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Mount Parnon: a micro hotspot of freshwater-dependent biodiversity in Greece

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Introduction

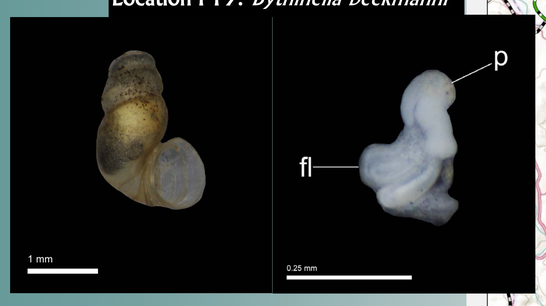
Greek freshwater ecosystems are widely recognized as hotspots of European freshwater biodiversity (1, 2). Hydrobioids (Caenogastropoda, Truncatelloidea) of Greece are in accordance with this observation since 79 species and subspecies belonging to 29 genera have already been recorded in Greek freshwater systems. A proportion of 69 % of the species and subspecies and 35% of the genera are endemic for Greece (3-10). Nevertheless, the hydrobioids of Greece remains understudied due to the complex hydrographic network of its drainages. This is the case of Mt Parnon (Eastern Peloponissos, Greece). Although the terrestrial molluscs of this mountain have been already thoroughly investigated and the ecological and biogeographical insularity of its peaks has been illustrated, its hydrobioid fauna remains almost unknown. Until today, the only known hydrobioid from Mt Parnon is the local endemic species *Bythinella beckmanni* (10).

Materials and Methods

- An exhaustive survey of hydrobioids in 38 stations (springs, fountains, cisterns, streams and rivers) was done in this area, during 2014 and 2015 within the framework of the National Natura 2000 Monitoring Survey supervised by the Management Body of Mount Parnon and Moustos Wetland.
- Fresh material was collected by hand from stones, gravel, mosses and dead leaves and preserved in 99% ethanol for genetic analysis and 70% ethanol for anatomical study. Only a few specimens were collected from each locality owing to the small size of their populations.
- Shells and parts of soft body were photographed submerged into water using a Canon EOS 1000D camera attached to a stereomicroscope (Stemi 2000-C, Zeiss, Germany).
- Species distinction and identification was based on morphological and anatomical characters.
- Jaccard index was used to measure the similarity between the various sampling stations based on their hydrobioid fauna and stations were clustered using UPGMA (Fig.1).

