

The Dusky Grouper

Has the King of the Mediterranean been dethroned?

By Molly Buchholz Sørensen

Finding a dusky grouper, *Epinephelus marginatus*, off the coast of Malta isn't as easy as it would seem these days. It is a bit strange, considering the ubiquitous Mediterranean marine fish is nicknamed the King of the Mediterranean. So where has the King of the Mediterranean gone?

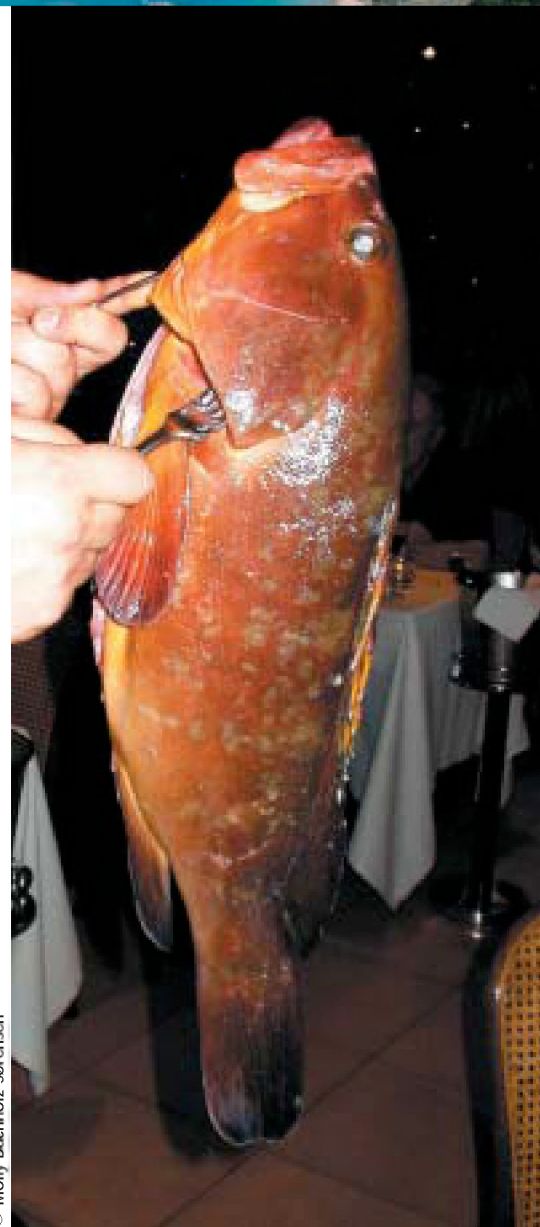
Dethroning of a king

Due to its severe population decline in 2001, the IUCN placed the dusky grouper on the Red List of endangered (EN A2d) species.¹ While there are published reports of unexplained mortality for the dusky grouper in Malta, and elsewhere in the Mediterranean Sea, going back as far as 1964, it seems the greatest culprit in its decline is anthropogenic in nature. The usual suspects seem to be involved: over-fishing, pollution, lack of ecosystem protection, swarms of jellyfish devouring everything in their path, even the slight warming of the Mediterranean Sea over the last 30 years has pushed the grouper's spawning sites northward into areas they were not previously found in the past.² Fishermen tend to seek out summer spawning aggregations, wiping out entire populations of fish. They target the few conspicuously silver-streaked large males in the group, skewing the female to male sex ratio even further. Over-fishing by anglers and spear fishermen are also contributing directly to the decline in abundance. In addition to these factors, a long life-history (up to 50 years), delayed sexual maturity, and predominately size-related sex reversal make it difficult for these dwindling populations to recover.

Need for conservation

In addition to its ecological importance in the Mediterranean Sea, there are other reasons to consider protection for the dusky grouper. They are, in fact, an economically important fish. Reef fish are considered a delicacy in Asia and the dusky grouper fetches some of the highest prices per kilogramme at the local fish markets in Malta. In addition to supplying high-end restaurants and their discerning customers with exotic gastronomic delights, they are also economically important to the local tourism market. Particularly here in Malta, the economy is heavily dependent on tourism, and speciality niches such as scuba-diving rely on faunal sighting as an attraction. There are even reports that local dive instructors will hand-feed groupers so they can reliably take happy-go-lucky tourists to see them.

Some countries such as Greece, Italy and Croatia have already begun to recognise the need for conservation of the dusky grouper and have started aquacultural studies to help restock the Mediterranean Sea and satiate the commercial demand. Others, such as France, have set up Marine Protected Areas such as the Port-Cros National Park, which consequently



One of many dusky groupers that will end up on a dinner plate; St Julian's, Malta.



A dusky grouper peers from behind a protective boulder in Zurrieq, Malta. (Photo courtesy of The Biological Conservation Research Foundation, BICREF, Malta.)

have benefited the dusky grouper due to their ecosystem restoration.²

Previous population differentiation studies of the north-western Mediterranean dusky groupers has determined that these high site-fidelity fish need to be managed at a local level.³ This is because genetic studies have shown that there are many subpopulations within the Mediterranean Sea due to deliberate local spawning practices.³ However, there is some mixing between these subpopulations due to pelagic larvae dispersal, but further studies which include the entire Mediterranean Sea are needed to clarify the genetic relatedness between these proximal populations. Due to Malta's central location in the Mediterranean Sea, between the eastern and western basins, it is especially relevant for

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conservation purposes to understand the phylogeographic patterns between these populations.

