NON-DETRIMENT FINDING FOR CITES-LISTED CORALS IN INDONESIA

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I. BACKGROUND INFORMATION ON THE TAXA

1. BIOLOGICAL DATA

1.1 Scientific and common names

Species considered in this cases study are known by the common name "stony coral". This included the order Scleractinia, which is represented by 17 families, 109 genera and more than 800 species of corals. Indonesia is located within the center of biodiversity with some 590 described species of coral, belonging to 82 genera (Best *et al.* 1989; Wallace *et al.* 2000; Veron 2002; Hoeksema 2006). Because of the high diversity of corals, and ongoing taxonomic revisions, it is not possible to name all coral species, let alone to include the synonymy, since many coral taxonomists are still in disagreement. Only a small portion of the stony corals found in Indonesian waters are currently being extracted for international trade. These are listed in Appendix 1. Beside scleractinian coral, two other anthozoan corals, *Heliopora* (blue coral) and *Tubipora* (organ pipe coral) are listed. There is also one group of hydrozoan corals in two families, the Stylasteriidae (*Distichopora* spp.) and Milleporidae (*Millepora*; fire coral).

1.2 Distribution

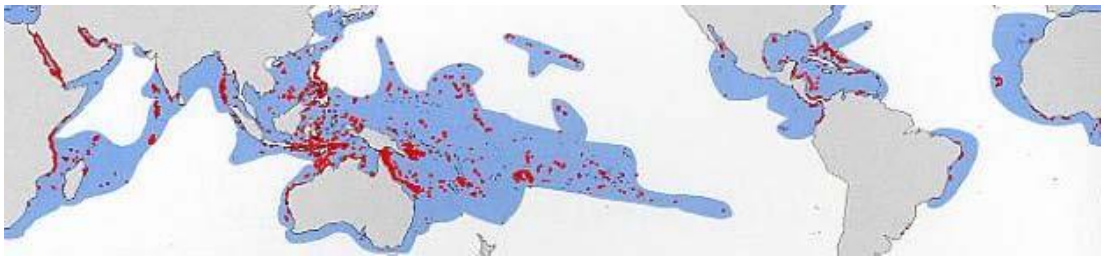
Indonesia has the largest and most extensive coral reefs ecosystem in the world. These are estimated to cover some 87,500 square km or 14% of the total area of corals reefs found worldwide (Tomascik *et al.* 1997). Coral reefs extend nearly 5,000 kilometers from east to west and 1,800 kilometers from south to north. The highest diversity of corals occurs in insular Southeast Asia, in the western Pacific Region (Equatorial Indo west Pacific, stretching from Sumatra and Java, Indonesia in the Southwest, Sabah and the Philippines in the north west; and Papua New Guinea in the north east) with diversity diminishing rapidly along latitudinal gradients. The highest diversity is due to the occurrence of various unique and complex ecosystems and existing external factors that provides the support make it possible for the marine biota to grow and develop optimally. Individual sites of reefs such as in Raja Ampat, Banda and Derawan may have more than 300 or more species. Therefore, it is not surprising that the sea around Sulawesi, Maluku and Papua becomes the center of high biodiversity in the world and is also known as one of the origins of various marine organism (Veron, 1995; Wallace et al., 2000; Spalding et al., 2001). (Veron 1995; Wallace *et al.* 2000; Spalding *et al.* 2001)

It is difficult to clarify the distribution of coral species in Indonesia one by one, but in general coral species appear to be distributed relatively evenly throughout the Indonesian waters (Suharsono 2008). Nearly all Indonesian coasts are covered by coral reefs, except for the east coast of Sumatra, the north coast of Java, south coast of Kalimantan and the south coast of Papua. Many coral species are very abundant, occurring in a wide variety of habitat types extending from shallow nearshore locations to deeper offshore shelf edge reefs; other species have a restricted distribution, occupying specific habitat types where they may occur at a low density. The dominant species in nearly all Indonesian waters are respectively *Acropora*, *Montipora* and *Porites*. As an example of corals distribution in Indonesia, research in Raja Ampat, Papua identified 456 coral species of 77 genera (Veron 2002). In Derawan Island, East Kalimantan, some 444 species occur and in Banda Island, 330 species (Suharsono *et al.* 2003). Coral distribution, as well as genera and species distribution in Indonesia can be seen in figures 1, 2 and 3.

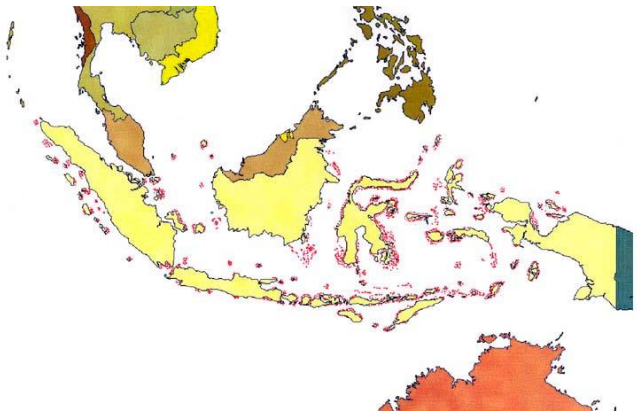
Most corals harvested to supply international markets come from areas relatively close to Java Island, Nusa Tenggara and Sulawesi, while those from other areas are as yet not utilized. At least some studies suggest that harvested areas can still support collection at the same levels as they did historically, based on the premise that the targeted species still exhibit the same size frequency distribution and the same number of reefs are being targeted (Suharsono, pers. Obs.).

Coral reefs with abundant coral cover about 250.000 km^2 of the earth surface. Coral reef (in red) always have coral, but zooxanthellate corals occur beyond the latitudinal range of reef (in blue).

The number of genera of reef corals occuring in various tropical regions (After"Distribution of Reef Building Corals' J.E.N. Veron. Oceanus, V ol 29. No. 2, p.27, 1986. Copyright ©1986 Woods Hole Oceanographic Institution).



Source: Veron (2000)



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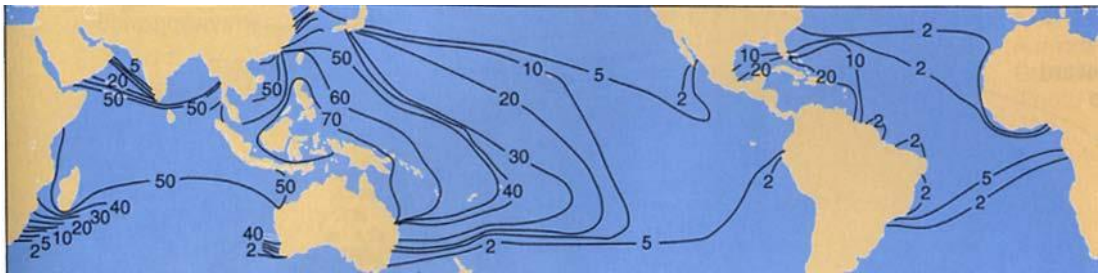

Source: Veron (1986)

Figure 1. Coral reefs distribution in Indonesia.

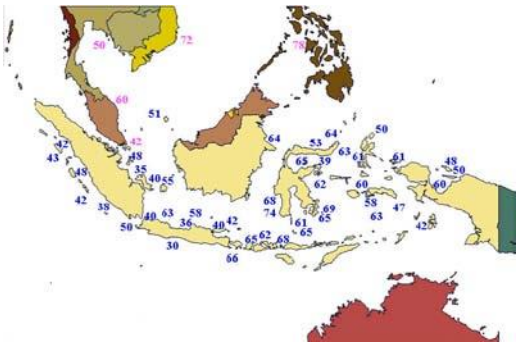

Figure 2. Distribution of coral genera in Indonesia. Total 83 coral genera found in Indonesia (Hadi *et al.* 2020a).

