Eco-friendly fishing gears based on code of conduct for responsible fisheries in the city of Banda Aceh, Indonesia

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Abstract. The aims of study was determine the fishing equipment that has the highest level of ecological friendliness. The study was conducted in March to May 2014 at Lampulo Fishing Port (PPS) and Alue Naga Fish Landing (TPI), Aceh Province, Indonesia. Descriptive method was used with the 175 fishermen as respondent divided into three categories, namely Purse Seine fishermen, Trammel Net, and Gill Net Fishermen. Data were etrieval using questionnaires and analyzed using descriptive analysis. The results of the study were described in graphical form, frequency and percentage (%). The results showed that the highest level of ecological friendliness fihing gear was gill net.

1. Introduction

The Code of Conduct for Responsible Fisheries (CCRF) is one of the agreements at the FAO's 28th Committee on Fisheries (COFI) in Rome on October 31, 1995, which was stated in resolution No. 4/1995 which officially adopted the Code of Conduct document for Responsible Fisheries. The same resolution also asked FAO to collaborate with relevant members and organizations to draft technical guidelines that support the implementation of the CCRF. This management has become an international principle and standard on patterns of behavior for responsible practices, in the exploitation of fisheries resources with a view to ensuring the effective aspects of conservation, management and development of aquatic biological resources related to the preservation of ecosystems and biodiversity. This management recognizes the importance of nutritional, economic, social, environmental and cultural aspects relating to fisheries activities and is related to all stakeholders who care about the fisheries sector. This procedure takes into account the biological characteristics of fisheries resources related to the environment / habitat and maintains the fair and sustainable realization of the interests of consumers and other fisheries users Direktorat Jenderal Peningkatan Kapasitas Kelembagaan dan Pemasaran DKP [1].

The CCRF or responsible fishery provisions are used as guidelines for carrying out fisheries activities responsibly. This guide is expected to provide completeness for national and international efforts to ensure sustainable and sustainable use of marine resources. The objectives of the CCRF are aimed at decision makers in fisheries management authorities and interest groups, including fisheries companies, fishing organizations, and non-governmental organizations concerned with the sustainability of marine resources and fisheries.

The environmentally friendly fishing activities is used as a reference in the use of environmentally friendly fishing technology and equipment. This can be seen in terms of operating methods, materials and equipment construction, capture areas as well as the availability of fish resources while maintaining environmental sustainability and fish resources, fisheries fishermen and all parties engaged in fisheries spread throughout Indonesian waters are expected to comply with applicable

regulations in operating fishing gear while maintaining the environment and the sustainability of fish resources [2]. Futhermore, Dahuri [3] stated that the management of fish resources is strongly related to the management of fishing operations and fishing targets. This activity seeks to maintain the sustainability of fish resources from the threat of extinction, and has been carried out for a long time by various fishing experts around the world.

The Directorate of Production of the Directorate General of Fisheries determines the factors that must be considered by fishing experts in carrying out environmentally friendly fishing [4]. These criteria are: (a) Criteria for environmentally friendly fishing, "determining fishing gear that in productive operation and catches have high economic value. Therefore fishing experts need to pay attention to several things contained in this point, including: fishing equipment must be selective; does not damage resources and the environment; minimize waste or discard fish ". (b) Fishing ground, "Determination of fishing areas that are in accordance with the size of the vessel and the type of fishing gear that is operated, the need to regulate fishing operations in the field, is expected to avoid conflicts between fishermen groups". (c) the utilization of fisheries resources must be managed fairly, "This is intended to increase the contribution toward economic nutrition and social welfare of the population". (d) Regulations, "It is necessary to note the regulations that regulate the operation of fishing operations that are environmentally friendly and responsible.

According Monintja [5] states that the criteria for fishing technology have several important rules, namely: High selectivity, does not endanger fishermen, is not destructive to fishermen, production is high quality, the product does not endanger consumers, minimum waste fish, does not catch protected or threatened species extinct, minimum impact on biodiversity and socially acceptable. Referring to this statement it can be concluded that fishing operations can be run well when the fishery business has several criterias for environmentally friendly fishing technologies. Hence, the objective of the present study was to determine the fishing equipment that has the highest level of ecological friendlinessin Banda Aceh City, Indonesia.

2. Materials and Methods

2.1. Time and site

This research was carried out at Lampulo Beach Fishing Port (PPP) and Alue Naga Fish Landing Site (TPI) Banda Aceh City. This research took place from March until May 2014.

