

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

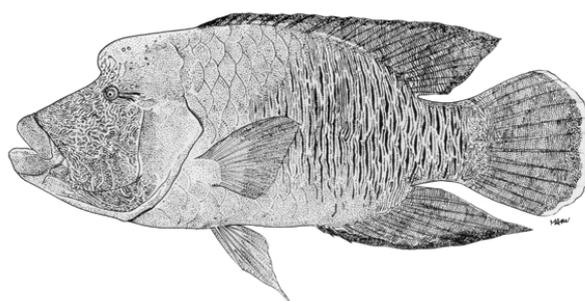
Inclusion of *Cheilinus undulatus* in Appendix II, in accordance with Article II, paragraph 2 (a), of the Convention and Resolution Conf. 9.24 (Rev. CoP12), Annex 2 a, paragraph B.

B. Proponent

The Republic of the Fiji Islands, Ireland, on behalf of the Member States of the European Community, and the United States of America.

C. Supporting statement1. Taxonomy

- 1.1 Class: Actinopterygii
- 1.2 Order: Perciformes
- 1.3 Family: Labridae
- 1.4 Species: *Cheilinus undulatus*
- 1.5 Scientific synonyms: None
- 1.6 Common names: English: humphead wrasse, Maori wrasse, Napoleon wrasse, Napoleon fish
 French: Kakatoï vareur (Seychelles), Napoléon
 Spanish: Napoleón
 Fijian: Varivoce
- 1.7 Code numbers: ---



FAO

Adult *Cheilinus undulatus* (Westneat, 2001)

2. Biological parameters

2.1 Distribution

The species ranges throughout the Indo-Pacific region, from the Red Sea to the Tuamotus, north to the Ryukyus, including the island of Taiwan, east to Wake Island, south to New Caledonia, throughout Micronesia (Myers, 1999; Huang, 2001; FishBase, 2002). Its range falls within the jurisdiction of 48 countries and overseas territories, including the proponents'. In these areas, *C. undulatus* is extremely patchily distributed with adults confined to steep outer reef slopes, channel slopes, and lagoon reefs in water 1-60 m deep. Adults appear to be sedentary over a

given patch of reef according to multiple accounts by divers or dive operations that return repeatedly to the same spots and report seeing the same individuals. Adults, however, move periodically to local spawning aggregation sites where they concentrate to spawn. Juveniles tend to prefer a more cryptic existence in areas of dense branching corals, while larger individuals and adults prefer to occupy limited home ranges in more open habitat on the edges of reefs, channels, and reef passes (Donaldson and Sadovy, 2001). In New Caledonia, surveys of multiple habitat types across six regions over a period of 12 years revealed particular habitat preferences for *C. undulatus*. Overall, humphead wrasse density was strongly correlated with the percentage of hard bottom or coral cover, while fish size was inversely proportional to coral cover (i.e., the smallest fishes were abundant in areas with high live coral) (Sadovy et al., 2004). The species is most often observed in solitary male-female pairs, or groups of two to seven individuals (Donaldson, 1995; Donaldson and Sadovy, 2001).

2.2 Habitat availability

Humphead wrasse are evidently dependent on healthy coral reef ecosystems for both juvenile and adult life stages. Adults may assemble in small or large numbers at certain spawning sites on outer reefs, but it is not known whether or not these sites represent a particular type of habitat or set of water conditions. Adults tend to be limited in habitat to outer reefs, channels, passes and lagoon reef areas, occupying a small proportion of total available healthy reef habitat. The threats to coral reefs have been well documented (Barber and Pratt, 1998; Bryant et al., 1998; Burke et al., 2002; Green and Shirley, 1999; Wilkinson, 1998), and include destructive fishing techniques, overfishing, dredging, land filling, mining of sand and coral, coastal construction, sewage discharge, and sedimentation from upland deforestation and agriculture. Bryant et al. (1998) estimate that 58% of the world's coral reefs are at risk from human activity. In Southeast Asia, the center of *C. undulatus*' distribution, 88% of coral reefs are at risk and half are at high or very high risk (Burke et al., 2002). In the 1997-1998 global coral bleaching event, it is estimated that 18% of Southeast Asian reefs were damaged or destroyed (Burke et al., 2002).

2.3 Population status

Local populations are described from reef surveys (fishery-independent data) and fishery data, although global population assessments have not been undertaken. It is important to note for marine fishes such global assessments are extremely difficult and have not yet been done for any reef fish. *C. undulatus* is believed to be uncommon to rare wherever it occurs, with natural densities never high even in preferred habitats. Survey results throughout the species' range in preferred habitats have shown adult densities of *C. undulatus* in unfished areas up to 20 fish per 10,000 m². However, after the onset of directed fisheries these densities drop rapidly so that a 50% decline or more is noted even under light to moderate fishing pressure (Donaldson and Sadovy, 2001; C. O'Connell, Australian Department of the Environment and Heritage, *in litt.*; 1 May 2002; Sadovy et al., 2004).

Figure 1 shows humphead wrasse densities (given as number of fish per 10,000 m²) from fishery-independent sources. Data derive from underwater visual censuses in 24 independent studies (i.e. different scientists) in the western Pacific in habitat suitable for the species (Sadovy et al., 2004) at different levels of fishing intensity (0 to 5, with 5 the highest). The data show that (a) adult humphead wrasse density is naturally low and variable and (b) densities are lower by 10 fold, or more, in areas that are fished even at light to moderate levels. In areas targeted by the live fish trade, fishing intensity is typically high (i.e. = 5 on this scale) and declines in fish catch rates or numbers can be 10-fold or more within less than a decade in accordance with Figure 1.

Reef Check underwater visual surveys were carried out with trained divers in the Indo-Pacific, in 34 countries or jurisdictions from 1997 to 2002. In surveys during 1997 and 1998, zero fish per 100 m² were recorded at over 80% of the sites surveyed with virtually no counts of over 0.5 fish per 100 m². Throughout the sampling period 1997-2002, mean densities ranged from zero to 1.4 fish per 100 m² (Data courtesy of the Reef Check global coral reef monitoring program;

www.reefcheck.org). While the scale of such surveys is small for large reef species like the humphead wrasse, the apparently low numbers of these fish in suitable habitat is notable.

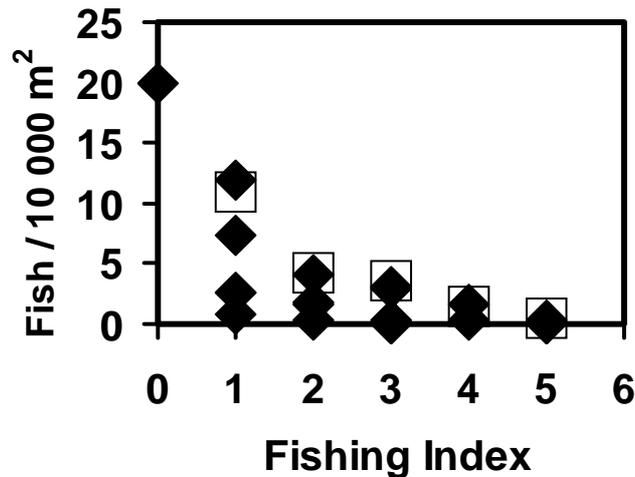


Figure 1. Humphead wrasse densities at different levels of fishing intensity (where 0 is none and 5 is highest; fishing pressure was based on population density or on a subjective measure relevant to the region) based on underwater visual census surveys in suitable reef habitat for the species. The data comprise 24 independent surveys in 11 countries in the western Pacific (summarized in Sadovy et al., 2004).

Humphead wrasse are listed as Vulnerable in the 2000 IUCN Red List (with proposed re-categorization as Endangered in the 2004 list) (assessor: A. Cornish; Evaluators: B. Russell; Y. Sadovy). In the IUCN classification system, a taxon is considered “vulnerable” when it is not considered Critically Endangered or Endangered (as per IUCN definitions) but is facing a high risk of extinction in the wild in the medium-term future, as defined by a multitude of criteria. For *C. undulatus*, these criteria were:

1. a population reduction in the form of an observed, estimated, inferred or suspected reduction of at least 30% over the last 10 years or three generations, whichever is the longer, based on actual or potential levels of exploitation; and
2. a reduction of at least 30%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on
 - a) a decline in area of occupancy, extent of occurrence and/or quality of habitat
 - b) actual or potential levels of exploitation.

