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Communication

A Case for Biological Zeros

Adrian Mallia [1] **and Patrick J. Schembri**

Department of Biology, University of Malta, Msida, Malta

Most ecological work on rocky shorcs cntails thc quantification of specics distributions and abundances relativc to some convenient and accurate datum point. Thc most commonly used arc tidc levels and chart data. The problem arises when tides arc virtually absent. as in most of the Mediterranean Sea or when accurate chart data arc not available.

In the Maltese Islands there is only one datum point. located in the Grand Harbour. Valletta (14" 30.64' E. 35" 53.60" N). A number of bench marks and trigonometric stations of various orders are found scattered all over the Islands. but these are not always located very close to thc shore so that levelling work from these stations to a particular study site may become quite a laborious task which may exceed the capabilities of most ecologists. Furthermore, some of these marks are old and location data for them are untraceable, while others have turned out to be inaccurate (William, E, personal communication, 1993). In fact. a project is currently underway by the Mapping Unit of the Planning Authority to recalibrate these stations and to establish new bench marks. A further complicating factor is that different charts make use of different datum points. Thus, while Admiralty Charts use a zero point (Chart datum) which is the level of lowest astronomical tide and the level to which all bathymetric soundings are referred, all heights shown on the official Government of Malta survey sheets use a datum point which is 0.5859m above the Admiralty Chart datum and which is taken to be mean sea level (MSL) for the Maltese Islands. Additionally, there is also a Public Works Department (PWD) datum which is 0.4100m above the Admiralty Chart datum. It is not always clearly stated which datum points charts and maps are based on.

This state of affairs has resulted in field workers having to resort to some other (possibly less accurate) datum point with which to relate all their data.

By far the most commonly used reference point is the so-called "biological zero". that is, the upper limit of phaeophyceans of the genus *Cystoseira* quantity (cfr. Boudouresque and Cinelli, 1976). These shrubby brown algae form a wide, mainly infralittoral. belt on most Mediterranean shores and in most places stop forming a consistent belt at about mean sea level. This has led some workers to utilise species of this genus as indicators of mean sea level. Different species or combinations of species occur in different parts of the Mediterranean. In the Maltese Islands the most commonly occurring species at sea level are *C. stricta*, *C. compressa*, *C. schiffneri* and *T. barbata* (Attard and Giglio, 1990; Borg. 1992; Calleja. 1991; Camilleri and Fleri-Soler. 1991; Vella. 1990).

Obviously. the position of this datum is somewhat subjective and cannot be determined with the same precision as for surveyed levels. which may be accurate to the nearest millimetre. Nonetheless there seems to be some relationship between this datum and mean sea level as any visit to the seashore on a calm day would suggest. It should also be kept in mind that the zonation of these algae on the shore is expected not to depend solely on physical factors, but also on biotic ones. The fact that different species, with different tolerances. occur in different parts of the Mediterranean and possibly also on different shores in the same geographical locality, also means that "biological zero" may not be the same everywhere.

As part of a wider project aimed at studying the zonation patterns of rocky shore communities in the Maltese Islands (Mallia, 1993) an attempt was made to quantify the relationship, if any, between this "biological zero" and mean sea level for the Maltese Islands.

This was done by fixing a 4cm long brass stud in a pre-drilled hole by means of Araldite adhesive at two stations, Qawra and Dahlet ix-Xmajjar on the north-eastern coast of Malta. The height of this stud above biological zero was determined using a slightly modified version of the can and tube method described by Eifion Jones (1980). Next, the height of the studs above the MSL datum was determined using the level and staff method and starting from the nearest trigonometric station or bench mark. The difference between the two measurements was then calculated (see Table I).

These results show that although the biological zero does not coincide with the MSL datum, the difference between the two is fairly constant. The difference

[1] Present Address: Environment Management Unit, Planning Authority, St Francis Ravelin, Floriana

LOCATION	Height of stud above "biological zero" (bottle and tube)	Height of stud above MSL (level and staff)	Difference in heights
Qawra	0.87m	1.10m	0.23m
DaMet ix-Xmajjar	0.88m	1.12m	0.24m

Table 1. Comparison of height data for the two localities.

between the two localities (0.01m) is very small and within the error range of the cam and tube method. Therefore, these results indicate that in the absence of an accurate, levelled datum, the biological zero is a reliable substitute datum point for ecological work on rocky shores.

Recent work in the Maltese Islands has also shown that other organisms might also be useful as indicators of sea level. For example, Azzopardi (1992) found that the lean shell aperture of the reef-forming, vermetid gastropod *Dendropoma petraeum*, which on Maltese shores extends its range of distribution well into the lower mediolittoral zone, is lowest towards mean sea level and increases on either side of it. Such organisms may be used as indicators on shores where a definite *Cystoseira* belt is missing.

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