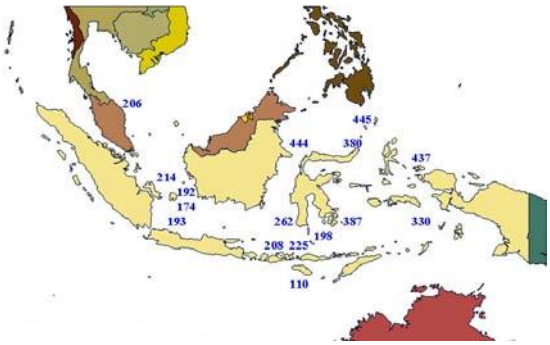

Figure 3. Distribution of coral species in Indonesia. Total 590 coral species found in Indonesia (Suharsono 2017).

1.3 Biological characteristics

1.3.1 General biological and life history characteristics

Corals grow and develop properly in clear water with optimal temperature between 28 – 30 °C and salinity of 32-34 °/₀₀. Vertical distribution of living corals in western Indonesia ranges between 1 – 20 m, while in the middle and eastern Indonesia they can grow in the depth of 40 m. Corals are differentiated into ahermatypic and hermatypic types. While the hermatypic corals is further sub-divided into reef building coral and non-reef building coral.

Stony corals include two classes of Cnidarians (Anthozoan and Hydrozoans) that secrete calcium carbonate skeletons. All Cnidarians have a sac-like body cavity (coelenteron) with a single opening which serves as mouth and anus. The opening is surrounded by tentacles with stinging cells. The body wall has two layers separated by a jelly like mesoglea. The animal (called the polyp) is sedentary and may be solitary and almost all coral are colonial, with individual polyps connected to each other via a series of tubes. Polyps range in size from less than 1 mm to more than 250 mm.

Some of the Indonesian coasts do not support coral growth because they are located close to big river mouths. River waters decrease the salinity and increase the turbidity of sea water, reducing the amount of sunlight available for photosynthesis by the symbiotic zooxanthellae within the coral tissue. High rates of sedimentation near river mouths also will smother and kill corals, unless they have a well developed ciliary mucus system.

Corals have occurred throughout most shallow marine environments surrounding Indonesia for million of years, especially those living around the Sulawesi Sea and the Banda Sea. In contrast, coral reefs found in the Java Sea and the Natuna Sea, particularly those growing in the Sunda Shelf and Sahul Shelf(shallow water between Australia and Papua), only became established about 8,000 years ago, during a period of rising sea level once shallow coastal areas were inundated with sea water.

Corals are invertebrates with simple body structure in tubular form, measuring between some millimeters to a few centimeters depending on the species. Corals may have separate sexes, while many exhibit both male and female reproductive structures

(hermaphrodites). Recent research indicates that corals can also reverse the sex or sex change (Loya dan Sakai 2008). Some species of corals exhibit mass spawning events once or twice per year, While corals in the tropical area such us in Indonesia reproduce all the year around; these corals release egg/sperm bundles into the water column for external fertilization. Other corals are known as brooders, where the female takes up sperm from the water, fertilizes the eggs internally, which develop into planulae larvae before being released. carry out external fertilization by releasing the eggs and sperms into the water. Corals that are known as brooders release well developed larvae that tend to settle on the bottom within hours to days, relatively close to the parent, while externally fertilized larvae require many days to weeks to develop, before settling on the bottom. Larvae from broadcast or spawner corals can be transported great distances before settling and recruiting to a reef.

Corals can reproduce sexually as well as asexually. Asexual reproduction occurs by fragmentation, budding and 'blubbing'. Branching corals usually propagate from detached branches that have been broken via physical disturbance (high wave action, ship groundings) or bio-erosion; these branches can reattach to the bottom and regrow into a new colony. Fragmentation is also done in solitary coral of genus Diaseris and Zoophylus which after reaching certain size they will fragment. Budding is commonly carried out by corals of the Family Fungiidae which are mostly solitary corals; under stress these corals often develop buds which can form new individuals. Branching corals of the Genus Goniopora also carry out propagation activities by 'bail out' that is by fragmentation of the polyp through forming small lump which then separates from the mother to become an individual of its own.

Corals that live in subtropical seas sexually reproduce once a year in the dry season, immediately before or after the full moon (up to 5-7 days after the full moon) in a tightly controlled mass spawning event. Brooding corals in Indonesia may reproduce all year round, with a peak reproductive event in August. Some corals, such as the brooding species Pocillopora damicornis can produce 300-500 larvae per day/colony. This species will mature at about 2 years when it achieves a minimum size of 10-15 cm in diameter. Spawning occurs in the night prior to the full moon at the time of low tide (Rudy 2006; Munasik 2008). They spawn or release the larvae at night to minimize the risk of predation. Spawning occurs during low tide to maximize possibilities of fertilization. The fertilized eggs and larvae float on the surface of the water, and are transported by water currents. Planulae may float for hours to days (or even weeks in some cases) until they become competent and identify a suitable hard substrate, upon which they will settle and attach to the substrate. As soon as the coral larvae find a proper place, they will begin to metamorphose into a polyp and begin depositing skeletal elements. Some larvae have symbiotic algae in their tissue which came from the parent, while others must acquire the zooxanthellae from the water column. The coral larvae are well distributed throughout Indonesian waters due to the role of the currents generated by monsoons wind a cross-Indonesian sea. East and west currents caused by the monsoon wind move six months eastward and six months reverse to westward direction. While the Indonesian through flow is moving continuously from the West Pacific to the Indian Ocean. The through flow provides an avenue of larvae from eastern part of Indonesia biota or West Pacific ocean Sea to southern part of Java and Nusa Tenggara (lesser Sunda). Monsoon current pattern ensures the availability of coral larvae from central and eastern Indonesia to the Java Sea, the South China Sea and vice versa (Wyrtky, 1961; Tillinger & Gordon, 2009; Ding et al., 2013; Feng et al., 2018).

Larvae of coral usually attach to crevices, cracks and other sheltered locations to avoid predation. While settlement and survival rates are highly variable, depending on a number of factors such as the species, suitability of the substrate and habitat and other biotic and abiotic pressures. Most broadcast spawners release million of gametes, however very few of these survive settle onto the reef and recruit into the population (<1% survival),

while brooders tend to have higher settlement success. In one study from Indonesia, settlement on ceramic (terra cotta) tiles placed at an angle was fairly high, namely 18 juvenile/month/m^2 (Rudy 2006). Coral require substrates that are free of macroalgae, dense turfs and sediments. Because they are sessile and attached, they compete heavily for the limited available space, either through rapid growth and overtopping or direct interactions (competition and aggression).

The growth of coral varies depending on the species and growth form, with reports ranging from mm/year for corals that are massive, submassive and meandroid, and up to about 20 cm/year for branching and plating corals. Many of the massive corals found in Indonesia are reported to increase in size by 0.5 to 2.5 cm/year while branching corals such as Acropora formosa and A. grandis can grow up to 20 cm/year. For example, in the Seribu Islands, branching corals exhibited linear branch extension rates of 5 – 20 cm/year (Sadarun 1999; Cahyani 2001; Aziz 2002). Individual colonies can continue to grow indefinitely, reaching sizes of meters to tens of meters in height/diameters; in some cases, especially the slow growing massive corals like Porites, individual colonies can live hundreds of years.

1.3.2 Habitat types

In general, corals grow in habitats with a hard bottom, clear water and continuous, flowing currents. In Indonesia, most other corals occur on fringing reefs, barrier reefs, atolls, and patch reefs. There are however, a number of commercially important corals that live in soft bottom habitats. For example, *Catalaphylia*, *Nemenzophyllia*, *Diaseris*, *Goniopora* and *Trachyphyllia* prefer grassbeds, algal flats and sandy or mud bottom habitats in either shallow or deep water. Many coral species, especially the ones with big polyps, can survive in turbid water. One example of a widespread and common coral found near mangroves and river mouths is *Galaxea*. Result of research on corals that live in turbid places indicated that they have undergone natural adaptation by changing the RNA/ DNA ratio (Bak dan Meesters 2002).

There are many distinct habitat types in Indonesia. It is thought that this high variability is one factor that has led to the unusually high coral diversity found in the area. For example, habitats include areas with substrates covered by fine sand while others have dead coral rubble substrates. The outer portion of the reef may slope gradually or near vertically to a depth of 300 m or more, and often there are over-hangs, caves and other features. Coral can grow in relatively enclosed bay and also in the open sea around oceanic reefs.

