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Acknowledgement

Assessing species for the IUCN Red List of Threatened Species relies on the willingness of dedicated experts to

Participants of the IUCN Shark Specialist Group Mediterranean Red List Workshop, September 2003, San Marino.

This report is dedicated to the memory of Dr Ran om A. Mer (1952 2007). Ram attended the IUCN Mediterranean Red List Workshop and gave a moving account of his bold endeavour to shark conservation.

1. Introduction

Chondrichthyans are a relatively small (approximately 1,200 species) evolutionarily-conservative group that has functioned successfully in diverse ecosystems for over 400 million years. Despite their evolutionary success, many chondrichthyans are increasingly threatened with extinction as a result of human activities and the conservative life history traits of this group of fishes. Generally, chondrichthyans are slow growing and late to mature, with low fecundity. These characteristics result in very low rates of potential population increase with little capacity to recover from overfishing (direct or indirect) and other threats such as pollution and habitat destruction (Fowler *et al*. 2005).

In 2003, the IUCN World Conservation Union's Shark Specialist Group (SSG), in collaboration with the IUCN Centre for Mediterranean Cooperation, established a regional group of experts to work more coherently towards improved conservation and management of chondrichthyan fishes in the Mediterranean. One of the primary aims of the group was to assess the threatened status of each chondrichthyan species that occurs in the Mediterranean by applying the IUCN Red List criteria. This work constitutes part of the SSG's global programme to complete IUCN Red List assessments for all chondrichthyan fishes. A summary of the results of the Mediterraneanm9over1fisheor aouppts forst e

Figure 1. Map of the Mediterranean Sea and surrounding countries.

Although the Mediterranean is a semi-enclosed sea, the chondrichthyan fish fauna is relatively diverse with an estimated 80 species (approximately 7% of total living chondrichthyans), comprising 45 species of sharks from 17 families, 34 batoid species from nine families and one species of chimaera (Compagno 2001; Compagno *et al*. 2005; Compagno in prep a; Compagno in prep b; Serena 2005). An illustrated checklist of all 80 species of chondrichthyans thought to occur in the Mediterranean Sea is provided in Appendix 1. However, this report focuses on 71 of the 80 species as the occurrence of the remaining nine species within the Mediterranean is either infrequent, questionable, or

al. 2005). Unfortunately, data collected are incomplete and some of the most important landings are not recorded due to several species being reported under one group. For example, only thornback ray *Raja clavata* has separate records data among the Rajids. Additionally, FAO data only report official landings and therefore bycatch returned to the sea is not included (Walker *et al.* 2005). Several species, (e.g. common skate *Dipturus batis*, sawback angelshark *Squatina aculeata* and smoothback angelshark *S. oculata*) are now considered locally extirpated or commercially extinct in the Mediterranean. Exploitation of such species continues, however, as they constitute bycatch in many other fisheries (Walker *et al.* 2005).

Although directed fisheries have caused stock collapse for some species, more significant threats to chondrichthyans are mortality in mixed species fisheries and bycatch in fisheries targeting more valuable species (Musick and Bonfil 2005; Stevens *et al.* 2005). There are no Mediterranean pelagic fisheries that target migratory oceanic sharks. However, longline fisheries targeting swordfish and tunas (which have increased in effort over the past three decades) pose a great threat to susceptible chondrichthyans taken as bycatch in this fishery (ICCAT 2001). Bycatch is poorly documented and data are rarely incorporated into national and international (FAO) statistics, therefore numbers of sharks caught as bycatch can only be crudely estimated (Camhi *et al.* 1998). Driftnetting catches large numbers of chondrichthyans. This fishing method, once used widely throughout the Mediterranean, is now prohibited here (see 6.2), however illegal driftnetting still occurs (WWF 2005). Chondrichthyans most vulnerable and frequently caught with driftnets include blue shark *Prionace glauca*, common thresher *Alopias vulpinus*, shortfin mako *Isurus oxyrinchus*, porbeagle *Lamna nasus*, basking shark *Cetorhinus maximus*, giant devil ray *Mobula mobular*, pelagic stingray *Pteroplatytrygon violacea*, requiem sharks *Carcharhinus* spp. and hammerheads *Sphyrna* spp. (Tudela 2004; Walker *et al.* 2005).

Recreational sport fisheries have increased noticeably over the past few years, particularly off the Italian, Spanish and French coasts. Although data are limited, target species mainly include thresher sharks *Alopias* spp. and blue shark *Prionace glauca*, with catches primarily composed of young individuals. Anglers are increasingly releasing their catches alive (SGRST 2003; Walker *et al.* 2005).

1.2.3 Habitat loss, environmental degradation and pollution

Pressures resulting from human population growth along the coastline are detrimentally affecting the marine ecosystem and are contributing to the threats faced by chondrichthyans. Rapid urban and industrial development and associated pollution have degraded critical coastal habitats, such as nursery and spawning areas (Camhi *et al.* 1998; Stevens *et al.* 2005; UNEP MAP RAC/SPA 2003). Fisheries activities such as intensive bottom-trawling reduce the complexity of benthic habitats, affecting the epiflora and epifauna and reducing the availability of suitable habitats for predators and prey (Stevens *et al.* 2005). Pollution can contaminate food sources, concentrating in animals at the top of the food chain and potentially affecting physiology and functioning (UNEP MAP RAC/SPA 2003). A number of studies have shown that some Mediterranean sharks, such as the spiny dogfish *Squalus acanthias*, contain illegally high (>0.50mmg/kg) concentrations of mercury. Trace metals and organochlorine residues have been found in the eggs, muscles, liver and kidneys of deepsea sharks such as gulper shark *Centrophorus granulosus* and blackmouth catshark *Galeus melastomus*, confirming that deepwater species are also being affected by pollution (UNEP RAC/SPA 2002).

1.3 Management implications

Due to their life history characteristics, it is not appropriate to apply conventional management models of teleost fisheries to chondrichthyan populations, and the need for a precautionary approach to their management has been repeatedly highlighted (e.g. in FAO 2000; Fowler and Cavanagh 2005a). International and regional conventions and agreements relevant to Mediterranean chondrichthyans are discussed in section 5 of this report. Protection has been granted to a very small number of shark and ray species and some fishing restrictions are in force. These restrictions are often unsatisfactory, however. In general, the management techniques and enforcement measures currently in place are inadequate to ensure the long-term survival of many species and populations (Camhi *et al.* 1998; Fowler and Cavanagh 2005a).

