A STUDY TO ESTABLISH THAT THE SHELF
OF THE MALTESE ISLANDS
IS A DISTINCT MANAGEMENT UNIT

Department of Fisheries and Aquaculture, MALTA

1. Characteristics of the Maltese Shelf and Marine Resources

1.1 Stock units and management area

In general, one of the criteria for choosing a management area is that it should enclose a significant number of isolated unit resources, or breeding populations. The last GFCM Studies and Reviews No 70, gives some of the criteria for establishing the existence of a unit stock, noting that where genetic identity cannot be established (which is the case for almost all Mediterranean resources), there are still good reasons based on geographical information, for establishing unit stocks which should be managed as a unit. Acceptable forms of indirect evidence of a unique stock are that the resource is associated with certain physical and oceanographic features which make it unlikely that larval contribution from other areas is a major source of recruitment, and that for shallow shelf resources (< 200 m), adult populations are believed to be isolated or almost isolated and not to migrate extensively as adults to adjacent populations. In this respect, apart from a narrow isthmus north of Hurd Bank, linking it with the southeast Sicilian shelf at 100-200m depth where some limited mixing of groundfish species probably occurs, the continental shelf of Malta can be regarded as an independent Management Unit for shelf demersal resources. There are sufficient reasons for managing its fish population as unit stocks, and this justifies treating the resources of the Maltese shelf as independent populations, for reasons expanded on below.

1.2 Configuration of the Maltese shelf and depth ranges of demersal resources

The Maltese Islands and their shelf lie within a distinct geological (tectonic) province and, with other isolated and distant islands of the Sicily Channel, (Pantelleria and Linosa) are characterized by Morelli (1973) as horsts (raised blocks of land bordered by geological faults) – in this case bordered by the deep water of the Pantelleria trough. To the north of Malta this drops to 200-400m, and this deep water plain extends some nautical miles distant from the nearest land mass, the SE tip of Sicily. To the east and south, the shelf eventually drops off to 600m and more, while to the northwest it continues as a ridge running parallel with the Sicilian coast. The shelf configuration is highlighted by figures 1, 2 and 3.

Apart from deep water species such as those noted in table 1b, the bathymetric configuration would suggest that for shelf resources, or those that spawn in shelf and slope waters, the Maltese shelf constitutes the main offshore area where spawning could be carried out for a significant proportion of the Maltese demersal resources. As such the resources in table 1a can reasonably be regarded as exclusively national resources.
Table 1A: Resources Proprietary to the Maltese Shelf

*Depth Ranges of Common Maltese Fish*

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>BOGUE</th>
<th>CUTTLE FISH</th>
<th>OCTOPUS</th>
<th>SMALL SCALE SCORPION FISH</th>
<th>PANDORA</th>
<th>COMBER</th>
<th>SPOTTED WEEVER</th>
<th>RED MULLET</th>
<th>GREY GURNARD</th>
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SP = Spawning Depth  
PD = Preferred Depth
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SP = Spawning Depth
PD = Preferred Depth
Even for deep water species such as hake which occurs down to 1000m, their preferred spawning range is from 100 to 300m, which is only available locally on the Maltese shelf. As for other deep water demersal resources however, their migration throughout the Sicily Channel area at or below 500m is not discounted, making them, and the other resources in table 1b, straddling stocks pertaining to more than one Management Unit.

1.3 The oceanographic context

The current system flowing past the Island is characterised (Lacombe 1973) by water masses from the Western Mediterranean flowing Southeast, parallel to the south coast of Sicily (fig 4a). There is no obvious movement of water masses between the two islands either on the surface, or at depth. This might lead one to suspect that larval dispersal between fish stocks spawning on the shelf of Sicily and on that of Malta, is limited. The deeper intermediate layer of water (at around 200m depth) flows in the opposite direction, i.e. a northwesterly direction, again, with little evidence of water movement between the shelves of Sicily and the Maltese Islands (fig 4b). This does not support the idea of easy transport of fish larvae between the Sicily shelf and Maltese waters, and it is more reasonable to assume recruitment to the shelf is local in origin and that local fish populations constitute local separate stocks. From a precautionary point of view, these should be managed as unit populations, separately from those of the shelf areas of adjacent mainlands or islands.

One could follow an analogous argument to that used by Oliver (1994) who showed that larval drift between the Mallorcan shelf and the mainland is improbable, hence that Mallorcan stocks are indigenous. These considerations make it likely that a significant proportion of the fish and invertebrate resources of the Maltese shelf (notably those in table 1a) constitute unit stocks.