2.2. Data collection

Questionnaires (questionnaires) were used as a tool to collect data. A total of 175 fishermen consisting of (purse seine fishermen = 52; gill net fisherman= 57; trammel net fisherman = 66) have been sampled in this study. Data collection related to environmentally friendly aspects of the fishing unit operated by fishermen in Banda Aceh City, refers to the FAO 1995 criteria. The data collected by the arrest unit is related to environmentally friendly aspects, among others: (1) Data selectivity of fishing gear, (2) Data on habitat damage by fishing units, (3) Data on the quality of catches, (4) Data on the level of security of fishermen, (5) Data on consumer security levels, (6) By-catch data from capture units, (7) Data concerning biodiversity from the operation of apparatus, (8) Data relating to the hazards of operating fishing units for protected fish, and (9) Data on fishing operations that are socially acceptable in the community.

Researchers used descriptive analysis, namely the results of the study were described in graphical form, frequency, and percentage (%). This analysis was conducted to find out the fishing equipment that has the highest level of environmental friendliness, aspects of CCRF that are most often violated by fishermen in Banda Aceh City, and the level of concern of fishermen for the use of environmentally friendly fishing equipment based on CCRF provisions.

2.3. Data Analyses

The data were analysed descriptively comparing with other related studies or reports.

3. Results and Discussion

3.1. Capture Selectivity

Purse Seine fishermen state that purse seine fishing gear can capture more than three species with different sizes in one hauling is 28 people (53.8%), 13 fishermen (25.0%) say that the purse seine catches can catch at most three species with far different sizes in one hauling, as many as 11 fishermen (21.2%) stated that the purse seine fishing gear caught less than three species with approximately the same size in one hauling, and there was no fisherman who stated that the purse seine fishing gear capture only one species with approximately the same size in one hauling. Gill net fishing gear shows as many as 47 fishermen (82.5%) stated that fishing gill net catches less than three types of fish with approximately the same size, as 7 fishermen (12.3%) stated that gill net fishing gear can only catch the most many three species of far different sizes, as many as two fishermen (3.5%) stated that fishing gear could catch at most three species of different sizes and one fisherman (1.8%) stated that the gill net can only catch one just the same size species. Trammel net fishing gear, as many as 27 fishermen (40.9%) stated that the Trammel net fishing gear can only capture less than three species with approximately the same size, as many as 14 fishermen (21.2%) said the Trammel net fishing gear could capture more than three species of different sizes, then as many as 14 fishermen (21.2%) also stated that the Trammel net fishing gear only caught only one species with approximately the same size, and 11 fishermen (16.7%) stated that the Trammel Net fishing gear caught at most three species of very different sizes.

3.2. Fishing Equipment Used Is Not Damaging Habitat

The purse seine fishing gear shows that as many as 33 fishermen (63.5%) stated that when the purse seine fishing equipment was operated it did not damage habibat, as many as 17 fishermen (32.7%) stated that when operating purse seine fishing equipment could cause damage to some habitats in the region broad, and two fishermen (3.8%) stating that when the purse seine fishing equipment is operated it can cause habitat destruction in a narrow area, while there is no fisherman who states that the purse seine fishing gear can cause habitat damage to other regions (not the place of arrest operations). Gill net fishing gear, shows the majority of fishermen, 49 people (86.0%) stated that the operation of gill net fishing equipment is not destructive (safe for habitat), as many as 7 fishermen (12.3%) stated that the operation of gill net fishing can cause damage to some habitats in a large area, the rest, one fisherman (1.9%) stated that the operation of gill net can cause damage to a portion of the habitat in a narrow area and no fisherman said that the operation of gill net causes damage to habitat in other areas (around fishing gear is operated). Trammel net fishing gear, shows 30 fishermen (45.5%) stated that the operation of net trammel fishing gear can cause damage to some habitats in a large area, as many as 24 fishermen (36.4%) stated that the operation of Trammell Net fishing gear does not damage the habitat (safe for habitat), then as many as 10 fishermen (15.2%) stated that the operation of Trammell Net fishing gear can cause habitat destruction in a narrow area, and two fishermen (3.0%) stated that the operation of Trammell Net fishing gear can cause habitat damage in other areas (area not capture area).