1.4 The IUCN Red List of Threatened Species™ – a tool for management

The IUCN Red List of Threatened Species™ (IUCN Red List) is widely recognised as the most comprehensive, scientifically-based source of information on the global status of plant and animal species. IUCN Red List Categories and Criteria are applied to individual species assessments (which contain information on aspects such as ecology and life history, distribution, habitat, threats, current population trends and conservation measures), to determine their relative threat of extinction. Threatened species are listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). Taxa that are either close to meeting the threatened thresholds or would be threatened were it not for ongoing conservation programmes are classified as Near Threatened (NT). Taxa evaluated as having a low risk of extinction are classified as

Least Concern (LC). Also highlighted within the IUCN Red List are taxa that cannot be evaluated due to insufficient knowledge, and therefore assessed as Data Deficient (DD). This category does not necessarily mean that the species is not threatened, only that their risk of extinction cannot be assessed with the current data available (IUCN 2006).

IUCN Red List assessments can be used as a tool for measuring and monitoring changes in the status of chondrichthyan biodiversity and our knowledge of the taxa. They are an essential basis for providing targets for management priorities, and for monitoring the long term success of management and conservation initiatives.

1.5 The IUCN Shark Specialist Group's Red List programme

The SSG is currently part way through a programme to complete global assessments for all chondrichthyan species (~1,200 worldwide) by the end of 2007. This 'Global Chondrichthyan Assessment' is primarily being undertaken through a series of regional workshops in order to facilitate detailed discussions and pooling of resources and regional expertise. Regional assessments are collated to produce the global assessment for each species (unless a species is endemic to the region, in which case the regional assessment will also be the global assessment). For widespread species, some regional assessment categories may differ from the global assessment. To date, workshops have been held for seven regions: Australia and Oceania, sub-equatorial Africa, South America, North and Central America, the Mediterranean, Northeast Atlantic and West Africa. There have also been two generic workshops; one for Batoids (skates and rays) and one for deepsea species.

1.6 Objectives

The two main objectives of the SSG's regional assessment process are:

- **to develop a network of regional experts** to enable species assessments to be continually updated as new information is discovered and to

2.1 Workshop procedure

The SSG held a regional IUCN Red List workshop in San Marino, September 2003, which was funded by the IUCN Centre for Mediterranean Cooperation and the David and Lucile Packard Foundation. Thirty regional and international experts from 14 countries convened to evaluate the Mediterranean chondrichthyan fish fauna and to formulate priorities for

2.2 The precautionary approach

The IUCN guidelines recommend assessors should adopt a precautionary, but realistic approach when applying criteria, but that all reasoning should be explicitly documented (IUCN 2005). For example, where a population decline is known to have taken place (e.g. as a result of fisheries) but no management has been applied to change the pressures on the population, it can be assumed the decline is likely to continue in the future. If fisheries are known to be underway, but no information is available on changes in catch per unit effort (CPUE), data from similar fisheries elsewhere may be used by informed specialists to extrapolate likely population trends. Additionally, where no life history data are available, the demographics of a very closely related species may be applied (Fowler and Cavanagh 2005b).

2.3 Regional and global assessments

At the Mediterranean workshop, it was not always possible to produce the global assessment for a species after completing its regional assessment. This was largely due to a lack of information from outside the region. In these cases, the global assessment is currently 'in preparation', pending information from other regions and subsequent review by the wider SSG network (~200 members worldwide).

It should be noted that not all species assessments carried out at the Mediterranean workshop currently appear on the IUCN Red List (2006), as they require additional information before their global assessment can be submitted. All global assessments are subject to review before being finalised and submitted to the IUCN Red List, after which time they will be periodically revisited and updated as new information becomes available. The IUCN Red List is updated yearly; readers are therefore urged always to consult the current IUCN Red List (www.redlist.org), to obtain the most up to date assessments.

2.4 Geographically distinct populations

The IUCN Red List allows for the separate assessment of geographically distinct populations. These subpopulations are defined as "geographically or otherwise distinct groups in the (global) population between which there is little demographic or genetic exchange "typically one successful migrant individual or gamete per year or less" (IUCN 2001). Subpopulation assessments are displayed separately on the IUCN Red List website and Mediterranean subpopulations are identified in this report (Table 3.1).

2.5 Review process

Since the Mediterranean workshop in 2003, some species assessments have been reviewed and updated at the SSG's Northeast Atlantic workshop (February 2006). All Mediterranean assessments and documentation have undergone significant review and editing following circulation to the wider SSG network. The resulting assessments are, therefore, a product of scientific consensus concerning species status and are supported by relevant literature and data sources.

Globally, of the 546 chondrichthyans assessed to date (Figure 3.1), 20% (110 species) are considered threatened, 17% (95 species) Near Threatened, 25% (136 species) Least Concern and 38% (205 species) Data Deficient. The results of this study demonstrate, however, that the status of chondrichthyans in the Mediterranean appears far worse.

Forty-two percent (30 species) of Mediterranean chondrichthyan fishes are considered threatened (Critically Endangered, Endangered or Vulnerable) within the region. Of these, 18% (13 species) are Critically Endangered, 11% (8 species) are Endangered and 13% (9 species) are Vulnerable. A further 18% (13 species) of Mediterranean chondrichthyans are assessed as Near Threatened and 14% (10 species) are assessed as Least Concern. Little information is known about 26% (18 species), which have therefore been assessed as Data Deficient (Figure 3.2).