The species was listed as vulnerable due to multiple and consistent accounts of marked declines with heavy fishing and in particular with the recent (since the early 1990’s) introduction of export fisheries associated with the international live reef food fish trade. Given the projected growth in this trade, especially into mainland China in the next few years, and the probable vulnerability of such a large and long-lived reef fish to overfishing, declines were projected to continue or worsen. This species can live at least 30 years (25 for males and 32 for females) and becomes sexually mature at 6 years (Choat et al., unpublished manuscript). This means that its generation time is expected to be in excess of 10 years and that the rate of intrinsic population increase is likely to be low; natural predators are few and natural mortality rate was determined to be 0.14 or less (Choat et al., unpublished manuscript). The species is hermaphroditic (with female-to-male sex change), which may make it more vulnerable to overfishing than species that do not change sex (see Section 2.7 – Threats).

2.4 Population trends

There are numerous studies of humphead wrasse population trends throughout the species' range (see country accounts below). These sources of information include both fishery-independent and -dependent data such as underwater visual censuses, fishermen's reports, dive operator reports, and anecdotal information. Collectively, these reports show declining populations in nearly all studied locations with suitable habitat subject to commercial fisheries.

In **American Samoa**, during recent surveys, the humphead wrasse was noted at an average of 2 fish per 10,000 m² at the more lightly fished Manu'a Islands and was absent at the more heavily fished Tutuila (Green, 2003).

In **Malaysia**, trends in catch volume (weight) or in *in situ* density estimates provide both fishery-dependent and fishery-independent means of assessing changes in fish abundance with fishing effort over time. No government fishery data are available (R. Busing, Malaysian Department of Fisheries, *in litt.*; March, 2004), but it is suspected that sub-market size fish (juveniles) are frequently grown out in captivity prior to sale and prior to spawning in the wild population. Figure 2 shows purchases of a large and typical trader in Kudat, Malaysia, one of the three major supply areas of humphead wrasse for the live food fish trade. This trader purchases fish from many fishermen who travel extensively to source fish for the business. Both the preferred smaller fish (i.e. < 0.5 kg) and mid-size fish have declined by more than 10 fold over the 8 year period over which data were available (1995-2002). Catch rates by individual boats supplying this business declined from approximately 10 kg/boat/month in 1995 when the business started in a relatively unexploited fishery for humphead wrasse to negligible catch rates per boat by 2002, when the business closed due to insufficient catch rates (Helen Hendry, Conservation Biology Group, Dept. Zoology, Cambridge University, UK, unpublished data). To maintain catch volumes, fishing boats travel ever further from home bases and rapidly move on from area to area in serial depletions of this species (TRACC, 2002).

In extensive series of underwater visual census surveys at more than 30 survey sites around Sabah (Malaysia) after intensive and uncontrolled fishing had occurred, only 2 sites had more than 1 humphead wrasse per km² with two reproductive sites identified. Population declines determined from these surveys, occurring since 1974, were 99.91% in humphead wrasse numbers when compared with similar unfished reefs. Sabah is the principle source of humphead wrasse in Malaysia, and a location central to the geographic range of the species with habitat suitable for the species. It is also surmised that spawning aggregations may have ceased in the area as a result of overfishing (TRACC, 2002). Declines are expected to continue given growing demand for the species, especially in mainland China and interest by the Malaysia government to promote its mariculture sector.

As is common in long-lived fishes, recruitment may be highly variable from year to year; under intense fishing pressure this could lead to severe depletions if recruitment remains low for extended periods (Roberts, 1996). Research at the University of Guam Marine Laboratory has indicated a recent pulse in juvenile recruitment to local reefs, but their source remains unknown (M. Tupper, unpubl. data; University of Guam).

Because local populations are severely reduced, it is possible these fish originated from offshore populations in reefs that have yet to be surveyed in U.S. territorial waters (T. Donaldson, University of Guam, *in litt.*, 20 May 2002). In some areas juveniles are rarely seen, however. Roberts (1996) notes that despite extensive diving in the Red Sea, he never saw a juvenile (i.e., < 40 cm TL) humphead wrasse, leading him to suggest that this species may recruit only episodically in some areas.

In **Australia**, there is conflicting information on humphead wrasse abundance. Queensland fisheries data show a sharp rise in catch rates for *C. undulatus*, from approximately 6 kg/day/boat in 1989 to almost 25 kg/day/boat in 1992, coinciding with rising interest in the live reef fish trade with Hong Kong SAR. Catch rates then stabilized at approximately 20 kg/day/boat from 1993-1998, suggesting no decline in local humphead wrasse stocks in Queensland (Samoilys, *in litt.* 1 June 2002). However, according to the CITES Management

Authority, evidence of decline is most obvious in Queensland waters (C. O'Connell, Australian Department of the Environment and Heritage, *in litt.*; 1 May 2002). Moreover, annual catch rates per boat dropped 50% from 0.23 mt in 1991 to 0.12 mt in 1998. Reports from several dive operators in northern Queensland indicate there has been a decline in *C. undulatus* at the sites they frequently visit. Even where the species is totally protected (Western Australia) or subject to various catch restrictions (Queensland), recent catches have been much lower than historic levels (Pogonoski et al., 2002). In addition, these operators report that the average size of humphead wrasse at these locations is much smaller than 10 years ago.

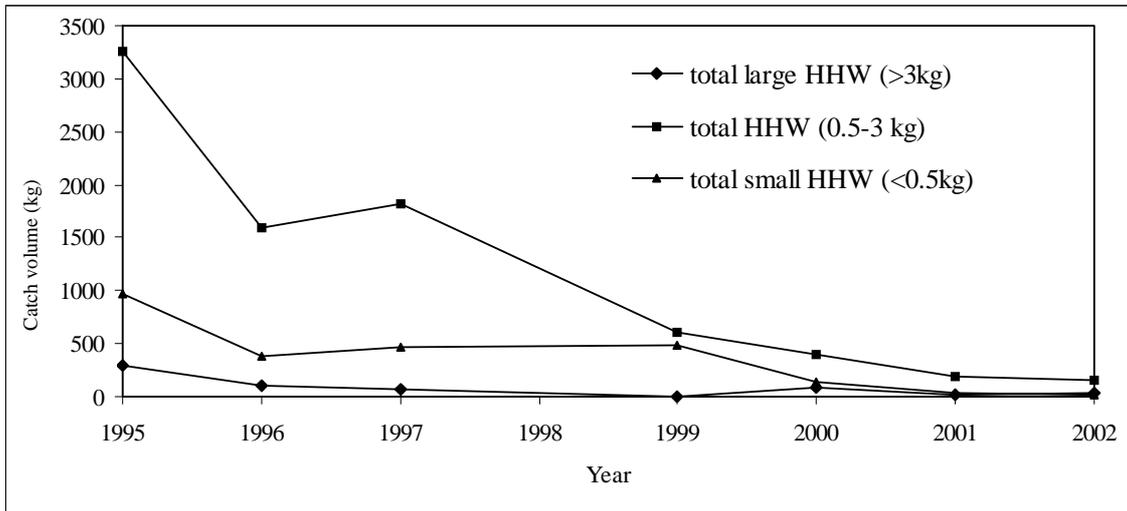


Figure 2. Annual purchases of typical live fish trader in Kudat, Malaysia, a center for the live reef food fish trade in eastern Malaysia (from Helen Hendry, Conservation Biology Group, Dept. Zoology, Cambridge University, UK, unpublished data).

Queensland volunteer diver surveys indicate local spawning aggregations have never exceeded 10 individuals since 1999. In the past, spawning aggregations of several hundred fish have been noted but have since completely disappeared for unknown reasons (Johannes and Squire, 1988). Dive operators have observed decline or disappearance of the species at six different reefs. The species may be more common on the Queensland outer reefs but the catches on outer reefs are much lower than historic levels (C. O'Connell, Australian Department of the Environment and Heritage, *in litt.*; 1 May 2002). The Australian Institute of Marine Science (AIMS) has been monitoring the Great Barrier Reef biota since 1992, and reports that the species is not common and may no longer be found at sites where it once occurred. Queensland Museum scientists have studied the Swain and Pompey outer reefs annually for the last three years, and have observed only four individuals. Historical information shows that the species was very common on these reefs in the 1950's and 1960's, and that declines have coincided with increased fishing activity (C. O'Connell, Australian Department of the Environment and Heritage, *in litt.*; 1 May 2002).