Some species, as well as certain genotypes within a species may be more adapted to high currents and wave action, such as many of the branching corals that occur on reef flats and reef crest on outer barrier reefs or oceanic islands. Other corals prefer calm, protected locations including back reef environments. Corals in the genus *Pocillopora* and Acropora prefer an open area with high to moderate wave energy. Many of the corals in the genus Porites and Goniopora prefer protected areas.

Corals can also be differentiated in terms of their need for sunlight. Some species of coral prefer an open place/shallow area with full sunshine, therefore they are called sun-loving while others such as *Cynarina*, *Blastomussa* and *Plerogyra*, live in protected areas at the back of big coral colony or live in a deeper part (shade loving coral).

1.3.3 Role of the species in its ecosystem

Corals have an important role in the ecosystem. In the food cycle corals act as primary producers as well as the primary consumers. Most corals live symbiotically with zooxanthellae, which are single called "algae" (dinoflagellates) that produce lipid and carbohydrates through photosynthesis which is shared with and directly utilized by the coral for their growth. In addition to that coral also catch zooplankton, small fish, phytoplankton

and detritus as supplementary food sources. The importance of zooplankton depends on the species, with larger polyp corals relying more heavily on plankton or plankton feeders.

Conversely, coral polyps are the food source for many marine animals (known as corallivores) such as the sea star *Acanthaster planci*, the gastropod *Drupella* and some species of fish such as the butterfly fish and parrotfish.

Corals also are the major factor responsible for building reefs and providing refuge for other coral reef organisms. The coral skeleton serves a place for other animals to lay eggs, to serve as a nursery ground, a temporary home, and a feeding ground for its associated animals. Physically, coral with its hard skeleton functions as the main support of the reef ecosystem. The strong structure of coral reef functions as wave breaker and to attenuate the current. Corals also produce land as their skeletons are broken during storms and they accumulate and become cemented in place. For human life coral is used as building material, food sources and medicinal material as well as for tourism and education.

1.4 Population

1.4.1 Global population size

Population size constitutes the most difficult question to answer. Firstly, most corals form colonies and only a small proportion of corals are solitarily individuals, making it difficult to determine the total number of individual animals or "polyps". Secondly, it is very difficult to estimated global population size of individual species, as coral reefs contain multiple species and include some that are dominant and others that can be rare overall or in certain locations. The existing corals in Indonesia amount to some 590 described species. In Indonesia these 590 species may occur over an area of over 8 million hectares. Thirdly, the distribution of coral depend on species, can be random, clumped or patchy, and multiple species will usually occur together, making it impossible to estimate the overall size of a population of individual species over broad areas. Furthermore, one species of coral can be difficult to find in one place while it is very abundant in another. Some examples of this include various species of *Fungia*, *Diaseris* and *Trachyphyllia*. One attempt at determining the distribution, abundance and the population structure of corals in Indonesia is summarized in Suharsono & Giyanto (2006) and Suharsono, 2008.

There are many methods that have been applied to estimate abundance and distribution of corals. One of the most simple approaches involves an estimate of the percent cover of corals which has been done in some locations in Indonesia at the level of growth form, genus and less frequently species. These estimates have been made using the Line Intercept Transect (LIT), belt transects or various photographic methods.

One of the most widely used approaches in Indonesia is to estimate the "condition" of reefs. For example, the Research Center for Oceanography-LIPI has conducted annual or biannual assessments of reef condition in numerous locations. Their recent surveys from the end of 2019 represent surveys in 1,153 locations distributed all over Indonesia. These results identified only 6.42% of Indonesia's reefs as being in excellent condition, 22.83% in good condition, 37.38% in fair condition and 33.82 % in bad condition (Table 1).

To estimate abundance of corals, and to determine levels that could be harvested sustainably, coral cover and abundance by growth form are both inadequate measures. Coral cover will not provide any meaningful information on the numbers of colonies, while growth form fails to identify even the abundance of individual genera, as multiple genera may have the same growth form. There has been an increased interest in applying protocols from the western Atlantic to Pacific reefs which involve at minimum observations on the number of colonies of individual genera within a given area, reported by size or size class. For example, Bruckner & Borneman (2006) used this approach to categorize the population dynamics of corals within Indonesia's largest collection area. They completed belt transects through all major habitat types and along depth gradients. These data provided quantitative information on the total numbers of each taxa and their size frequency within each habitat

type. This was then extrapolated to estimate the total abundance through the collection area by calculating the area of each habitat type and multiplying it by the abundance/unit area of each taxa.

While it is not possible to provide quantitative data on the total number of each coral taxa within Indonesia, most studies have identified large declines in coral condition, both through measures of losses of living coral cover, and mortality of individual corals. What is interesting is that all countries in the southeast Asia region (Philippines, Vietnam, Malaysia and Singapore), with exception of Indonesia and parts of Thailand, reported high rates of decline from 1994-2004. Indonesia was the only country that showed improvements in reef condition across the board since 1999, with a shift from most reefs having less than 25% cover in 1999 to many more that have 25-50% cover in 2004 (Wilkinson 2000). Other reports provide a less than rosy picture. For instance, in the past 50 years the proportion of degraded reefs increased from 10% to 50%. Western Indonesia, which is the most populated and the area with most of the coral fisheries is in much worse condition than eastern Indonesia (Burke *et al.* 2002).

Table 1. Status of coral reefs condition in Indonesia. Data ware taken from 1,153 locations all over Indonesian waters (Hadi, M. Abrar, *et al.* 2020).

Location	No. of Location	Excellent (%)	Good (%)	Fair (%)	Poor (%)
West	459	8.71	21.79	38.13	31.37
Central	429	5.36	22.38	35.90	36.36
East	265	4.15	23.40	38.49	33.96
Indonesia	1,153	6.42	22.38	37.38	33.82

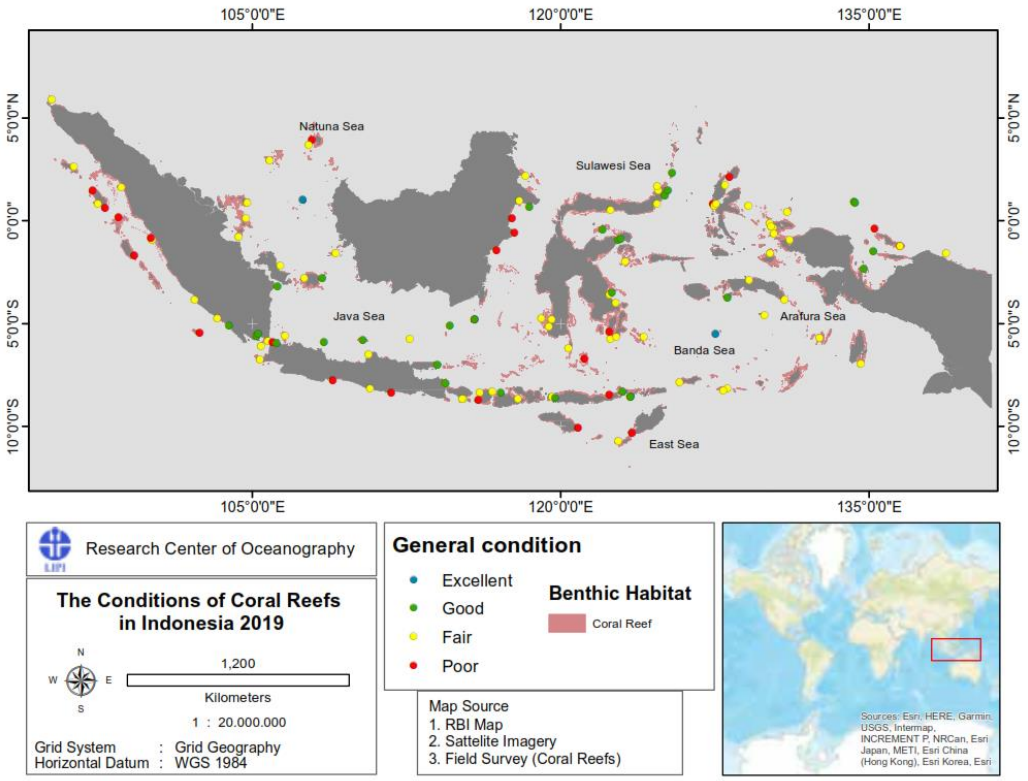

Figure 4. The conditions of coral reefs in Indonesia (Hadi, M. Abrar, *et al.* 2020).

