NDF WORKSHOP CASE STUDIES
WG 8 – Fishes
CASE STUDY 3
Cheilinus undulatus
Country – **INDONESIA**
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NAPOLEON FISH, *CHEILINUS UNDULATUS*, INDONESIA

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I. Background information on the taxa

1. BIOLOGICAL DATA

1.1 Scientific and common names:

Cheilinus undulatus (Napoleon fish/wrasse, Humphead or Maori wrasse)

1.2 Distribution:

Widely distributed on coral reefs of the Indo-Pacific with adults extensively using outer reef slope habitats; hence distribution follows that of coral reefs in region in particular the outer reef slopes for adults and inshore areas of live coral which are favoured by small juveniles (Sadovy *et al*., 2003). *For map see end of document*.

1.3 Biological characteristics

Species attains 2 m in length and can exceed 30 years of age. After a dispersive pelagic egg and larval phase of unknown duration and dispersal distincce, settlement and movements from shallow inshore waters to deeper offshore reef slope areas occur with body growth with only limited movements thereafter, as far as is known. The Napoleon fish reproduces over many months in small male-dominated temporary aggregations and is a protogynous (female to male sex-changing) hermaphrodite with female-biased adult sex ratio. Adults only reproduce in small aggregations that form briefly on a regular basis along outer reef slopes as far as is known. The species feeds mainly on invertebrates, with some fishes in the diet and is thought to

be important predator of *Acanthaster planci* (crown of thorns starfish), a species known to devastate coral reefs if its populations increase to high levels (Sadovy *et al*., 2003).

1.4 Population

1.4.1 *Global population size*

The species is naturally uncommon and thought to be declining due to historically unmanaged fisheries throughout extensive parts of its range. Population estimates have been calculated for Indonesia (see Annex 1) and the Non-Detriment Finding (NDF) for Indonesia was partly determined using these estimates. The species is 'conservation-dependent' which means that wherever it is fished and unmanaged, its numbers drop very quickly and numbers are very low. It only occurs at natural densities in fully protected areas and/or where it is not fished at all because fishing is too difficult or dangerous or otherwise does not occur. The area from which most capture and trade of the species is generated is probably the area that encompasses a large part of its global population given the high proportion of global reefs involved in source countries (Indonesia, Philippines, Malaysia and PNG – see map below). Therefore, successful implementation of CITES and national level management in these four countries is probably very important for a significant proportion of the entire species.

1.4.2 *Current global population trends*

___increasing _X__decreasing ___stable ___unknown

1.5 Conservation status

1.5.1 *Global conservation status*

___Critically endangered
_X_Endangered
___Vulnerable
___Near Threatened
___Least concern
___Data deficient
IUCN Red List Endangered (2004:
http://www.iucnredlist.org/search/details.php/4592/all).

1.5.2 *National conservation status for the case study country*

In Indonesia the species is regulated with no export of fish permitted <1kg and> 3 kg since 1995 and an annual NDF, since 2007, of 8,000 fish annually. The main threat is uncontrolled fishing. Law/regulation/

decree for Napoleon fish exists as well as a policy framework for management of harvest and export regulations. However, these are not yet sufficiently implemented to be effective. Confusion is common among fishermen, collectors, and exporters, and even within subsections of the Department of Marine Affairs and Fisheries (DKP) which is involved in fishery issues. Law enforcement needs to be more effective and there needs to be good co-operation between the various government sections that deal, respectively, with commercial fish and threatened species (i.e. PHKA, BKSDA, and DKP Quarantine, and Customs) for management. Marine Conservation Areas exist but effectiveness of protection is low or unknown.