In Fiji, the species has virtually disappeared from some places (Thaman, 1998) and is suspected to be extirpated on one island from fishing (Dulvy et al., 2003). In 52 fisherman interviews in Fiji, 24 fishermen used to or still catch the species (SCRFA, 2003). Regular catch rates of 2-5 large fish per month in the 1970s and 1980s declined to 1 per month or just several large fish per year, suggesting very large declines over the 20-30 year period involved. Underwater surveys provide valuable comparative information from different areas in Fiji. In 1994, six fishing grounds, with varying levels of fishing pressure in the southern and eastern regions of the Fijian archipelago, were surveyed with five sites per fishing ground and 36 replicates per site for a total area of 162,000 m² and about 100 diver hours (Jennings and Polunin, 1996, 1997). Out of 10,000 fishes surveyed of > 15 cm TL, only five humphead wrasses (0.05% of all fish) were seen despite the surveys being conducted in habitat suitable for the species. More recent (1995/6) surveys in the same areas on the NW coast of Kadavu Is. (covering 126,000 m² and

over about 150 diver hours) yielded zero humphead wrasse observations. Local villagers suggested that numbers had become scarcer because of the arrival of outside spearfishers (Simon Jennings, pers. comm.). In 1999-2000, underwater visual censuses (UVC's) around 13 islands in Lau (where fishing pressure is relatively low) yielded an average of 2.6 fish per 10,000 m² (range 0.7-4.78) (N. K. Dulvy, Centre for Environment, Fisheries and Aquaculture Science, Lowestoft Laboratory, UK, pers. comm.). In all, seven separate locations were surveyed in Fiji spanning the range of fishing pressure from low (= 1) to highest (= 5), yielding a range of 0.0 - 8.4 humphead wrasse per 10,000 m². The large difference in densities is almost certainly the result of fishing pressure. According to interviews, pressure has only increased beyond low levels on this species in the last 20-30 years.

In addition, trends in the catch volume of humphead wrasse sold domestically in Fiji show an overall decline in the period of 1992 to 2003. In 1994 and 1996, domestic sales of humphead wrasse were around 22.5MT respectively; in 2002, the domestic sales were recorded as 10.6MT and, in 2003, 3.5MT. In Labasa, the main retail outlet for this species in Fiji, the majority of specimens sold are between 50 - 70 cm and thus have not reached sexual maturity. A number of villages in southern Viti Levu stated during Fisheries surveys that they have not recorded a catch of humphead wrasse for the last 10-15 years and that the species is rarely seen (Fiji Department of Fisheries data, April 2004).

In **Indonesia**, traders and fishermen indicate that catch rates have been declining and harvest is now maintained only by moving to new fishing areas or making longer fishing trips. Catches of humphead wrasse declined from 50-70 kg per month in the early 1990s to 10-50 kg by the end of the decade, with serial depletions common. Many fishermen note that this species is scarcer now compared to five years ago when 45-kg fish could be caught; now individual fish of over 25 kg are rare and fishermen have to travel further from home ports to maintain catches of this species (Bentley, 1999). Multiple anecdotal or popular accounts from experienced ichthyologists, divers and fishers indicate severely reduced numbers of humphead wrasse in many areas of Indonesia according to their previous personal experiences. The sum of these accounts suggests depletions in much of the Indonesian archipelago. On a one-month dive trip in Indonesia (Sulawesi, Maluku, Komodo and Bali) of 4-5 dives most days at remote islets and reefs only one small *Cheilinus undulatus* was seen (J.E. Randall, Bishops Museum, Honolulu (USA), *in litt.*; 19 November 2000). In many areas around Indonesia frequented by divers, *C. undulatus* is uncommon where once individuals were readily seen, although juveniles may be seen again once live reef fishery operations cease (M. Erdmann, USAID Natural Resource Management Program - Indonesia, pers. comm.). Fisherman interviews (N= 40) in 2004 in SW Sulawesi, and the Kei Islands (Maluku) included a question on the humphead wrasse. This study consistently showed that wherever the species had been heavily targeted it had become rare within the last 10-15 years, but where not fished as a target it was still seen (by divers) and occasionally taken incidentally. Moreover, much of the catch currently appears to be of juveniles which are either sold directly or placed in cages for grow-out.

In the **Society Islands (French Polynesia)** the humphead wrasse was reported to be uncommon in the early 1970s with large fish becoming rare following the advent of spearfishing, in particular the practice of spearing large fish in their night resting holes. In Moorea, 15 months of surveys between 1982 and 1983 indicated that fish occupied inner fringing reefs, tops of the barrier reef, and the outer reef. Censuses also recorded this species in the lagoon of Mataiva atoll in 1981, 1983 and 1985, but not in 1987 and numbers were generally low in all surveys (Sadovy et al., 2004).

In **Palau**, interviews with 30 experienced fishers (with at least 10 years fishing) from throughout the country revealed that nine fished for humphead wrasse. The species was generally perceived to be uncommon and the number and body size have declined most probably due to SCUBA night spearfishing and increasing pressure for the species (SCRFA, 2003). Palau government fishery department figures show that market landings (local sales) increased up to about 3,000-3,500 kg per year in the 1980s and then had declined more than 10-fold by the early 1990s to a few hundred kg annually. Protective legislation was introduced in 1994 and the species cannot be exported or caught below 65 cm in length; not all sales go through markets, some are thought to go directly to restaurants or for local customs.

Table 1. Summary of humphead wrasse abundance from various studies (see text for details). UVC = underwater visual census.

| Country | Earlier record | Later record | Change |
|---|---|--|---|
| Palau (annual catch) | Before export fishery 3-3.5 mt (mid 1980s) | After export fishery started < 0.3 mt (mid 1990s) | > 10 fold decline |
| Fiji (annual catch) | 22.5 mt (1994) | 3.5 mt (2003) | > 80% decline |
| Australia | Catch per boat per year (1991) = 0.23 mt | Catch per boat per year (1998) = 0.12 mt | Catch rates per boat per day stable, catch rates per boat per year declined 50% despite some fishing restrictions |
| East Malaysia annual trader purchase | 3.3 mt (1995) | 0.2 mt (2003) | > 10 fold decline |
| UVC data | 1974 | post-2000 | > 90% decline |
| UVC data (24 study sites and 17 independent surveys in western Pacific) | No or light fishing circa 10-20 fish /10,000 m ² | Medium to heavy fishing 0 - 0.3 fish /10,000 m ² | Marked declines in density occur once this species is fished, halving even under light fishing conditions (see Figure 1). |

The humphead wrasse spawns in temporary aggregations or groupings that form on a regular basis, and often in the same places monthly or daily. In some areas, few of these aggregations appear to remain (e.g. Malaysia – TRACC, 2002). There are also examples whereby aggregations have become severely reduced (e.g., Australia – Johannes and Squire, 1988) and reports that aggregations have been specifically targeted (e.g., Indonesia) because of the relatively high catches that can result. General concerns about target fisheries on reef fish spawning aggregations, and associated aggregation losses, resulted in a “Call for Action” by the International Tropical Marine Ecosystem Management Symposium to protect and manage these reproductive events (Manila, Philippines; March 2003). Particular concerns are that aggregations can be easily found and overexploited and that they could be an example of hyperstability. Hyperstability occurs when declines in population numbers are masked because remaining animals congregate to spawn even under reduced conditions. Hyperstability may have been a key factor in the severe declines in fisheries for aggregating species.

2.5 Geographic trends

Although it does not appear that the overall geographic range of the species has changed significantly over recent history, localized depletions and extirpations have been noted mainly at edge of range sites (see above). Experiences in the live reef food fishery, which targets *C. undulatus* and several large grouper species (Family Serranidae) for luxury Asian restaurants, indicate serial overfishing has occurred in the Indo-Pacific according to accounts by both fishers and buyers interviewed. Numbers are now negligible at edge-of-range sites such as Hong Kong SAR compared with previous low occurrences. This species has evidently become rare in the South China Sea. It used to be taken occasionally in Hong Kong SAR and was once abundant in nearby reefs (e.g. Pratas Reef) but is no longer taken in these areas (Sadovy and Cornish, 2000; P. Chan, Chairman, Hong Kong Chamber of Seafood Merchants, pers. comm.; J. Wong, Marine Conservation Society, Hong Kong, pers. comm.). Although occasionally taken around the islands off southern Orchid and Green Islands (near the island of Taiwan), young fish are rarely seen underwater and there is only a “limited amount of population left” (Shao, *in litt.* 20 November 2000).