Figure 3.1 Percentage of globally
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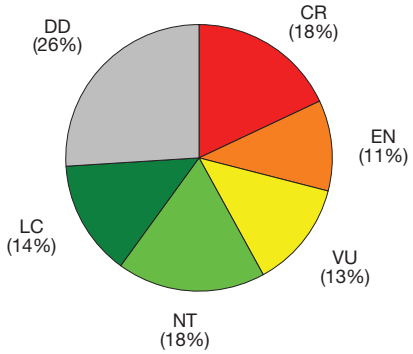
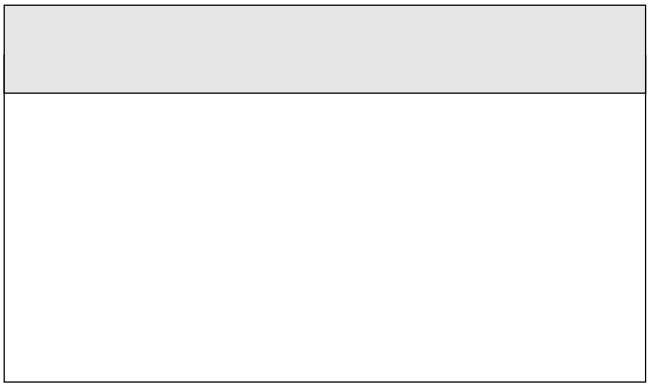


when more data become available, but it is notable that only one species, the deepwater Portuguese dogfish *Centroscymnus coeloloepis* has a better conservation status inside the Mediterranean than it has globally.

3.2 Major threats

A summary of the major threats to chondrichthyans in the Mediterranean, as identified in the IUCN Major Threats Authority File for each species IUCN Red List assessment, is presented in Table 3.3. The percentage of chondrichthyans currently susceptible to each of the major threat categories



3.6 Data Deficient species

This initial effort to produce IUCN Red List assessments for Mediterranean chondrichthyans has confirmed that there is a significant lack of information on the status of many species in the region. Twenty-six percent of species assessed were categorised as Data Deficient, indicating there is not enough information to enable accurate assessment of their extinction risk. This is often due to a lack of research, or because species are (or have become) rare, or have a limited geographic distribution. Therefore, they may be especially vulnerable to anthropogenic threats, in particular over-exploitation. Research efforts focusing on species for which there is currently little knowledge must be dramatically increased. A Data Deficient listing does not mean that these 18 species are not threatened. In fact, as knowledge improves, such species are often found to be amongst the most threatened (or suspected as such from available evidence). It is therefore essential to direct research efforts and funding towards these species as well as those in threatened categories (Cavanagh *et al*. 2003). This is particularly important when there are apparent threats yet virtually no available data on population sizes or biological parameters. In addition, many of the large shark species such as the bigeye thresher shark *Alopias superciliosus*, copper shark *Carcharhinus brachyurus*, dusky shark *C. obscurus* and spinner shark *C. brevipinna* pose a particular dilemma. Are these species rare in the Mediterranean, or just rarely caught and reported? In most cases it is currently not possible to be certain. Studies like the Mediterranean Large Elasmobranch Monitoring Project (MEDLEM, http://www.arpat.toscana.it/progetti/pr_medlem_en.html) will provide more information on the status of such species in the near future (Walker *et al*. 2005) and should be encouraged and expanded.

4. Ca e die t

Eight case studies from Mediterranean IUCN Red List assessments are presented below, illustrating a range of factors affecting chondrichthyan populations in the Mediterranean Sea. The case studies provide examples of species assigned to each of the six IUCN Red List categories. Summaries of all species assessments from the region are included in Cavanagh *et al*. (in prep).

4.1 Maltese skate *Leucoraja melitensis* (Clark, 1926)

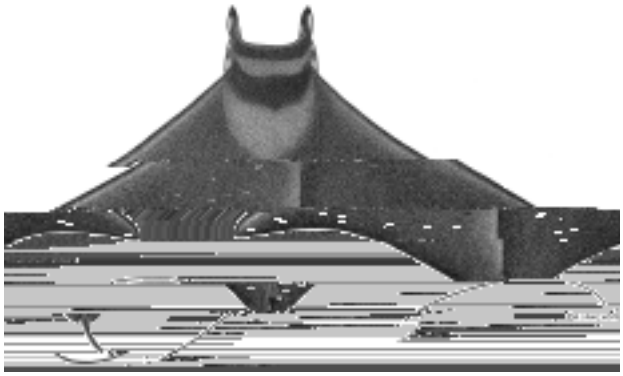
Mediterranean: Critically Endangered A2bcd+3bcd+4bcd
Global (Mediterranean endemic): Critically Endangered A2bcd+3bcd+4bcd (2006)

Mediterranean assessment authors: Ungaro, N., Serena, F., Dulvy, N.K., Tinti, F., Bertozzi, M., Pasolini, P., Mancusi, C.

4.2 Giant devil ray *Mobula mobular* (Bonnaterre, 1788)

Mediterranean: Endangered A4d
Global: Endangered A4d (2006)

Mediterranean assessment authors: Notarbartolo di Sciara, G., Serena, F. and Mancusi, C.



The giant devil ray is a huge pelagic plankton feeder, predominantly restricted to the Mediterranean Sea, which gives birth to a single large pup at unknown intervals. Its limited range and low reproductive capacity make it very vulnerable to overfishing. Although no direct fishery for giant devil rays exists, high mortality rates are reported from accidental catch in pelagic fisheries in the Mediterranean. It is at threat from driftnetting, which continues despite being banned in Mediterranean waters (WWF 2005), and from accidental capture by longlines, purse seines, trawls and fixed traditional tuna traps "tonnare". The giant devil ray is listed on Annex II 'List of endangered or threatened species' of the Barcelona Convention (see 5.2.2), which requires Parties to ensure maximum protection and aid the recovery of listed species. It is also listed on Appendix II (Strictly protected fauna species) of the Bern Convention (see 5.2.1). These listings are only implemented in Malta and Croatia. Recently, the General Fisheries Commission for the Mediterranean (GFCM) and International Commission for the

Conservation of Atlantic Tuna (ICCAT) introduced legislation to ban the use of pelagic driftnets within the Mediterranean basin. If implemented, this would eliminate one of the most severe threats to the giant devil ray. Without implementation of these measures, it is inferred that this giant ray will become increasingly rare in the Mediterranean; it is assessed as Endangered. Strict enforcement of protection and raising awareness with fishermen may prevent this ray from becoming more threatened in the future (Notarbartolo di Sciara *et al.* 2006).

