

A Review on Ornamental Coral Farming Effort in Indonesia

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Abstract

Until now Indonesia is the biggest exporter for ornamental corals, for both wild and cultured. Coral collecting activity is potentially decreasing the number of species and population in nature. To minimize the pressure on nature, since 2002 government has required companies/traders to culture the ornamental corals. Government hopes in some years ahead, cultured corals may gradually replace the wild corals harvesting.

ICRWG is an independent group that gives suggestions or recommendations for a better ornamental coral management. In coral farming issue, ICRWG involves in some activities, i.e. to review the guideline of coral farming/transplantation developed by Directorate General Forest Protection and Nature Conservation (PHKA) which was issued in January 2008; and to assess companies' coral farming activities, together with Research Centre of Oceanography-Indonesian Science Institute (P2O-LIPI).

After several years of involvement, we come out with some aspects that need to be improved: **Firstly**, species is successfully propagated especially fast-growing species under genus *Acropora*, *Pocillopora*, *Seriatopora*, *Hydnophora* and *Montipora*. However the achievement has not been followed yet with slow-growing ones since it needs more research on bio-ecological aspect and on finding best culturing method for every species. To reach the goal, Scientific Authority and Management Authority need to push companies to reinforce their coral farming activities and furthermore determine the effective timeline to replace wild corals with cultured. **Secondly**, knowledge and skill of BKSDA staffs on coral identification and monitoring aspect must be increased as a way to eliminate the possibility of companies to act careless or deceive practices. **Thirdly**, coral tagging obligation must be enforced since so far it is the most effective controlling tool for Indonesia and importing countries. ##

1. Introduction

Indonesia is a part of the worldwide live coral trade. There are many problems raised along this extraction. Currently, Indonesia is in the middle of addressing small part of problems through coral farming/culturing. This paper tends to give descriptive information regarding status of wild coral trade and progress of culture coral initiative for commercial purpose in Indonesia. Most of information was gathered from ICRWG involvement in some management aspects of ornamental coral trade.

1.1. Indonesia and wild coral trade

To protect many organism within Indonesia jurisdiction, Government enacted Regulation No 7 year 1999 that protects almost 300 genus of plants and animals both living in land and water. Unfortunately, corals are not listed among them. From group of Anthozoa, protected status is given only to species under genera *Antipathes* while corals according to a higher regulation, are categorized as a wild animal which can be utilized for commercial purpose.

As a result of that policy, Indonesia became the biggest exporter of live corals for aquarium purpose. Indonesia supplied about 66% and 71% of international market demand in 2000 and 2001, respectively^[1]. Four years afterward, or in 2005, Jonas within 2008 said Indonesia supply domination became bigger which was climbing up to 91% while the rest is distributed amongst Fiji, Bahamas, Solomon Islands, and Tonga^[2].

CITES lists corals in Appendix II which means utilization for commercial purpose is tolerable as long as it meets the terms i.e. will not be detrimental to the survival of the species and must be prepared and shipped to minimize any risks of damage to health. What Indonesia act in accordance with the convention is sets up number of tolerable corals to be extracted from Indonesia's coral reefs ecosystem. The number, or known as quota is issued yearly by Management Authority (MA) which then distributed among companies through Indonesian Coral Shell and ornamental Fish Association (AKKII, Asosiasi Koral Kerang Ikan hias Indonesia).

Since major preference on international coral trade has moved from dead coral to live coral in early 1990s, live coral supply in market is increasing about 12-30% every year within 1992-1999, with USA as the main destination^[3]. Considering the trade potency to degrade coral reefs ecosystem, has initiated NOAA to hold an International Workshop on Stony Corals Trade in 2001. The workshop objectives were to develop approaches for sustainable management, to develop best practices for coral identification, and to build monitoring protocol for stony coral resources. The workshop came out with a number of recommendations, including: (1) Provisions for licensing, training and certifying fishers; entry limit into the fishery; and specifications for reporting, compiling and analyzing fishery data, (2) Setting limits on the volume, size and taxa of collected corals, (3) Establishment of defined collection sites for individual collectors and cooperatives and no-take areas that include the same type of habitats utilized by collectors, (4) Assessments and monitoring of collection sites and control sites to evaluate the status of the resource and harvest impacts, (5) Responsibilities and requirements of collectors, middlemen, and exporters, and (6) Sustainable financing schemes to ensure sufficient funds are recovered from license, collection and export fees to pay for effective management and monitoring.^[4]

In fact, theoretically, all items are best fit to address many problems of coral trade that Indonesia faces. What problems does Indonesia face? Then has Indonesia adopted the recommendations? Is live coral trade in Indonesia better now? The following paragraphs are describing some situations exist.