1.5.3 *Main threats within the case study country*

___No Threats
___Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other: _____
___Unknown

2. SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1 Management measures

The species has been managed since 1995 in Indonesia when control of catching and export size was introduced due to high value of/demand for fish in the live food-fish export market. Fish less than 1kg can be used for grow-out (i.e. fattening in captivity) and those over 3 kg that are caught must be released. Only fish between 1kg and 3 kg can be legally exported. The management measure was intended to exert some control on the trade and to stop the use of cyanide as a fishing method by permitting traditional fishing methods only. Note that the catch of fish <1kg is permitted to allow for 'culturing' or 'cultivation' of fish which is seen as a type of 'mariculture' or fish farming. Since all the fish involved in culturing, cultivation or mariculture in respect of this species involve wild-caught fish raised in captivity to market size – any such defined fish must be considered as wild fish and subject to NDF permits at export.

Management in respect to the source area within Indonesia is controlled by SATSDN (domestic transport permit) which involves a permit that all traders must have to transport the fish from where it is being captured to destinations within Indonesia. Exporters must have a CITES Permit for export and permits to move fish at the national level. There are no additional management restoration or alleviation measures other than some designated marine protected areas. However, with few exceptions, fishing continues in most protected areas in Indonesia and so there are few known fully protected marine areas or natural refuges for this species. Transport within Indonesia is supposed to be conducted only under permit with catches under the NDF assigned differentially to different regions of the country. Full details of management legislation are available on pp. 34-43: http://www.humpheadwrasse.info/AC22_Final.pdf. On the import side, Hong Kong requires an import licence in advance of import of live fish and there is a stricter domestic measure for possession. For Mainland China, the other major importer, see the following note.

NOTE: Mainland China is a major importers but has not yet implemented the CITES Appendix II listing for this species. This means that while Hong Kong issues export permits from Hong Kong into Mainland China for transhipment, there are no permits issued at import into Mainland China or monitoring across the border. According to information recently received from the CITES Management Authority in China, a revision of the national listing of species has been underway (the last one was in 1988) and the Napoleon fish has been included in the proposed revised listing. The proposed revision has been submitted to the National Council and is waiting approval, which may occur within 2008. Monitoring the species under Category II of national protection is reportedly occurring but this could not be confirmed and data were not available. If approved, the revised listing would ensure much improved enforcement for the species (communication from Mr. Fan Xiangguo).

2.2 Monitoring system

Sporadic market surveys for landings are conducted as part of national level fishery monitoring, and annual landings within Indonesia have been reported to FAO since the early 2000s. Detailed underwater visual census surveys have been conducted in six locations for fish size and density in eastern Indonesia by the Indonesian Scientific Authority, in collaboration with the IUCN Groupers & Wrasses Specialist Group to produce information for the NDF. Fish collected for grow-out are supposed to be monitored regularly by the government in the different regions of Indonesia.

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED

3.1 *Type of use* (origin) **and destination** (purposes)

Wild-caught live animals destined for high-value luxury food in restaurants in export trade is the major use; this is one of the highest priced live fishes at retail in this restaurant trade with retail prices (in demand centres overseas) recorded as high as US$150/kg. Major destination is Hong Kong (much of which is transhipped to Mainland China). Also destinations in Singapore (much of which goes through to Hong Kong) and Taiwan. Most international trade is in live fish although some chilled fish also occurs (as known from confiscations of chilled fish imported into Hong Kong from Indonesia). Domestic consumption is not common and occurs largely because of fish that die prior to live export or are caught incidentally as part of the multi-species reef fish fishery: exporters sometimes accept dead fishes and export these mixed with other fishes such as groupers to Taiwan and Hong Kong.

All fish marketed and trade for this species are wild-caught, with extensive capture and grow-out in captivity of sub market-sized juveniles to marketable sizes. There is no hatchery production and mariculturists do not expect that mariculture (i.e. artificial production or farming) of the species will be possible in near future. The sum of all uses of the species must be taken into account when examining total removals of fish from the wild for the purposes of NDF – these uses are: export live at market size (including wild-caught juveniles grown-out to market size), export chilled, local consumption live, and local consumption chilled. All uses need to be accounted for in determining NDF.

