

Size variation of six species of oxudercine gobies along the intertidal zone in a Malayan coastal swamp

G. Polgar^{1,*}, V. Bartolino²

¹Institute of Biological Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia

²Institute of Marine Research, Swedish Board of Fisheries, Lysekil, Sweden

*Email: gianluca.polgar@gmail.com

Marine Ecology Progress Series 409: 199–212 (2010)

Supplement. Cladogram of the Oxudercinae; topographic profile; ratio of the wet area to the total area; species and size class composition; cluster analysis of strata according to environmental conditions; sampling grid design; presence-absence matrix of species and size classes; grid structure; species' maximum recorded size

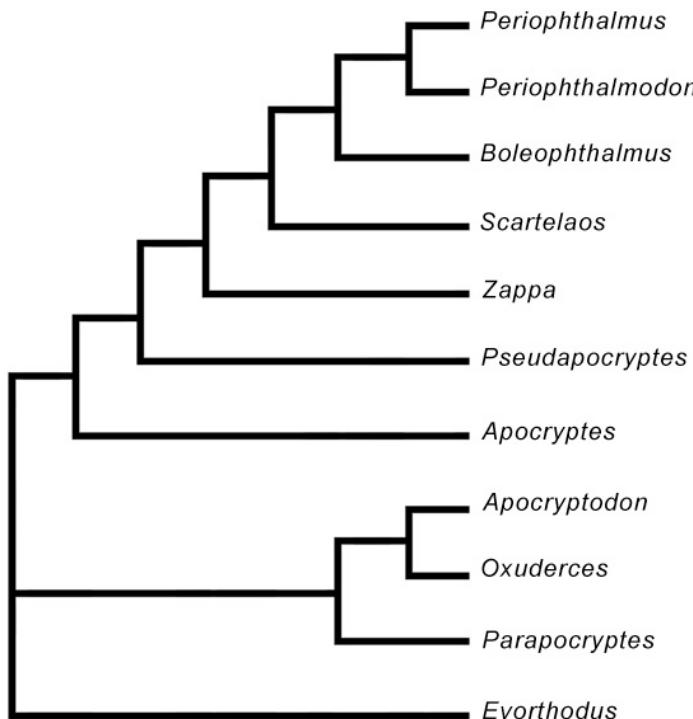


Fig. S1. Cladogram of the Oxudercinae (Murdy 1989). The genus *Evorthodus* (Gobiidae: Gobionellinae) was used as an outgroup to root the Maximum Parsimony tree, that is based on morphological and eco-ethological characters. If assumed to reflect the group's phylogeny, this cladogram shows the monophyly of the 2 tribes Periophthalmini (genera *Periophthalmus* to *Apocryptes*) and Oxudercini (genera *Apocryptodon* to *Parapocryptes*); in the former tribe, the sequential cladogenesis of mudskipper genera would include species with decreasing degrees of eco-physiological aquaticity (i.e. increasing terrestriality)

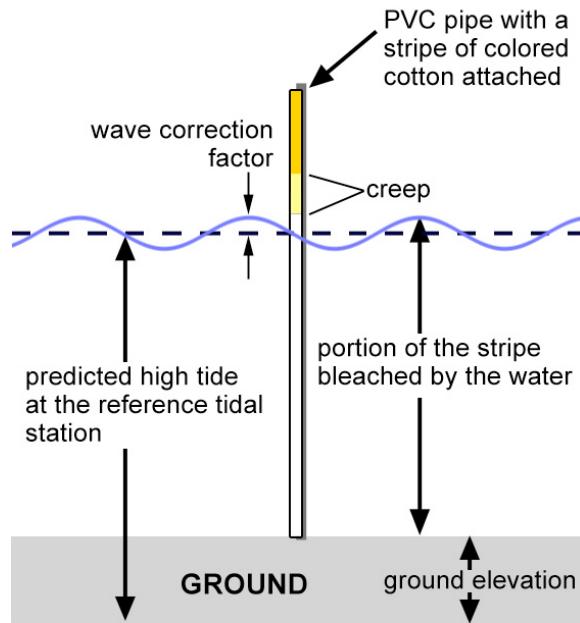


Fig. S2. Diagram of the method of the cotton stripes to calculate ground elevation (for the details, see English et al. 1997). The wave correction factor was applied along the grid, assuming a linear reduction of wave height with distance, from sea to land