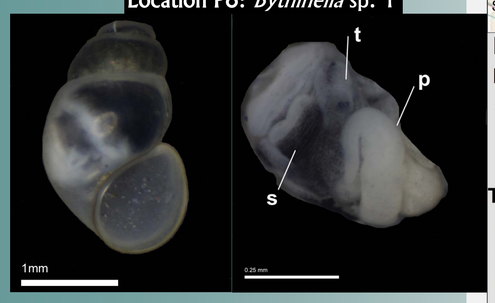
Location P19: Valvatiform 2

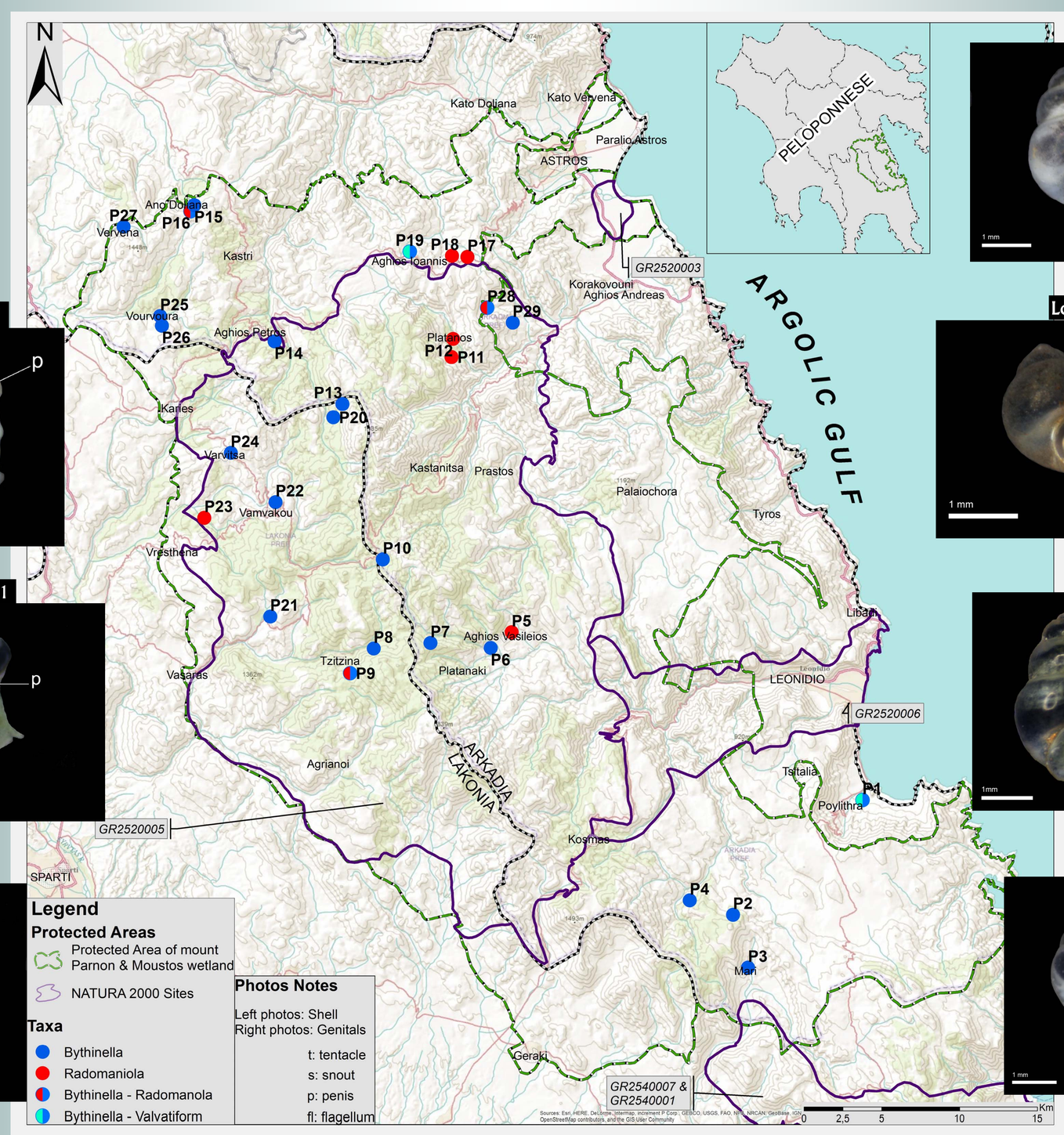
Location P19: *Bythinella beckmanni*



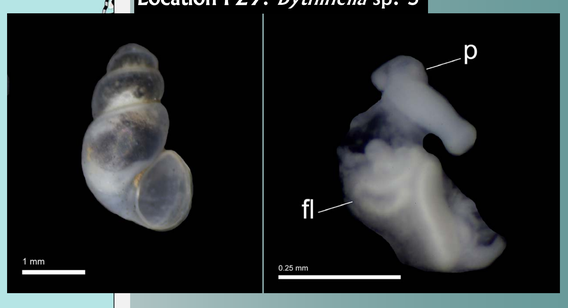
Location P12: *Radomaniola* sp. 1

Location P6: *Bythinella* sp. 1



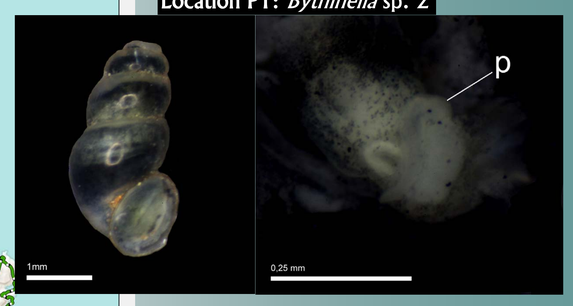


Location P29: *Bythinella* sp. 3

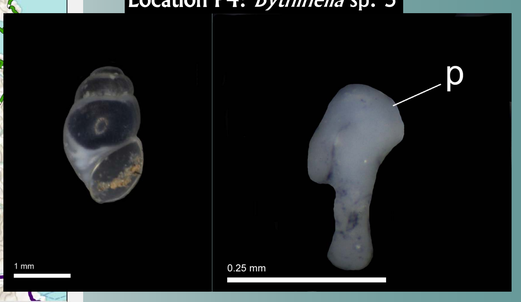


Location P5: *Radomaniola* sp. 2

Location P1: *Bythinella* sp. 2



Location P4: *Bythinella* sp. 5



Legend

Protected Areas
- Protected Area of mount Parnon & Moustos wetland
- NATURA 2000 Sites

Taxa
- Bythinella
- Radomaniola
- Bythinella - Radomanola
- Bythinella - Valvatiform

Photos Notes

Left photos: Shell
Right photos: Genitals
t: tentacle
s: snout
p: penis
fl: flagellum

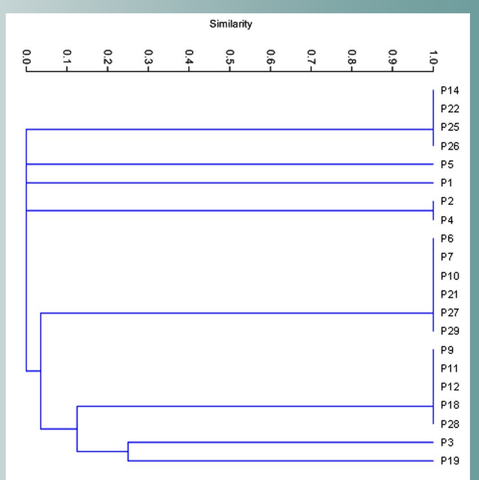


Figure 1: UPGMA cluster of the Jaccard similarity index of the sampling stations

Results-Conclusions

In the freshwater systems of Mt Parnon:

- Three genera and nine hydrobioid species were recorded in twenty eight localities.
- *Bythinella* and *Radomaniola* were found in 23 and 10 localities respectively. These genera coexist in three localities.
- One or two unknown until now valvatiform taxa were collected in two localities.
- Although species delimitation of *Bythinella* remains rather unclear (11), the constant anatomical differences between some populations allow the distinction of at least four *Bythinella* species.
- The local endemic species *B. beckmanni,* apart from its type locality on the southern slope of Mt Parnon (10), was also found in a new locality in the northern part of the mountain.
- Two distinct species of *Radomaniola* were recorded; the differentiation of the anatomical characters indicates that one of them should be assigned to *Radomaniola* s. stricto and the other to *Radomaniola* s. lato.
- In many cases the similarity of the sampling stations seems to be independent from their geographic distance (Map and Fig. 1) possibly because *Bythinella* and *Radomaniola* taxa follow the disjunct distribution pattern observed in various hydrobioids of the Balkan Peninsula (6, 12).

To our knowledge all the taxa collected are endemic or locally endemic to Mt Parnon.
The endemism of hydrobioids of Mt Parnon in combination with the features of their biotope (small surface, instability and fragility) make Mt Parnon a micro-hotspot of freshwater-dependent biodiversity in Greece.

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Management Body of mount Parnonas & Moustos wetland