CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

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ADDITIONAL INFORMATION ON THE FAMILY CORALLIIDAE

The following document submitted by the United States* provides additional information and clarification on points made in the FAO advisory panel review (FAO 2010) and the IUCN/TRAFFIC analysis of CITES CoP 15 Prop. 21.

Executive Summary

Seven species in the family Coralliidae are in international trade, and unsustainable harvest and trade has led to the overexploitation of most known beds containing these precious corals. While data gaps exist, the available information provides numerous concrete examples of widespread decline in areas targeted by fisheries that exceed the historical extent and recent rates of decline recommended for an Appendix-II listing for a low productivity species. Harvest to support international trade has been the most detrimental to four species (*C. rubrum, C. konojoi, C. secundum*, and *C. sp. nov*.) over the last 50 years (large historical extent of decline), with recent declines observed in *C. rubrum, P. japonicum,* and *C. elatius*.

- *C. rubrum* occurs over a large distributional area and wide depth distribution, but most colonies are restricted to 30-200 m depth with low densities, with exception of certain shallow areas that have high rates of turnover. Landings data shows large declines beginning in the late 1970s, reaching a low point *before* the use of non-selective gear was banned or fishing effort was decreased. Coral dredging is thought to have removed all colonies that grew in exposed areas down to the limit of 100-200 m, SCUBA fisheries first depleted 35-40 m habitats (1950s), then intermediate depths at 50-70 m (1970s and 1980s). In addition, size structure and branching patterns have been altered and only limited recovery has occurred in closed areas after 20 years. Shallow areas (20-60 m) throughout the Mediterranean are identified as overexploited, and the fishery is progressively moving into deeper water (70-150 m) where colonies are larger but at lower densities and are more susceptible to extirpation.
- *P. japonicum* and *C. elatius* are restricted to a narrow band along the continental shelf (regional waters around the islands of Japan and Taiwan, and possibly the Philippines). These species are rare today, occurring at unusually low densities in the wild compared to related species in Hawaii that are 10-100 fold denser in unfished areas. *C. elatius* and *P. japonicum* are the dominant taxa in Pacific landings (e.g. 5-15 metric tons/yr and 1-3 t/yr, respectively), but this represents < 1% of historic landings and mostly consists of dead colonies.
- *C. konojoi, C. secundum,* and *C. sp. nov.* formerly occurred in high abundances within the largest known Pacific Coralliidae beds, the Emperor Seamounts. These beds are estimated to cover an area 20-40 times larger than available Coralliidae habitat in Hawaii. The first species overexploited from these beds *w*as *C. konojoi, w*ith over 3,500 tons landed from 1965 to1989. Since this period, landings of this taxa have ranged from 0-1 ton/year (< 1% of the landings in prior years). *C. secundum* and *C. sp. nov.* (pooled in FAO data) were landed in high volumes during 1982-1989 (770 tons). Since this period, no more than 1 ton has been landed in any year, which also represents < 1% of historic landings. ROV and drop camera surveys in

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* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat or the United Nations Environment Programme concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

2008-2009 suggest the beds are commercially extinct. There are no other known populations of *C. sp. nov*. The total size of all *C. secundum* populations off Hawaii is estimated to represent no more than 10-20% of the size of the Emperor Seamount populations. *C. lauuense (C. regale)* is restricted to small, isolated beds off Hawaii and total population size is small. It has been landed in commercial quantities only once during exploratory fishing. If the fishery were to reopen it may be rapidly overexploited and may qualify for Appendix-I due to limited distribution, small population size, and little interbreeding between coral beds.

- Numerous intrinsic factors increase the vulnerability of Coralliidae to overexploitation: a low fecundity; size-dependent reproduction; slow growth rates; late age at first maturity; long generation time; a sessile, attached existence; low density; specialized habitat requirements; seed dispersal mechanisms that limit long-distance genetic exchange; and specialized behavior that limits reproduction. In particular, *C. rubrum* populations in the NW Mediterranean experienced localized mass mortality events in 1987, 1999, 2003, 2005, and 2006, associated with unusually high temperatures (Cerrano and Bavestrello 2008). Moreover, because overfishing is now coupled with anomalous mortality events, the persistence of *C. rubrum* appears uncertain in these shallow environments under predicted scenarios of warming (Garrabou et al. 2001; Harmelin 2009).

Brief synopsis of taxonomic issues

There are currently 31 recognized species and several undescribed species. Kükenthal (1924) lists 16 species, and Bayer described an additional 13 new species (Bayer 1955, 1956, 1964, 1996) and assigned another species to the genus (Bayer 1993). Bayer and Cairns (2003) subsequently divided the genus into two separate genera, *Paracorallium* and *Corallium*. This revision identifies 26 species. They do not mention six species reported in earlier studies: *Corallium boshuense, C. niveum, C. porcellanum, C. pusillum, C. vanderbilti,* and *C. variabile. C. lauuense* has a high commercial value but has been landed commercially only once during a single exploratory mission. *C. lauuense* has also been reported as *C. regale.* It is listed as separate species in Bayer and Cairns (2003) and in the *US Precious Coral Fishery Management Plan.* Baco and Shank (2005) stated: "*C. lauuense* was previously misidentified and referred to as *C. regale*" which is not an indication of synonymy*.* There are, however, still unresolved taxonomic problems concerning these two species and other recent publications suggest they are a single species (Parrish 2007). The species *C. lauuense* is also spelled *C. laanense* (Bayer and Cairns 2003). For purposes of this proposal, *C. lauuense* and *C. regale* are considered synonymous.

Bayer (1956) also indicates that *C. vanderbilti* is not a valid species. An additional species was also identified by Grigg (1982) as being in trade, *Corallium nobile.* He subsequently referred to this as *C. elatius* (Grigg 1984). *C. nobile* is not considered a valid species.

Of the 31 species, 25 are not commercially exploited: *Corallium abyssale*, *C. borneense*, *C. boshuense*, *C. ducale*, *C. halmaheirense*, *C. imperiale*, *C. johnsoni*, *C. kishinouye, C. maderense*, *C. medea*, *C. niobe*, *C. niveum*, *C. porcellanum*, *C. pusillum*, *C. reginae*, *C. sulcatum*, *C. tricolor*, *C. vanderbilti*, *C. variabile, Paracorallium inutile*, *P. nix*, *P. salomonense*, *P. stylasteroides*, *P. thrinax*, and *P. tortuosum.* Other than occurrence data, no information is available on the population status or trends for these species. CoP15 Prop. 21 indicates that 24 species qualify for inclusion in Appendix-II based on look-alike criteria [Article II, paragraph 2 (b) of the Convention, and they satisfy Criterion A]. If *C. vanderbilti* is a valid species, the correct number should be 25 species, as listed above.

Prop. 21 recommends Bayer and Cairns (2003) as a taxonomic reference for the family Coralliidae. This document covers 25 species, plus one species considered synonymous (*C. regale*). Three other taxonomic references Kükenthal (1924); Bayer (1964, 1996) provide taxonomic descriptions of species not in Bayer and Cairns (2003).