1.4.2 Current global population trends

___ increasing ___ decreasing _X_ stable ___ unknown

Long term observation of coral reefs from 1993 to 2019 indicates that coral reef condition in Indonesia is relatively stable, especially for good and excellent reefs. The poor and fair reefs appear to be fluctuating; the recovery process may occur when the reefs suffer acute stress but fail when intense chronic stresses arise (Figure 5).

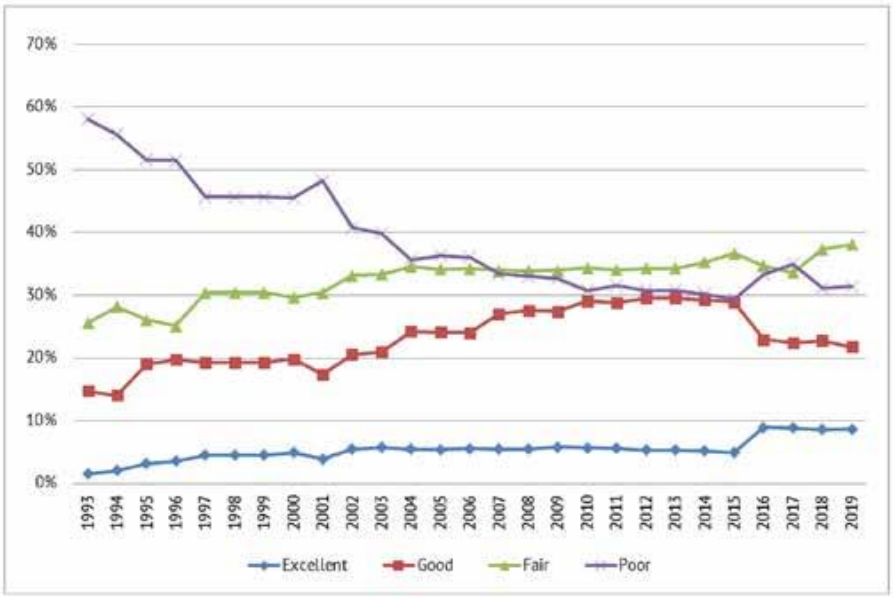

Figure 5. Grapic of trend of coral reefs condition in Indonesia from 1993-2019 (Hadi, M. Abrar, *et al.* 2020).

1.5 Conservation status

1.5.1. Global conservation status (according to IUCN Red list)

___ Critically endanger _X_ Near threatened
_X_ Endangered ___ Least concern
_X_ Vulnerable _X_ Data deficient

The conservation status of 845 zooxanthellae reef building coral species were assessed using IUCN Red List criteria in 2007 where 141 species were data deficient of the remaining 704 species were categories with elevated risk of extinction including 231 in the threatened categories (Figure 6). The highest proportion of vulnerable and near threatened coral species were found in the epicenter of marine biodiversity (in the Indo Malay-Philippine Archipelago), the Coral Triangle Species in the families Euphyllidae, Dendrophylliidae and Acroporidae are particularly at risk with more than or close to 50 % of species in a threatened category.

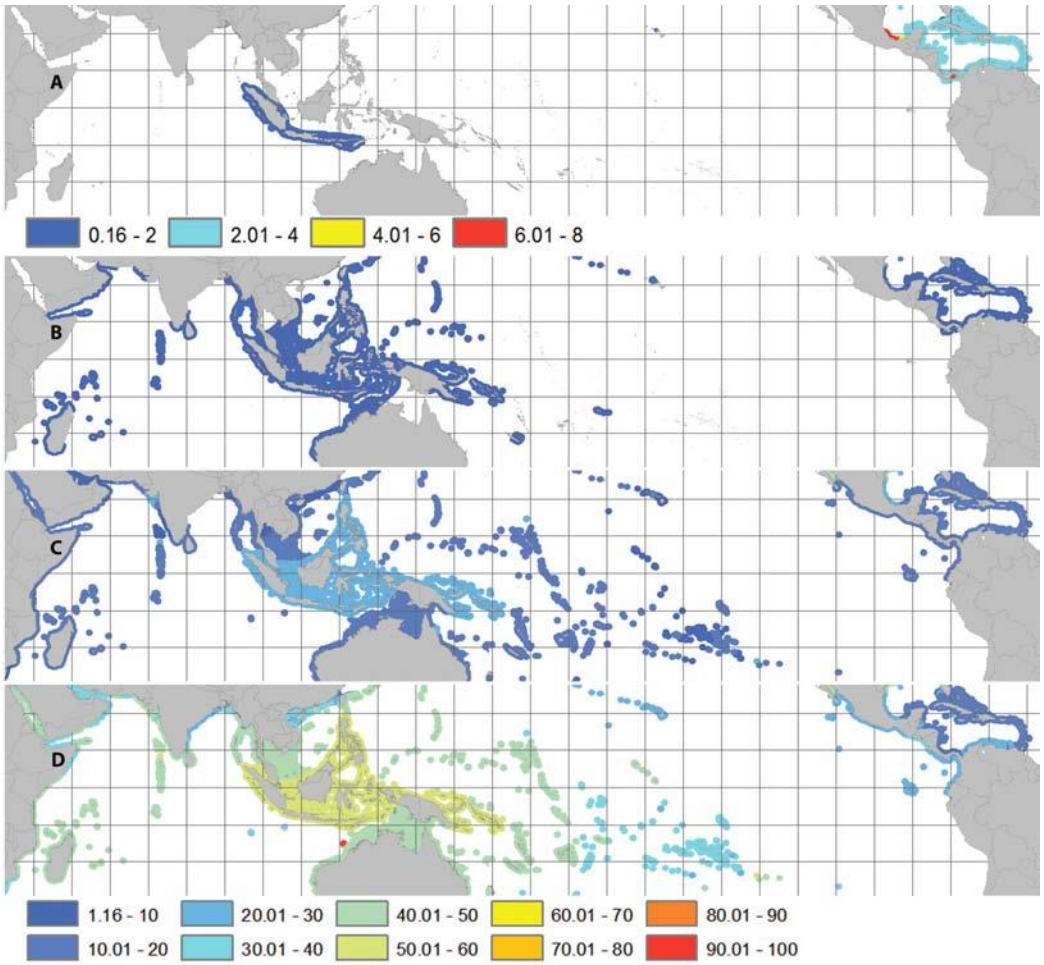

Figure 6. a) Critically Endangered species as percent of total species in area, b) Critically Endangered and Endangered species as percent of total species in area, c) species in all Threatened categories (Critically , Endangered and Vulnerable) as percent of total species in area, and d) species in Threatened and Near Threatened categories as percent of total species in area. Calculations are based on a cell size of 10 km^2 (Carpenter *et al.* 2008).

1.5.2 National conservation status for the case study country

The Indonesian government gives very serious attention to coral reefs since their condition in some locations have undergone very serious degradation, which has been most dramatic near large population centers, but also includes large losses in remote locations presumably from climate change impacts (e.g., bleaching events). Despite that, in general, the coral condition in Indonesia is still relatively good (Figure 7).