4.3 White shark *Carcharodon carcharias* (Linnaeus, 1758)

Mediterranean: Endangered A2bc+3bc+4bc
Global: Vulnerable (2000). Update in preparation

Mediterranean assessment authors: Fergusson, I.K., Soldo, A., Morey, G. and Bonfil, R.

This flagship species has long been the focus of negative media attention as a result of its occasional lethal interactions with humans and perceived nuisance to some commercial fisheries (Fergusson *et al.* 2005). Due to this much exaggerated perception there are occasional attempts to capture and kill these sharks, which have been targeted in the past for sportfishing, commercial trophy hunting or human consumption (although no directed Mediterranean fishery has ever existed) (Fergusson *et al.* 2005). Although currently under review, the white shark has been listed as globally Vulnerable on the IUCN Red List since 2000. However, it is considered to be at a higher risk of threat in the Mediterranean, and has therefore been assessed as Endangered in this region (Fergusson *et al.* in prep.). Historical quantitative data for *Carcharodon carcharias* in the Mediterranean are patchy, but available information provides sufficient evidence for declines of 50–60% to be inferred and an increasing scarcity of white sharks through the latter half of the 20th century (Fergusson *et al.* in prep.). Records are declining despite increased scientific monitoring (especially in Italy, Malta, Croatia, Tunisia and Spain) and considerable growth in tourism and resort development during the last 40 years, which should have increased opportunities for sightings.

Offshore records in the Mediterranean have included captures across all size-classes made by pelagic longlines, bottom trawls, driftnets and purse seines. *C. carcharias* has a tendency to approach boats readily and to scavenge from fishing gear, which increases their vulnerability, potentially resulting in accidental entrapment or deliberate killing by commercial fishermen (Fergusson *et al.* 2005). In certain regions, such as Sicily, the white shark has traditionally been viewed negatively, as a costly interference to fisheries (Fergusson *et al.* in prep.). The impact of habitat degradation might be especially acute in the Mediterranean, where growing areas of intensive human inhabitation, especially for tourism, overlap with white shark habitat . Declines of traditional regionally- important prey such as blue fin tuna (Morey *et al.* 2003; Soldo and Dulcic 2005) alongside threats to other important prey, including small cetaceans (Morey *et al.* 2003) and other demersal and pelagic fishes, are suspected to have had a serious impact on white sharks in the Mediterranean (Fergusson pers. comm.).

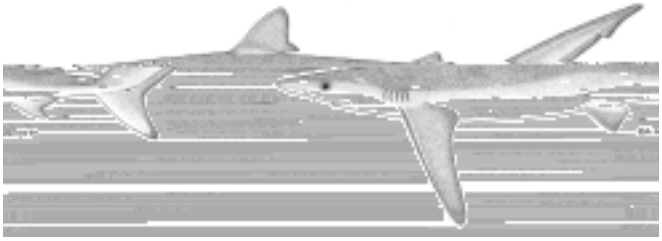
Entrapment in fixed tuna rearing pens and towed tuna cages may also pose a threat to white sharks in the region. Although little is known of the direct impacts of tuna cages, their increasing use, evidence for unreported encounters (Morey pers. comm.), and the potential for white sharks to be illegally killed through conflict with industry workers raises concerns. Similar issues are known to have arisen in southern Australia and Mexico (Galaz and Maddalena 2004).

The Mediterranean white shark population is classified as Endangered on the evidence of declines and the likely fishery pressures placed upon their apparent reproductive and nursery grounds in the Sicilian Channel (Fergusson *et al.* in prep.). This species has been included in both Bon0.0051 Tc 0.0831 Tw (td Maddale3na 200Conv0.00om)]Te fd

improve the situation for the white shark. An additional approach could be to implement a scheme of protective management in 'critical habitats', selected by interpreting biogeographical data. Such efforts should focus upon the Sicilian Channel and its environs (Fergusson 2002; Fergusson *et al.* in prep.).

4.4 Blue shark *Prionace glauca* (Linnaeus, 1758)

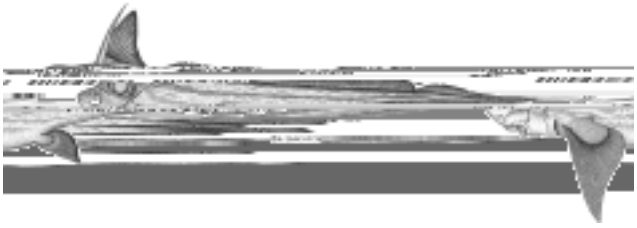
Mediterranean: Vulnerable A3bd + 4bd



4.5 Rabbitfish *Chimaera monstrosa* Linnaeus, 1758

Mediterranean: Near Threatened
Global: Not Evaluated (an assessment has been completed and submitted to IUCN for inclusion in the 2007 IUCN Red List).

Mediterranean assessment authors: Dagit, D.D., Hareide, N. and Clo, S.



Chimaera monstrosa is widely distributed throughout the Northeast Atlantic and western Mediterranean Sea, but rarely recorded from the eastern Mediterranean. Although one of the better known of the chimaeroid fishes, limited information is available regarding its biology and ecology. Data on the life-history parameters of *C. monstrosa* are also limited, but it is long-lived (estimated 30 years for males and 26 years for females) and likely to be vulnerable to population depletion (Calis *et al.* 2005). In the Mediterranean, this species is found at depths from 100m, but is most abundant between 500–800m (Baino *et al.* 2001). Several specimens have also reported from the Balearic Sea at depths of 650m and from the eastern Ionian Sea at 800m (Sion *et al.* 2004). Commercial trawling is intense between depths of 50–700m in the Mediterranean (Colloca *et al.* 2003). Bottom trawling below depths of 1,000m in the Mediterranean has been prohibited by the General Fisheries Commission for the Mediterranean (GFCM), although the effectiveness of this measure is unknown. The preferred depth range of *C. monstrosa* occurs at depths less than 1,000m, however, and it is therefore still vulnerable to deepwater fisheries.