Criteria

Prop. 21 summarizes available biological, population, fisheries and trade data for the family Coralliidae. These data demonstrate declines in several commercially exploited species, and extirpation of the corals from the largest known Coralliidae beds (Emperor Seamounts). The 2010 FAO and IUCN/TRAFFIC reviews recognize the boom and bust cycles characteristic of this fishery, acknowledges that the resource has been overexploited and states that C. rubrum meets the criteria in terms of the historic extent of decline. However, the FAO review indicates that "populations representing a large portion of the abundance of the seven species proposed for listing under Article II paragraph 2(a) …globally did not meet the decline criteria for Appendix-II." While there are large data gaps for most populations and species in the family Coralliidae, numerical values provide concrete examples of decline for the species in commercial trade that exceed the historical extent of decline and recent rates of decline recommended for listing in Appendix-II. Further evidence can be inferred from recent exploratory surveys carried out in the Emperor Seamounts. As noted in Annex 2a of Res. Conf. 9.24 (Rev. CoP 14), these species would need to have declined to 15-20% of their pre-exploitation population levels for consideration for Appendix-I, and 5-10% above that for an Appendix II listing. However, footnote 2 in Annex 5 of Res. Conf. 9.24 (Rev. CoP 14) also indicates that taxon and case-specific factors (e.g. patterns of exploitation, biology, area of distribution, and other vulnerability factors that may increase extinction risk) should also be considered. Considerable new information has become available since CoP 14, including a) differences in the population structure for *C. rubrum* in shallow fished areas vs. protected areas and deep water environments that are not yet targeted by fisheries; b) submersible surveys by Japan in the Emperor Seamounts that failed to identify a single large population of *Corallium*; and c) supplementary landings data from Japan that was not included in the FAO datasets. All of these datasets clearly demonstrate declines in populations of Coralliidae in areas where fisheries have been or are currently active, including both numerical data and taxon-specific factors. These points are clarified in more detail below:

Productivity: *C. rubrum* is a low productivity species in the 2010 FAO review. Other taxa are thought to also be low productivity species, but the FAO review notes that there are few biological data. While this is true for most species, *C. secundum* life history parameters are better known. This species also demonstrates traits of a low productivity species and was acknowledged as a low productivity species in the 2007 FAO review of the CoP 14 proposal. Furthermore, several of the parameters used to estimate productivity are based on older estimates of growth and age determined by counting growth rings, which underestimate true age by a factor of 2.6-4.5 (Garrabou and Harmelin 2002; Marschal et al. 2004; Roark et al. 2006).

Small population: The 2010 FAO review states correctly that there are no estimates of the total size of populations of species in the family Coralliidae. However, it also makes an unsubstantiated statement that “the family is widely distributed and probably occurs in relatively large numbers worldwide.” While the family Coralliidae is widespread, available information on individual species suggest that they do in fact occur as small, genetically isolated populations (Abbiati et al. 1993; del Gaudio 2004; Baco and Shank 2005; Costantini et al. 2007 a, b, 2009). The abundance of individual species that are commercially exploited over their entire distributional range may be much larger than the numeric guidelines provided in Annex 5 (e.g. each species has a total population size that exceeds 5000 individuals), but the effective population size of each species is much smaller because a species occurs as fragmented units that occupy a small area (e.g. a portion of a seamount with appropriate environmental conditions), and each of these population segments are isolated from other populations. Due to their sessile nature, reproduction between individual populations is unlikely to occur, making them distinct populations that are vulnerable to overexploitation.

Restricted distribution: The 2010 FAO review states that no estimates of the distributional area were included in the proposal. Part of the difficulty in determining area of distribution of a species of Coralliidae reflects the depth at which the taxa occurs and the difficulty in conducting deep sea research. Nevertheless, there is ample information to suggest individual species do have a restricted distribution. Although worldwide surveys to locate beds of *Corallium* have been undertaken since the 1960s, using progressively more advanced technology, no populations have been identified that are viable for commercial exploitation since discoveries of coral beds in Hawaii and the Emperor Seamounts in the 1960s and 1970s. All known beds that were large enough to be commercially exploited are located north of 19º latitude, including the western Mediterranean basin (*C. rubrum*), Pacific islands off the Philippines, Japan, Okinawa and the island of Taiwan), in international waters around Emperor Seamounts, and off Hawaii. While these encompass a large geographical distance, it is important to keep in mind that the beds are restricted to certain habitats and depths within this range, which consists of a relatively small area (< 5%) within their distributional range.

- **Mediterranean/Atlantic populations:** *C. rubrum* occurs over a wide geographic area and across a wide depth range, in the western and central Mediterranean, with smaller populations off Yugoslavia, Cyprus, south coast of Portugal, and the African coast in the Atlantic. The total number of colonies of this species throughout its range is very large, yet individual populations form small, discrete patches. These patches may contain hundreds to thousands of colonies in shallow water, but these populations are not commercially viable and colonies exhibit high rates of early mortality before reaching sexual maturity. In other areas, especially deeper water and in fished areas, the coral occurs in much smaller aggregations consisting of tens to hundreds of colonies per patch, with colonies concentrated on individual banks, outcrops, or ledges, and surrounded by expansive areas of unsuitable habitat that does not contain coral (Tsounis 2005). Although isolated colonies occur both very shallow (10-20 m depth) and very deep (to 600 m depth), the bulk of the population is restricted to a relatively narrow depth distribution (e.g. 30-200 m).
- **Central Pacific/Hawaii populations:** Coralliidae occur throughout the island chain from the main Hawaiian Islands to Midway Island, over a distance of about 2800 km. Within this range, individual beds are geographically isolated, occurring predominantly on certain sides of seamounts and in deep channels between islands, in environments with high currents, low levels of sedimentation, and a certain

temperature range (Grigg 1988). There are 16 known precious coral beds in Hawaii. All small in size, with much larger beds in the Emperor Seamounts (Fig. 2). One Pacific species, *C. secundum*, occurs in the Hawaiian Islands and adjacent international waters around Emperor Seamounts. Grigg's revised (2002) estimate states that the total population size of *C. secundum* is 220,000 colonies at Makapu'u. This is the largest coral bed in Hawaii and also has the largest population of species in the family Coralliidae found in Hawaii (Parrish 2007). While the distributional range is very large, total area of occupancy for this species in Hawaii is likely to be less than 10 km^2 (based on a known size of 4.3 km^2 for the largest bed, Makapu'u, and < 1 km^2 for the next three largest populations; Grigg 2002; Parrish 2007). In the Emperor Seamounts, total suitable habitat at the depth range of *C. secundum* is estimated at several hundred square km (Grigg 1974). The second commercially valuable species, *C. lauuense,* only occurs in Hawaii. It has been found on at least 8 Hawaiian seamounts, but is most abundant on three seamounts. Total area of occupancy is also estimated at less than 10 km^2.The second largest bed in Hawaii (Keahole Point) is dominated by this coral, yet it had an estimated abundance of only 7,000 colonies (of *C. lauuense*), while the third largest (Cross Seamount) had only 2,500 corals (*C. lauuense*). The only other bed with a significant number of *Corallium* colonies is WestPac bed. The other 12 precious coral beds are all smaller in size, and contain fewer colonies (Parrish 2007).

- **Western Pacific populations:** The 2010 FAO review presents unreferenced data indicating there are 28 known areas of coral in Japan and 11 in the Philippines, but do not identify the size of these areas or their distribution. The overall area is likely to be fairly small, as coral populations are restricted to certain depths (e.g. mostly from 100-500 m depth) on the continental shelf, in areas affected by the Kuroshio Current. Coralliidae populations have been identified from the south-western part of the South China Sea (N 19 E 112) to Saguma Bay, Japan (N 28 E 126), with most areas located between 100-500 m (summarized in Bruckner and Roberts 2009; Fig. 1). Two of the commercially important western Pacific species (*C. elatius*, *C. konojoi*) extend over a large latitudinal gradient (about 3800 km from the Philippines to Japan, approx. 16-35º N latitude), but populations are restricted to a narrow belt along the continental shelf on the eastern edge of the Kiriosha current, mostly from 100-500 m depth (Fig. 1). The third species, *P. japonicum,* is restricted predominantly to Japan, from the Ryukyu Archipelago to Sagami Bay, where the Kuroshio current deflects eastward (Bruckner and Roberts 2009; Nonaka and Musik 2009) Extensive exploratory missions conducted throughout the Pacific in the 1980s (Grigg 1971; Carleton 1987; Harper 1988) identified several new taxa and also extended the range of some described species (e.g. isolated colonies were collected in Guam, Mauritius, Palau, Solomon Islands, and other locations), but only individual colonies were collected in each area. No single population identified in these surveys was considered large enough to support commercial exploitation.