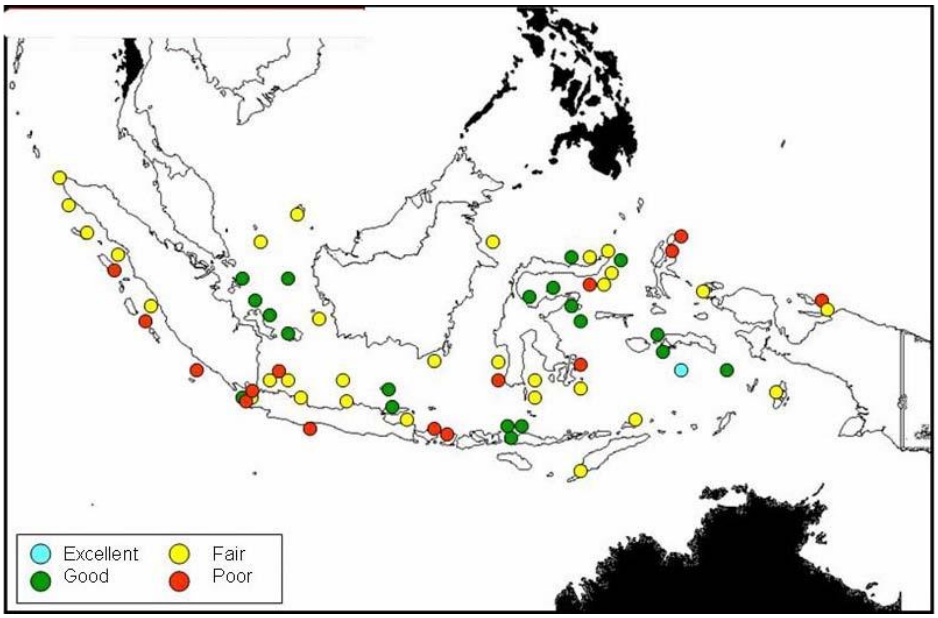

Figure 7. General coral reef condition in Indonesia (Hadi *et al.* 2020a).

1.5.3 Main threats within the case study country

___ No threats.
_X_ Habitat loss/ Degradation (human induced)
____ Invasive species (directly affecting the species).
_X_ Harvesting.
____ Accidental mortality (e.g. bycatch).
____ Persecution (pest control)
__X_ Pollution.
__X_ Other climate change (elevated sea water temperature, disease, tsunami, COTs).
____ Unknown.

The main causes of coral degradation in Indonesia are the result of human activities and localized impacts from natural factors. In the 2002 Reefs at Risk Assessment human activities threaten over 85% of Indonesia's reefs. The principle threats to these reefs are overfishing and destructive fishing, which threatens 64 and 53 % of Indonesia's reefs, respectively. Both sedimentation and coastal development threaten about 20 % of the country's reefs. Among the most egregious of the destructive fishing practices, bombing is a common practice by subsistence fishermen, while cyanide is used to target large groupers for the Live Reef Food Fish trade and thousands of species of aquarium fishes. Coral reefs adjacent to large cities have been subjected to serious degradation due to high pollution of household and industrial wastes. In 1983 and 1998 Indonesia experienced increase of sea water temperature in the waters of Natuna, Java, Bali, Lombok and Sunda Straits. Increase of sea water temperature of 3-4°C can bring about massive coral death of 80 – 90% (Brown dan Suharsono 1990; Suharsono 1999). Significant coral mortality was also associated with the 1998, 2010 and 2016 bleaching event, but coral recovery from this event seems to be well on the way. There have also been localized impacts from outbreaks of crown-of thorns and Drupella snails, which have largely impacted branching corals. There are also recent reports on increases of coral diseases in Indonesian waters.

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

2.1 Management measures

2.1.1 Management history

The Research Center for Oceanography of Indonesia has been monitoring the coral reef condition in Indonesia since 1993. These studies have demonstrated linkages between coral degradation and human activities as well as to natural factors. Worried by the continuing degradation of coral reefs, various discussions, seminars and workshops have been organized to develop a program of saving the Indonesian coral reefs. In 1998 such a program was developed and named the COREMAP (Coral Reef Rehabilitation and Management Program). To execute the program, a National Policy Strategy and Action Plan for Coral Reefs was constructed. COREMAP Program are composed of three phases namely initiation phase (3 years), acceleration phase (6 years), internalization (6 years), and was started in 2000. The last program 2019 is implemented in 6 Provinces and 15 Districts in Indonesia (see COREMAP). COREMAP activities consist of Research, monitoring and education, Public awareness, institutional strengthening, communitties base management and law enforcement and surveillance.

Indonesian Government is a developing country with serious interests in protecting and conserving coral reefs. For example, they have allocated about US $ 105 million to manage coral reefs over the last 9 years. In 2007 the Government also launched the program of Coral Reef Triangle Initiative which involves 6 countries, namely Indonesia, Malaysia, Papua Guinea, the Philippines, Timor Leste, and Solomon Islands.

In response to the CITES Appendix II listing of corals, Indonesia has developed specific guidelines for sustainable utilization of coral resources. These were developed in coordination with management authority (Directorate general for Forest Protection Conservation), Scientific Authority (Indonesia Institute of Science) and ICRWG (Indonesian Coral Reef Working Group). The Management Authority and Scientific Authority was set up a quota in order to control the coral trade. The first quota of corals implemented since 1997 which is now broken down by species.

2.1.2 Propose of the management plan in place

The objective of COREMAP is to balance the management between intensity and different uses based on available scientific data and carrying capacity of the environment, to enhance the standard of living of coastal communities who are dependant on coral resources, and to develop cooperative coral reef management systems involving all parties. The simple way of COREMAP objective is to increase the prosperity of the coastal communities by keeping the coral reefs in better condition.

2.1.3 General elements of the management plan

There are five main components in the COREMAP program which are identified in the National Policy Strategy and Action Plan. These include: research and monitoring, institutional strengthening, community-based management, law enforcement and surveillance, public awareness and education. Under the activities of Research and monitoring includes research on the status of coral reefs condition and health which is done yearly.

Coral harvest for international trade is currently allowed in 9 provinces, but it must occur outside protected areas and tourism areas. In addition, coral is supposed to be taken at levels below the regeneration rate for each species, and at a specific size (e.g. 25 cm for fast growing species and 15 cm for slow growing corals). These guidelines also recommend that collection only occur in sites where population assessments have occurred and

monitoring is undertaken to ensure sustainable utilization. Along with specific methods of coral removal, coral collection sites are under a minimum of a four years rotation period.

2.1.4 Quota setting

There is no obligation of the range state to set up of quota for CITES-listed species. However the government of Indonesia was decided to set up the quota as an effective tool to control the international coral trade. These is in line with the 14th meeting the conference of the parties adopted Res.Conf.14.7 (Rev.Cop 15) on Management of Nationally established export quotas.

The quota lists the allowable harvest by species/genus for each of the 9 collection areas, and the allowable exports which are about 90% of the allowable collection, to take into account mortality and discards during collection. The quota for coral harvest is currently established using available information on reef accretion rates, rates of coral growth, condition of reefs from sites where monitoring has occurred, and estimates of reef area. Initially, a total quota was established at 1,000,000 colonies between 15-25 cm in diameter, which represented 0.00035 % of the total coral reef area in good to excellent condition. The quota was based on the assumption that reef accretion rates range from 1 to 1.5 cm per year, growth rates are from 2.5 - 3.0 cm per year and harvest occurs only on about 30% of the reefs in Indonesia, specifically those in good to excellent condition (Suharsono 1999). The quota is subdivided among individual taxa (to the species level, or in some cases to genus) for each of 11 provinces.

The quota allocated for 2021 included over 411,900 live corals, 700,000 pieces of reef substrate with attached soft corals and 150 metric tons of live rock. The quota for 2021 is listed in Appendix. In addition to the quota, there is a ban on the export of coral skeletons (recent dead corals).

2.2 Monitoring system

Research to understand the coral reefs condition was done initially in a selected area which is considered representative of the coral reefs in the area. The initial approach involved a rapid assessment to determine the general condition of the coral reef. This was later supplemented with permanent transects that are reexamined annually, to determine the baseline and amount of change over time.

2.2.1 Methods used to monitor

The permanent transect are monitored each year using a Line Intercept Transect. The area to be monitored annually are located in 15 Districts in West Sumatera (Northern Pagai, Southern Nias, Siboga); East Sumatra (Natuna, Batam, Riau and Lingga); South Sulawesi (Selayar and Pangkep); Southeast Sulawesi (Buton and Wakatobi); Papua (Raja Ampat and Biak and East Nusa Tenggara (Sikka). Monitoring activities take advantage of the advancement of digital photography in taking data. Data is taken using a camera therefore this method is called Underwater Photo-transect (UPT). In principle, there is no difference between LIT and UPT. The difference is only in the event of taking the data with the camera. This change has been made since 2015. The advantage of using UPT is less time needed in diving and data in the form of photos can be analyzed for various purposes.