Hong Kong SAR is the chief importer of the species in the live reef food fish fishery (although significant but unknown volumes are shipped through Hong Kong SAR into mainland China), and has a fleet of vessels for transporting live specimens of humphead wrasse and other reef fishes across Southeast Asia to Hong Kong SAR ports. Once the populations around Hong Kong SAR were extirpated, fishing fleets of small boats targeted the Philippines. Fish buyers from Hong Kong SAR now consider the Philippines humphead wrasse populations to be depleted (Sluka, 2000; interviews with Y. Sadovy, U. of Hong Kong). Fishing effort in the live reef food fish trade has grown, and larger vessels are now fishing farther abroad from the Maldives to the west and east to many of the Pacific nations (Sluka, 2000). Humphead wrasse became so depleted in the Maldives from export fisheries that the government banned exports of the species in 1997 because of concerns over the possible impacts of loss of the species to the dive tourism sector. A recently published book by the Asian Development Bank (ADB, 2003) recommends that the humphead wrasse and similarly threatened species should not be included in the live fish export trade.

2.6 Role of the species in its ecosystem

The humphead wrasse is the largest member of the wrasse family (Labridae), growing to over 2 meters and 190 kilograms; although fish above 1.5 m are probably rare (Choat et al., unpublished data). It is a large carnivorous predator in reef ecosystems, feeding particularly on fishes, mollusks, sea urchins, crustaceans, and other invertebrates (Randall et al., 1978) although the full extent of its role in the ecosystem is unknown. It is one of the few predators of toxic animals such as sea hares, boxfishes, and crown-of-thorns starfishes (Randall et al., 1978; Myers, 1999; FishBase, 2002) and has been implicated in ciguatera poisoning in the live reef fish trade (Myers, 1999; Donaldson and Sadovy, 2001; C. O'Connell, Australian Department of the Environment and Heritage, *in litt.*; 1 May 2002).

2.7 Threats

Threats include 1) intensive and species-specific removal for the live reef food fish trade at all stages of its life and particularly the extensive capture of late-stage juveniles for direct sale or for 'grow-out' (see below where 'culturing' is discussed); 2) highly efficient harvest techniques, including spearfishing with SCUBA or hookah (i.e., compressed air) gear and poison fishing (with cyanide or other toxins such as *Derris trifoliata*) in predictable shallow water locations; 3) lack of national and regional management; 4) recruitment and growth overfishing; and 5) illegal, unregulated, or unreported (IUU) fisheries (Donaldson and Sadovy, 2001). In addition, the species' essential coral reef habitat is seriously threatened by human activity throughout the Indo-Pacific region (see Section 2.2 Habitat Availability). Destructive fishing practices, such as sodium cyanide use which stuns animals for capture and incidentally kills living coral, have been well documented and are spreading in the Indo-Pacific region (Barber and Pratt, 1998; Jones and Hoegh-Guldberg, 1999; Burke et al., 2002; Bryant et al., 1998; Johannes and Riepen, 1995). Despite its prohibition in many countries (including major exporters such as the Philippines and Indonesia), cyanide is still the preferred method for capturing certain live reef fish for international trade in some areas (Burke et al., 2002, Bryant et al., 1998; Johannes and Riepen, 1995; Barber and Pratt, 1998). Indeed, larger fish are difficult to catch any other way, other than by nighttime capture. After cyanide is applied, divers may break away the living coral to get access to the hiding area, and remove the fish to clean water where it will often recover for shipment or holding in net pens (Sadovy et al., 2004).

The most serious threat to this species is overfishing for international trade. This species is long-lived and naturally uncommon, and if it is similar to other reef fishes of similar size and biology (e.g., sequential hermaphroditism; aggregation spawner) it is expected to have low rates of replacement and therefore be particularly vulnerable to fishing pressure (Donaldson and Sadovy, 2001). Moreover, being one of the largest of all reef fishes, they have few natural predators which means that fishing mortality may rapidly exceed natural mortality, and thus lead to the rapid declines noted once fishing intensifies. Researchers remain concerned over the species' future because its status as a luxury food item will prevent demand from shrinking even as humphead wrasse become rarer and more expensive. Exploitation is expected to continue as stocks continue to decline (Donaldson and Sadovy, 2001). There are no regional (and few

national) efforts to manage the live reef fish trade. Although data are not available from throughout its range, all locations observed with significant exports and no effective controls show that *C. undulatus* numbers have declined by 10-fold or more within a decade or less. High exploitation rates are expected to continue, or more likely, intensify. For a low productivity species like humphead wrasse, these large declines far exceed a normal “fishing down” effect or intentional reduction in stock size to maximize productivity as part of a standard fisheries management approach.

There have been claims that humphead wrasse can be cultured or “farmed” to meet international demand. In the case of this species, culturing only involves the grow-out of wild-caught fish which may actually pose a threat to wild populations. There is no hatchery production for the humphead wrasse. In many areas, small fish are simply taken from the wild and raised in floating net cages until saleable size. This activity is commonly referred to as “culture” or “cultivation”, but in the case of the humphead wrasse is essentially a capture fishery of juveniles and subsequent maintenance in captivity to legal or marketable size. In Indonesia, while regulations prohibit the take of fish < 1 kg and > 3 kg for direct export, fish of prohibited sizes can be taken for culture; this is also the case in the Philippines with the ‘culture’ loophole allowing for an intensive, uncontrolled and unmonitored fishery of juvenile fish. In the case of small fish, this simply means that they are grown out to market size, which is typically less than the size at sexual maturation. Moreover, there is a developing export market for juvenile humphead wrasse for the marine aquarium trade (Y. Sadovy, pers. obs. Hong Kong SAR Tung Choi Street aquarium shops). The impact on the age structure and reproductive potential of wild populations depends on the size of fish taken and their likelihood of reaching adulthood and reproduction (Sadovy and Pet, 1998). A lack of information on stock/recruitment relationships, growth rates, and maturation rates precludes modeling of surplus production at small size classes. Furthermore, humphead wrasses are sequential hermaphrodites, meaning they first mature as females at smaller sizes then can subsequently mature into males. The controlling factors in this sequential change are not well understood, but selective removal of particular size classes of fish could significantly impact a population’s reproductive potential through excessive targeting of males (large fish) or juveniles likely to survive to adulthood. The fishery on juveniles poses the single greatest threat to humphead wrasse populations.

3. Utilization and trade

3.1 National utilization

The live reef food fish trade involves more than ten popular taxa of groupers and wrasses, which are traded live for luxury restaurant markets in Hong Kong SAR, mainland China, Singapore, and other nations. Rare species such as *C. undulatus* command the highest prices, ranging from USD 90 to USD 175 per kilogram (retail, 1997 prices) in Hong Kong SAR markets (Lau and Parry-Jones, 1999). Humphead wrasse are banned from export in many areas of the Indo-Pacific (e.g., Maldives, Palau, Australia, and Niue). Significant importers (e.g., Hong Kong SAR) do not require landings reports by locally licensed vessels involved in the fishery (although informal and voluntary data collection occurs from these vessels). In a 1999 study by TRAFFIC East Asia, researchers found that Hong Kong SAR had over 4,000 locally licensed fishing and transport vessels of which 1,600 operated primarily outside of Hong Kong SAR waters, although only a small proportion of these vessels import live fish. The reporting exemption is significant, and results in serious underestimation of the Hong Kong SAR import volumes. Hong Kong SAR customs data indicated the province imported 21,000 tonnes of live reef fish (all species) in 1997, while independent interviews with Hong Kong SAR fish wholesalers indicated imports of 32,000 tonnes worth USD 500 million in the same year (Lau and Parry-Jones, 1999).

Humphead wrasse have significant cultural value in many small island developing states. In several countries it has long been an important ceremonial fish, sometimes reserved for kings or special community festivities (Y. Sadovy, University of Hong Kong, *in litt.*, 31 March 2002). In addition, many of these nations utilize humphead wrasse and other reef fishes in artesanal fisheries or small-scale spearfisheries to supply local demand (Birkeland and Friedlander, 2001). Free diving with spearfishing equipment is the typical method of capture in these domestic

fisheries, but even this harvest can lead to declines (especially when augmented by SCUBA equipment). Guam reports that the species is now rare in its waters, even though the territory does not engage in the live reef food fish trade (P. Bassler, Guam Department of Agriculture; *in litt.* 22 April 2004).