Assessment by species

Prop. 21 used three primary sources of quantitative data to estimate decline: population data on density and abundance, landings data, and data on the size structure of populations, and supplemented this with semi-quantitative and observational information. These are further clarified on a species by species basis below.

Corallium secundum. Populations of *C. secundum* are reported from Hawaii and international waters around the Emperor Seamounts, with isolated colonies identified off Japan and the island of Taiwan. Although there is evidence that the species has not declined in Hawaii, the species has experienced marked declines in international waters on Emperor Seamounts, which represents the largest segment of this species population distribution.

1) Given the large area of potentially suitable habitat in the Emperor Seamounts (total area 300-400 km^2) vs. the occurrence of small, isolated precious coral beds throughout Hawaii (total area of about 10 km^2), over 90% of the population of this species would have formerly occurred in Emperor Seamounts.
2) No quantitative data are available on the abundance/density of this species from the Emperor Seamounts prior to inception of the fishery. However, it is reported as one of the dominant taxa in the FAO landings data from 1981 to 1989, with < 1 ton landed per year after 1989.
3) ROV and drop camera surveys conducted in 2006 and 2008 throughout the Emperor Seamounts by Japan (Fisheries Agency of Japan 2008) failed to locate any large aggregations of Coralliidae; they did identify isolated colonies of *Corallium* spp., most of which were dead.
4) Combining the large area over which they have been overexploited with the dramatic shift in landings suggests *C. secundum* has undergone a decline of at least 90% throughout its range, and the only healthy populations remaining occur in small isolated beds in Hawaii were fisheries are inactive.
5) The 2010 FAO panel concluded that there has been no decline of Coralliidae in Hawaii and states that, "In Hawaii, harvest of the family Coralliidae is under a management scheme and there has been an increase in population density since 1971." This statement is taken out of context of the research that has been performed and is not valid for several reasons:

a) An assessment of the actual abundance of *Corallium* spp. has not been done in any precious coral bed in Hawaii. The best available data are from a single bed, Makapu'u, which is the largest bed in Hawaii. Even though this is the only area with a long history of exploitation, it has a higher density and abundance of colonies than anywhere else in Hawaii (Parrish 2007). For all other known coral beds in Hawaii, there have been single baseline surveys undertaken (some of which included collection of quantitative data on population dynamics). It is not possible to determine population trends (Grigg 1974, 1988, 2002; Parrish 2007).

b) The "baseline" surveys conducted by Grigg in 1971 (Grigg 1974) do not reflect a virgin population. A fishery operated in this area during 1966-1969, which removed an estimated 2000 kg using tangle net dredges. Grigg (1974) indicates the 1971 survey was done in areas that had not been targeted by the fishery, but it is not clear how this was ensured, given the extensive nature of the fishery.

c) The repeat surveys were done using different methods which are not directly comparable. The first survey was based on 9 transects, each 5 m X 300 m, while surveys in 1983/1985 involved 3 transects each about 6 m X 1000 m, and the 2001 surveys were based on 25 areas, each 100 m^2. Therefore, these survey data cannot be used to make inferences about population density.

d) The first repeat survey was done in 1983, after 4 years of no fishing, so direct impacts of the fishery that operated from 1972-1979 are unknown. This suggests, however, a decline in the size of colonies which may be associated with the selective removal of the largest colonies. Grigg (2002) also suggests that the large number of 10-15 year size classes reflect settlement during the period of selective harvest, which would indicate that harvest actually increased recruitment. However, 10-15 year colonies would have settled largely before the selective fishery began (e.g. 1969-1973). In addition, another study (Grigg 1988) concludes that recruitment was density independent and mortality from harvesting did not affect recruitment.

e) The presumed increase in density during 1971-2001 (from 0.022 to 0.3 colonies/m^2) must be viewed with caution. First, different methods were used, different areas within the bed were examined during each of these time points, and the bed was found to be larger overall during the most recent (2001) survey. Accordingly, it is possible that high density areas were missed during the earlier surveys. Second, the density from 1971 to 1983 was virtually unchanged (from 0.02 to 0.022), which would suggest the fishery had no impact on abundance (since this reflects pre and post harvest). This is not plausible given the differences in size structure and the reported landings. There is also no indication that the surveys were done in the areas where the fishery operated (Parish 2007).

f) An increase in density does not necessarily equate to an increase in the effective size of the population. Because this is a branching coral species, a higher number of small colonies can occupy a given area than large colonies. These smaller colonies have fewer polyps and contribute less to future generations and overall may represent fewer individuals (polyps) due to the three-dimensional branching structure.

g) The 2010 FAO review also suggests that "recovery of the population from harvesting in the 1970s was also demonstrated by the increase in frequency of older year classes in 2001 compared to 1971, 1983 and 1985." The figure does show an increase in the frequency of intermediate classes, as compared to 1983 and 1985, but the population has not recovered to levels recorded in 1971, as the largest colonies were still underrepresented. An increase in the size of colonies would be expected for a species with such low rates of natural mortality after a prolonged absence of fishing (e.g. over 20 years from 1979 to 2001), solely due to growth of the smaller colonies. These data indicate that 20 years has not been adequate to allow for full recovery as the largest size classes are still absent. Furthermore, Parrish (2007) notes that *C. secundum* are much smaller in size at other locations.

h) Parrish (2007) surveyed six coral beds during 1998-2001, noting that colonies were most dense in the center of a patch, and they diminished at the edges. He reported densities of only 0.0056 colonies per m^2 area for *C. secundum* at Makapu'u and WestPac beds, which is substantially less than Grigg's estimates, further illustrating the difficulties in assessing decline. Parrish also noted that this coral was much less common at all other beds. Parrish (pers. comm.) also states that the abundance he reports is not directly comparable with Grigg's estimates because of different methods and possibly different sampling locations.

***Corallium lauuense*:** The 2010 FAO review concludes that there is no evidence of decline for this species and also states that it is one of the more common species of deep sea octocoral in Hawaii. While it is true that there is no evidence of decline, the reference to statements made by Baco and Shank (2005) are taken out of context. First, there are 100s of species of octocorals found in Hawaii that are not in the family Coralliidae, many of which are very rare. Second, these researchers never conducted quantitative surveys of the abundance of *C. lauuense*. Those studies that have quantitatively assessed this species (e.g. Grigg 2002; Parrish 2007) determined that:

1) *C. lauuense* has a small overall population size, occurring at low density/abundance on up to 16 areas in Hawaii, but it is not known from areas outside of Hawaii.
2) *C. lauuense* is the most abundant member of this family at three beds in Hawaii, occurring at densities of about 33 colonies per 100 m^2 area at Brooks, and about 15 colonies per 100 m^2 area at Keahole and Cross (Parrish 2007). Because the spatial extent of these populations is very small, total number of colonies in each area is very small (hundreds to thousands).
3) *C. lauuense* has been commercially harvested only once (61 kg from Keahole Bed in 1999-2000) during exploratory surveys. The effect of this is unknown as the bed has never been quantitatively surveyed. However, the removal was only 20% of the allowable quota and the fishery was subsequently discontinued because of marginal investment returns, both of which further support the conclusion that the coral was less abundant than previously thought.
4) This species is also highly vulnerable to overexploitation if the fishery in Hawaii were to become active again, as individual populations are small (the largest known population off Cross Seamount was estimated to only contain 2500 adult colonies; Grigg 2002). Populations are suffering from inbreeding depression, as heterozygote deficiency was noted in every studied population. If the fishery were to become active it is possible that it would qualify for Appendix-I within the near future.