2.2.2 Confidence in the use of monitoring

Application of LIT/UPT method has met the international standard and is done by qualified researchers so that the result of monitoring in each locality is scientifically justifiable. Comprehensive reports of the results of monitoring of all locations are kept in the library of COREMAP–LIPI. Based on the data from 1,153 reef site show that in general there were about 31% of reefs having more than 50% live coral cover (good and excellent condition) and these were relatively stable for the last five years (Hadi *et al.* 2020a).

2.3 Legal framework and law enforcement

There are at least 5 Acts that can be used to base the management of coral reefs in Indonesia. These are Act No 5 of 1990 on conservation of the living environment and its ecosystems; Act No 31 of 2004 jo Act No 45 of 2009 on Fisheries; Act No 27 of 2007 on Management of Coastal Area; Act No 32 of 2009 on Protection and Management of Living Environment; and Act No 23 of 2014 on Local Autonomy in which all included coral reefs to be properly managed. In addition to that there is a Government Regulation No 8 of 1999 which regulate the utilization of biota; and this regulation appointed PHKA, Ministry of Living Environment and Forestry as a management authority while LIPI as scientific authority.

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

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

Stony corals are harvested for building materials and road construction, in Lombok and Bali for production of lime, the domestic ornamental industry and also for international trade as curios and aquarium specimens.

Indonesia has been the world's largest coral exporter since 1993. Currently only live coral may be exported; trade in skeletons (recently killed and bleached coral) for curios has been prohibited since 1998. The Indonesian Government gives only export permission for live coral, so that coral can only be used for aquarium ornamentation and not for other purposes.

While all exports were historically wild-harvested corals, over the last decade there has been a large expansion in Indonesia of coral farms that are producing colonies for export from fragments of a donor colony. The Indonesian government , through the management authority and scientific authority, is developing a policy to gradually phase out wild harvest, with all exports ultimately being obtained through coral mariculture. While this is currently being done in a wide variety of ways, some of which are more environmentally friendly. For example, some "farmers" remove an entire colony which is broken into pieces that are attached to a substrate and then exported. Other farmers have collected a "mother" colony of a species of interest, they fragment only a portion of the colony and allow the mother colony to grow back. The fragments are attached to substrates and allowed to grow to a marketable size before being exported.

Since 2008, the government of Indonesian through SA and MA has issued a guide book to carry out a good practice for coral cultivation or transplantation that must be obeyed by cultivators by regulation of the Director General of Forest Protection and Natural Conservation, Ministry of Forestry of the Republic of Indonesia No. SK.09/IV/Set-3/2008. Transplantation activities are monitored and audited every 2 years to ensure that the transplantation is done correctly. The result of the audit are used as the basis for determining the eligibility of cultivators to produce coral transplants and the quota of transplant results. Once the mariculture effort is deemed successful, Indonesia proposes to prohibit wild harvest.

While hundreds of individuals collect coral, only AKKII (the Indonesian Coral Shell and Ornamental Fish Exporters Association) members are allowed to legally export wild-harvested corals and farmraised corals.

3.2 Harvest

3.2.1 Harvest regime

Coral harvesting occur throughout the year with peaks depending on market demand. Harvesting is lowest during summer season and highest during the winter season, from

November until Christmas. Corals are exported commonly to Europe, United States and Japan. The current proportion of export between wild-harvested corals and maricultured corals is closer to 55:45.

Presumably, research is conducted in each location where harvest is allowed to determine sustainable levels. The approach used to achieve this is based on data from the Line Intercept Transect and the Belt Transect. These two methods are used for two different types of coral habitats, namely the LIT is used for reef building coral assemblage (e.g., those corals found on reefs), while Belt Transect is used for corals in which the larger proportion of the population are non reef building species (e.g., those corals found in grassbeds and soft bottom habitats). Example of result and the research method is presented in a paper entitled: "A formulation approach to quantify the abundance of coral genera" by (Suharsono dan Giyanto 2006). In short the result of this method provides a value for each species. The values range between 5 – 20 and coral that have the total abundance value of 17 –20 can be commercialized and those that have a value 5 – 10 (harvest prohibited) must be left undisturbed. In addition in the harvest site study of potential stock always done in order to investigate the stock of ornamental coral as well as the reef condition. These study is to ensure that there would be no detrimental effect on species population and environmental. Recently several locations where the people used to harvest the coral actively monitored in 2018-2019 (Hadi 2020b).

Harvesting of coral from nature must be carried out by trained fishermen. It must be done with great care since it involves live coral. The fishermen will do just that, since dead corals are not saleable. Usually coral harvesting by fishermen is based on order from the importers. Fishermen will do the harvesting when an order from the importer is received including verification of the species wanted.

3.2.2 Harvest management

Harvest management is based on the decree of the Ministery of Forestry No: 447/Kpts- II/2003 concerning administration directive of harvest or capture and distribution of the species of wild plant and animal species. In this ministerial decree is included regulation and custom of harvesting, quota allocation, capture location, utilization of specimen of wild animals, permit of harvest or capture, permit for foreign commercial utilization, permit for foreign transport of wild animal, coordination and the role of the community, the role of non-government organization, the role of association, control of harvest of the wild specimens, information system and data base, law enforcement and sanctions etc.

The management of coral harvesting also involve Non-Government Organizations as a control agent and in this case include in the Indonesian Coral Reef Working Group (ICRWG) which consists of non-government organization, relevant government institutions such as the Ministery of Marine Affairs and Fisheries, National Development Planning Agency, Ministery of Commerce, Ministery of Environment and Forestry, Indonesian Institute of Sciences. ICRWG also issued a guide book on "Pattern of Sustainable Use of Ornamental Coral". This book is expected to guide sustainable use of coral, enhance the welfare of the fishermen and the state of foreign exchange, and safeguard sustainable coral reefs.

To facilitate management and control of coral trading, the Indonesian Government requires all exporters to unite in an association called AKKII (Indonesian Coral, Shell and Fish Association). The performance of AKKII is unrelated to that of the government but they have the duty to control, manage, and to watch its members for sustaining coral trading without causing coral degradation.

3.3 Legal and illegal trade levels

Legal trade through quota mechanism follows that of the CITES, and the Exporters who belong to AKKII presumably obey the regulation controlled by the management authority. The possibility of existing illegal trade is believed to be very unlikely since it is controlled by the exporting countries as well as by the importing countries of CITES members.

Corals that are reported to be exported illegally form Indonesia largely involve misidentifications relating to the taxonomical problems. For example, the scientific name of *Wellsophyllia* was believed to be *Trachyphyllia* or vice versa, so that the export transaction was considered not valid (illegal). Some NGOs suggest there is considerable smuggling that may occur to the non CITES member country, but the government of Indonesia believes illegal trade to CITES member countries is very small. All exporters that are members of AKKII are discouraged to become involved in illegal trade, since they can be banned from trading forever if caught. There are several stages of sanctions in accordance with the decree of the Ministry of Forestry No: 447/Kpts-II/2003, consisting of administrative sanctions, fines and suspension or revocation of permits.

II. NON-DETRIMENT FINDING PROCEDURE (NDF)

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDF:

__X__ yes ___ no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

The criteria used to ascertain the NDF is the decrease in total number and measurement of the exported coral species. To date the amount exported for each coral species is relatively small compared to the existing potency. As a matter of fact there is no problem to meet the quota of export. The size of each coral species (which is controlled), which is used as an indicator for the NDF, does not show any significant decrease. In addition to that monitoring is done during harvest time to observe the condition of the coral reefs.