3.3. Produce high quality fish.

The purse seine fishing gear, shows that the majority of fishermen, namely 39 fishermen (75.0%) stated that the catch (fish) was still alive when the net was lifted onto the ship, and as many as 13 fishermen (25.0%) said the fish was dead but the fish condition still fresh when the net is lifted, there is no fisherman who states that the catch of the purse seine fishing gear is dead, fresh, physically disabled and rotten when the net is lifted by the ship. Gill net fishing gear shows, that most fishermen, 48 people (84.2%) stated that the condition of the fish when gill net is lifted is still alive, a total of 7 fishermen (12.3%) state that the fish is dead but still in fresh condition when the gill net is lifted there were only two fishermen (3.5%) who stated that after the net was lifted the condition of the fish died, physically disabled but the fish was still fresh, but no fisherman said that the fish died and rotten when the net was lifted. Trammel net fishing gear, shows the majority of fishermen, 47 people (71.2%) stated the condition of the fish when caught alive, as many as 18 people (27.3%) fishermen stated that the condition of the fish when caught dead but still fresh, then one fisherman (1.5%) stated that when

caught fish dead, physically disabled, but still fresh, and there was a fisherman who stated that the condition of the fish died and rotten when caught.

3.4. Fishing Equipment Does Not Harm Fishermen

The purse seine fishing gear, shows as many as 25 fishermen (48.1%) stated that the purse seine fishing gear is safe for fishermen during the operation process, 24 fishermen (46.2%) stated that purse seine fishing gear and how to use it can cause temporary health problems for fishermen, and three fishermen (5.8%) stated that fishing gear and how to use it could result in permanent disability in fishermen, and no fisherman stated that purse seine fishing gear and how to use it could result in death for fishermen. Gill net fishing gear, shows as many as 29 fishermen (50.9%) stated that gill net fishing gear and how to use it can result in permanent disability in fishermen, and 28 fishermen (49.1%) stated that net gill fishing and how to use it can cause health problems the temporary nature of fishermen. No fisherman stated that gill net fishing equipment and how to use it could result in death for fishermen and fishing gears to be used safely by fishermen. Trammel net fishing gear, shows that as many as 33 fishermen (50.0%) stated that Trammel Net fishing gear and how to use it can cause temporary health problems for fishermen, as many as 16 fishermen (24.2%) stated that Tramell Net fishing gear and how to use it could result in permanent disability in fishermen, then 15 fishermen (22.7%) stated that Trammel Net fishing gear and how to use it safely for fishermen, and two fishermen (3.0%) stated that Trammel Net fishing gear and its use could result in death for fishermen.

3.5. Production Does Not Harm Consumers

The purse seine fishing gear, shows that as many as 41 fishermen (78.8%) stated that the captured fish with purse seine fishing equipment is safe to consume by consumers, 7 fishermen (13.8%) said that the catch had a very small chance for health problems for consumers, as much as three fishermen (5.8%) stated that catches with purse seine fishing had the potential to cause health problems for consumers, and only one fisherman (0.6%) stated that the yield produced by the purse seine fishing equipment caused consumer deaths. Alta captures gill net, showing that most fishermen are gill net, that is 47 people (82.5%) stated that the catch of gill net fishing equipment is safe to be consumed by consumers, as many as 7 fishermen said that the catch of gill net gear could have very little chance for consumer health problems , as many as two fishermen (3.5%) stated that the catch produced from the net gill fishing equipment could have the chance to cause health problems for consumers, and as many as one fisherman (1.8%) stated that the catch produced from gill net fishing had the opportunity to cause death consumer. Trammel net fishing gear, shows the majority of fishermen, namely 48 people (72.7%) said that the fish caught from Trammel Net fishing gear is safe for consumption by consumers, as many as 13 fishermen (19.7%) said Trammel Net caught fish had very little chance for health problems if consumed by consumers, then as many as four fishermen (6.1%) stated that they had the chance to cause health problems if they consumed Trammel Net catching fish, and only one fisherman (1.5%) stated that the chance to cause the death of consumers when consuming the catch from the Trammel Net fishing gear.