1.2 Problems of Indonesia's wild coral trade

According to the quotas set up by Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry (PHKA, Perlindungan Hutan dan Konservasi Alam), the government institution which acts as Management Authority (MA), more than 70 taxa from Scleractinia, plus *Heliopora coerulea*, *Tubipora musica*, *Millepora* spp. and *Disticopora* spp reach hobbyists around the world every year. Between the year 1999 and 2008 more than 600 thousands pieces of live corals were allocated to be exported, yearly.

Looking at the realization number of export, it shows the extraction of slow-growing corals is about four times larger of fast-growing corals as seen on the Figure 1. The realization number showed here is based on CITES Permit issued by PHKA. Wabnitz *et al.* (2003)^[1] who extracted import and export data from GMAD (Global Marine Aquarium Database) also came out with similar situation. They showed most traded genera since 1999, not in order are *Catalaphyllia*, *Goniopora*, *Heliofungia*, *Lobophyllia*, *Trachyphyllia*, *Turbinaria*, *Euphyllia*, *Galaxea*, and *Acropora*. Based on Suharsono (1998)^[5], besides the last three genera, the rest are corals growing in a slow rate. A high attention should we put on this fact.

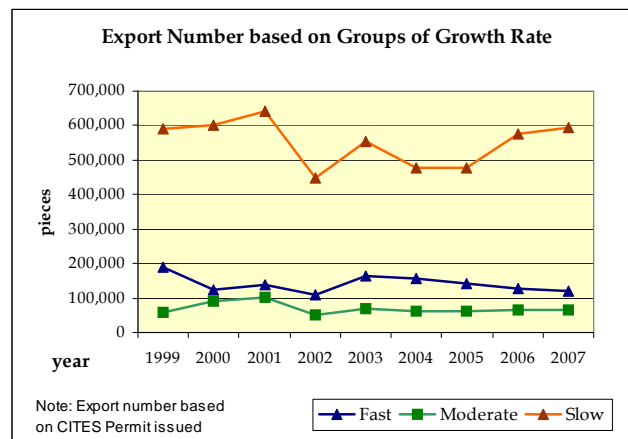


Figure 1 Export number of live coral based on groups of growth rate

The high demand and extraction level of the slow-growing corals has raised an apprehensive about the decreasing of coral population of certain species, which may end to local extinction. To these reasons, international scientists put a high attention on Indonesia's coral reef quality. Moreover, the governments of importer countries also showed their concern. For example, European Union (EU) suspended the import of certain live coral species from Indonesia. This concern has raised from 1999, and in 2008 the suspension was still applied to *Heliofungia actiniformis*, *Blastomussa wellsi*, *Cynarina lacrimalis*, *Scolymia vitiensis*, *Euphyllia cristata*, *Plerogyra sinuosa*, *Plerogyra lichtensteini*, *Catalaphyllia jardinei*, *Hydnophora microconos* and *Trachyphyllia geoffroyi*. The suspensions were taken after Scientific Review Group of EU considered Indonesia could not provide enough scientific information on the status of distribution, abundance, growth and recruitment rates of those species, which their quota number is high and/or slow in growth^[6].

Although a recommendation from Coral Trade Workshop about limiting coral collected is based on experience from Indonesia, unfortunately Indonesia has not taken into account the coral size in formulating the quota. Formulation and number of quota have been subject to be criticized by scientists and conservationists for many years.

Two points of recommendation according to collection area management are (1) the idea of users to have a responsible to manage the collection area and (2) the importance of assessment and monitoring of collection area to understand resources status and impact of coral harvest to ecosystem. Government arranges collection area in some levels. At national level, unit of collection area is provincial; for example in 2007 there are 56 coral species with a total 126,850 pieces are allowed to be harvested from South Sulawesi Province. Bureau of Natural Resource Conservation (BKSDA, Balai Konservasi Sumberdaya Alam) as an extension of PHKA for province level has responsible to determine the sites of coral collection for each province. The problem is the sites are totally the same between one species and another, or in other words, the site determination is not based on species potency each site has. According to Bruckner (2002b)^[7] and Yusuf *et al.* (2006)^[8], species composition and its abundance are specific for each collection site. Between year 2002 and 2006 several surveys carried out to assess ornamental coral resources in Lampung and Central Java (2002)^[9]; South East Sulawesi (2003)^[10], and Belitung (2006)^[11].