Apart from the above, Indonesia also applies the principle of sustainable used, among others:

a) The location of coral harvesting is outside conservation area, tourism area, protected areas by the Local Government, agreed traditional areas of local community;
b) Size of the harvested coral are between 5 -20 cm;
c) Coral harvesting in one location can be done only after its abundance has been evaluated by SA and ICRWG;
d) Collecting of coral must be done with care without destructing the targeted coral or other biota in the surrounding area that are not the target;
e) Coral harvesting must be done by trained fishermen;
f) The amount of coral collected must be based on the quota which was decided by the Supreme Court (MA) Issuance of permit and extension of permit needs a verification, field monitoring and evaluation.
g) Field monitoring is done once a year in the collection site to obtain information in deciding the quota;
h) Monitoring is to be done by the MA and SA starting from collection site up to the exporting site;
i) Collection and division of quota is based on province and diversified for each province in order to prevent concentrated harvesting in one location;
j) Export permission is not given for recently dead coral. Permit is given only for live corals, this is to push fishermen and exporters to be more careful so as not to suffer

from loss. Handling living coral need real care starting from the time of collection up to the hand of exporters so that they will remain in good condition;

k) The policy to permit export of living coral only is also intended to prevent smuggling of coral;
l) All exporters and fishermen are required to execute coral transplantation. The portion of coral quota from nature will be decreased and those from transplantation will be increased and at the appropriate time there will be very minimal amount.

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

The main data was evaluation of export realization, field data resulting from monitoring which was collected by means of UPT and Belt Transect and was analyzed whether or not there is a decrease in the number and measurement, and is there any change in state of the abundance of one species of coral, for instance from the status of commercialization or to be prevented from being commercialized.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

The quality and quantity of data collected, from the stand point of the amount are quite sufficient since the monitoring is done in the location of coral harvesting for export and is always done by government researchers and staff coming from the NGO who are best qualified. While data that come from export realization can also be answerable to the management authority as well as to that of exporter association.

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

The listing of an entire order, e.g. the Order Scleractinia in the CITES is very unusual. This may have first been done due to difficulties in identifying individual coral species, but this approach presents difficulties for CITES authorities in exporting and importing countries, and for enforcement officers. Recently, a revision of the listing focused on improving identification requirements by identifying those corals that could be identified to species, those that only needed to be identified to genera and those that could be reported to spescies, based on CITES notification No. 2013/035. While this clarified reporting requirements for live corals and it offered a viable way to differentiate reef substrate and live rock from coral, it still presents many difficulties because of taxonomic difficulties and the extensive expertise required to correctly identify corals.

Because individual species vary in abundance, and some are very common, not all species "qualify" for listing. While Indonesia feels these should not be included, this is largely a response to their similarity (e.g., look-alike criteria). Without listing all corals, it is likely that many more shipments would be confiscated due to questions about identification on permits.

In terms of making a NDF, the great number of species of corals and the large extent of coral reefs in the Indonesian sea presents difficulties when conducting stock assessment studies for each species and to carry out monitoring of each species. The uniqueness of reef corals as colonial and not individual, animals and their differing biological characteristics from other biota, further complicate the making of NDF.

6. RECOMMENDATIONS

There are severals recommendation to setup quota using different data and information that collected and analysis as follows:

It is necessary to evaluate the current list of corals included in CITES Appendix II to select species of corals which are threatened with extinction due to trade. While it would not be feasible to exclude common corals from CITES, those that are indeed threatened should be considered for Appendix I.

Identification of corals in trade presents large problems to customs and wildlife inspectors. More emphasis is needed on identification training and adoption of standards for reporting.

Determination of a sustainable quota, a quota is one mechanism for ensuring that a resource is utilized sustainably, but it must be based on science. The quota should reflect the total amount of each taxon coming out of the water, and not the amount of coral that is exported. In addition, the quota should be established for each geographic collection area, based on the condition of the reef, the abundance of the targeted coral, the extent of other reef uses, and impacts from natural and anthropogenic disturbances that may affect survival of targeted taxa. The quota should also take into account life history strategies, such as rates of growth, recruitment rates, and population demography. Various quantitative data, such as the abundance, size frequency distribution, growth rates, mortality and recruitment, in combination with the total area occupied by a targeted species and the area under collection pressure, can provide an initial estimate of the potential yield of each taxa under different levels of collection.

A classical fisheries model was modified for precious corals by (Grigg 1984) and was also applied to stony corals to estimate the maximum sustainable yield for *Pocillopora verrucosa* in the Philippines (Ross 1984). This model involved a calculation of the biomass that could be harvested, based on an assessment of the standing crop in the harvested area, the growth rate, and the instantaneous rate of recruitment and natural mortality. For sustainable harvest, the model requires that the corals obtain a minimum size (age) to allow for reproduction, which in the case of *Pocillopora* was estimated to be 18 cm (6 years). This type of model may be suitable for branching corals, especially those harvested for curios, as these taxa are generally harvested at a large size. However, it may not be applicable to the other species that are not so widespread, they exhibit slower growth rates and much lower rates of reproduction. In addition, the average size of most corals collected for the aquarium trade is small and often pre-reproductive. The first of spawning of massive corals vary among species. *Goniastrea aspera* examined in colonies of various size show that the first spawning found in 4.5 cm in mean colony diameter (Sakai 1998), *Pocillopora damicornis* release planula larvae 10 cm in colony diameter (Richmond 1987).

As a first step in developing a model applicable to Indonesia, Bruckner & Borneman, 2006 assessed the largest collection area in Indonesia, off Spermonde. This involved 1) a determination of the total number of different habitat types and their aerial coverage within the Archipelago; and 2) total number of each taxa found within the region and their size structure, as determined from the abundance and diameter of stony corals identified per unit area (from belt transects), multiplied by the area occupied by each taxa, to determine how many were available for harvest. They then established a conservative level (% of the population) that could be removed, considering the life history of each taxa and the actual size distribution. This ranged from 1-10% of the population, with higher numbers for the faster growing corals that were very common and are known to recruit well. These numbers were then compared to the existing harvest quota for the Spermonde Archipelago, to determine whether the quota was sustainable or it had the potential to result in overexploitation. Recommendations were made to reduce the level of harvest of certain taxa currently under high collection pressure (based on the field data and empirical life history data), while other species were identified that could be collected at higher levels to

make up for the loss in revenue associated with reduced collection pressure. This work also suggested that the proposed level of off-take (a certain percentage of the population) was only an interim measure, and follow-up Monitoring would be needed to verify that this was sustainable and an adaptive management approach may need to be incorporated to reduce or increase that percentage based on the responses of the population, and considerations of some of the other threats affecting the population.

An alternative, and much simpler approach from that proposed by Bruckner & Borneman (2006) is included in Suharsono & Giyanto (2006). A formulation approach to quantify the abundance of corals developed Suharsono & Giyanto (2006) can be considered to obtain basic information necessary in determining the potency and condition of coral to set quota for coral trade. The line intercept transect and the belt transect method has been used to calculate the total value for each coral based on the number of occurrence, the genera dominance, the size of the colonies and the coral coverage in each study area was assigned scale, weight and value. A total value range from 5-20 and the assignment abundance category of coral is 17-20 very common, 14-16 common, 11-13 uncommon, 8-10 rare, and 5-7 very rare. Coral categorized as very common can be harvested, coral categorized as common can be harvested with caution, coral categorized as uncommon has harvests which are limited, coral genera classed as rare and very rare are not permitted to be harvested.

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Appendix

Appendix 1. List species of quota coral for export 2021. There are 56 species of scleractinian coral and 4 species of non scleractinian coral.