3.6. Low By-Catch

The purse seine fishing gear, shows that as many as 28 fishermen (53.8%) stated that by-catch by three types and sold at the market, 13 fishermen (25.0%) stated that the by-catch (by- catch) consists of several species that sell well on the market, as many as 10 fishermen (19.2%) by-catch are less than three types and are of high value in the market, only one fisherman (1.9%) states that the results by-catch consists of several types of species that are not sold on the market. Gill net fishing gear, shows that as many as 42 fishermen (73.7%) stated that by-catch produced by gill net fishing gears consists of several types of species that sell well on the market, as many as 7 fishermen (12.3%) stated that by-catch produced by fishing gill net is less than three types and sold well on the market, as many as 6 fishermen (10.5%) stated that by-catch produced by gill net fishing equipment was less of the three types and are of high value in the market, and the remaining two fishermen (3.5%) state that by-catch produced by gill net fishing equipment consists of several types of species that are not sold on the market. Trammel net fishing gear, shows 36 fishermen (54.5%) stated that the by-catch produced by

Trammel Net fishing gear consists of several species that sell well in the market, as many as 22 fishermen (33.3%) stated that by-catch from Trammel Net fishing gear is less than three types and sell well on the market, then as many as 6 fishermen (9.1%) state that the by-catch by Trammel Net fishing gear is less than three types and high value in the market, and two fishermen (3.0%) stated that the by-catch of the Trammel Net fishing gear consists of several types of species that are not sold on the market.

3.7. Impact of Low Biodiversity

The purse seine fishing gear, shows that as many as 30 fishermen (57.7%) stated that fishing gear and the way it operated caused the death of several species but did not damage the habitat, as many as 18 fishermen (34.6%) stated that fishing gear and the way it operated caused the death of several species and destroying habitat, then three fishermen (5.8%) stated that fishing gear and how to operate it caused the death of all living things and damaged the habitat, and only one fisherman (1.9%) stated that the purse seine fishing equipment was safe for biodiversity diversity. Gill net fishing gear, shows that as many as 35 fishermen (61.4%) stated that fishing gear and the way it operated caused the death of several species but did not damage the habitat. A total of 16 fishermen (28.1%) stated that fishing gear and how to operate it safe for biodiversity diversity , as many as five fishermen (8.8%) stated that the net gill fishing gear and the way it operated caused the death of several species and damaged the habitat, and one fisherman (1.8%) stated that the fishing gear and the way it operated caused the death of all living creatures and damaged the habitat . Trammel net fishing gear, shows as many as 35 fishermen (53.0%) stated that stated that Trammel Net fishing gear and how to operate it safely for biodiversity diversity, as many as 27 fishermen (40.9%) stated that fishing gear and the way it operated caused the death of several species but it does not damage the habitat, then three fishermen (4.5%) state that fishing gear and the way it operates can cause death in some living creatures and damage the habitat, and only one fisherman (1.5%) states that the Tramel Net fishing gear and how to operate it can cause death in all living things and damage habitat.

3.8. Do Not Harm Protected Fish

The purse seine fishing gear shows that as many as 30 fishermen (57.7%) stated that at the time of fishing gear operation that was ever caught, 16 fishermen (30.8%) stated that the fish that had been protected never caught when the fishing gear was operated, so fishermen (7.7%) stated that at the time of fishing gear operation that was protected several times, only two fishermen (3.8%) stated that protected fish were often caught when the fishing gear was operated. Gill net fishing gear, shows as many as 36 fishermen (63.2%) stated that when the operation of protected fish net gill fishing equipment was caught, as many as 19 fishermen (33.3%) stated that during the operation of protected fish gill net fishing several times were caught then only two fishermen (3.5%) stated that protected fish have never been caught by gill net fishing equipment and no one who claims that protected fish is often caught by fishing gear. Trammel net fishing gear, shows as many as 36 fishermen (54.5%) stated that when the operation of protected fish trammel net fishing equipment was caught, 16 fishermen (24.2%) stated that when the trammel net fishing gear was operated, several times were caught. then 11 fishermen (16.7%) stated that protected fish were never caught by gill net and three fishermen (4.5%) said that protected fish were often caught by the fishing equipment used.

