECHTER & FALKNER (1990) have mentioned briefly the occurrence of *Planorbella duryi* in Europe, both in botanical gardens and open reservoirs with heated water, namely in Austria (Baden, Villach) and in Malta. It was also found in greenhouses of north-western Germany. The route of migration to Europe is not known, but specimens inhabiting artificial reservoirs in Poland, Austria and Germany came either from Florida or from South Africa.

The rich population of *Planorbella duryi* found in Lake Albano in Italy develops in natural conditions. The species was introduced here probably with plants cultivated in gardens in close vicinity of the lake (e.g. in Castel Gandolfo) or derives from aquaria. It could have originated from a greenhouse in Europe, from South Africa or directly from Florida. The mentioned snail found here a quite friendly environment and life conditions promoting its spread. The nearest place, from where *Planorbella duryi* was recorded is Malta, but no detailed information about it was given by FECHTER & FALKNER (1990). Therefore the relation between the two populations of the species inhabiting the Mediterranean region is unclear.

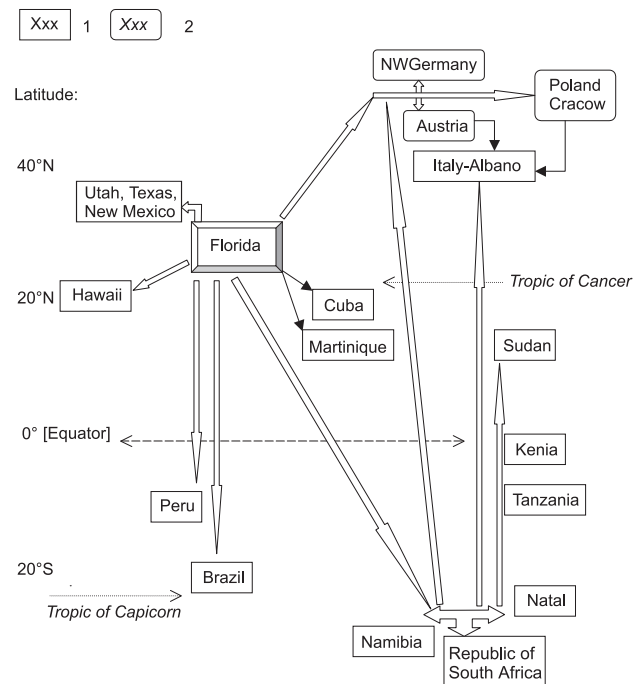


Fig. 6. Migration routes of *Planorbella duryi*



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