Annual landings of humphead wrasse at Palau's commercial markets ranged from 500 kg to 3,500 kg between 1976 and 1990 and have dropped yearly from 3,409 kg in 1985 to 454 kg in 1990. Market data for 1990-1991 indicate that 142 humphead wrasse were sold through the PFFA (Palau Federation of Fishing Associations) representing about 63% of the total humphead wrasse landings in Palau that period. In 1992, market landings of adults totaled 225 kg, mainly in July-September, while 197 kg of juveniles were landed, mostly in May. In the mid 1990s, a 2-year summary report was made of all fish going through the three main markets in Palau. Of 9,000 fish sampled from night-time spearing (the principle capture method for this species for domestic use), only 6 were humphead wrasse and these measured from 60-150 cm TL (T. Graham, Palau Conservation Society, pers. comm.; 12/21/98). In 1993, 1994, 1995 and 1996, annual catches dropped from 682 kg to 138 to 26 to 0 kg, respectively (Sadovy et al., 2004). *C. undulatus* was targeted for export during the 1985-1986 peak of the Palau live reef fish trade, but harvest was suspended in 1998 due to fears of overfishing.

The species is exploited fairly heavily in Fiji, with variable annual landings and a maximum of 25 mt recorded since 1990 in annual fishery reports. Malaysia, Philippines and Indonesia exhibit active "culturing" or net pen grow out for humphead wrasse, catching sizes of 10-40 cm, which are then exported live once they reach market size after grow-out (Sadovy et al., 2004). These countries also directly export a small number of *C. undulatus* at marketable size (without grow-out) for the live reef fish trade.

In non-consumptive use, the humphead wrasse is valuable to SCUBA diving operators. Individual fish maintain consistent home ranges on particular reefs, and become familiar to operators in the area. There are campaigns in progress to collect information on the species from recreational divers and promote its conservation for such uses. (C. O'Connell, Australian Department of the Environment and Heritage, *in litt.*; 1 May 2002; T. Donaldson, University of Guam, *in litt.*, 20 May 2002; Y. Sadovy, University of Hong Kong, *in litt.*; 3/31/02; Napwatch-<http://www.divesociety.ch/napwatch.htm>).

3.2 Legal international trade

Although an important part of the live reef fish trade because of its high unit value, the humphead wrasse makes up a negligible proportion of the total trade in live reef fish and its apparent traded volumes are extremely low for a commercially exploited fish species.

Sadovy et al. (2004) reviewed the current legal trade of humphead wrasse into Hong Kong SAR, China and their results are summarized in this section. Minimum annual imports of humphead wrasse to Hong Kong SAR (the single largest importer) ranged from 37 to 189 tonnes during 1997-2002. Most of these declared shipments arrived from the Philippines and Indonesia via Hong Kong SAR-licensed vessels that voluntarily reported landings to government officials although they are not required to do so. Other source countries included Kiribati, Vietnam, Australia, China, and more recently, Thailand. This voluntary system records an unknown subset of imported fish although it is the major importers who provide data. For example, a survey designed to ground-truth Hong Kong SAR customs data in April-June 2001 directly recorded 6,701 kg of humphead wrasse in a sub-sample of vessels while Hong Kong SAR customs data only recorded a total of 3,270 kg of the species over the same sampling period. Imports into Hong Kong SAR are now largely by air. This represents a marked shift away from maritime imports, which represented 96-99% of all imports (by weight) in 1997-1999, 41% in 2002, and 15% in 2003 (to September) (data provided by Y. Sadovy, University of Hong Kong; originating from Census and Statistics Department/Agriculture and Fisheries and Conservation Department, Hong Kong SAR). The increased frequency of imports by air has important monitoring and potential enforcement implications, since imports by air are better monitored than those by sea and thus easier to inspect.

Australia used to monitor exports of *C. undulatus* as "Maori wrasse", and volumes grew almost 10 fold from 555 kg in 1996 to 5,170 kg in 2000. This increase was directly attributable to demand in the Asian live reef food fish trade (C. O'Connell, Australian Department of the Environment and Heritage, *in litt.*; 1 May 2002). Export of fish for anything other than display was prohibited in December, 2003.

The one company currently in operation in Fiji began exporting live specimens of reef fish in mid-2003. For the six-month period of operation in 2003, 13,000 kg of live reef fish were exported of which only 50.8 kg (8 live specimens) were Humphead Wrasse. This company also exports dead specimens (chilled / frozen) since its establishment in 1999. Data on exports of chilled / frozen humphead wrasse exports from 1999 - 2003 were not available (Fiji Department of Fisheries, April 2004).

Surveys of the major live reef fish markets in Hong Kong SAR, conducted sporadically between December 1995 and November 2003, provided details on sizes and on the relative importance of different species of fish in the live reef fish trade for sale to the public for both food and aquarium trade. The humphead wrasse was one of the most highly valued economically and the ninth most abundant species in the markets prior to 1998. Individuals being sold at two of the three major markets were between 25 and 95 cm with the majority between 30 and 60 cm TL (sexual maturation occurs at about 50 cm so many of these are juveniles; Choat et al., unpublished manuscript). In September 2001, small numbers of juveniles, measuring about 4-10 cm TL (N= 12) started to appear on retail sale in local aquarium fish shops. In recent years, there appears to be a trend toward smaller humphead wrasse in Chinese markets (Lau and Parry-Jones, 1999; T. Donaldson, University of Guam, *in litt.*, 20 May 2002); a survey of the Hong Kong retail outlets made in December 2003/January 2004 revealed that most fish on sale were in the 35-40 cm TL size class (Sadovy, unpublished data). Some of the traders in Hong Kong SAR reported a declining availability of larger reef fishes overall, and surmised this was due to overexploitation in nearby nations (Lau and Parry-Jones, 1999). Other explanations could be a desire for smaller fish by consumers, lower shipment costs (by air), export size limits (e.g., Indonesia), and lower mortality in transit when compared to larger fish. Sales staff also suggested that many of the fish coming in had been "grown-out" and this explained their lighter color.

Hong Kong SAR traders re-export a certain amount of live reef fish. Although Hong Kong SAR customs data in 1997 did not show re-exports of humphead wrasse, interviews with Hong Kong SAR traders that same year revealed that 10-20% of all live reef fish imported to that jurisdiction were re-exported to southern mainland China (Guangzhou, Shenzhen, and Zhuhai). The vast majority of these re-exports were the high value species such as giant grouper (*Epinephelus lanceolatus*), humphead wrasse, and coral trout (*Plectropomus* spp.) and there appears to have been an increase in the trade of relatively higher priced live fish (Lau and Parry-Jones, 1999) in recent years for this trade (ADB, 2003). Traders do not appear to object to better protection for this species on economic grounds because it is such a small part of their trade; they are concerned only that a listing of this species would open the door for similar listings of other species (P. Chan, Chairman, Hong Kong Chamber of Seafood Merchants, pers. comm.).

3.3 Illegal trade

As noted below, several nations prohibit the export of humphead wrasse by province, by size class, or completely. Nonetheless, these banned specimens still appear in Hong Kong SAR markets and traders have acknowledged that smuggling is common (Lau and Parry-Jones, 1999; Sadovy et al., 2004; Johannes and Riepen, 1995). In addition, *C. undulatus* are sometimes harvested with cyanide despite widespread prohibition of its use. Although some companies cannot legally export large humphead wrasse, they can sell them to foreign vessels (Sadovy et al., 2004; Johannes and Riepen, 1995; Donaldson and Sadovy, 2001). Of two ships exporting humphead wrasse out of the Kei Islands in Indonesia, only one has a permit to do so (SCRFA, 2004). Listing in the CITES Appendices would provide the international legal framework with which to regulate the import of illegally exported specimens.