***Corallium sp. nov*.** is found from Midway Island, Hawaii to Emperor Seamounts, 28^o-36^{o}N, at 1000-1500 m depth; the species is not known to occur anywhere else. There are no pre- or post-harvest data on population abundances, as these areas were never quantitatively assessed. However, two factors provide evidence that this taxa has undergone over a 90% decline:

1) This species was one of the major components of landings reported in the 1980s (pooled with landings data for *C. secundum* also from Emperor Seamounts), but has been rarely reported in landings data since 1990 (max = 1 ton/yr) even though a small fishery is still active (Fujioka 2008).
2) Survey data from the Emperor Seamounts undertaken by Japan in 2008 (Fujioka 2008) failed to identify a single large aggregation of this species.

Paracorallium japonicum occurs in the western Pacific off Okinawa and Bonin Islands, on banks between Okinawa and the island of Taiwan, off Pescadores Islands near the island of Taiwan, and in the South China Sea, 26^o-36^{o}N, from 100-300 m depth. There are no available data on population trends. However, this species is reported to be extremely uncommon, occurring at a very low density. One recent study, off Amami Island, southern Japan, identified densities of only 0.47 colonies/100 m^2 (Iwasaki et al. in press). It was first reported in FAO data in 1983-1984, when landings were their highest (10 tons/yr), and landings declined to 1 ton by 1991, fluctuating between 0-3 tons in subsequent years.

C. elatius occurs from the northern Philippines to Japan, 19^o-36^{o}N latitude, at 100-330 m (Grigg 2002). Isolated colonies have also been obtained from Guam, Mauritius, and the Solomon Islands, but no large populations of this species have been identified outside of Japan. The species first appeared in FAO landings data in 1983, and landings have fluctuated from 0-17 tons/yr (mean over 25 years = 6.85 tons, over 60% landed by Taiwanese fishermen). This is currently the dominant Pacific species landed today. No quantitative surveys showing trends in population abundance over time are available, yet most of the landings from both the islands of Taiwan and Japan are reported to consist of dead coral, which suggests healthy populations no longer exist in these fished areas.

C. konojoi occurs from the northern Philippines to Japan, 19^o-36^{o}N latitude, at 50-150 m depth, and around the Emperor Seamounts. This species was the dominant component of landings from 1965-1982 and the second most important species from 1983-1987, all of which was landed around Emperor Seamounts. Landings of this taxa declined to zero by 1989. It only reappeared in the FAO dataset at very low volumes in 2006-2008. While there are no current population trends or quantitative time sequences of population trends, the species is likely to have been extirpated from Emperor Seamounts, based on recent 2006 ROV surveys and 2008 drop camera surveys (Fisheries Agency of Japan 2008), and it occurs at very low densities in regional waters off the islands of Japan, Okinawa, and Taiwan.

C. rubrum, a species endemic to the Mediterranean and adjacent portions of the eastern Atlantic, has experienced both a historical extent of decline and recent rates of decline that exceed the criteria listed in Annex 5 guidelines for an Appendix-II listing based on catch data, population information, and size structure. There is also considerable evidence that deep water populations exhibit numerous vulnerability and risk factors that would lead to this species qualifying for Appendix-I in the near future if fisheries continue to expand into these areas.

1) The 2010 FAO review recognizes that "some fished areas in the Mediterranean demonstrate a historical extent of decline in a few metrics (trends in number of polyps per colony and population fecundity) commensurate with the Annex 5 guidelines on extent of decline for low productivity species." The review acknowledges that "there has been a clear over-exploitation of shallow water beds which has led to a shift in harvesting to deeper water colonies." Yet, there is also a contradictory statement that "decline to a lesser extent was found in the catches, maximum size of colonies, mean height and proportion of older colonies per stock."

2) The 2010 FAO review concludes that management measures have been implemented and recruitment appears strong, using Sardinia as the only example. While it is true that Sardinia has implemented new measures, these occurred largely because shallow populations have undergone such an extensive decline that it is no longer economically feasible to fish in these areas. In response to this, fishing in shallow water has been banned, while deeper areas have been opened, even though biological information on these beds is limited to a few recent studies. There has also been an increase in the minimum diameter from 7 mm to 10 mm. However, numerous problems remain:
   a) There is no quantitative evidence in any of these studies that recruitment in deeper areas is strong or has increased. High levels of recruitment are only reported in shallow populations that are not-commercially viable, have shorter generation times, and high turnover.
   b) Although the minimum diameter is larger, there is an allowance of undersized colonies. One recent study found that 50% of the colonies in samples landed were actually < 10mm basal diameter (Chessa and Scardi 2009).
   c) ROV surveys throughout deep water in Sardinia also showed that two of the four managed areas (southwestern and northern coasts) were overexploited as they were dominated (78% and 90%, respectively) by colonies that were < 10 cm, and 44-49% were < 5 cm. Also, 35% of the colonies in all areas were < 5 cm and only 23% were above 10 cm height (Cannas et al. 2009).

3) The 2010 FAO review stresses the opinion that catch data for the Mediterranean is not indicative of decline, including changes in fishing intensity, changes in management, and a shift in gear type used to harvest coral from non-selective dredges to selective SCUBA harvest. The review also incorrectly states that landings declined by only 40% between 1978-80 and 2004-07.
   a) In the Mediterranean, 12 countries report landings data to FAO. When examined as pooled data there is a sharp decline over 20 years, from a maximum of 98 tons in 1978 to 20 tons in 1998, which is nearly an 80% decline, not 40%.
   b) The decline may be partially attributed to a phase-out of the use of non-selective dredges, a reduction overall in effort, and a change in management schemes. However, these changes are not the only reason for the decline. SCUBA fisheries were first introduced in the 1950s, while the use of the coral dredge was not banned until 1989 (Sardinia only) or 1994 (throughout the rest of European waters). Landings were already less than 50% of 1978 levels (42 tons) in 1984. They remained at these low levels (32-48 tons) for the next five years, which was prior to the ban on the use of *ingegno*. Even in Italy, where the coral dredge was banned five years earlier than in other locations, landings had already declined from a peak of over 72 tons in 1978 to 40 tons in 1980, and 19.3 tons in 1985, with < 10 tons landed each year up to 1988. Even though landings in Italy following the ban were about half the amount prior to the ban, this reduction is minimal when compared to changes observed during years when the *ingegno* was still legally used.
   c) Landings reported by individual countries have continued to show sharp peaks and declines since inception of SCUBA fishing which are suggestive of the discovery of large aggregations of coral in a particular area, followed by rapid overexploitation of these populations.

4) The 2010 FAO review acknowledges the importance of size for colonial modular organisms, noting the decline in mean height for Spain from 61.8 mm to 27 mm from 1986 to 2003. While the Panel concluded correctly that colony size should be considered in addition to abundance due to the exponential increase in larval production with the increase in colony size and complexity (more branches), they incorrectly conclude that a shift from 61.8 mm to 27 mm represents a 56% decline in reproductive potential. This is determined by examining solely a two-dimensional measure – the reduction in height. The review fails to take into account the change in branching structure (e.g. loss of 2^{nd}, 3^{rd}, or 4^{th} order branches) associated with a shift from larger to small colonies, which accounts for most of the loss of reproductive potential. In other studies, based on measurement of the total length of all the branches, this shift has been estimated to be equivalent to 80-90% decline (Bruckner 2009).