However, the same as South Sulawesi case, SA, MA and BKSDA did not optimally used the assessment results to develop a more accurate quota (sizes of coral and collection sites).

To know potency of ornamental coral or to define precise collection areas/sites or to understand the impact of coral harvesting to ecosystem, we need very intensive surveys. This implies to a big resources needed. Government says funding, experts and time are always the problems. Contrary to the fact, if government actively involves and supports networking among universities, a part of the problems is possibly to be addressed.

Management of ornamental coral trade, in the context of management area, has not yet become government's attention. Even though collection area with no management (no rotation or no closure systems) has a potency to decrease population of highly targeted species. A significant decrease of coral population will affect the coral reproduction success and in the long run will influence the health and stability of coral reef^[1]. The fear is partly showed for *Heliofungia actiniformis* which since 1999, the quota from South Sulawesi has never been below 6,000 pieces with the highest reached 9,500 pieces in 2006. A study demonstrated that the size-selective on small size *Heliofungia actiniformis* will change the size-frequency distribution and species population.^[12] Another research found the potency of *Catalaphyllia jardinei* in Spermonde Islands, South Sulawesi was much lower than its quota and the authors have suggested government to stop collecting of *Catalaphyllia jardinei* from Spermonde^[7].

In a general statement, Indonesia has not adopted the recommendation from the workshop. other than setting up the quota, there is no new policy or management measures has been applied for live coral trade from in Indonesia.

The next question will be there is any way to address those problems. One action done by importing country i.e. by retailers in Los-Angeles and some other exporting countries, Fiji and Solomon Islands, is mariculturing coral or coral farming^[1]. The government of Indonesia also sees coral farming is deserved to be tried to reduce pressures caused by live coral extraction.

2. Coral farming/coral propagation: An effort to address the problems

2.1 Policies to foster coral farming

Government hopes that some years ahead, live coral collection can be partly or totally replaced by coral farming products. To decrease live coral collection, since year 2002, government has encouraged companies/exporters to initiate coral farming or coral culture. Consequently, a number of companies were soon built coral farming in several areas. PHKA was furthermore to foster coral farming, decided not to issue permit to do wild live coral collection anymore for new companies, but they were directed to build coral farming.

However, in the absence of guidelines needed by companies (i.e. how to do coral farming) or by government field staff (to do controlling and monitoring), the initiatives were implemented but not effectively managed. Regulation of plants and wild animals rearing (which coral is categorized as a wild animal) was available three years after the coral farming initiation. ICRWG (Indonesian Coral Reef Working Group) and AKKII were intensively pushed PHKA to make a coral farming regulation or guideline. Finally, in January 2008, the guideline was enacted after three-year long discussion among PHKA, ICRWG and AKKII. Below are the regulations that administer coral farming in Indonesia:

1. Ministry of Forestry Regulation No P.19/Menhut-II/2005 on Wild Plant and Animal Rearing.
2. PHKA Regulation No 09, January 2008 on Guideline of ornamental coral transplantation for commercial purpose. Indonesia names this coral farming with coral transplantation. The regulation administers technical and administrative aspects of transplantation. Technical

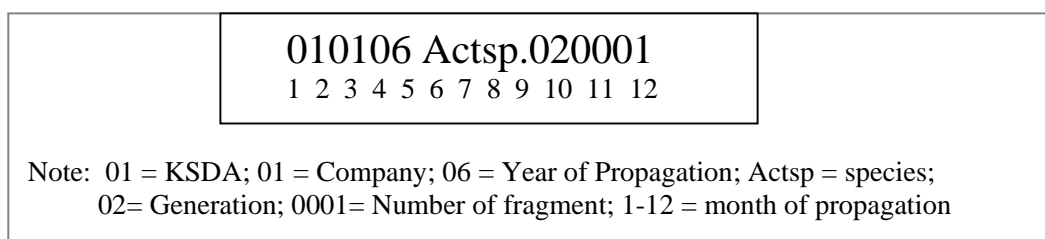


Figure 2. Tag format for cultured coral

2.2 Progress of coral farming

Government policy to close live coral collection for new companies but widely open for coral farming, consequently, has created a lot of coral farming practices. Five years after 2003, ICRWG recorded there were 55 coral farming scattered in eight provinces with Bali and Jakarta are the favorites (see Table 2). The farms were developed by 41 companies of which 19 of them were new players. There is no live corals quota for Bali but because it has many advantages such as a lot of companies, strategic beach as farming location, and a busy international airport make Bali as main location for coral farming so far.