3.2 Harvest:

All fish are taken from the wild. For the luxury live fish trade, the preferred size range is 0.5-1 kg. The fish is considered difficult to catch by hand-line and most fish of smaller size are caught by cyanide. Dead fish are taken by spearfishing at night or incidentally while line-fishing. If targeted specifically by fishers, this species is destined for the live export market. The species is taken by fishers who have the means to catch and maintain fish alive, often with the assistance of traders/exporters in terms of supply of gear or cyanide and/or temporary holding facilities for grow-out.

3.3 Legal and illegal trade levels

Illegal (unpermitted and illegal size) exports by sea and air continue as determined by seizures in Hong Kong of shipments without permits

and fish of illegal size according to Indonesian regulation. Illegal movement of fish, including some of illegal size, also occur within Indonesia, as determined by seizures and personal observations of illegal sized fishes in trade within the country.

There have been at least four seizures of Napoleon fish from Indonesia into Hong Kong – these were either forfeited or the cases are still under investigation. Forfeited fish have been used for scientific study once the case is finished. Both live (24) and chilled (16) fish are involved, all imports were by air and there was concealment in mixed fish shipments (i.e. mixed with groupers and labelled as groupers).

II. Non-detrimental Finding procedure (NDFs)

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFS?

__yes _X_no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

Methodology and data for NDF: Two independent methods were used to calculate NDF. (1) The first involved internal consultations within Indonesia involving traders, the Indonesian CITES Management and Scientific Authorities (i.e. stakeholders) and taking into account the actual export figures which were far lower than the permitted exports at the time; the Precautionary Principle was also applied. (2) A field survey (Underwater Visual Census or UVC – see APPENDIX for detail) was conducted to determine fish abundance by size class per unit area (to thereby calculate a density of fish) mainly in the habitat occupied by adult fish (outer reef slope). Some surveys were also done on inner reefs, which are juvenile habitat areas. Total reef slope area in Indonesia was calculated to determine fish abundance by multiplying fish density by reef area. Both approaches to NDF formulation, i.e. (1) and (2) gave the same recommendation, adopted in 2007, of 8,000 animals for export annually.

Since density varied substantially between fished and unfished areas, three different fishing conditions were used; protected/unfis-

hed, medium fishing pressure and heavy fishing pressure and the proportion of Indonesia's reefs under these three sets of conditions estimated by consultation. Taking account of these three sets of fishing pressure conditions and the fish densities in each, and using an estimation of the adult habitat the total number of adults was calculated for the country. Comprehensive underwater visual censuses (UVC) for numbers and sizes of fish were undertaken in 6 locations in eastern Indonesia, where most fishing for the species is now based, to determine densities. A species-specific fishery model was then developed, using established fishery modelling techniques and biological parameters tailored for the species (Sadovy et al., 2003; Sadovy et al., 2008), to calculate a sustainable annual catch. Since fishing activity for the species includes both live and dead fish and local and export use, had to be made of the total of all of these extractive activities in the calculation of a viable export quota for NDF. To gain specific information on the grow-out phase (grow out of wild caught juveniles until they reach market size), interviews were conducted with aquaculturists involved in the fattening process of small fish (i.e. grow-out). The fishery model incorporated an interactive programme to allow for country-level, stock-specific NDFs to be calculated, and the model was spearheaded by a world fisheries expert Andre Punt, under the auspices of FAO.
(see: http://www.humpheadwrasse.info/C1023_Full_Pub.pdf).