Topographic profile

This method (English et al. 1997) utilises vertical coloured cotton stripes that are bleached by the slack high tide and is particularly sensitive to waves at lower intertidal levels (G. Polgar, pers. obs.). Therefore, during the measurements of the bleached cotton stripes, the maximum height of swells (~50 cm) was visually estimated by direct observation of a reference PVC pipe in Stratum E (open mudflat). Since the waves' height is gradually reduced from sea to land by the drag force exerted by both mangroves and the sea floor (Mazda et al. 1997), a wave correction factor (Fig. S2) was adjusted along the grid, assuming a linear reduction with distance (Mazda et al. 1997). Due to the flat morphology of the area, the topographic variation along the short side of the grid (i.e. along the coastline) was assumed to be negligible

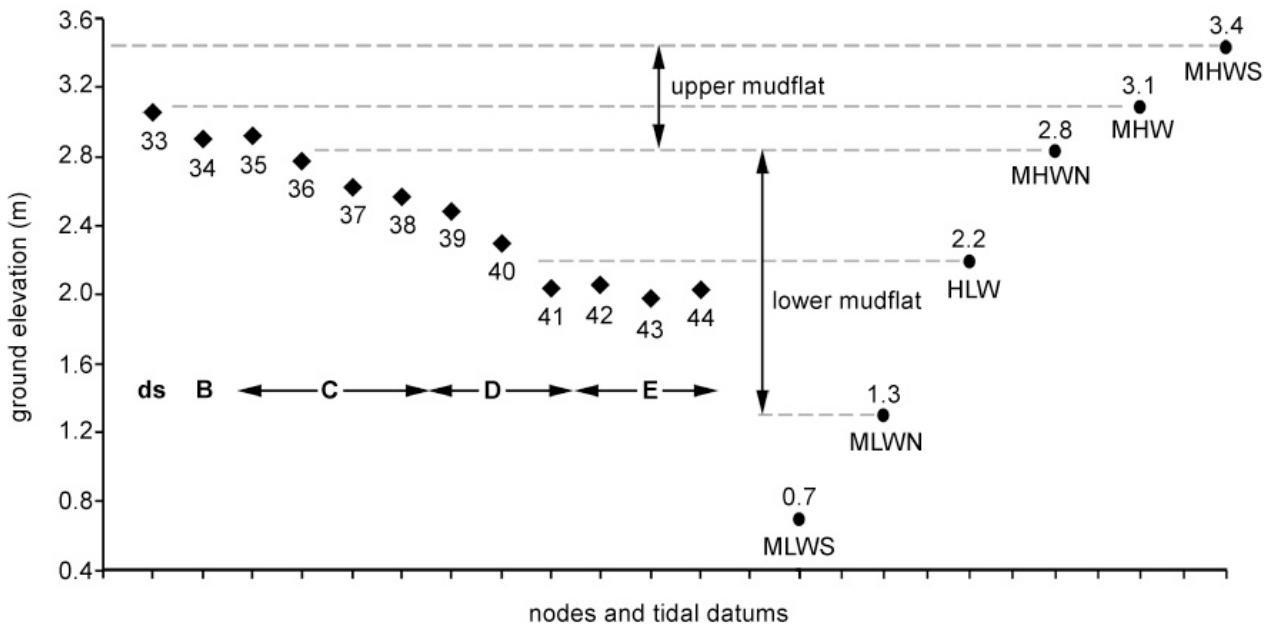


Fig. S3. Topographic profile of the longer side of the grid (nodes 33 to 44, Strata B to E; ds: debris step; see also Fig. 2, Table S3). Tidal datums were obtained from tide tables of Tanjung Piai (©Crown Copyright and/or database rights. Reproduced by permission of the Controller of Her Majesty's Stationery Office and the UK Hydrographic Office (www.ukho.gov.uk); see main text for details). MLWS: Mean Low Water Spring; MLWN: Mean Low Water Neap; HLW: Highest Low Water; MHWN: Mean High Water Neap; MHW: Mean High Water; MHWS: Mean High Water Spring. The classification of mudflat zones is from Dyer et al. (2000)