Molecular conservation genetics

Molecular conservation genetics seeks to manage biological threats by protecting, maintaining and restoring unique species and their genetic diversity. The integration of population distribution mapping, identification of extrinsic environmental factor(s) and population genetic theory play a significant role in the qualitative and quantitative assessment of species status and determination of sustainable conservation strategies. Candidate organisms for molecular conservation genetic analysis typically have small fragmented populations and suffer from loss of genetic diversity due to inbreeding. This results in a decreased ability to evolve in response to stochastic events and thus a decline in population. For this reason, minimising the loss of genetic diversity from inbreeding and isolation is a major objective in genetic conservation and management.

Research at the University of Malta

The intention of this research is to conserve and manage the local population of the highly endangered marine fish species *Epinephelus marginatus* in the Maltese archipelago. Our lab will use conservation genetics to determine species sustainability within the Maltese populace. Data collected from microsatellite and mitochondrial DNA (mtDNA) molecular markers will be used to determine population differentiation within the Maltese population of dusky groupers and to determine their relatedness to proximal populations within the Mediterranean Sea. We will also be probing locally for the possible development of cryptic species and speciation. Devoid of the application of population genetics, we may preserve the incorrect population or squander precious rights on a populace that has become increasingly rare but not at risk of extinction.

Anyone interested in helping with this conservation project in the form of sample donation should please contact Molly Buchholz Sørensen.

References

1. Cornish, A and Harmelin-Vivien, M (2004). *Epinephelus marginatus*. In: IUCN 2006. 2006 IUCN Red List of Threatened Species (www.iucnredlist.org). Downloaded on 05 September 2007.
2. Bodilis, P, Ganteaume, A and Francour, P (2003). Recruitment of the dusky grouper (*Epinephelus marginatus*) in the north-western Mediterranean Sea. *Cybio* 27(2), 123-129.
3. De Innocentiis, S, Sola, L, Cataudella, S and Bentzen, P (2001). Allozyme and microsatellite loci provide discordant estimates of population differentiation in the endangered dusky grouper (*Epinephelus marginatus*) within the Mediterranean Sea. *Mol. Ecol.* 10, 2163-2175.
4. Kara, M and Derbal, F (1996). Morphométrie, croissance et mortalité du mérour *Epinephelus marginatus* (Serranidae) de côtes de l'Est algérien. *Cah. Biol.* 36, 229-237.

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Conservation genetics

Its use in assessing the population structure of the Bluntnose Sixgill Shark

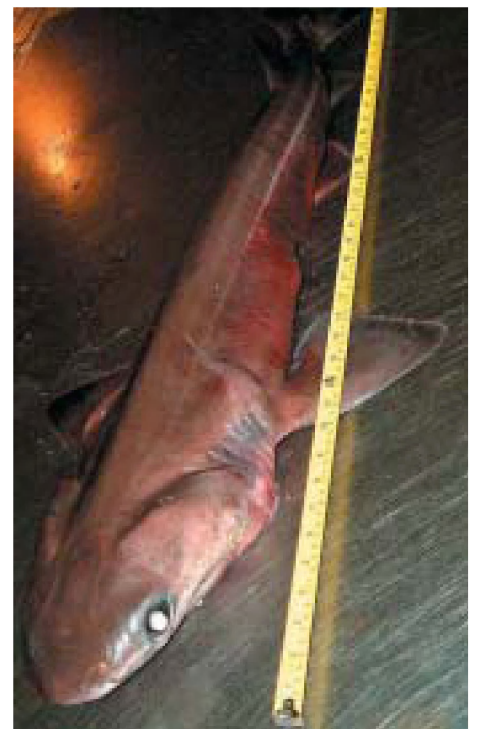
By Noel Vella

A wide range of elasmobranch species are caught annually around the Maltese Islands, in the central and southern Mediterranean, some of which are categorised as near-threatened, vulnerable, endangered, or even critically endangered, by the IUCN. Examples include *Hexanchus griseus* (bluntnose sixgill shark), *Squalus acanthias*, *Centrophorus granulosus* and *Leucoraja melitensis* (IUCN, 2006).

Nevertheless, even though their survival is being compromised, local scientific data that could back up and improve any management or conservation action plans for the protection of both the elasmobranchs and the markets associated with them has only begun to be compiled in recent years (Dalli, 2004; Dalli & Vella, 2006: poster presentation at the MarBEF Conference on Marine Research and General Assembly in Lecce, Italy, May 2006; Dalli & Vella, in prep.).

Over the past years, anthropological effects, mainly the development of better fishing strategies, have led to continuous exploitation of elasmobranchs, including sharks, both as target species and as by-catch. Due to this,

there is growing concern regarding the decline of many shark species. Moreover, vulnerability is enhanced due to slow growth rates, high age of maturity, low offspring production per litter and lack of biological and demographical data, thus making them a special group of marine organisms for which more data needs to be collected and conservation strategies need to be designed. For this purpose, elasmobranchs need to be considered separately from teleost fishes as the latter have a different biology and exhibit different population structures and life-histories. Furthermore, there are a few hundred known shark species, each of which responds differently to the pressures imposed by exploitation. However, elasmobranchs are usually tackled as a single entity due to the



Bluntnose sixgill shark *Hexanchus griseus*.