5) The introduction of SCUBA fishing for *C. rubrum* in the 1950s allowed divers to access areas that had been previously excluded from non-selective coral dredges – including caves, ledges, crevices, and overhangs. Landings by this fishery were initially very high, and several populations that are considered non-commercially viable today supported SCUBA fishermen in the 1950s and 1960s. For instance, Liverno (1983) provides reports from three locations where divers initially worked very shallow until resources were depleted, progressively expanding efforts into deeper areas as shallow populations were overexploited (Tsounis et al. in press).

6) *C. rubrum* is now acknowledged to be widely overexploited in shallow water (20-60 m). Today, most colonies landed from shallow areas throughout the Mediterranean are very close to the minimum allowable size that has been implemented in many locations since the 1980s (7 mm basal diameter), very few larger colonies are in landings, illegal harvest is expanding, and undersized colonies are being identified in landings. The size structure of populations in fished areas has been altered such that reproductive potential has declined by 80-90%. The only locations where the coral remains abundant is in shallow ephemeral populations that are not considered commercially viable (due to their small size, short generation time, and rapid turnover) even though they once supported fisheries (Tsounis et al. in press). Although a general conclusion reached at all recent consultations and workshops is that shallow areas throughout the region are overexploited, fisheries c*ontinue t*o target these areas throughout the region (with exception of Sardinia, where shallow harvest has been banned because populations are no longer commercially viable). This problem is further exacerbated by poachers, which are reported to be more numerous in Spain than licensed fishermen (Tsounis et al. 2009.), and there is the continued use of non-selective coral dredges illegally in places such as Tunisia (Mustapha 2010).

Use of catch data for Pacific Coralliidae populations

The 2010 FAO panel felt the use of the catch data were not reliable as an indicator of population decline. They are, however, useful to characterize the boom and bust cycles. They state several concerns with these data, including economics, management practices, inability to separate live and dead coral in landings, spatial differences, differences in fishing practices, and other factors. While there are inherent problems associated with the landings data, these data provide a strong indication of declines in the resource and many important points have been overlooked in their review. Furthermore, the 2010 FAO review is incorrect in stating that the "pooled regional catch statistics are the only information in the proposal available to describe historical declines in the different parts of the Coralliidae range …" when referring to Pacific *Corallium* populations. By examining these data by species, and comparing the changes with published information on the locations of fisheries and field surveys that have been done in these areas, it is possible to identify locations that have been overexploited and to infer levels of decline for the species overall.

1) **Landings in the Pacific:** The 2010 FAO review concludes that "total harvesting of *Corallium* in the Emperor Seamounts, western Pacific, by Japan and Taiwan Province of China declined to small fractions of their maximum values between 1979-81 and 1989-91 – 4% and 1% respectively (Table 2 in proposal). Total reported landings of Coralliidae in the Pacific declined to about 3% of the historical peak of 350 tons between 1984-86 and 2004-07 (Fig. 4)." While the statistics are correct, it is incorrect to state that the historical landings are from the western Pacific, and it is misleading to lump all of the different species together. The majority of the landings (in fact all of the *C. konojoi, C. secundum,* and *C. sp. nov*.) from the 1960s to 1989 were from international waters in Emperor Seamounts, with very little from other western Pacific waters. In contrast, *C. japonicum* and *C. elatius* are harvested only off the islands of Taiwan and Japan in national waters, and are not known to occur around Emperor Seamounts.
2) **Economics:** The changes in landings in the Emperor Seamounts have been attributed to a decline in the resource (CoP15 Prop. 21) as well as a decline in the wholesale value of the product (Kosuge 2007), both of which could render fisheries uneconomical. There are two periods when the wholesale value of *C. konojoi* declined to levels that made fishing uneconomical (1967 and 1971-1972), yet fishing resumed a few years later and landings of this taxa subsequently increased (Fujioka 2008). By 1988, *C. konojoi* beds were reported to be overexploited (Fujioka 2008), a fact supported by landings data which remained at < 3 tons per year over the last two decades (FAO 2008), which is < 1% of the landings during peak years. Markets were also reported to be flooded with low quality Midway deep-sea coral in 1981-1982, which caused the price of *Corallium* to decline to less than US$100/kg (Grigg 2002). According to Kosuge (2007), Japan and Taiwan abandoned fisheries in the central Pacific due to high costs of harvesting coral in deep water and increased landings of low quality coral, but presumably not due to a strong decline in abundance or biomass. Interestingly, landings data of Midway deep sea coral does not show this trend, as this species (lumped with *C. secundum*) was not reported in FAO data until 1982; instead, *C. konojoi* showed a decline during this period, and subsequently both landings of *C. konojoi* and Midway deep sea coral dramatically increased during 1983-1987. Furthermore, wholesale prices of *Corallium* rapidly increased to unprecedented highs in the late 1980s and 1990s, yet landings since 1989 have remained at historic low levels. If abundant coral resources still remained off the Emperor Seamount Chain, landings should contain living, large old growth colonies, rather than only low quality coral as reported by Kosuge (2007). Declines in the density and abundance of the coral would also trigger increases in the amount of effort needed to harvest the same amount of coral, also driving fisheries costs up. Even though the two taxa known only from the Emperor Seamounts still show up in FAO data and Taiwanese coral draggers have been observed fishing for coral in this location (Fishery Agency of Japan 2008), production over the last two decades is < 1% of the yield in the 1980s (FAO 2008).
3) **Dead corals in the Pacific:** The 2010 FAO review also states that Japan and the island of Taiwan purposely target dead coral. There is no published evidence that this is the case. Furthermore, this is

economically counter-intuitive as this coral is lower quality and has a lower wholesale value. Table 2 identifies a decline in the amount of live *C. konojoi* during 1989-2008, while noting no trend for the other two species harvested in these regional waters (*C. japonicum* and *C. elatius*). What is alarming is the small amount of live coral in landings today (5-16%). Prop. 21 concludes that the increased landings of dead coral are primarily due to the fact that the beds have been overexploited and only isolated colonies remain as well as dislodged colonies previously detached by trawling activities and other physical stressors. The FAO panelist from Japan suggested that the target for these non-selective fisheries is soft bottom areas, whereas the bulk of the coral beds are left unexploited. While there are no published data available showing the exact location of corals within the 28 known beds, this seems highly improbable as a) videos available on the internet (www.Sangokuiai.jp) showing the selective harvest off Okinawa illustrate a low density and abundance of corals in the family Coralliidae; b) if higher density areas exist the submersible could selectively remove colonies from these areas with minimal habitat impacts, thereby increasing yield; and c) recent surveys done in known coral areas off Okinawa identified densities that are 5-100 times less (0.05-0.005 colonies/m^2) than reported in populations examined off Hawaii (0.2-1 colony/m^2), and no high density patches of coral were identified.