Tabel 2. Number of coral farming in various provinces

Province	Coral farming activities
Bali	16
Banten	4
Jakarta	26
Central Java	1
East Java	3
Lampung	2
East Nusa Tenggara	1
South Sulawesi	2

Some companies have showed seriousness to build up the coral farmings but some others built the farming only to fulfill government's obligation. Seriousness is showed through several experiments on (1) finding light substrates, (2) finding modesl and tag sizes to make a simple, small, cheap and light tag, with the most important is not annoy the beautiful of corals, (3) good maintaining growth and health of transplants, and (4) culturing moderate to slow growing corals. Some examples of substrate and tag develop by companies are shown in the last page of this paper. Vice versa, they are who only fulfill the obligation show (1) low quality of maintaining because minim of cleaning frequency, and (2) inappropriate farming mechanism, for example the size of fragments growing for brood are too big. Nowadays, there are about 25 active companies who keep running the farming and actively export coral transplant while the others stopped their coral farming activities.

Farming method used is propagation through fragmentation for both of branching and foliose corals, and ICRWG never met other method applied in fields. ICRWG saw someone star (*) species were successfully transplanted and found them at every coral farming location. Those were species within genus *Acropora*, *Pocillopora*, *Seriatopora*, then *Hydnophora*; all of them

were corals with branching lifeform and fast growth rate. One star species were found only at some farms was *Merulina ampliata* meanwhile *Galaxea* spp are from the two stars' corals. Some species were not included in the list but companies tried to culture were *Turbinaria* spp. *Pavona cactus*, *Favites* spp and *Favia* spp.

Members of *Acropora*, the fastest species that can grow for 20 cm/year^[13], has given a big contribution for the success. Based on the success, starting from 2008, SA and MA unlisted *Pocillopora damicornis*, *Pocillopora verrucosa*, *Seriatopora hystrix*, *Stylophora pistillata*, *Hydnophora rigida* from live coral quota. In the same time, quota of *Acropora* spp and *Montipora* spp for year 2008 was decrease by half of 2007 quota.

Since 2007 MA obligated the companies to estimate and propose yearly maximum production plan. Tabel 3 below is the example of production plan year 2008. Two stars species number is only 10% of one star species.

Species (*)	No (pieces)	Species (**)	No (pieces)
<i>Acropora</i> sp.	1,356,469	<i>Caulastrea</i> sp.	40,767
<i>Hydnophora rigida</i>	53,626	<i>Echinophyllia aspera</i>	10,788
<i>Merulina ampliata</i>	24,346	<i>Echinopora lamellosa</i>	19,929
<i>Montipora</i> sp.	152,572	<i>Euphyllia ancora</i>	280
<i>Pocillopora damicornis</i>	53,419	<i>Euphyllia glabrescens</i>	52,634
<i>Pocillopora eyduoxi</i>	13,712	<i>Galaxea astreata</i>	9,391
<i>Pocillopora verrucosa</i>	58,188	<i>Galaxea fascicularis</i>	10,696
<i>Porites cylindrica</i>	25,854	<i>Turbinaria mesenterina</i>	11,140
<i>Porites lichen</i>	10,055	<i>Turbinaria peltata</i>	10,378
<i>Porites nigrescens</i>	22,293	<i>Turbinaria reniformis</i>	10,250
<i>Seriatopora caliendrum</i>	11,711	<i>Turbinaria stellulata</i>	1,885
<i>Seriatopora hystrix</i>	61,049		
<i>Stylophora pistillata</i>	51,157		

Tabel 3. Production plan of coral farming year 2008
Source: Directorate General PHKA, 2008.

2.3 Analysis from ICRWG

Along several years of involvement, we put concern on four aspects that need to be improved. In our opinion, the absence of guideline in five years of implementation is the major reason why the problems occurred.