Although no specific data on population trends over time are available, considering this species' preferred depth range is entirely within the range of current fishing activity, its unproductive life history characteristics, and suspected high rate of mortality to discards, this species has been assessed as Near Threatened (Dagit *et al.* in prep.). Further information is required on deepwater fishing activities (including catch and bycatch levels, effort and trend monitoring). The ban on deepwater trawling below 1,000m may afford some protection to the deepest part of the stock. However, given that its preferred depth range is entirely within the range of fisheries in this region, both present and future fishing pressure are likely to be unsustainable for *C. montrosa* and additional management measures are required.

4.6 Spotted ray *Raja montagui* Fowler, 1910

Mediterranean: Least Concern
Global: Not Evaluated (an assessment has been completed and submitted to IUCN for inclusion in the 2007 IUCN Red List).

Mediterranean assessment authors: Ungaro, N., Serena, F., Tinti, F., Bertozzi, M., Pasolini, P., Mancusi, C., Notarbartolo di Sciara, G., Dulvy, N. and Ellis, J.

Raja montagui is a small, relatively fecund skate, found from Norway in the Northeast Atlantic to Tunisia and western Greece in the Mediterranean Sea (Bauchot 1987; Serena 2005; Stehmann and Burkel 1984). In the Mediterranean, the majority of the population appears to exist between 100–500m, although it occurs from the shallows to 600m (Baino *et al.* 2001). As intense commercial trawling occurs between 50–700m, the entire depth range of *R. montagui* is within the depths of fisheries and this species is captured as bycatch (Colloca *et al.* 2003). Despite these levels of fishing pressure, and although temporal fluctuations in abundance have occurred, populations of *R. montagui* appear to be stable in most parts of the Mediterranean (Relini *et al.* 2000). The small body size of this species (average total length 60cm), means it is possibly more resilient to fishing impacts compared to the larger-bodied skate species. Therefore, this species has been assessed as Least Concern in the Mediterranean, although population trends and bycatch levels should be monitored to ensure a stable population is maintained. *R. montagui* may also benefit from general conservation measures (e.g. landing size regulations and effort reduction) to ensure that it remains Least Concern in the future (Ungaro *et al.* in prep.).

4.7 Portuguese dogfish *Centroscymnus coelolepis* (Bocage and Capello, 1864)

Mediterranean: Least Concern
Global: Near Threatened (2003), Update in preparation

Mediterranean assessment authors: Clo, S. and Hareide, N.

Centroscymnus coelolepis is one of the deepest living sharks. It is widely but patchily distributed in the Atlantic, Pacific and Indian Oceans, living on or near the sea bottom over continental slopes and upper and middle abyssal plain rises. This species has very slow growth and low fecundity, resulting in a very low intrinsic rate of increase and making it vulnerable to population decline where it is fished (Stevens and Correia 2003).

The Mediterranean population of *C. coelolepis* appears to be distributed deeper than populations in the Atlantic and Pacific (Clo *et al.* 2002). Bottom trawl surveys indicate that it is found from 1,301m to a maximum depth of 2,863m (Clo *et al.* 2002; Grey 1956; Massut and Moranta 2003; Priede and Bagley 2000; Sion *et al.* 2004). In trawl surveys in the western Mediterranean (Balearic Islands), Massut and Moranta (2003) recorded this species from 1,301–1,700m and Sion *et al.* (2004) from 1,500–2,500m. Both studies reported that *C. coelolepis* increased in abundance at the greatest depths surveyed. The species was also recorded using a video camera in the eastern Mediterranean at 1,500–2,500m in the Cretan Sea and at 2,300–3,850m in the Rhodos Basin (Priede and Bagley 2000). In February 2005 the General Fisheries Commission for the Mediterranean (GFCM) adopted the Decision to refrain from expanding deep water fisheries operations below depths of 1,000m, which entered into force in September 2005 (FAO 2005, see 6.1). The effectiveness of this measure is unknown.

Although data for this species in the region are scarce, there is no evidence that the population has declined. The few data available indicate that *C. coelolepis* generally increases in abundance with depth in the Mediterranean, affording it refuge from fishing pressure. In the absence of evidence for population declines, and given that the GFCM Decision offers it refuge from fishing pressure, *C. coelolepis* is considered Least Concern in the Mediterranean. Although not targeted in the Mediterranean Sea, any level of bycatch would be of concern because of this species' intrinsic biological vulnerability to depletion. Therefore its status will rely on the strict implementation of the GFCM deepwater trawling ban; the efficacy of this measure should be monitored and bycatch of deepwater fisheries accurately reported. If fishing expands below 1,000m in the future, this assessment will need to be revisited.

4.8 Bigeye thresher *Alopias superciliosus* (Lowe, 1839)

Mediterranean: Data Deficient
Global: Not Evaluated (in preparation)

Mediterranean assessment authors: Vacchi, M., Macias, D., Fergusson, I., Mancusi, C. and Clo, S.

Alopias superciliosus has been poorly documented in the Mediterranean and is considered scarce or rare (Barrull and Mate 2002). There are no available data on catch trends for this species in the region, although significant reductions in thresher sharks have been reported through catch per unit effort (CPUE) comparisons in the Northwest Atlantic pelagic longline fishery (Baum *et al.* 2003), and suspected declines have occurred elsewhere.

A. superciliosus is a bycatch of the semi-industrial fisheries (swordfish and other pelagic fisheries) of southern Spain, Morocco, Algeria, Sicily and Malta, and of artisanal trammel and gillnet fisheries elsewhere in the Mediterranean Sea (Bauchot 1987). In recent years, increasing numbers of new records from the eastern Mediterranean (sometimes multiple captures) demonstrate that this species also penetrates widely to the east of Malta, occurring in the waters off Israel (Levantine basin), in the Aegean Sea off Turkey and southern Greece, and off southern Crete (Fergusson pers. comm; Golani 1996). Evidence from offshore pelagic fisheries in southern Sicily and Malta indicate that *A. superciliosus* is caught in unknown numbers each year, but routinely discarded at sea (hence the vernacular name 'false thresher', because of a perceived low local value).

Despite the apparent threat posed by bycatch, the lack of records and further information on the population of *A. superciliosus* in the Mediterranean prevents an assessmentmult, like n

8th Conference of Parties in 2005 agreed to begin the development of a CMS Instrument for the conservation of all migratory shark species listed on CMS. Progress towards this goal will be initiated in 2007. See: http://www.cms.int/ for more information.