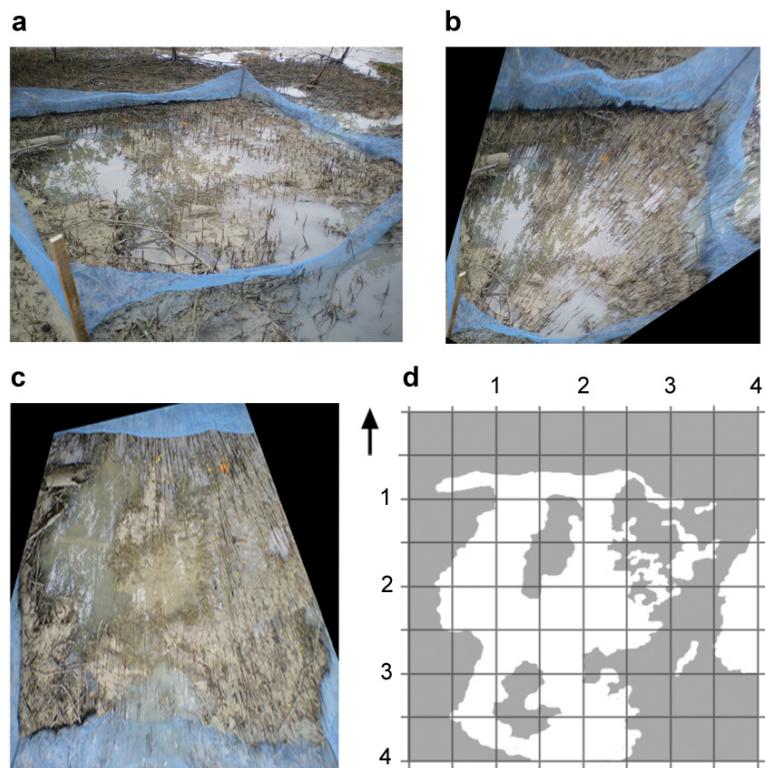


Fig. S4. Measure of the ratio of the wet area to the total area (WA): examples of original and rectified images and digital sketches. (a) one of the original photos of the plot (node 60, Stratum B); (b, c) 2 rectified images utilised to draw the digital sketch ((b) is the rectified version of (a)); (d) digital sketch of the 4×4 m quadrat, plan view (white area: substrate covered by water; gray area: exposed substrate; the arrow indicates the position of the sea: images in panels (b) to (d) are oriented in the same way)