First is about time and species target. Fast and some moderate growing species were succeeded to be propagated but the successful has not been followed yet with slow-growing ones. The last one needs more research on bio-ecological aspect and on finding best culture method for every species. SA sets a target in year 2011 that coral culture can replace all of coral branching listed in live coral quota (*Pers.comm.* with SA). However, it is only a target from SA and not a common target among government, users and association. The worst is no discussion at all about the target.

Some companies develop experiments in culturing non-branching corals, but unfortunately the result is not for shared or for public. It is the nature of trade -a competition that makes them keep the experiment as a company's secret. That condition makes progress in coral farming is relatively slow. In our opinion, government should give incentive to research institutions or

should push companies to work together with research institutions, NGOs or universities (where the human resources are abundance) to develop research on coral culture to foster the shifting from live to culture corals.

Second is about monitoring and controlling. We are talking in two levels, field and administration. 1) Field level; in almost coral farms ICRWG visited, we found discrepancy between reports and facts in field, in species transplanted and its number. Monitoring and controlling capacity of government field staff is proved to be weak and is still based on paper/report submitted by company. In most cases they did not cross check the report to what available in the field. It happens because PHKA did not give capacity building on coral identification nor guideline of controlling and monitoring mechanism to BKSDA. ICRWG has informed this situation to PHKA. Nevertheless, limited budget, lack of field staffs but in the other way there are many organisms to be managed, are main reason why capacity building is not well implemented. 2) Administration level; capacity production and realization are not showing the real capacity and companies performance since export number has not been used in evaluation of coral farming performance.

Third is about coral tagging. Even there is an obligation for companies based on Forestry Ministry Decree No 355 year 2003, to apply coral tagging, in practices, implementation are not consistent. Companies said the inconsistency happened because the obligation only comes from Indonesia but not necessary required by importing countries. Low enforcement also plays role why tagging runs inconsistent. We hope PHKA Regulation No. 09 year 2008 will effectively be enforced. Additionally, delegation of EU SRG who visited coral farming last year showed their fully supports on the use of tagging as a control tool in exporting and importing countries, especially will help EU's customs to differentiate between live and culture corals.

Fourth is about Management Authority. It is more an anticipation opinion. According to Government Regulation No 60 year 2007 on Conservation of Fisheries resources, MA of fresh water and marine organisms will be moved to Ministry of Marine Affairs and Fisheries (DKP, Departemen Kelautan dan Perikanan). Time in one year ahead must be effectively filled with transfer information, knowledge, skills and networking from Ministry of Forestry to DKP. Coral farming is a new mechanism and is still looking for an ideal management. It is a challenge for DKP to develop a better management.

3. Recommendations from ICRWG

Indonesia has rich coral diversity so it has stronger power to play an important role in the trade of cultured corals. This was admitted by Fiji who is developing coral farming as well, by saying Indonesia is a big competitor and many buyers are more interested to cultured corals from Indonesia since Indonesia is able to provide/fulfill with high value species and base on size markets demands^[14]. Finally, ICRWG comes up with several recommendations mentioned below:

1. To reach the goal, Scientific Authority and Management Authority need to determine the timeline to replace wild corals with cultured.
2. Government should push companies to work together with research institutions or universities in coral farming to foster the initiative for example through develop researchs on moderate and slow-growing coral culture.
3. Guideline on cultured coral species and training on controlling and monitoring for BKSDA staffs (and next time can be used by DKP) should be prepared to eliminate companies act careless or deceiving practices.

4. Involve importing countries on using of coral tagging as a control tool. Important to involve United States as the main importer of Indonesia's ornamental corals.