No.	Family / Species	Province									Totals
		Bangka Belitung	Banten	West Java	East Java	Lampung	West Nusa Tenggara	South Sulawesi	Central Sulawesi	South-West Sulawesi	
A. Scleractinian											
	Acroporidae										
1	*Acropora spp.*	-	-	-	-	600	200	600	400	400	**2,200**
2	*Montipora spp.*	200	-	-	-	500	-	500	500	800	**2,500**
	Fungiidae										
3	*Herpolitha limax* (HOUTTOYN)	-	-	200	-	200	200	700	-	-	**1,300**
4	*Fungia spp.*	500	-	-	1,500	3,000	1,000	3,000	3,000	3,000	**15,000**
5	*Cyloseris sp*	-	-	-	700	500	350	-	-	700	**2,250**
6	*Fungia distorta* (MICHELIN)	-	-	-	-	-	50	-	-	250	**300**
7	*Fungia fragilis* (MICHELIN)	-	-	-	-	-	250	-	-	250	**500**
8	*Heliofungia actiniformis* (QUOI & GAIMARD)	3,000	-	-	3,200	2,000	900	2,500	5,000	5,000	**21,600**
9	*Polyphyllia talpina* (LAMARCK)	300	-	500	1,000	700	500	1,000	500	-	**4,500**
	Oculinidae										
10	*Galaxea astreata* (LAMARCK)	300	300	300	600	200	-	1,000	1,000	-	**3,700**
11	*Galaxea fascicularis* (LINNAEUS)	400	-	500	500	400	200	1,000	1,000	-	**4,000**
	Mussidae										
12	*Blastomussa wellsi* (WIJSMAN - BEST)	300	-	-	-	300	200	800	1,100	800	**3,500**
13	*Symphyllia sp.*	250	-	-	-	100	-	1,000	650	700	**2,700**
14	*Lobophyllia corymbosa* (FORSKAL)	700	900	-	1,000	600	500	1,500	1,800	2,000	**9,000**
15	*Lobophyllia sp.* (EHRENBERG)	1,000	-	200	1,000	500	500	1,500	2,300	2,000	**9,000**
16	*Cynarina lacrymalis* (EDWARD & HAIME)	750	-	100	500	1,000	100	1,500	1,250	1,800	**7,000**

No.	Family / Species	Province									Totals
		Bangka Belitung	Banten	West Java	East Java	Lampung	West Nusa Tenggara	South Sulawesi	Central Sulawesi	South-West Sulawesi	
17	*Acanthophyllia deshayesiana*	500	-	-	-	-	-	750	-	1,750	**3,000**
18	*Scolymia vitiensis* (BRUGGEMANN)	200	-	-	-	500	-	500	1,600	1,500	**4,300**
19	*Acanthastrea sp.*	100	-	-	-	100	-	100	350	350	**1,000**
	Merulinidae										
20	*Merulina ampliata* (ELLIS & SOLANDER)	350	-	300	-	100	300	500	300	-	**1,850**
21	*Hydnophora exesa* (PALLAS)	550	450	-	900	900	700	1,600	450	-	**5,550**
22	*Hydnophora microconos* (LAMARCK)	500	-	500	500	850	200	500	500	-	**3,550**
	Pectiniidae										
23	*Pectinia sp.*	250	-	-	200	200	-	750	500	1,000	**2,900**
24	*Echinophyllia sp.*	200	-	-	-	200	-	-	500	600	**1,500**
25	Oxypora sp.	-	-	200	-	-	200	-	-	600	**1,000**
26	*Mycedium elephantotus*	100	-	100	-	-	-	-	500	800	**1,500**
27	*Mycedium robokaki*	100	-	100	100	-	-	-	-	700	**1,000**
	Caryophylliidae										
28	*Euphyllia glabrescens* (CHAMISSO & EYSENHARDT)	1,000	-	-	1,000	800	200	1,000	2,500	2,500	**9,000**
29	*Euphyllia divisa* (VERON & PICHON)	-	-	-	-	-	-	-	600	-	**600**
30	*Euphyllia paradivisa* (VERON)	-	-	-	-	-	-	900	-	900	**1,800**
31	*Euphyllia cristata* (CHEVALIER)	1,500	-	-	1,500	1,500	1,000	2,500	1,500	2,500	**12,000**
32	*Euphyllia ancora* (VERON & PICHON)	1,000	-	-	1,500	1,000	1,500	2,000	2,500	2,500	**12,000**
33	*Euphyllia paraancora* (VERON)	-	-	-	-	600	-	-	1,200	1,200	**3,000**
34	*Plerogyra turbida* (HUDGSON & ROSS)	-	-	-	800	-	200	2,500	-	4,000	**7,500**
35	*Plerogyra sinuosa* (DANA)	1,000	1,000	-	1,000	1,000	1,000	1,000	2,500	2,500	**11,000**
36	*Physogyra lichtensteini* (EDWARD & HAIME)	1,500	-	850	850	1,300	600	550	850	1,500	8,000

No.	Family / Species	Province									Totals
		Bangka Belitung	Banten	West Java	East Java	Lampung	West Nusa Tenggara	South Sulawesi	Central Sulawesi	South-West Sulawesi	
37	*Catalaphyllia jardinei* (SAVILLE - KENT)	900	-	-	1,000	900	1,100	2,100	3,100	3,900	**13,000**
	Dendrophylliidae										
38	*Turbinaria peltata* (ESPER)	900	-	900	900	1,200	800	900	900	1,500	**8,000**
39	*Turbinaria sp.*	800	-	-	500	1,000	500	1,600	1,600	2,000	**8,000**
40	*Eguchipsammia fistula (ALCOCK)*	800	-	-	1,000	1,200	500	2,000	500	2,000	**8,000**
41	*Tubastrea sp.*	500	-	-	1,000	1,000	500	2,500	500	2,000	**8,000**
	Poritidae										
42	*Porites sp.*	2,000	1,000	1,500	3,000	1,500	1,500	3,500	3,000	3,000	**20,000**
43	*Goniopora Lobata* (EDWARD & HAIME)	3,500	-	-	3,000	2,000	2,000	4,500	5,500	4,500	**25,000**
44	*Goniopora sp.*	3,000	1,000	2,000	3,000	2,000	2,000	6,000	6,000	7,000	**32,000**
45	*Goniopora stokesi* (EDWARD & HAIME)	4,000	1,000	1,000	2,500	2,500	1,000	5,750	5,750	6,500	**30,000**
46	*Alveopora sp.*	-	-	-	200	-	-	150	250	400	**1,000**
	Faviidae										
47	*Caulastrea sp.*	1,200	500	-	1,400	1,400	1,000	2,500	2,000	4,000	**14,000**
48	*Favia sp.*	1,000	-	-	500	750	1,000	750	-	1,500	**5,500**
49	*Favites sp.* (ELLIS & SOLANDER)	1,200	500	-	800	800	1,000	1,500	1,000	2,000	**8,800**
50	*Goniastrea sp.*	200	-	-	200	200	400	500	-	1,000	**2,500**
51	*Montastrea sp.*	200	-	-	800	400	300	1,500	800	1,000	**5,000**
52	*Diploastrea heliopora* (LAMARCK)	500	-	-	-	-	-	-	-	-	**500**
53	*Cyphastrea serailia* (FORSKAL)	-	-	400	-	-	-	-	-	-	**400**
54	*Echinopora lamellosa* (ESPER)	-	-	-	-	300	-	-	200	-	**500**

No.	Family / Species	Province									Totals
		Bangka Belitung	Banten	West Java	East Java	Lampung	West Nusa Tenggara	South Sulawesi	Central Sulawesi	South-West Sulawesi	
	Trachyphyllidae										
55	*Trachyphyllia geoffroyi* (AUDOUIN) (PICHON)	4,500	-	1,000	3,000	4,000	2,000	8,000	3,500	4,000	**30,000**
	B. Non-Scleractinian Coral										
	Helioporidae										
56	*Heliopora coerulea* (DE BLAINVILLE)	-	-	800	500	500	-	-	-	-	**1,800**
	Tubiporidae										
57	*Tubipora musica* (LINNAEUS)	550	-	650	500	1,000	300	1,500	1,000	1,000	**6,500**
	Milleporidae										
58	*Millepora spp.*	350	-	150	-	500	-	500	-	-	**1,500**
	Stylasteridae										
59	*Distichopora spp.*	-	-	-	-	-	-	800	-	-	**800**
60	*Substrat* (Unindentified Scleractinian)	50,000	90,000	90,000	90,000	100,000	30,000	100,000	75,000	75,000	**700,000**
61	*Live rock* (Unindentified Scleractinian)	-	30,000	20,000	50,000	50,000	-	-	-	-	**150,000**
										Totals	**1,261,900**