To refine estimates of Napoleon fish habitat area to determine fish numbers for the FAO model the following method was explored: Landsat-7 satellite images were downloaded from two databases (http://www.reefbase.org; http://glcf.umiacs.umd.edu) and imported into a format easy to be handled in ArcGIS (the Erdas Imagine img format) and visualized into an ArcGIS project. The next step was the manual assessment of the coral reef edges, drawing a polyline shape file; a 100 meter buffer was applied to both sides of the lines delimiting the reef edges and the resulting area calculated of all the polygons generated in this way. (From: Evaluation of reef habitat for the Napoleon fish, *Cheilinus undulatus* (CITES Appendix II) in Indonesia, Malaysia and Papua New Guinea using Remote Sensing techniques. Axel Oddone, Roberta Onori – FAO study – unpublished). A trade survey was also undertaken (see Sadovy 2006).

Only air exports from specified ports in Indonesia are now permitted (since July 2007) to improve enforcement given the enormous challenging of enforcement in respect of import and export by sea.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

Major problems: (1) Illegal exports by sea continue including though Malaysia and Singapore and out of the Philippines into Malaysia. In 2007 Singapore exported almost 10,000 kg of Napoleon fish to Hong Kong – these fish cannot have come from Singapore and almost certainly came from Indonesia. (2) Application of the Appendix II listing has not been applied in Mainland China, a major importer, such that import permits are not issued at the Hong Kong/Mainland China border. (3) There is poor or slow communication between the Indonesian CITES Management Authorities and Hong Kong when seizures occur in Hong Kong, and Indonesia has not notified Hong Kong, the major importer, of the air-only export ruling – both situations have important enforcement implications for Hong Kong. (4) There is concern regarding habitat loss/degradation in Indonesia: continued illegal fishing such as using cyanide can cause habitat loss/degradation and could affect the Napoleon fish in its young stages since it appears to favour living branching coral. (5) While there are a number of legislated marine protected areas (MPAs) in Indonesia, few appear to be protected giving the Napoleon fish very little protection through MPAs. (6) Fish caught under 1 kg are supposed to be released back to the wild or grown-out to market size but most fish are sold directly for market and not grown out. Floating cages are used just to keep fish until there are sufficient to be exported, not used for grow-out.

6. RECOMMENDATIONS

KEY RECOMMENDATIONS IN RELATION TO NDF

I. There is a need for more strict monitoring by the relevant authorities (customs) of exports from Indonesia to ensure that exported fish are not of illegal size and that they are not mislabelled by being hidden in mixed species shipments and recorded as 'grouper' which are not under any controls (both situations have been documented to occur). It is recommended that Napoleon fish-only exports be mandated, and no 'mixed species' shipments be allowed to address this problem.
II. Illegal, unregulated and unmonitored exports from Indonesia through Malaysia and Singapore need to be addressed.
III. It is recommended that minimum size limits be added to the export quota to help strengthen existing legislation in Indonesia and to ensure maintenance of spawning biomass; a large proportion of exported fish are in their pre-reproductive phase.