5.1.2 The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES was established in recognition that international cooperation is essential for the protection of certain species from over-exploitation through international trade. It creates the international legal framework for the prevention of trade in endangered species of wild fauna and flora and for the effective regulation of international trade in other species which may become threatened in the absence of such regulation. Two Mediterranean shark species are listed on Appendix II of CITES: basking shark and white shark. Proposals to list two more Mediterranean species on Appendix II (porbeagle *Lamna nasus* and spiny dogfish *Squalus acanthias*) and all species of sawfish Pristidae on Appendix I may be debated by the 14th Conference of Parties in 2007.

CITES' other major role in promoting the sustainable management of wild species (arguably as important, if not more important than species listings on its Appendices), is through the adoption of Resolutions and Decisions. Resolution Conf. 12.6 encourages Parties, *inter alia*, to identify endangered shark species that require consideration for inclusion in the Appendices, if their management and conservation status does not improve. Decision 13.42 encourages Parties to improve their data collection and reporting of catches, landings and trade in sharks (at species level where possible), to build capacity to manage their shark fisheries, and to take action on several species-specific recommendations from the Animals Committee. Many of the latter taxa are threatened in the Mediterranean, including spiny dogfish, porbeagle, white shark, tope shark *Galeorhinus galeus*, sawfishes family Pristidae, gulper sharks genus *Centrophorus*, requiem sharks genus *Carcharhinus*, guitarfishes Order Rhinobatiformes, and devil rays family Mobulidae. Angel sharks family Squatinidae, sandtiger sharks family Odontaspidae, and thresher sharks family Alopidae, were also identified as of potential concern.

Parties were also urged, through FAO and regional fisheries organizations, to develop, adopt and implement new international instruments and regional agreements for the conservation and management of sharks, and to consider recommendations for activities and guidelines to reduce mortality of endangered species of sharks in bycatch and target fisheries (CITES 2006; Fowler and Cavanagh 2005a). See http://www.cites.org/ for more information.

5.1.3 United Nations Convention on the Law of the Sea (UNCLOS)

UNCLOS provides a framework for the conservation and management of fisheries and other uses of the sea by giving Coastal States the right and responsibility for the management and use of fishery resources within their national jurisdiction (the territorial sea, which can extend up to 12 nautical miles). UNCLOS also recognises Coastal States' right to claim an exclusive economic zone (EEZ) of up to 200 nautical miles. The management goal adopted by UNCLOS (Article 61(3)) is that of maximum sustainable yield, qualified by environmental and economic factors. The provisions of UNCLOS directly related to the conservation and management of sharks include the duty placed on Coastal States to ensure that stocks occurring within their jurisdictional waters are not endangered by overexploitation. See http://www.un.org/Depts/los/

5.2.3 Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea

In 2003, the United Nations Environment Programme's Regional Activity Centre for Specially Protected Areas (UNEP RAC/SPA), in collaboration with the IUCN Centre for Mediterranean Cooperation and the IUCN SSG, developed the *Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea*. The Action Plan was developed in line with many of the international and regional instruments applying to the conservation and management of sharks in the Mediterranean, outlined in this section, including the Protocol concerning Specially Protected areas and Biological Diversity (Barcelona Convention), the FAO IPOA-Sharks, and the UN Fish Stocks Agreement (UNEP MAP RAC/SPA 2003). The production of this Action Plan has identified specific measures required for improving the conservation and sustainable management situation of sharks in the Mediterranean Sea. It is important, however, that recommendations contained within the Action Plan are implemented and that the Action Plan is periodically updated, to ensure it is effective.

6. Fishing restriction and management applying to chondrichthyan in the Mediterranean

The General Fisheries Council for the Mediterranean (GFCM), responsible for Mediterranean fisheries, has not yet taken action to implement management specifically for chondrichthyan fishes, whether through a Mediterranean Shark Plan (under the FAO IPOA–Sharks) or other measures, but is addressing the issue.

6.1 Deepsea fisheries

The GFCM recently decided to refrain from expanding deep water fishing operations beyond the limit of 1,000m. This Decision was adopted at the 29th session of the GFCM held in Rome in February 2005 and came into force in September 2005 (FAO 2005). It significantly reduces the threat of potential exploitation pressure to highly vulnerable deepwater species, many of which are seriously threatened outside the Mediterranean. The restriction of deep water fisheries has made it possible to list the Portuguese dogfish *Centroscymnus coelolepis* and the little sleeper shark *Somniosus rostratus* as Least Concern within the Mediterranean region, because these species occur below 1,000m and are now protected from fisheries. Many other deepsea chondrichthyan species occur at depths less than 1,000m (Sion *et al*. 2004), however, and are therefore still vulnerable to fishing in the Mediterranean.

6.2 Driftnetting

The UN global moratorium on all large-scale pelagic driftnet fishing was adopted in 1992. Driftnetting with nets greater than 2.5km in length was prohibited in the Mediterranean by the EC in that same year and under a binding Resolution by the GFCM in 1997. A total ban on driftnet fishing came into force from the beginning of 2002. Also in 2003, the International Commission on the Conservation of Atlantic Tuna (ICCAT) banned the use of driftnets, making it illegal for non-EU as well as EU fleets to use driftnets in the Mediterranean. Despite these bans, driftnetting in the Mediterranean continues illegally with a large scale Moroccan driftnet fleet and sizeable Italian, French and Turkish driftnet fleets operating (Tudela 2004; Tudela *et al*. 2005; WWF 2005). Loopholes in Mediterranean fishing regulations have created a new category of anchored floating gillnets. These modified gillnets have, however, been described as an attempt to disguise driftnet fishing under another name, since they are still large scale driftnetting gears that target large fish species, and are therefore illegal (WWF 2005).

6.3 Shark finning

Shark finning refers to the removal and retention of shark fins with the rest of the shark discarded at sea. This wasteful practice results in the utilisation of only 2–5% of the shark with the remainder being thrown away. Finning threatens many shark stocks, the stability of marine ecosystems, sustainable traditional fisheries and socio-economically important recreational fisheries (IUCN 2003b). Increasing demand for shark fins, driven by traditional Asian cuisine, has led to such a dramatic increase in world shark fin prices that they are now extremely valuable. Thus the increased incentive to target and fin sharks that might previously have been released alive is now a major global concern (Rose and McLoughlin 2001).