4) **Harvests off Japan:** Table 3 in the 2010 FAO review indicates that catches in the three areas in Japan increased over a 20 year period from 1989 to 2009. While there are no landings data included to determine the level of increase, pooled landings data from FAO suggest the increase has been minimal, with large fluctuations in intervening years. Data presented in Carleton and Philipson (1987) and Grigg (1993) for Japan show a 90% decline in landings from 1979 to 1989 (from 14,516 kg to 1057 kg), which is not mentioned in the review. Pooled landings reported by Japan in 1989 was 3.8 tons while in 2007 it was 4.6 tons, with the years in between varying from 0.1 to a maximum of 4.7 tons; this does not represent a substantial increase and it is still only about 35% of the coral landed in these areas in 1979. Furthermore, an examination by species does not show increases during 1989-2008. Landings data for the species landed at the highest volume (*C. konojoi*) was 2.2 t in 1989 and 2.1 in 2008.

Applicability of criteria to the family Coralliidae

There are numerous difficulties in applying the quantitative guidelines in the footnote for commercially-exploited aquatic species in Res. Conf. 9.24 (Rev. CoP14), largely because they do not work well for widely distributed, sessile colonial marine organisms. They were developed for fisheries species which are unitary organisms that are free swimming. The 2010 IUCN/TRAFFIC analysis correctly concludes that the "language in the footnote is derived from conventional fisheries biology and management practice, which itself can only meaningfully be applied to conventional fisheries stocks. It is, arguably, even less relevant to the case of Coralliidae than the general criteria and guidelines in the Resolution." However, the available evidence strongly suggests that regulation (i.e. inclusion in Appendix-II) is required to ensure that the harvested species do not become eligible for inclusion in Appendix-I in the near future (Annex 2a A), especially for *C. rubrum* and *C. lauuense*, while regulation is required to ensure that harvest is not reducing the wild population to a level at which its survival might be threatened by continued harvest or other influences (Annex 2a B) for all other species.

The ICUN/TRAFFIC review suggests that there is little evidence that harvest is likely to threaten the survival of *C. rubrum* as a result of reduced colony size or associated reduction in reproductive potential. They state "no definite link has been established between recruitment rates (as opposed to recruitment potential) and colony size or absolute production of larvae, nor has it been clearly demonstrated that small colonies or those at lower densities are inherently more vulnerable to extinction." Bruckner (2009) shows the exponential reduction in larvae associated with a reduction in size and also discusses limitations to reproduction due to the sessile nature of the species and the requirement for internal fertilization which clearly becomes limiting as density declines; while these factors may not affect the ability of a coral larvae to settle and recruit, it affects the ability of colonies to successfully produce larvae and hence, the number of larvae that are able to recruit. It is known that only a small portion (< 1%) of coral larvae ever survive to settlement stage, and if you start with a lower number of larvae, the number available to recruit declines even more. There are numerous studies from other branching octocorals as well as stony corals that show similar trends, illustrating the importance of large size colonies for survival of the taxa. For both *C. rubrum* and *C. secundum*, peer-reviewed publications indicate these species are recruitment limited; the only exception to this may be the two ephemeral shallow water populations off France and Italy that are dominated by high densities of non-commercial-sized small colonies, but even in these areas recruitment is highly variable spatially and temporally. Furthermore, areas in shallow water with high abundances of small colonies (e.g. non-commercial populations) have undergone widespread mortality events. While this has not resulted in extinction, these populations are much more susceptible to other threats such as summertime temperatures that exceed their tolerance thresholds; more than half the small colonies within shallow populations are affected by high rates of mortality due to natural factors such as sponge bioerosion and predation which is less common in populations dominated by larger corals. While fragmented populations are likely to remain, especially in deeper water in areas not accessible to fishing, these represent isolated subunits that are unlikely to interbreed; when combined with localized settlement and limited potential for dispersal, it is highly likely that individual patches that are extirpated will never recover, further reducing the genetic diversity of the species (Santangelo et al. 2009).

Adequacy of existing management

The 2010 FAO review stresses the importance of local management. They state that improvements have been made in some areas and populations appear to be well managed and are showing high recruitment. At the workshop in Naples, representatives from many Mediterranean countries presented information about existing and planned coral management strategies. No Mediterranean country has a comprehensive management plan for *C. rubrum* that is based on population assessments of local breeding populations. There are various measures in place such as licensing of fishermen, quotas, minimum size, gear restrictions, and, more recently, limits in some locations on harvest in shallow water to allow time for these depleted populations to recover. Unfortunately, these measures are not adequate to protect the coral, as the shallows are depleted and resources in deeper water appear to be in better shape, yet they reflect recovery that has occurred over about a 20 year period since the ban on non selective dredges. As evidenced by areas that have been closed, a 20 year rotation is inadequate, as colonies have only achieved about 25% of their MSY and they are still considerable smaller in size than that observed in the 1950s and 1960s (Tsounis et al. 2009). In many countries certain areas have been closed shortly after the emergence of fishing, due to commercial extinction of populations, with fishermen moving into new areas. This type of rotational harvest should be abandoned as, even at small scale, populations and patches should not be harvested in a way that completely depletes the largest size class (Tsounis et al. 2010). Perhaps one of the largest problems with management is that permits are issued for harvest in areas even though there is inadequate information on the status of populations or biological parameters of the corals in those populations; to date population surveys have not been undertaken in the vast majority of areas where fisheries occur.

1) For *C. rubrum*, only one location (Sardinia) has adopted new measures that may allow sustainable harvest, but the current management strategy is relatively new, implemented to prevent further overexploitation of shallow resources. First, the requirement for an increased minimum size (10 mm diameter) is necessary, but there still is the allowance of the take of smaller colonies (to 8 mm in size), so this measure is basically similar to that adopted by many countries over 20 years ago. An 8 mm basal diameter represents a size that is well below MSY. Second, while there are new studies in these deep water environments, few quantitative data exist on population structure and no information on biological parameters (e.g. growth rates and recruitment rates) is available for deep water populations. Recent studies from Sardinia suggest deep water populations (60-150 m) are reported to be in better shape than shallow areas (Cannas et al. 2009), based on the indication that populations dominated by larger sized corals. Nevertheless, this study acknowledges that colonies are much sparser and the data show that more than one third of all colonies examined in transects were still < 5 cm and only 23% are above 10 cm height. Even though there are larger colonies in deep water off Sardinia, it is unclear whether these are abundant enough to support a sustainable fishery, as biometrical analyses done by Chessa and Scardi (2009) showed a very large percentage of the corals harvested by fishermen in deep water off Sardinia were well under the minimum allowable size of 10 mm (basal diameter).
2) For Japan, the 2010 FAO review indicates that management is effective as “only three out of twenty-eight known areas with coral beds have been assigned for harvest.” The review also indicates that these areas have supported fisheries for over 20 years and landings are reported to have increased over this time. There is also the indication that “non selective gear is used only in soft bottom habitats and large assemblages of the coral are left untouched on rocky outcrops.” Protection of major assemblages and closure of most known coral beds is a positive step towards sustainable management. However, there is no quantitative evidence of the occurrence of these large aggregations – in fact the only quantitative surveys conducted to date show densities that are well below that reported for other Pacific species in Hawaii. Landings have also remained at very low levels, according to FAO data, even though there is no harvest quota and there is a high demand for these corals.
3) The use of size and quota-based restrictions provides a viable approach to sustainable management, but the relevant biological parameters must be known. Much of the historic measures implemented in Hawaii and the Mediterranean were based on incorrect estimates of age. More accurate aging studies have shown that the generation length is much greater than previously proposed for both *C. rubrum* and *C. secundum*. For both *C. secundum* and *C. rubrum*, estimates of maximum sustainable yield (MSY) and management measures (such as existing minimum size of harvest) are now known to be largely inadequate for sustainable management because these were based on an incorrect higher estimated rate of growth, earlier age of first reproduction, and a shorter lifespan. For instance, about 25 years ago recommendations were made to increase the minimum size of harvest for *C. rubrum* to at least 10 mm diameter, yet this was never adopted. These recommendations suggested that MSY for *C. rubrum* could be

achieved if the coral was harvested at an age of at least 80 years; instead, corals have continued to be harvested at a much younger age of about 11 years or less, which corresponds to a basal diameter to 7 mm, the smallest diameter that interests the industry. As a result, changes in size structure of *C. rubrum* in fishing yields has been observed in most areas, with a shift towards smaller size and absence of large colonies in landings (Santangelo et al. 2009).