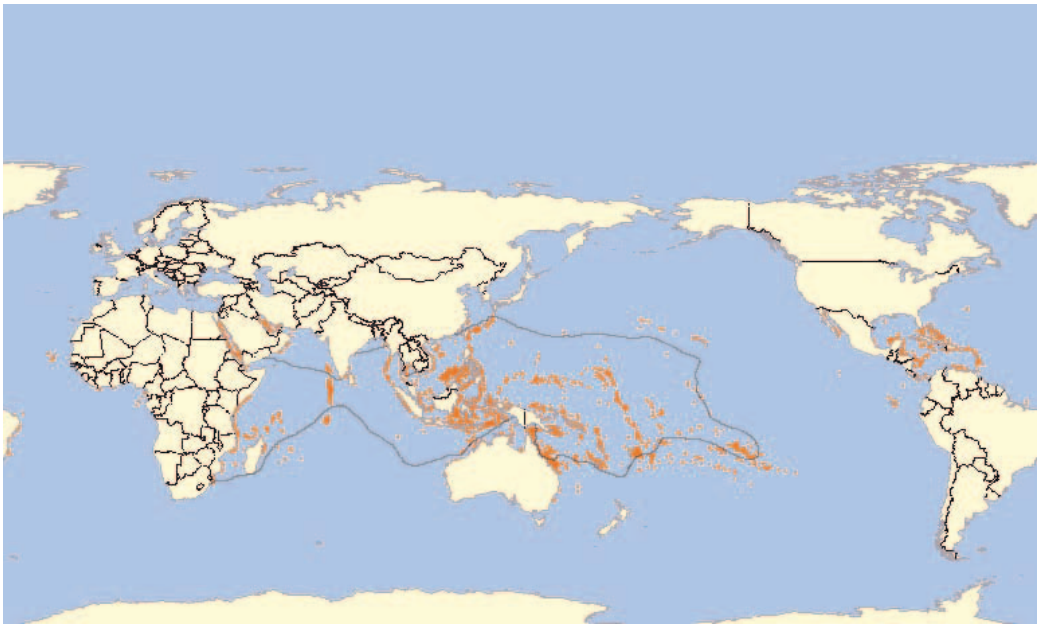
IV. Survey sites in Indonesia should be re-monitored within the next 5 years or so by UVC to determine whether the management measures in place and the NDF are being effective.
V. There is a need to improve estimates of domestic use of Napoleon fish, of both live and chilled fish.
VI. Additional studies are needed to better understand the grow-out (fattening) phase of the Napoleon fish in terms of mortality rates, length of grow-out period, numbers and sizes caught, etc. Mortality rates at capture and during fattening need to be refined for the fishery model since they represent removals from wild stock (even though they can no longer be used in any way).
VII. There is a need to develop methods applicable to data-poor/resource limited situations to corroborate and complement the UVC methodology.
VIII. There is a need to develop decision rules that link indicators and reference points in the adaptive management of the Napoleon fish. For example what will be the indicators used by the CITES Authorities in Indonesia to determine whether the NDF is effective, or to adjust it up or down accordingly?

ADDITIONAL RECOMMENDATIONS

IX. Illegal shipments or sizes of fish should be prosecuted to set an example to traders. Few if any prosecutions appear to have occurred despite a number of interventions of illegal shipments. One major problem in this regard is that illegal imports into Hong Kong occur through consignees who are not held accountable for lack of permits. This means that the exporting company cannot easily be held responsible for consigning illegal shipments.
X. There is a need to develop a protocol for handling live fish that are imported illegally.
XI. Traders in both exporting and importing countries and fishers need to understand the reasons for the CITES Appendix II listing especially since a CITES listing for a food fish is not within their experience.
XII. There is a need for cooperation between the various government departments within Indonesia in the management of the species. A major problem with the Napoleon fish is that it is the first commercial food reef fish listed under CITES Appendix II and jurisdiction for commercial food fish and threatened species fall under different departments within the government which have not had to work together before.
XIII. There is a need for closer and more efficient communication between the national level CITES Management Authorities in impor-

ting and exporting countries, especially when illegal shipments are seized and when new regulations are introduced; an example is the air-only export regulation in Indonesia which was not communicated to Hong Kong authorities. Lack of prompt communication makes enforcement more difficult on the importing side. The air-only regulation is very important since legal trade by ships into importer countries like Hong Kong is too difficult to monitor and adequately enforce due to heavy volumes of sea traffic and multiple landing points.

Distribution of Napoleon wrasse within outline (blue in colour version of map) and on coral reefs which are indicated by the dark areas (red in colour version of map)



CITATIONS AND WEBLINKS

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ANNEX 1

(EXTRACTED AND ADAPTED FROM Sadovy, 2006

– refer to original document for detail and full citations)

The "GPS (Global Positioning System) Density Survey" method was used for the Underwater Visual Censuses (UVC) during this project, as it is particularly suited to assessing abundance of uncommon and wide-ranging species, such as C. undulatus (= humphead wrasse or HHW) (Colin et al, 2005). Even in relatively undisturbed regions, HHW are among the less common of reef fishes. Conventional underwater visual survey (UVC) techniques (typically 50 or 150 m long transects) are not really feasible to document the abundance of these reef fish. To be able to survey the amount of area needed to gain a definitive idea of the occurrence and abundance of HHW, distance and areas one order of magnitude or more must be surveyed compared to conventional UVC techniques.