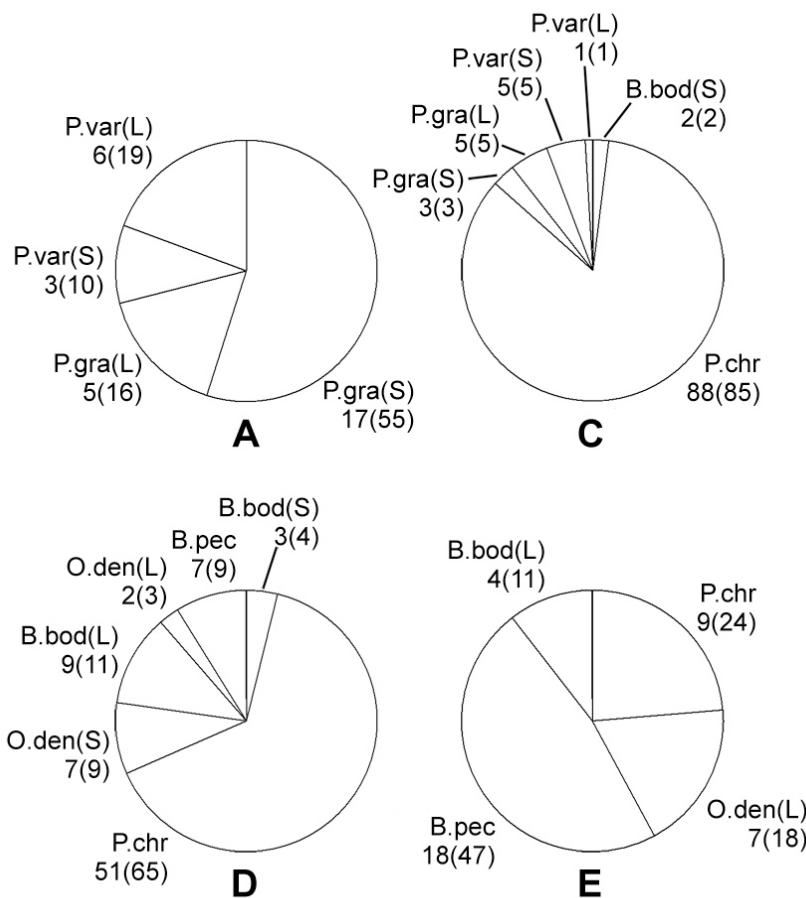


Fig. S5. Species and size class composition by stratum (A to E): counts and percentages (in parentheses). Stratum B contained only *Periophthalmus chrysospilos* ($n = 103$); (S) = small; (L) = large; species abbreviations as in Fig. 3

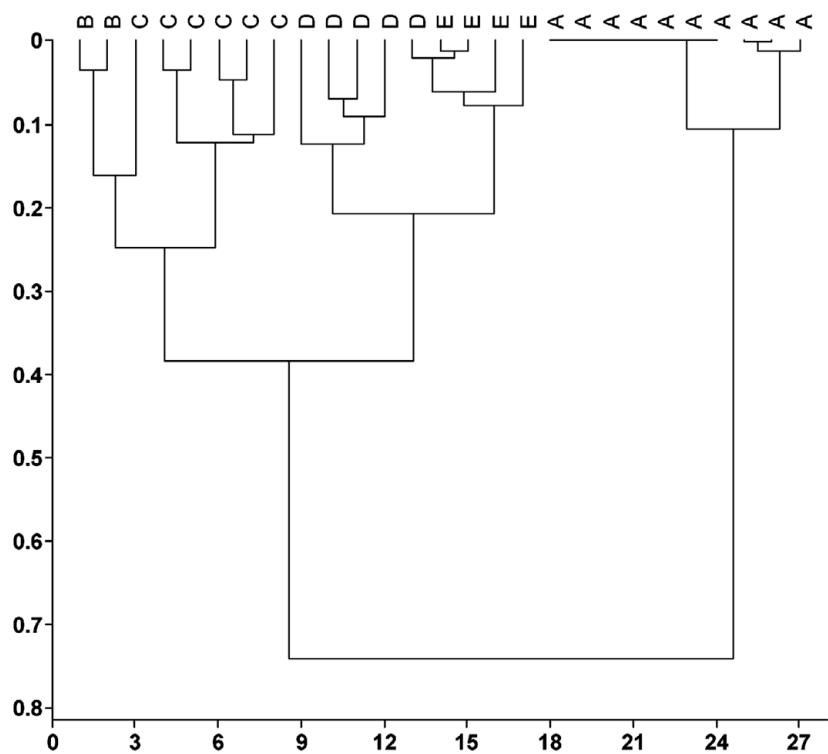


Fig. S6. Cluster analysis (Gower distance) of quadrats versus all the measured environmental variables. When values were missing (LV, EM and HO in Stratum A), the distance was calculated by pairwise deletion. The dendrogram showed a good correspondence with the defined strata

Table S1. Grid design: strata (A to E); the sampling effort, or the number of sampling units (quadrats) per stratum (q) was proportionally distributed with respect to the number of nodes in each stratum (n):

$$q = (q_{\text{tot}}/n_{\text{tot}}) \cdot n$$

where q_{tot} is the total number of quadrats, and n_{tot} is the total number of nodes; qs: number of sampled quadrats; q%: percentage of the sampled nodes within each stratum

Strata	n	q	qs	q%
A	28	10.5	10	36
B	4	1.5	2	50
C	16	6.0	6	38
D	12	4.5	5	42
E	12	4.5	4	33
Total	72 ^a	27	27	-

^aA strip of 8 nodes along the debris step (Fig. 2) was eliminated from the grid, since no mudskipper was ever found here. A total of 33 to 50 % of the nodes were sampled in each stratum