Implementation issues

The 2010 FAO Expert Advisory Panel considered certain aspects of implementation of a CITES Appendix-II listing for Coralliidae and recognized efforts by the proponents to address implementation issues. The panel discussed introduction from the sea, the making of CITES non-detriment and legal acquisition findings, identification of specimens in trade, and the likely effectiveness of an Appendix-II listing. The panel correctly noted that, should the listing be adopted, exports and introductions from the sea of Coralliidae specimens will require issuance of CITES documents (export permits and introduction from the sea certificates) supported by non-detriment findings. The panel raised particular concern with regard to identification of worked specimens of Coralliidae to species level and the development of a "suitable protocol" for pre-Convention specimens. Although the panel did not recommend an Appendix-II listing for Coralliidae it stated that "since international trade is a driver of their harvesting, if such a listing resulted in a tightening of their management, it could lead to an improvement of their status." The panel expressed concern, however, about the administrative burden associated with a listing.

Like any new CITES Appendix-II listing, there will be challenges associated with effective implementation. We do not expect any of these challenges to be insurmountable. Other coral taxa have been listed in Appendix II for more that two decades, including black corals (Order Antipatharia) which, like red and pink corals, are harvested primarily for use in jewelry. We believe the CITES Appendix-II listing has been effective in ensuring that the international trade in black corals is sustainable and that it would likewise prove effective for red and pink corals. Following CoP14, the United States provided partial funding for and participated in two workshops on the science and management of and international trade in species in the family Coralliidae. Based on discussions at CoP14 and information gathered during the workshops, we identified several measures we believe will help ensure the effectiveness of a CITES Appendix-II listing for this taxon. CoP15 Prop. 21 and CoP15 Doc. 54 provide steps to address implementation issues associated with a potential listing. We note that CoP15 Prop. 21 includes an annotation that would delay the entry into effect of the listing for 18 months to enable Parties to resolve technical and administrative issues. Specific issues raised by the panel are discussed below.

1) **Identification of species in trade.** The panel noted the difficulty of identifying Coralliidae specimens to species when they have been processed into jewelry or other products. We acknowledge this difficulty and have recommended in CoP15 Doc. 54 that Parties agree to amend Resolution Conf. 12.3 (Rev. CoP14) to allow worked specimens of Coralliidae to be recorded on CITES documents at the genus or family level. This recommendation is similar to provisions in Resolution Conf. 12.3 (CoP14) for certain specimens of coral rock in the order Scleractinia and to what has been agreed for certain taxa of hard corals in Notification to the Parties No. 2003/020. We recommend that the Parties agree that live and raw (unworked) specimens of Coralliidae be identified to the species level. Sweden, on behalf of the member States of the European Community, has made similar recommendations for black coral (see CoP15 Doc. 37). .We note that there are currently four Coralliidae species listed in Appendix III (listed by China in 2008) and acknowledge the difficulty of identifying worked specimens of these species in trade.

   The United States, in collaboration with TRAFFIC Canada, is developing an identification manual that includes keys, photographs and descriptions to assist in differentiating Coralliidae from other corals in trade, including look-alike taxa, and also to discriminate individual species in the family Coralliidae. The guide will be completed by December 2010 and will be available in printed and electronic versions. A reference collection is also under development.

2) **Pre-Convention specimens.** We are aware that entities involved in the red coral industry maintain stockpiles of raw and semi-worked Coralliidae specimens. Stockpiled coral harvested prior to a listing would be considered 'pre-Convention' specimens for CITES purposes and could be traded under a CITES pre-Convention certificate. This situation is not unique to Coralliidae and Management Authorities will be able to draw on past experiences to establish procedures for trade in pre-Convention specimens. During the 18-month delayed implementation period, Management Authorities in countries with stockpiled Coralliidae specimens should work with the industry to develop a process for preparing inventories or otherwise accounting for pre-Convention material.

3) **Legal acquisition findings.** The panel noted that the high value of Coralliidae products might encourage illegal harvest and trade and considered that certifying harvest as having occurred in international waters when it had been illegally harvested within a country's national jurisdiction "would appear to be a potential problem." We note that the market conditions that serve as an incentive for illegal harvest and trade exist whether or not these corals are listed under CITES. One of the benefits of a CITES listing is that it provides a mechanism for cooperation between countries to detect and curtail such illegal trade.

4) **Paperwork associated with tracking.** We acknowledge that there is a paperwork burden associated with any CITES listing. The panel raised concerns about the "significant amount of paperwork [that] would be required to track all items in trade " To help address these concerns we have proposed, in CoP15 Doc. 54, that Parties agree to amend Resolution Conf. 13.7 (Rev. CoP14) to recognize a personal effects exemption for up to seven specimens of finished Coralliidae items with a specified maximum weight, which would reduce the paperwork requirements for, for example, specimens purchased by tourists while traveling abroad, with minimal impacts on the conservation benefits of the listing.

5) **Non detriment findings:** At both workshops there were general discussions on the subject of non detriment findings. Participants explored several possible improvements to national management and potential regional management approaches for widely distributed species such as Mediterranean *C. rubrum*. The potential challenges regarding non detriment findings are not unique to the family Coralliidae; during the 18 month period of delayed implementation, Parties will have the opportunity to address any potential issues related to making non detriment findings.

In considering the likely effectiveness of a potential CITES Appendix-II listing, the panel concluded:

> *The panel is convinced that the Coralliidae do require to be managed within EEZs and in areas beyond national jurisdiction in a fashion which takes account of their long life and their ecological role. The Panel considered that these long-lived species require appropriate and effective local management such as harvest restrictions and rotational closures and protected areas to facilitate their sustainable harvest.*

We agree with this assessment and note that the findings required under a CITES Appendix-II listing will promote the implementation of precisely the types of management measures the panel recommends.

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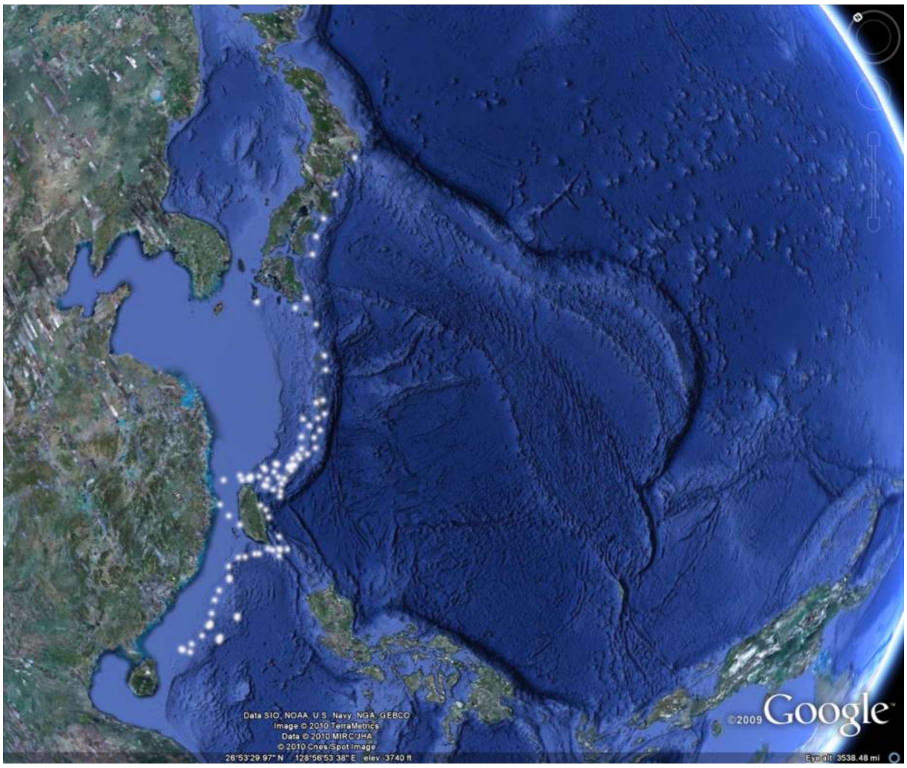