The GPS density survey method uses a "position logging" Global Positioning System (GPS) receiver in a water-proof floating housing which is towed on the surface by the observer. It can be used snorkeling (towed behind the swimmer) or SCUBA diving (GPS float deployed from diver reel). The GPS is set to log its position every 15-30 seconds, allowing an accurate record of the track surveyed after downloading. The observer carries a water-proof watch synchronized to the second with the time displayed by the GPS receiver. Fish within a predetermined distance either side of the swim track (up to 10 m in clear water) are surveyed by swimming along a reef feature or in a relatively straight line (in this case in adult habitat for the species) at a steady pace or drifting with currents. The time any target fish is observed is recorded on an underwater slate, as well as the estimated standard length. The standard length is estimated visually from experience with reference to a length scale in centimeters on the side of the recording slate. Total length would be somewhat greater than standard length reported here and is easily determined from standard length using the relationship of these two values. It is estimated that such length estimates are accurate to within about 10-15% for an experienced observer (McCormick and Choat 1987). Fish of 5-20 cm standard length were assigned to 2.5 cm size classes (5, 7.5, 10, 12.5, 15, 17.5, 20 cm). Those from 20-50 cm were assigned in 5 cm increments, and from 50-100 cm in 10 cm increments. Fish more than 100 cm in standard length were lumped in a single class, as it is difficult to estimate length in such large fish with precision.

When the logged data from the GPS are downloaded using Garmin Map Source World Map software (or other similar for other brands of GPS receivers), this provides a continuous

track of the survey swim and, within the accuracy limits of the GPS, a permanent record of the area surveyed, allowing for replication in the future (e.g. for follow-up studies). Using the concurrent time log and the time of fish observations, the position on the track where any fish was observed can be closely (within a few m) determined from the time and position data. The distance (and thereby the area covered depending on swath width – the swath is the distance each side of the transect being surveyed) covered during a given survey is documented and the number of fish observed provides a density (fish per unit area) value. The survey track and positions of individual fish along that track can be plotted on habitat maps, satellite images, etc., to provide a visual display of fish numbers and distribution against a habitat image providing insights into the relationship between the fish and the environment.

In essence, the GPS Density Survey is a quantitative method for measuring distribution and density of uncommon, wide-ranging reef fishes. Usually, the surveys were conducted along a given reef feature, such as the edge of the reef slope or a given depth contour along a sloping outer reef face. At other times, the surveys, particularly on shallow reef flats, ranged across open bottom without any particular feature or habitat being followed. Since the tracks are latitude-longitude referenced, these surveys can be repeated at a future date by any qualified observer. In most cases fish were surveyed 10 m either side of the swim track for a total survey swath of 20 m with each meter of track swim resulting in the survey of 20 square meters of bottom area. While it is not possible to measure the swath width being surveyed exactly, an approximation of the width is achieved by noting the angle of view from the horizontal compared to the water depth. For example, if the water is 10 m deep, then the 10 m side swath width would represent at 45 degree angle from the observer. Shallower water depths would have a higher angle of view to the point where the water might become too shallow to be able to clearly see 10 m to the side of the observer. In the present case, because HHW were so uncommon, any fish that were seen were within 10 m of the survey track and were therefore counted. Only in the situation where fish are common does the accurate determination of swath width become a critical issue, since whatever error in swath width occurs, also reflects in the abundance of fish.

The GPS Density Survey method is most useful for fishes that are easily visible against the reef surface (not camouflaged), relatively large, and are not disturbed by human swimmers. If not common then double-counting is not a potential problem and if the fish is large and wide-ranging, the GPS method is far more practical than standard line survey methods.