The extent of finning within the Mediterranean region is unknown. Two finning regulations apply within Mediterranean waters: the EU has adopted a finning ban (Regulation 1185/2003, Europa 2006b), as has the International Council for the Conservation of Atlantic Tunas (ICCAT 2005). Finning was likely occurring prior to these regulations (SGRST 2003). To date there is no information on the enforcement of these regulations in the Mediterranean, but concerns have been voiced that the EU Regulation may be ineffective because it allows permits to be issued for removing shark fins on board and landing them separately from the carcasses. The permitted fin:carcass ratio adopted in the EU and under ICCAT is also higher than in other regions of the world and can potentially enable fishers to land fewer sharks than were actually finned (Fordham 2006; IUCN 2003b; IUCN SSG 2003).

7. Chondrichthyan monitoring programme in the Mediterranean

Lack of adequate scientific information is often cited as being one of the reasons for failing to introduce or implement suitable management measures for chondrichthyan fishes. It is widely recognised, however, that the need for precautionary management is urgent and should proceed based on whatever information is available. Several research and monitoring programmes have taken place and continue to operate in the Mediterranean Sea that contribute knowledge, enabling efforts to develop shark conservation and management to progress. For example, the MEDLEM project (Mediterranean Large Elasmobranch Monitoring) collects data on incidental

8. Concl ion

This report presents the first comprehensive regional IUCN Red List of chondrichthyan fishes of the Mediterranean Sea. With 30 out of 71 species considered threatened (42% are Critically Endangered, Endangered or Vulnerable); the Mediterranean region has some of the most threatened chondrichthyan populations in the world. Currently, just eight species (six sharks and two rays) are granted some form of protection under international or regional agreements. Three main management measures (deepsea fisheries, driftnetting and shark finning bans) are now in place in the Mediterranean; these should directly benefit

9. Recommendations

The following recommendations were formulated by the participants of the IUCN SSG Mediterranean IUCN Red List workshop, after considering the results presented in this report and consulting with the UNEP RAC/SPA *Action Plan for the Conservation of Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea*. These recommendations are intended to complement and take forward existing advice for the conservation and management of chondrichthyans within the Mediterranean region, in light of newly collated information on the IUCN Red List status of Mediterranean chondrichthyans summarised within this report.

1. CITES Parties to implement Resolution Conf. 12.6 on the conservation and management of sharks (http://www.cites.org/eng/res/12/12-06.shtm) and Decision 13.42 (http://www.cites.org/eng/dec/valid13/13-42&43.shtml) directed to Parties, including species-specific recommendations in document CoP 13 Doc. 35 Annex 2 (http://www.cites.org/eng/cop/13/doc/E13-35.pdf).

2. Improve coordination between existing environmental and fisheries organisations and international and regional Conventions that address shark conservation and management in the Mediterranean and Black Sea, by increasing collaboration and ensuring a uniform application of the ecosystem approach and the precautionary principle.

3. UNEP-RAC/SPA to update the priority list of species in the *UNEP Mediterranean Action Plan for the Conservation of Chondrichthyan Fishes* and the Appendices of the SPA protocol, in light of this comprehensive IUCN Red List assessment of Mediterranean chondrichthyans, and to continue to do so as more IUCN Red List assessments are become available/are updated.

4. Mediterranean States urgently to make provisions for the legal protection of species identified as being threatened in the Mediterranean.

5. Mediterranean States to develop and implement National Plans of Action, as outlined by the UN FAO IPOA-Sharks.

6. GFCM to initiate the development of a Regional Shark Plan and management strategies specifically aimed at the conservation and sustainable use of commercially exploited chondrichthyan fish species and species taken as bycatch, in the context of the precautionary principle.

7. GFCM and Mediterranean States to develop and support fishing practices that minimise bycatch and/or facilitate live release.

8. The current moratoriums on driftnetting and deepsea fishing should remain in place but need to be strengthened to improve their effectiveness. Adequate enforcement measures are crucial.

9. Mediterranean States to support existing research programmes and develop new research programmes on the biology, ecology and population dynamics of threatened species and in areas that are poorly known or under threat. Resources urgently need to be directed towards species assessed as Data Deficient, which are potentially threatened.

10. Financial donors, such as the EU, should highlight such research programmes, including long-term monitoring, as a priority for funding.

11. Researchers to identify and map critical habitats for endangered species.

12. Mediterranean States should restore and protect identified critical habitats through appropriate monitoring and management measures.

13. UNEP RAC/SPA, in conjunction with GFCM, should develop and facilitate training, particularly in the fields of taxonomy and monitoring methods, (to enable the accurate collection of species-specific landings) and stock assessment.

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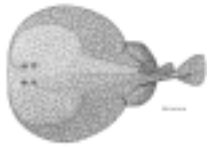
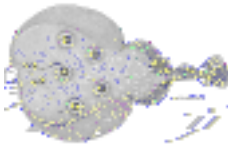
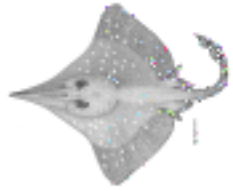
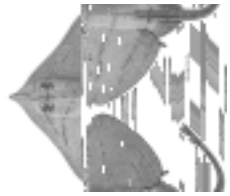
Appendix 1. Checklist of chondrichthyan fishes in the Mediterranean Sea

Class: CHONDRICHTHYES

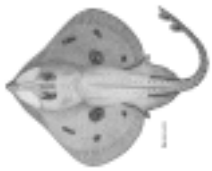
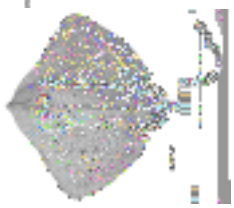
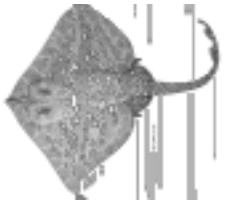
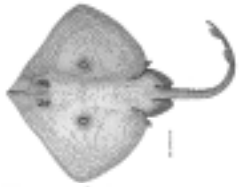
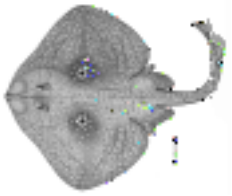
Subclass
Holocephali

