

coefficient or b_2 value (i.e., Standardized $\dot{V}O_2 = a + b_1(PO_2) + b_2(PO_2)$) becomes increasingly negative as capacity for regulation of $\dot{V}O_2$ increases. MANOVA of $b_2 \times 10^3$ values suggested that acclimation to 25 °C significantly increased capacity to regulate $\dot{V}O_2$ ($P = 0.053$). However, overall capacity of *L. angulifera* for O_2 regulation is not exceptional, average $b_2 \times 10^3$ values indicating nonregulation to good regulation over tested conditions. Lack O_2 regulation of $\dot{V}O_2$ is characteristic of littorinid snails (McMahon, 1992), reflecting the essentially aerobic nature of their upper eulittoral fringe/maritime zone habitats.

The phylogenetic relationships of *Littorina striata* as deduced from allozyme data

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Recently, Backeljau & Warmoes (1992) assessed the phylogenetic relationships of ten Atlantic Littorinidae using two tree making methods (UPGMA and Distance Wagner) applied on three genetic distances inferred from allozyme data. It was concluded that (1) *Melarhaphe* and *Littorina* are only distantly related, (2) *Littorina striata* clusters with *Littorina*, (3) the generally accepted relationships between *L. littorea*, *L. obtusata* complex and *L. saxatilis* complex are supported and (4) *L. saxatilis* is a sister group to *L. arcana* + *L. nigrolineata*. In addition, it appeared that the Distance Wagner method, which is free of molecular clock constraints, performed better than UPGMA (which relies on a molecular clock).

In the present contribution we use the data set of Backeljau & Warmoes (1992) to evaluate in how far other evolutionary rate independent tree making methods support these conclusions. These methods include (programs used in parentheses) : Neighbor-joining (NEIGHBOR), Fitch & Margoliash (FITCH), Maximum Likelihood (CONTML) and Parsimony (MIX, PENNY, IE* + BB*) as implemented by the algorithms of PHYLIP 3.4 and HENNIG86. Parsimony trees were bootstrapped to place confidence limits on the branching points. We also assessed to what extent different data input orders affected tree topologies, including those obtained by UPGMA. This latter was tested using a data set published by Janson (1985).

Following observations were made : (1) different genetic distances provoke different topologies, even when subjected to the same tree making method ; (2) none of the methods used recovered completely the topology of the Distance Wagner tree presented by Backeljau & Warmoes (1992) ; (3) parsimony analysis confirmed the "traditional" branching pattern within the *L. saxatilis* complex (*L. nigrolineata* is sister taxon to *L. saxatilis* + *L. arcana*), but placed *L. striata* at the base of the tree ; (4) the maximum likelihood tree did the same, but confirmed the Distance Wagner tree with respect to the relationships within the *L. saxatilis* complex ; (5) both Neighbor-joining and Fitch & Margoliash trees yielded a wide array of tree topologies, but only when Cavalli-Sforza's chord distance was

used these topologies were \pm comparable to those obtained with the Distance Wagner method ; (6) Fitch & Margoliash and UPGMA trees were clearly susceptible to data input orders. Hence, none of the methods used in this contribution could confirm the placement of *L. striata* within the genus *Littorina*.

REFERENCES

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The relationship between size, position on shore and shell ornamentation in *Littorina striata*

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Shells of small (< 7 mm) *Littorina striata* are frequently nodulose, but shells of larger individuals are striate. Nodulose *L. striata* dominated the littoral fringe of a black basalt Azorean shore where daytime rock temperatures rise significantly higher than nearby shores of different rock composition or colour. There was no evidence of intraspecific size-partitioning on the latter shores, where the numbers of striate and nodulose *L. striata* were approximately equal between high eulittoral (low-shore) and high littoral fringe (high-shore) localities. It is hypothesized that small *L. striata* attain a resting posture better able to minimize heat absorption from the substratum than attained by larger individuals. Smaller individuals also take advantage of both posture and a nodulose shell surface to more effectively re-radiate absorbed incident radiant thermal energy to the atmosphere by convection. Thus, small, nodulose *L. striata* are especially well adapted to occupy geologically young basaltic rocks commonly fringing islands of the mid-Atlantic. This investigation was conducted during the Second International Workshop of Malacology of the Azores and is to be published in full in the Proceedings of the Workshop.

Morphometrics of small rough periwinkles

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The taxonomic status of *Littorina neglecta* has been the subject of controversy since its description in 1844. Later regarded as a subspecies of the widespread, variable *L. saxatilis* (eg. James 1964), it was then re-established as a full species (Heller 1975). Recently *L. neglecta* has been considered a barnacle-dwelling 'ecotype' of *L. saxatilis* (Johannesson & Johannesson 1990). Similar morphs exist in other species of rough periwinkle which may support an 'ecotype' status for *L. neglecta* (Reid 1993). Prior results have relied on comparatively small data sets. The present study provides results from an analysis of shell shape in about 2 500 specimens of rough periwinkles from around the North Atlantic, using the methods of Grahame and Mill (1989). The majority of specimens analysed were less than 5.5 mm in columella height, the largest recorded size for *L. neglecta* in this study.