3.4 Actual or potential trade impacts

International trade appears to be the major threat to this naturally rare species because of high demand, the selective capture of juveniles fish, and its biological characteristics which make it particularly susceptible to exploitation at even the lowest levels of fishing intensity. Current levels of harvest appear unsustainable in many jurisdictions. Demand is increasing in China as more people learn about live reef fish, and as income grows demand is projected to grow as the live reef fish trade expands. Recent trends indicate a relatively greater interest in the trade of more valuable species, like the humphead wrasse, probably because of their greater profitability (ADB, 2003). The increasing ease of international trade, both because of trade barrier reduction and air transport improvement, will facilitate the international trade in live fish including humphead wrasse. The large vessels that transport live fish across the Indo-Pacific have access to the most remote locations and significant refugia for this species will probably disappear if market demand, and the species' value, continue to increase. A CITES Appendix-II listing should result in improved understanding of trade routes, stricter regulation of harvesters and transshippers, and the international legal framework to regulate trade to within sustainable limits. Most importantly, the requirement for non-detriment findings prior to issuance of CITES export permits should result in improved domestic management and monitoring programs to greatly alleviate pressure on this species. Domestic trade and traditional use of humphead wrasse would not be directly affected by CITES requirements, but improved localized management may reduce allowable harvest in the near term to effect stock restoration. At least one humphead wrasse range country has permitting programs in place to monitor exports. In Indonesia, permits for legal export of humphead must be obtained by the exporters and this is done with the national fishery management authority; fishermen do not need to get these permits directly.

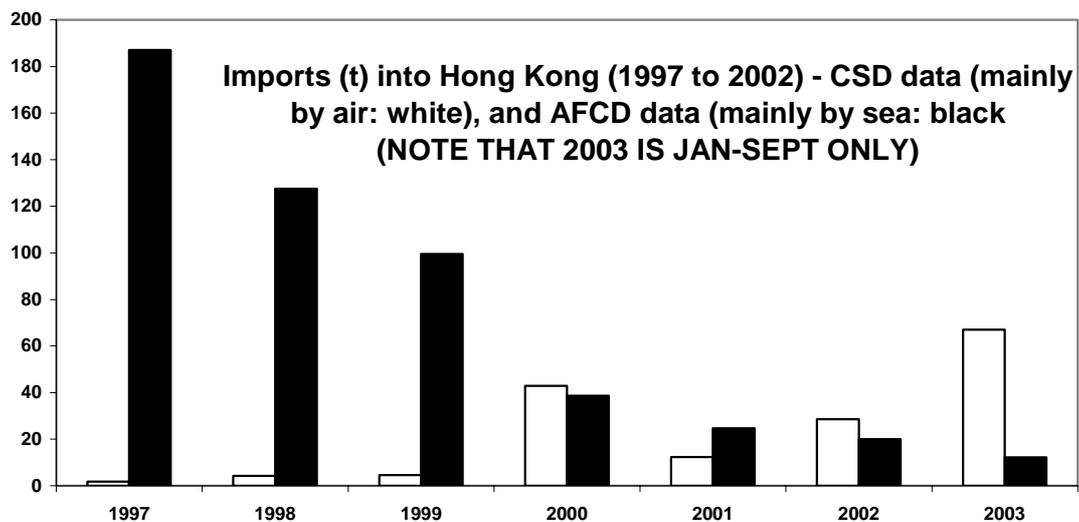


Figure 3. Annual imports of humphead wrasse into Hong Kong SAR showing relative proportions of air and sea imports. (For 2003, Hong Kong SAR government data through September indicate that only 15% of total imports, by weight, are now coming in by sea.)

3.5 Captive breeding or artificial propagation for commercial purposes (outside country of origin)

Closed system (or hatchery) culture (e.g., no reliance on wild broodstock) is currently not possible and is unlikely to occur at commercial levels soon because of small larval sizes, rare broodstock, and feeding regimen problems (T. Donaldson, University of Guam, *in litt.*, 20 May 2002; M. Rimmer, Department of Primary Industries, Queensland, Australia, pers. comm.). Research on hatchery production of humphead wrasse is in its early stages. The basic biology of the species (longevity, fecundity, triggers for sex change in females) requires further research. Juveniles are said to be hardy, tolerant of crowding, and can be grown out in net pens with reasonably fast growth rates. However, closed-system culture is apparently too costly to be commercially viable (Johannes and Riepen, 1995; T. Donaldson, University of Guam, *in litt.*, 20

May 2002). Artificial production is also limited by inadequate numbers of suitable spawning stock from the wild (T. Donaldson, University of Guam, *in litt.*, 20 May 2002). As noted in Section 2.7, the “farming” or culturing of humphead wrasse simply consists of growing out wild-caught juveniles until they reach marketable or legal size for export.

4. Conservation and management

4.1 Legal status

4.1.1 National

The humphead wrasse occurs in northern Australia waters off Western Australia, Northern Territory, and Queensland and is prohibited from harvest in Western Australia under the Fish Resources Management Act 1994. This action was taken in 1998 when it was determined that the local stocks were not large and were highly susceptible to overfishing. It has been assessed as “lower risk” (conservation dependent) using the IUCN guidelines by the Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Freshwater Fishes and is being considered for listing by the Threatened Species Scientific Committee as a threatened species under the Environmental Protection Biodiversity Conservation Act 1999 (<http://www.deh.gov.au/biodiversity/threatened/species/consider-fauna/index.html>, 30 April 2004). Recent events ended the Australian fishery, because humphead wrasse have been implicated in ciguatera poisoning in Hong Kong SAR. In response, the Australian Quarantine Service and the fishing industry agreed to ban the export of *C. undulatus* from Queensland waters. In addition, Sydney Fish Markets have decided to reject imports of all humphead wrasse from the Pacific rim, and industry in Northern Territory, Queensland, New South Wales, and Victoria has agreed to this policy (C. O’Connell, Australian Department of the Environment and Heritage, *in litt.*; 1 May 2002). Exports of the species are now prohibited from Australia with a few exceptions for display purposes.

In Fiji, the Ministry of Fisheries and Forests is currently developing domestic legislation that will ban the capture and sale in, and export of humphead wrasse from Fiji. This legislation will be in effect before the end of 2004. Temporary policy guidelines also have been developed for the live reef food fish trade (LRFFT) in Fiji. Such temporary measures include the prohibition of the capture and export of humphead wrasse for commercial purposes, and the storage of this species in holding cages (Fiji Department of Fisheries, April 2004).

The Maldives banned the export of humphead wrasse in 1995 based on concerns about loss of this fish from recreational diving sites. Despite this regulation, Hong Kong SAR import statistics show the Maldives exporting 100,965 kg of humphead wrasse worth USD 635,000 to Hong Kong SAR in 1998 (Shakeel, 1994; Lau and Parry-Jones, 1999).

In Palau, the species was targeted for the live reef fish trade, which peaked between 1985-1986. The export of humphead wrasse was then suspended in 1998 due to fears of overfishing. National laws also prohibit trade in specimens < 25 inches in total length.

In the Philippines, the province of Palawan banned the direct export of humphead wrasse of certain sizes because of overfishing concerns in 1994 (renewed in 1998) (Johannes and Riepen, 1995). However, an exemption to the Palawan law which allows the capture of juvenile fish for grow-out, effectively cancels out any protection conferred since most fish are evidently taken in the juvenile size range for grow-out for the live fish trade.

In New Caledonia, catch of humphead wrasse is not permitted during spearfishing competition (M. Kulbicki, pers. comm.)

In Niue, the interference, take, kill, or bringing to shore of humphead wrasse is prohibited without the written approval of the government (Niue Domestic Fishing Regulations, 1996).

4.1.2 International

There are no international protections in place for *C. undulatus*. Indeed, for low volume reef fish fisheries such as these, there are no active or even relevant regional fisheries authorities and they are not covered by any management strategies or data collection programs of the United Nations Food and Agriculture Organization (FAO).

4.2 Species management

4.2.1 Population monitoring

There is a variety of visual census surveys designed to monitor coral reef health, which detect humphead wrasse incidentally or as part of a standardized sampling protocol. These surveys are summarized in Sections 2.4 and 2.5 above, and involve a gamut of techniques including volunteer diver surveys (e.g., Reef Check, Napwatch, GreenReef etc.), scientific censuses (e.g., Australian Institute of Marine Science efforts, Great Barrier Reef Marine Park monitoring, IRD-New Caledonia), and incidental observations made during other research initiatives. Very few countries currently monitor landings of this species.

4.2.2 Habitat conservation

An increasing number of marine protected areas (MPAs) are being established throughout southeast Asia, including Indonesia, Malaysia, the Philippines, Singapore and Thailand. Nonetheless, there are often conflicting responsibilities for the resources, a lack of coordination among different agencies, limited funding and technical expertise and/or lack of enforcement. Burke et al. (2002) assessed 646 marine protected areas throughout Southeast Asia and determined that only 46 (14%) were managed effectively with adequate funding, personnel, and planning. There is no known effort to specifically conserve reef habitat for *Cheilinus undulatus*, but marine reserves and regulations that control human activity on coral reefs incidentally protect and conserve the species. In Malaysia, spawning sites are only known from protected areas (TRACC, 2002).