Order
CHIMAERIFORMES
Modern Chimaera

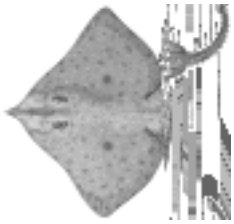
Class: CHONDRICHTHYES				
	Family	**Scientific name**	**Common name**	
Suborder				
RHINOBATOIDEI	RHINOBATIDAE			
Guitarfishes	Guitarfishes	*Rhinobatos cemiculus*	Blackchin guitarfish	
		Rhinobatos rhinobatos	Common guitarfish	
Suborder				
TORPEDINOIDEI	TORPEDINIDAE			
Electric rays	Torpedo rays	*Torpedo marmorata*	Spotted torpedo ray	
		Torpedo nobiliana	Great torpedo ray	
		Torpedo sinuspersici	Marbled electric ray	Occurrence of this species in the Mediterranean Sea is uncertain
		Torpedo torpedo	Ocellate torpedo ray	
Suborder				
RAJOIDEI	RAJIDAE			
Skates	Skates	*Dipturus batis*	Common skate	
		Dipturus oxyrhynchus	Sharpnose skate	
		Leucoraja circularis	Sandy skate	
		Leucoraja fullonica	Shagreen skate	

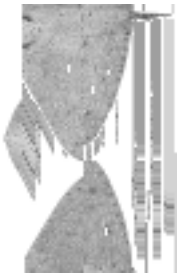
* Illustrations are not to scale.

Class: CHONDRICHTHYES

Family	Scientific name	Common name	
Suborder RAJOIDEI Skates con'd	*Leucoraja melitensis*	Mal e e ka e	
	Leucoraja naevus	C ckoo ka e	
	Raja asterias	A lan ic a ka e	
	Raja brachyura	Blonde ka e	
	Raja clavata	Thornback ka e	
	Raja miraletus	T ine e ka e	
	Raja montagui	Spo ed ka e	
	Raja polystigma	Speckled ka e	
	Raja radula	Ro gh ka e	

* Illustrations are not to scale.

	Raja undulata	Undulate ray	
	Rostroraja alba	White skate	
DASYATIDAE Whiptail Stingray	*Dasyatis centroura*	Roughtail stingray	
	Dasyatis chrysonota	Blue stingray	
	Dasyatis pastinaca	Common stingray	
	Himantura uarnak	Honeycomb stingray	

Class: CHONDRICHTHYES				
	Family	**Scientific name**	**Common name**	
Suborder MYLIOBATOIDEI Sting rays and devil rays	GYMNURIDAE Butterfly rays	*Gymnura altavela*	Spiny butterfly ray	
	MYLIOBATIDAE Eagle rays	*Myliobatis aquila*	Common eagle ray	
		Pteromylaeus bovinus	Bull ray	Occurrence of this species in the Mediterranean Sea is uncertain
	RHINOPTERIDAE Cownose rays	*Rhinoptera marginata*	Lusitanian cownose ray	
	MOBULIDAE Devil rays	*Mobula mobular*	Giant devil ray	
Suborder LAMNIFORMES Mackerel shark	ODONTASPIDIDAE Sand tiger shark	*Carcharias taurus*	Sand tiger shark	
		Odontaspis ferox	Small toothed sand tiger	
	ALOPIIDAE Thresher shark	*Alopias superciliosus*	Bigeye thresher	
		Alopias vulpinus	Thresher shark	

* Illustrations are not to scale.

CETORHINIDAE		
Ba king ha/k	*Cetorhinus maximus*	Ba king ha/k
LAMNIDAE		
Macke/el ha/k	*Carcharodon carcharias*	G/ea_t hi_e t ha/k
	Isur01G7yMaeych	

Mustelus mustelus	Smoo hho nd
Mustelus punctulatus	Black po moo hho nd
Carcharhinus altimus	Bigno e ha k
Carcharhinus brachyurus	B on e hale ha k
Carcharhinus brevipinna	Spinne ha k
Carcharhinus falciformis	Silk ha k
Carcharhinus limbatus	Black ip ha k
Carcharhinus melanopterus	Black ip eef ha k
Carcharhinus obscurus	D k ha k
Carcharhinus	

Class: CHONDRICHTHYES			
	Family	**Scientific name**	**Common name**
		Prionace glauca	Blue shark
		Rhizoprionodon acutus	Milk shark 
	SPHYRNIDAE Hammerhead shark	*Sphyrna lewini*	Scalloped hammerhead 
		Sphyrna mokarran	Great hammerhead 
		Sphyrna zygaena	Smooth hammerhead 

Appendix 2. Summary of the IUCN Red List Categories and Criteria Version 3.1

These five criteria (A–E) are used to evaluate whether a species belongs in a category of threat (Critically Endangered, Endangered or Vulnerable)

Use any of the criteria A–E	Critically Endangered	Endangered	Vulnerable
A. Population reduction	Declines measured over the longer of 10 years or 3 generations		
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%
A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following: **(a)** direct observation **(b)** an index of abundance appropriate to the taxon **(c)** a decline in area of occurrence, extent of occurrence, and/or habitat quality **(d)** actual or potential levels of exploitation **(e)** effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.			
A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.			
A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on (b) to (e) under A1.			
A4. An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.			
B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
B1. Extent of occurrence	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy	< 10 km²	< 500 km²	< 2,000 km²
AND at least two of the following:			
(a) Severely fragmented, **OR** Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals.			
(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals.			
C. Small population size and decline			
Number of mature individuals	< 250	< 2,500	< 10,000
AND either C1 or C2:			
C1. An estimated continuing decline of at least: (up to a max. of 100 years in future).	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
C2. A continuing decline **AND** (a) and/or (b):			
(a) (i) No. of mature individuals in each subpopulation.	< 50	< 250	< 1,000
(a) (ii) or % individuals in one subpopulation at least.	90%	95%	100%
(b) extreme fluctuations in the number of mature individuals.			
D. b)			