Fig. 1. Known distribution of *Corallium konojoi* and *C. elatius*. *Paracorallium japonicum* also occurs in the same area, but only extends from Ryukyu Archipelago north. FAO (2009) also identifies the occurrence of these species in 28 locations off the Philippines, but specific locations are not reported. Data from Bruckner and Roberts 2009; Nonaka and Muzik 2009.

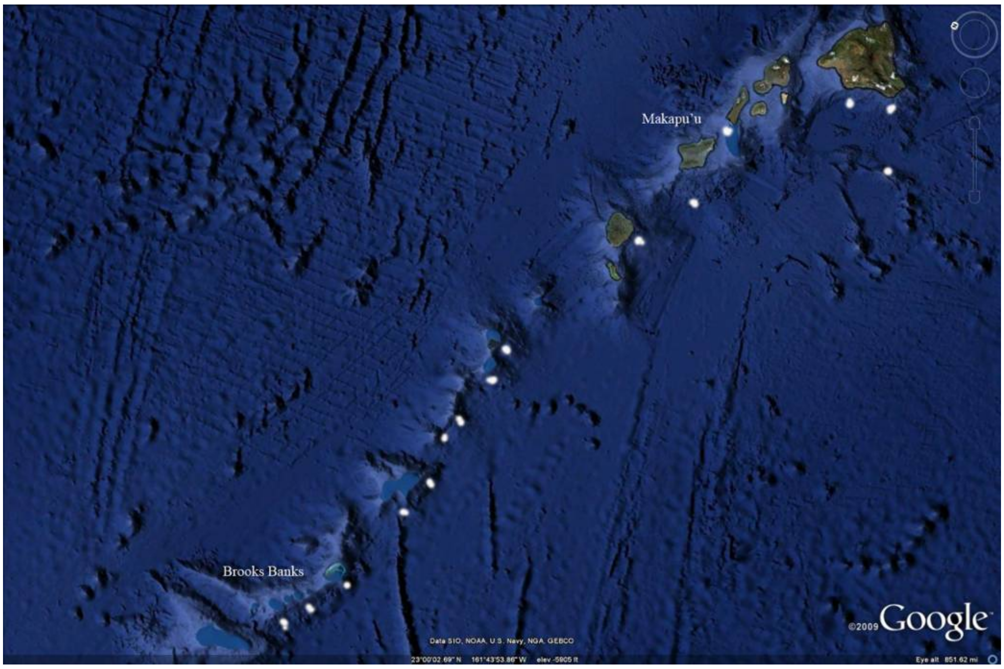

Fig. 2. Locations known to contain *C. secundum* and/or *C. lauuense* in Hawaii. Although these species occur over a large distance, individual beds are small (< 5 km^2 each), very isolated, and restricted to very specific habitats (e.g. channels between islands and tops and slopes of seamounts in areas of high currents).

Table 1. Species in the family Coralliidae. Species of commercial value are in bold Torntore (2002). [3] refers to two un-described species from Midway Island in deep water: garnet coral occurs at depths of 700-900 m and deep sea coral occurs at depths of 800-1500 m.

SPECIES	DISTRIBUTION	Depth (m)	CITATION
C. abyssale	Hawaii	2405	Bayer 1956; 1964
C. boshuense	Boso Peninsula, N of Sagami Bay, Japan	540	Kishinouye 1903
C. borneense	North Borneo	534	Bayer 1950
C. ducale	Eastern Pacific: Mexico, Guadalupe Island	1000-2000	Bayer 1955; 1964
C. elatius	Western Pacific: northern Philippines to Japan and the island of Taiwan; Guam, Solomon Islands, Mauritius, Palau	150-330	Ridley 1882
C. halmaheirense	Indonesia	1039	Hickson 1907
C. imperiale	Eastern Pacific: Baja California, Mexico, Guadalupe Island	600; 1000-2000	Bayer 1955; 1964
*P. inutile**	Japan, Tonga[2]	100-150;300-350[2]	Kishinouye 1903
P. japonicum*	Western Pacific : Japan, Okinawa and Bonin Islands; Vanuatu[2]	80-300; 250-450[2]	Kishinouye 1903
C. johnsoni	Northeast Atlantic: Ireland	1340	Gray, 1860; Bayer 1964
C. kishinouyei	Cross Seamount: Hawaii	1145	Bayer 1996
C. konojoi	Western Pacific from Japan to northern Philippines; Palau; Chinese islands of Hainan, Solomon Islands[2]	50-200; 262-382[2]	Kishinouye 1903
C. lauuense (C. regale)	Hawaii, American Samoa	365-580	Bayer 1956; Baco and
C. maderense	Eastern Atlantic: Ireland	753	Johnson 1898, Hickson 1907
C. medea	Western Atlantic: Cape Hatteras to Straits of Florida; oceanic seamounts off Brazil	380-500; 522-567	Bayer, 1964, Castro et al. 2003
C. niobe	Western Atlantic, Florida USA	650-670	Bayer, 1964
C. niveum	Pailolo channel , Hawaii	230-280	Bayer 1956
*P. nix**	New Caledonia	240	Bayer 1996
C. pusillum	Izu Island, Japan		Kishinouye 1903
C. reginae	Indonesia, Timor Sea	122 m	Hickson 1905
C. rubrum	Mediterranean and E. Atlantic: France, Spain, Italy, Greece, Tunisia, Corsica, Turkey, Sardinia, Sicily, Portugal, Morocco, Canary and Cape Verde Islands.	5-300	Linnaeus,1758; Weinberg, 1978
*P. salomonense**	UK: Chagos Archipelago, Indian Ocean	217-272	Bayer 1993
C. secundum	W. Pacific waters around Hawaii, Japan and the island of Taiwan; Chinese islands of Hainan, in 'straights' of Hong Kong, American Samoa, Emperor Seamounts	231-564	Dana 1846; Bayer and Grigg, 1976
*P. stylasteroides**	Mauritius; western Samoa[2]	136; 350-360[2]	Ridley 1882
C. sulcatum	Boso Peninsula, N of Sagami Bay , Japan	180-540	Kishinouye 1903
*P. thrinax**	New Caledonia	240	Bayer 1996
*P. tortuosum**	Pailolo channel, Hawaii, Tonga[2],	153-408; 325[2]	Bayer 1956; Bayer and Grigg 1976
C. tricolor	Eastern Atlantic		Johnson 1898
C. sp. nov. [3]	Midway Island to Emperor Seamounts	700-1500	Grigg, 1982
C. variablile	Ceylon, Indian Ocean		Thompson and Henderson 1906