3.9. Can be Accepted Socially

The purse seine fishing gear, shows that as many as 28 fishermen (53.8%) stated that the purse seine fishing gear fulfilled three of the four items above, as many as 16 fishermen (30.8%) stated that the purse seine fishing equipment only fulfilled two of the four items The above requirements, as many as six fishermen (11.5%) stated that the purse seine fishing equipment met all the above requirements, and as many as two fishermen (3.8%) stated that the purse seine fishing equipment only fulfilled one of the four items above. Gill net fishing equipment, shows that 31 fishermen (54.4%) stated that fishing gill net meets all of the above requirements, as many as 23 fishermen (40.4%) stated that gill net fishing gear fulfilled three of the four items above, then two fishermen stated that the gill net fishing gear fulfilled two of the four requirements above, and one fisherman (1.8%) stated that the gill

net fishing gear fulfilled one of the four items above. Trammel net fishing gear, shows as many as 31 fishermen (47.0%) stated that trammel net fishing gear fulfilled three of the four items above, as many as 26 fishermen (39.4%) stated that the trammel net fishing gear fulfilled all the above requirements, then six fishermen (9.1%) stated that trammel net fishing equipment fulfilled two of the four items above, and three fishermen (4.5%) stated that trammel net fishing gear fulfilled one of the four items above.

This study shows that the catching device using gill net in the waters of Banda Aceh is having the highest level of environmental friendliness and high selectivity. The results of this study refer to Supardi [6] which states that the net gill includes passive, selective and environmentally friendly fishing gear. The operation of conventional Gill Net (which is commonly operated in Indonesia) is relatively simple, most of the operations carried out use human power. Furthermore, previous research conducted by Sutanto [7] in marine fishing business activities in Pemalang district with gill net and *cantrang* fishing gear is still quite profitable, as indicated by the R / C ratio of 1.32 while the *cantrang* is 1.18.

The use of trammel net fishing equipment in general can be concluded that it is less environmentally friendly compared to the results of the study of the use of fishing gill net above, which shows the highest level of environmental friendliness. Thus, this is consistent with the results of research conducted by Rusmilyansari [8] which states that fishing gear categories are less responsible, namely fishing gear; is encircling gill net, drift gill net, three-layer net (trammel net), purse seine, jermal and beach seine. Meanwhile, according to Sadhori [9], stated that in the operation of trammel net is considered an environmentally friendly fishing device because in the operation of trammel net does not damage the basic ecosystem of the waters. The material for making trammel net is also environmentally friendly, not looking for waters because it does not leave pulp. Trammel net settings are also easy and harmless for fishermen.

The purse seine fishing gear has the lowest level of environmental friendliness compared to fishermen who operate trammel net fishing gills and gill net. The results of research on fisheries biologists in the Bali strait revealed that lemuru became the target of purse seine boat fishing has over exploited [10,11]. This can be concluded that the operation of purse seine fishing equipment can continuously cause over fishing and is not environmentally friendly due to overfishing.

4. Conclusion

This study shows that gill net is having the highest level of environmental friendliness and high selectivity, while trammel net is less environmentally friendly.

References

[1] Direktorat Jenderal Peningkatan Kapasitas Kelembagaan dan Pemasaran DKP (DJPKKP DKP). 2003 Urgensi Implementasi Code of Conduct for Responsible Fisheries (CCRF) dalam Pengusahaan Sumberdaya Kelautan dan Perikanan.
[2] Dahuri R 1993 *Prosiding Simposium Perikanan Indonesia I* 297-316
[3] Dahuri R 2001 *Jurnal Ekonomi Lingkungan* 17(2) 139 - 171
[4] Direktorat Produksi Direktorat Jenderal Perikanan 2000 Petunjuk Teknis Penangkapan Ikan Ramah
[5] Monintja D 2001 Pemamfaatan sumberdaya pesisir dalam bidang perikanan tangkap. Prosiding Pelatihan Pengelolaan Wilayah Pesisir Terpadu Pusat Kajian Sumberdaya Pesisir dan Laut Institut Pertanian Bogor, Bogor
[6] Supardi A 2011 Usaha penangkapan ikan dengan gillnet materi penyuluhan perikanan. Pusat Penyuluhan KP-BPSDMKP Jakarta
[7] Sutanto A H 2005 Analisis efisiensi alat tangkap perikanan gill net dan cantrang *Thesis* Pasca Sarjana Universitas Diponegoro Semarang
[8] Rusmilyansari R 2012 *Fish Scientiae* 2(4) 141 151
[9] Sadhori N 1985 *Teknik penangkapan ikan* Angkasa Bandung

[10] Merta I G S, Widana K, Yunizal, Basuki R 2000 Status of The lemuru fishery in Bali Strait its development and prospects Papers presented at the workshop on the fishery and management of Bali Sardinella (*Sardinella lemuru*) in Bali Strait Fish Code Management. FAO Roma P: 1-42
[11] Setyohadi D 2009 Journal of Fisheries Sciences 11(1) 78-86