References

- [1] Wabnitz, C., M.Taylor, E. Green, and T. Razak. 2003. *From Ocean to Aquarium*. UNEP-WCMC, Cambridge: 64 hlm.
- [2] Knittweis, L. & M. Wolff. 2008. Live coral trade impacts on the mushroom coral *Heliofungia actiniformis* in Indonesia: potential future management approaches. *Dalam: Knittweis, L. 2008. Population Demographics and Life History Characteristics of Heliofungia actiniformis: A Fungiid Coral Species Exploited for the Live Coral Aquarium Trade in the Spermonde Archipelago, Indonesia*. PhD Thesis, Centre for Tropical Marine Ecology, Bremen, Germany.
- [3] Bruckner, A.W. 2002a. Trends in International Trade in Stony Corals: a Synopsis of CITES Data. *Dalam: Bruckner, A.W. 2002. Proceedings of the International workshop on the Trade in Stony Corals: Development of Sustainable Management Guidelines*. NOAA Technical Memorandum NMFS-OPR-23, Silver Spring, MD, p56-57.
- [4] Bruckner, A.W. 2002c. Conclusion: Sustainable management guideline for stony coral fisheries. *Dalam: Bruckner, A.W. 2002. Proceedings of the International workshop on the Trade in Stony Corals: Development of Sustainable Management Guidelines*. NOAA Technical Memorandum NMFS-OPR-23, Silver Spring, MD, p136-149.
- [5] Suharsono. 1998. Condition of Coral Reef Resources in Indonesia. *Jurnal Pesisir dan Lautan*. Vol 1(2): 44-52.
- [6] Raymakers, C. 2002. EU Trade Controls on Stony Corals from Indonesia. *Dalam: Bruckner, A.W. 2002. Proceedings of the International workshop on the Trade in Stony Corals: Development of Sustainable Management Guidelines*. NOAA Technical Memorandum NMFS-OPR-23, Silver Spring, MD, p60-61.
- [7] Bruckner, A.W. 2002b. Surveys of Coral Collection Sites in the Spermonde Archipelago, South Sulawesi. *Dalam: Bruckner, A.W. 2002. Proceedings of the International workshop on the Trade in Stony Corals: Development of Sustainable Management Guidelines*. NOAA Technical Memorandum NMFS-OPR-23, Silver Spring, MD, p117-135
- [8] Yusuf, S., A.A.A. Husain, dan A. Bahar. 2006. Studi Kondisi, Potensi dan Prospek Pemanfaatan Berkelanjutan Biota Terumbu Karang untuk Ornamen Akuarium. *Jurnal Mitra Bahari*. Vol 1 Desember 2006-Maret 2007: 54-70
- [9] TERANGI. 2002. Report on coral stock assesment in Rembang, 11-17 July 2002 and Lampung, August 19-23, 2002 to TRAFFIC-EUROPE and AKKII. Jakarta.
- [10] Johan, O. 2003. *A report of ornamental coral stock assessment in Kendari, Southeast Sulawesi 18-21 October 2002*. ASOSIASI KORAL KERANG DAN IKAN HIAS INDONESIA (AKKII) and INDONESIA CORAL REEF WORKING GROUP (ICRWG), Jakarta.
- [11] ICRWG. 2006. *Laporan survey keberadaan karang hias di perairan Belitung dan Banten*. ICRWG. Jakarta.
- [12] Knittweis, L. & M. Wolff. 2008. Live coral trade impacts on the mushroom coral *Heliofungia actiniformis* in Indonesia: potential future management approaches. *Dalam: Knittweis, L. 2008. Population Demographics and Life History Characteristics of Heliofungia actiniformis: A Fungiid Coral Species Exploited for the Live Coral Aquarium Trade in the Spermonde Archipelago, Indonesia*. PhD Thesis, Centre for Tropical Marine Ecology, Bremen, Germany.
- [13] Suharsono. 2008. *Bercocok Tanam Karang dengan Transplantasi*. COREMAP Program, Pusat Penelitian Oseanografi-LIPI, Jakarta
- [14] Lal, P. and A. Cerelala. 2005. *Financial and Economic Analysis of Wild Harvest and Cultured Live Coral and Live Rock in Fiji*. A Report prepared for the: Foundation of the Peoples of the South Pacific International, Suva, Fiji; South Pacific Regional Environment Programme, Apia, Samoa; and Department of Environment, Ministry of Lands & Mineral Resources, Republic of Fiji Islands. The Canada South Pacific Ocean Development Programme Phase II C-SPODP II.
- Keputusan Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam tahun 1999 sampai 2008 tentang Kuota pengambilan tumbuhan alam dan penangkapan satwa liar.
- Keputusan Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam tahun 2008 tentang Penetapan rencana produksi karang hias hasil transplantasi.
- Kepala Pusat Penelitian Oseanografi Lembaga Ilmu Pengetahuan Indonesia tahun 2008 tentang Jenis-jenis karang yang dapat ditranplantasi

Photo credit on Annex:

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Annex. Some models of tag, substrates and others applied in culture coral