4.2.3 Management measures

In Fiji, the Ministry of Fisheries and Forests is currently developing domestic legislation that will ban the capture and sale in, and export of, humphead wrasse from Fiji. This legislation will be in effect before the end of 2004.

Temporary policy guidelines also have been developed for the live reef food fish trade (LRFFT) in Fiji. Such temporary measures include the prohibition of the capture and export of humphead wrasse for commercial purposes, and the storage of this species in holding cages. An observer monitoring program for catch, effort and export will be established for the LRFFT. Furthermore, export of all live reef fish must be conducted from designated airports where they can be checked and monitored before export. Export by sea will not be allowed.

There are two companies licensed to operate in the LRFFT in Fiji although, as of April 2004, only one company is in operation. This company has stated to the Department of Fisheries that it will cease take of Humphead Wrasse in the interim period whilst the regulatory mechanisms are being developed. Fiji currently has a moratorium in place preventing any companies other than the two already authorized from entering the LRFF industry (Fiji Department of Fisheries, April 2004).

In Indonesia, a Ministerial Decree of Agriculture from 16 May 1995 prohibits the catch of humphead wrasse except for research and "cultivation". The Directorate General of Fisheries issued a rule on 6 September 1995 which allows traditional fishermen to catch humpheads in certain fishing areas with boats < 5 gross ton displacement, by hook and line, fish trap, and gill net. Size limit is between 1 and 3 kg, and the specimens are then available for export by third party companies. Any company purchasing or exporting such fish must have a permit. A Ministerial Decree of Trade issued on 24 May 1996 bans the

export of all humphead wrasse except those caught in compliance with the regulations above. Under this regulation, Directorate General of Fisheries No: 330/DJ.8259/95 (6th Sept. 1995), fish that are outside of the permitted size range can be used for mariculture (undefined but in current practice involving the grow-out of wild-caught juveniles) or must be freed. Data on the number of fishing permits, fishing ground locations, grow-out operations, wild harvest, and port of export for humphead wrasse should, under the regulation, be reported to the Directorate General of Fisheries every three months. Requests for these data by researchers have been unsuccessful (Y. Sadovy, University of Hong Kong, pers. comm.) and the data are probably not collected (Husni Amaralluh, BPPI – Indonesian agency for mariculture development and assessment; *in litt.*; April 2004). In Hong Kong SAR, many traders still obtained large, illegal-sized, humpheads from Indonesia in 1997. Therefore, enforcement of export laws for humphead wrasse appears to have been lacking in recent years. There also appear to be exemptions in Indonesian regulations for foreign cargo vessels transporting live specimens out of national waters (Sadovy et al., 2004). The full enforcement of the regulations in Indonesia is considered to be impossible given staffing problems (Indrawan, 1997).

In Papua New Guinea, there is a 65 cm minimum size limit for exporting humphead wrasse but this does not prevent fishers from catching and holding smaller humphead wrasse in cages (culturing) until they attain 65 cm TL. All live fish operators are required to obtain licenses, but the implementation of these regulations is unknown (National Gazette No. G99, June 17, 2002; P. Lokani, The Nature Conservancy, Papua New Guinea, pers. comm.).

Mitigation of harvest through hatchery supplementation appears economically unfeasible (see above section on captive breeding). Other drawbacks include high predation on juveniles and genetic “bottlenecking” if fingerlings are derived from limited numbers of broodstock (T. Donaldson, University of Guam, *in litt.*, 20 May 2002).

4.3 Control measures

4.3.1 International trade

There are no international trade control measures for *C. undulatus*. Importantly, there is no regional fishery management authority charged with the management in any form of this species, or which could be involved in its management. The Asia Pacific Economic Cooperation forum funded the development of voluntary industry standards for the live reef food fish trade, but they have not yet been completed or adopted. If implemented, these may assist exporting countries in making the required non-detriment and legal acquisition findings required by CITES.

4.3.2 Domestic measures

American Samoa (U.S.) banned the use of spear-fishing with SCUBA gear in April 2001, after declines in grouper and wrasse populations coincided with the advent of commercial harvest in 1994. When this fishery moved to neighboring Independent Samoa, two districts comprising 20 villages immediately imposed an identical ban and are advocating a national prohibition (Birkeland and Friedlander, 2001). All U.S. Pacific territories require licenses to export marine fishery products, and American Samoa requires that export ventures are locally owned. The U.S. Exclusive Economic Zone (to 200 nautical miles seaward of any territory or state) is regulated by a federal council that sets licensing and other regulations for commercial fisheries, including any future development of live reef food fish trade.

New Caledonia (France) requires that fillets of the fish must be sold with a piece of the skin attached to enable identification of this species. However, the species cannot be exported from New Caledonia.

In 2001, the Guangdong Provincial Government announced the first checklist of special provincial protected aquatic wildlife which includes the humphead wrasse. Anyone

involved in the protection, rearing, utilization, or scientific research of these species should follow the Guangdong Provincial Wildlife Protection Law and apply for a permit to conduct the given activity (Protection of Aquatic Wildlife

Handbook, Guangdong (China) Provincial Oceanic and Fishery Administration; 2001).

In Fiji, the Ministry of Fisheries and Forests is currently developing domestic legislation that will ban the capture and sale in, and export of humphead wrasse from Fiji. This legislation will be in effect before the end of 2004. Temporary policy guidelines also have been developed for the live reef food fish trade in Fiji. Such temporary measures include the prohibition of the capture and export of humphead wrasse for commercial purposes, and the storage of this species in holding cages.

Other than the national management measures mentioned in Section 4.2.3 above, there are no known trade controls or licensing requirements imposed by range states.

5. Information on similar species

In international trade, humphead wrasse are exclusively sold as live specimens for the luxury food market with a small number for the aquarium trade. Fiji, however, previously exported chilled/frozen fillets but exports of all specimens (live, chilled or frozen) of this species are now prohibited; international trade in chilled or frozen fish elsewhere is not known. Preference is given to trading in live specimens due to the higher prices they command on the international market. Given the species' unique appearance (including distinctive markings, large adult size, cranial "hump") at all stages of its life history, it is highly unlikely to be mistaken for other species such as groupers, snappers, or coral trout found in the same markets. Shipments arrive by sea or air terminals, where inspections by customs and wildlife officials are routinely carried out for other species (Lau and Parry-Jones, 1999; Y. Sadovy, University of Hong Kong, *in litt.*, 31 March 2002).

6. Other comments

During development of this proposal, the United States attempted to consult all Parties and relevant U.S. domestic jurisdictions within the range of *C. undulatus*. Where possible, a consultation letter was sent to a Party's Management Authority and Scientific Authority. A total of 33 jurisdictions were contacted via facsimile or email correspondence, some of which were undeliverable due to invalid fax numbers or other technical difficulties. The six responses received are summarized below. The member States of the European Community also discussed the proposal at a March 19, 2004 meeting and later achieved consensus to co-sponsor it with the other proponents.

Fiji: Fiji's Ministry of Local Government, Housing, Squatter Settlement, and Environment stated that Fiji attaches great importance to the conservation of its natural resources and was a strong supporter of a similar proposal to list humphead wrasse in Appendix II at CoP12. Most notably, as an active participant in the live reef food fish trade, Fiji has agreed to co-sponsor the present proposal and has thus agreed with the supporting statement for listing shown above.

Guam (U.S. territory): The proponents received a response from the Guam Department of Agriculture, which stated that they supported the inclusion of humphead wrasse in Appendix II. The respondent indicated that the species is in a vulnerable state globally due to the live reef food fish trade, habitat loss, and a lack of coordinated management. On average, Guam officials have seen less than 10 adults in fishery surveys over the last six years. Guam does not participate in the live reef fish trade, but domestic markets are supplied with a fishery based on SCUBA and snorkel spearfishing. Landings are estimated via creel surveys, and show dramatic variation since 1985. There are currently no restrictions on the take of humphead wrasse in Guam, but five marine preserves have been established to protect coral reef habitats and associated species like *C. undulatus*.