More recent remote sensing imagery (Barale and Filippi 1997) confirms that Malta is surrounded by water masses ‘oceanic’ in character, with levels of chlorophyll lower than for Italian / Sicily shelf waters, where nutrient availability is higher (fig 5). For this reason, the island shelf can be characterised as low in primary productivity compared with mainland shelves, probably in part due to the strong currents and limited rainfall and runoff from the Maltese Islands. As such, the fishery productivity is limited not because the resources are underfished, but because of inherent limitations in nutrient availability. In other words, Malta’s fishery productivity is limited and the ecosystem is of the fragile oligotrophic or oceanic type. A confirmation of the low productivity of oceanic-type waters around Malta is provided by the low abundance of small pelagic fish in Maltese waters, which is a consequence of the low planktonic abundance.
The current system in the Mediterranean (from Lacombe 1973)

CIRCULATION SUPERFICIELLE EN ÉTÉ

Figure 4A

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Valletta.
Tel: 225236 225238
Fax: 231294
Movement of intermediate layer of water in Mediterranean (from Lacombe 1973)
Classification of Maltese waters from remote sensing information

A paper by Barile and Filippi (1997) of the EU Ispra Applications Institute, points out that on the basis of ocean colour and temperature information, the Mediterranean can be divided into specific bio-geographical provinces, and that there is a marked transition between western and eastern regimes coinciding with the Straits of Sicily.

Central and Eastern Mediterranean waters are oligotrophic with higher temperature and lower nutrients than Western Mediterranean and coastal waters. This shows well in two independent classifications of water characteristics in the two figures shown. Maltese waters (arrow) is clearly characterized by offshore water masses, quite distinct from coastal waters of Sicily (see dotted line separating two provinces). We should therefore expect the Maltese fauna to be distinct, and show similarities with eastern Mediterranean recourses, with slower growth rates, generally lower biological and fishery productivity per area of shelf, and a more fragile ecosystem.

Figure 5

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Valletta.

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Fax : 231294
2. Implications of the Medits 2000 Technical and Biological Report

The Medits 2000 survey of the M3 region provides evidence that the ichthyofauna of the Maltese shelf is rather different from that of the shelf areas of the rest of the Sicilian Channel despite having quite a number of species in common. Focussing on the 5 most abundant species for each sub-region\(^1\) by stratum (see Annex I for data), one can erect a simple species similarity index (SSI);

\[
\text{(SSI)} = \frac{\text{IC}}{\text{I}}
\]

IC = No species common to both areas
I = Total number species in sample

<table>
<thead>
<tr>
<th>Stratum A (10-50m)</th>
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<th>M3b</th>
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\(^1\) M3a: South Tyrrhenian Sea (Volturno River – Capo Suvero), M3b: South Tyrrhenian Sea (Capo Suvero – Capo San Vito); M3c: Sicily Channel; M3d: Maltese Waters
From this comparison stratum by stratum, it emerges that although some species are shared in common, the three Italian mainland shelf areas are generally more similar to each other than they are to the ichthyofauna of the Maltese shelf. When comparing the Maltese waters to the rest of the Sicily Channel, it is clear that the difference between them is greater for the shallowest stratum (<50 m), and is relatively less for the deepest stratum (>500 m). The latter is to be expected, since the adult populations of the shallower strata are more likely to be isolated from the mainland shelf populations than the deeper strata which are common to both inside and outside the Maltese waters.

Some species in particular, namely Octopus vulgaris and Sepia officinalis in the shallower stratum, and in general, cartilaginous fish, the squid Illex coindetti, Zeus faber, and the skate, Raja clavata, were common and largely characteristic of Maltese waters and less common elsewhere. Especially for the rays and cartilaginous fish, and probably also Zeus faber, the presence of species which are especially vulnerable to intensive trawling, such as sharks and rays which have a low reproduction rate, is an indicator that the faunal communities here have not been drastically altered by trawling. In this respect, Maltese waters may serve as a ‘refugium’ for these vulnerable species in the central Mediterranean.
REFERENCES


Medit (2000). Technical and biological report; Region M3d (Maltese Waters)

Oliver, P. (1994). Dinamica de la poblacion de merluza (Merluccius merluccius L.) de Mallorca (reclutamiento, crecimiento y mortalidad) Microfichas No. 2 Instituto Espanol de Oceanografia.
ANNEX I

Stratum A (10-50m)

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Stratum C (100-200m)

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* Biomass Index (kg/km²)
Stratum D (200-500m)

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Stratum E (500-800m)

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