Hong Kong SAR (China): The Hong Kong Agriculture, Fisheries, and Conservation Department (AFCD) responded to the consultation and made several technical corrections and clarifications about Hong Kong SAR data in the proposal. The respondent also provided re-export data that showed low volumes of re-exports outside Hong Kong SAR, and stated that this showed re-exports were not "significant" as indicated in the proposal. The AFCD letter also noted that the fishery officer quoted

from 1997 (below) was not involved in CITES matters, and had not addressed the possible enforcement problems in an Appendix-II listing (e.g., monitoring of illegal landings from fishing boats). Hong Kong SAR noted that the increased use of aircraft to ship humphead wrasse into Hong Kong SAR and the associated ease of inspection (as per the proposal) could only reflect that there must be a great improvement of trade monitoring under the status quo. The respondent also mentioned potential problems with licensing and permit issuance in exporting nations that should be carefully considered. Finally, Hong Kong SAR stated its belief that range countries are in the best position to cooperatively manage their natural resources, including the establishment of catch and export quota systems for each exporting country.

Indonesia: The Indonesian Directorate General of Forest Protection and Nature Conservation responded to the consultation, stating that they were not in a position to support an Appendix-II listing because the species is considered to be “common and abundant locally across its range in Indonesia.”

Japan: A response was received from the Fisheries Agency of Japan, which stated the species is distributed around the Ryuku Islands of Japan where approximately 7 to 11 mt are harvested annually by harpooning and hand-and-line fishing. Japan stated that the stock is in stable condition there and not threatened with extinction, with no substantial changes observed in the catches during the past five years (landings figures were provided). The respondent said that sustainable utilization of humphead wrasse largely depends on fishery management, and thus the species’ conservation should be dealt with by national or regional fisheries authorities. Japan also proposed that FAO should convene an expert meeting to assess global and regional stock status of this species, with a view toward developing sustainable management measures for harvesting nations. The respondent also said that cooperation and technical assistance for sustainable utilization were more important than restrictions on trade for *C. undulatus*, and that income generated by humphead wrasse sales in developing nations should be respected. Finally, Japan hypothesized that inclusion of the species in Appendix II would “abuse” the CITES Appendices, attract global attention to the species, and exacerbate perceived problems in the absence of fishery management measures.

Singapore: The Singapore Agri-Food and Veterinary Authority (CITES Management Authority) responded, and stated that if a commercial species is scientifically proven to be threatened with extinction as a result of over-exploitation, measures should be implemented to prevent any unsustainable use. The respondent said that the Southeast Asian Fisheries Development Center (SEAFDEC) is a regional fisheries organization working with FAO to develop sustainable management measures for fish stocks. Also, Singapore indicated that some countries are now able to farm many food fish species including humphead wrasse. Singapore was of the view that FAO and regional fishery management organizations, not CITES, are the competent authorities to manage fish stocks and ensure sustainable use.

At a 1997 APEC workshop on the impacts of destructive fishing practices on the marine environment, the head of the Hong Kong SAR Agriculture, Fisheries, and Conservation Department (Capture Fisheries Division) made the following statement in his publication from his oral presentation:

Regarding the alleged cyanide fishing activities reported to take place in foreign waters, direct enforcement from Hong Kong SAR is not possible. The most effective way to address the issue is for the producing economies to direct effective enforcement measures against cyanide fishing and to control trade in fish species that may become, or are already endangered, by listing them under CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora). This will provide the necessary legal framework and impetus for concerned governments to take effective control over cyanide fishing and trade in such species. (Sham, 1998).

Assessment of the humphead wrasse under criteria recommended by FAO for CITES listings of marine fishes

The UN Food and Agriculture Organization (FAO) has considered extinction risk for marine fishes in the context of CITES listings proposals. FAO (2000; 2001) notes that large, long-lived, and late-maturing species generally have low productivity and are at a higher risk of extinction from exploitation than species with higher productivity.

The ability to sustain exploitation, or productivity, is the single most important consideration when assessing population status and vulnerability to overfishing. Generation time is a useful surrogate for productivity. The most vulnerable species are those with an intrinsic rate of population increase (r) of < 0.14 and a generation time of > 10 years (FAO 2000). Population status data presented and calculated from FishBase (2002) indicate that this species falls within FAO's lowest productivity category.

The Second FAO Technical Consultation on the Suitability of the CITES Criteria for Listing Commercially-Exploited Aquatic Species (FAO 2001) and the CoP12 Committee I criteria working group formulated the following caveat to the "decline" definition shown in Resolution Conf. 9.24 (Rev. CoP12), Annex 5:

A general guideline for a marked recent rate of decline is the rate of decline that would drive a population down within approximately a 10-year period from the current population level to the historical extent of decline guideline (i.e. 5-20% of baseline for exploited fish species). There should rarely be a need for concern for populations that have exhibited an historical extent of decline of less than 50%, unless the recent rate of decline has been extremely high.

Even if a population is not declining appreciably, it could be considered for listing in Appendix II if it is near the extent-of-decline guidelines recommended above for consideration for Appendix I-listing. A range of between 5% and 10% above the relevant extent-of-decline might be considered as a definition of 'near'.

FAO's advice indicates that a decline of 80% (i.e., down to 20% of historical biomass or numbers) could be reason for listing low productivity species (such as humphead wrasse) in Appendix I. From the present listing proposal, it is evident that *Cheilinus undulatus* has undergone more than an 80% decline from historical baselines throughout a significant portion of its range. In fact, almost all of the humphead wrasse populations described in this proposal show signs of declines exceeding 90% and no evidence of recovery or even stabilization. Thus, the species clearly qualifies for listing in Appendix II at a minimum.

7. Additional remarks

The IUCN has developed a Grouper and Wrasse Specialist Group to address the conservation and research needs for these vulnerable taxa. In response to consultations by the proponents, the group submitted the remarks in Annex.

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Comments of the IUCN Grouper and Wrasse Specialist Group

Assessment of the humphead wrasse using CITES biological criteria

The proposal for the listing of the humphead wrasse on Appendix II of CITES is based on an assessment of the species' biological and conservation status, based on a range of different data types and sources, as follows and using the CITES Appendix II listing criterion in Resolution Conf. 9.24 (Rev. CoP12) Annex 2a, paragraph B(i) ('It is known, inferred or projected that the harvesting of specimens from the wild for international trade has, or may have, a detrimental impact on the species by: exceeding, over an extended period, the level that can be continued in perpetuity).

1. The species is most threatened by overfishing, especially of large adults and of juveniles. It has been subjected to unsustainable fisheries in several parts of the world, especially in Southeast Asia, especially the epicenter of its geographic range, including Indonesia, Malaysia, the Philippines, South China Sea, and also out into the western Pacific, including Palau and Fiji. Data and multiple anecdotal accounts, including comments from the live reef fish industry, from these fisheries presented in the preceding pages clearly show that catches have fallen substantially over relatively short periods once fishing occurs and if it is not carefully managed, especially after introduction of a live reef fish export trade. The export based live reef fish trade and unregulated local fisheries (especially if SCUBA is used) appear to be the greatest threats and demand is predicted to grow.
2. Illegal exports have been noted from Indonesia and probably also occur or have occurred from the Philippines (Palawan) and Maldives. The species is easily exported illegally for the live reef fish trade when this is conducted by boats.
3. The value of this species is expected to increase if numbers continue to decline because it is part of a luxury export market wherein rarity tends to be inversely proportional to value. This means that it continues to be viable to seek fish even at low population levels well past the points of biological overfishing. Demand for this species is expected to grow as wealth in demand centers, and especially in mainland China, and interest in live reef fish increase. On the other hand, the value of this species as an object of eco-tourism may be considerable.
4. The apparently heavy take of juveniles of this species is associated with direct sales since smaller fish are generally preferred in the retail sector and gain the highest price per kg, but also with 'grow-out or mariculture. However, the species cannot be hatchery-produced and all grow-out is associated with a juvenile capture fishery with potential to undermine population persistence and recovery. Such grow out may be permitted where a fishery of certain size classes is prohibited (e.g. In Indonesia and Malaysia) undermining any benefits from the prohibition For this species, the term mariculture is misleading since it always involves the capture of animals from the wild and their subsequent grow-out and never includes full cycle (or hatchery) production. As such, mariculture is a further contributing factor in overfishing.
5. There is no regional management authority and FAO is not involved in any way in the management or data collection of this species. Information on the fishery and trade are needed and a listing on Appendix II would greatly assist in this respect.
6. The species is rare naturally and numbers are rapidly reduced even at low levels of fishing pressure – it is not biologically capable of withstanding an export level fishery and does not occur at natural levels of abundance unless in a managed fishery or in a marine protected area.