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ASSESSMENT OF THE IMPACT OF COMMERCIAL FISHING ACTIVITIES ON DOLPHIN POPULATIONS

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ABSTRACT

The research aim was to emphasize the risk of incidental catch of dolphin by fishing gears as well as the elaboration of the steps and recommendations supporting the protection of the marine mammals. These problems become a national concern, after Romania became Contracting Party of the „Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area” (ACCOBAMS).

The research program focused on the following topics:

- analysis of the current fishing practices used in the commercial fishery and the risk assessments of incidental catching dolphins;
- ecosystem response to the fishing activity and the long term influence on the marine mammals;
- elaboration of recommendations supporting dolphin protection.

Key words : Black Sea, trawl, gill net, longline, bottom line, dolphins

MATERIAL AND METHOD

The research aimed at the analysis of the present fishing practices in the commercial fishery and assessment of the risk of accidentally catching dolphins.

The materials used included:

- the results of the Romanian research observations on the technical features of the fishing equipments, namely on the catching mechanism of the fishing target by the stationery and towed fishing gears;
- the information on this matter received from the experts in the Black Sea coastal states.

There are different types of fishing gears for the active and passive fishery used in Romania in the inshore and offshore marine fishery.

The stationary fishing gears include the equipments for catching in general the fish migrating for spawning and feeding in shallow waters, namely (ADAM *et al.*, 1981):

- longlines and bottom lines;
- gill nets for the Danube shad, turbot and sturgeons;
- sea pound nets.

The longlines and bottom lines are hook fishing gears for catching high commercial value fish.

The longline is a row of hooks with baits alluring the fish which is caught when swallowing the hook with bait.

The longlines are main fishing gears for some species (such as dogfish, goby) and auxiliary fishing gears for turbot, sturgeons, stringray and thresher.

At the Romanian Black Sea shore, the goby longlines are used in the southern area, a small number of goby longlines are used in the northern area, while the longlines for sturgeons, turbot and dogfish – along the entire littoral (Fig. 1).

The dolphins can become victims of these fishing gears if they are allured either by the bait in the hooks of the longlines for dogfish, or by the small fish (flounder, turbot juveniles) already caught in the longlines.

The bottom lines are traditional fishing gears exclusively used in fishing sturgeons in the sector Sf. Gheorghe – Ciotic.

These fishing equipments consist of rows of big fishing hooks, hanging in the water mass or near the bottom and making up a sort of barrage for the sturgeons moving around the said sector (Fig. 2).

Unlike the longlines, there is no bait in the bottom line hooks, the fish is caught when trying to cross the hook barrage.

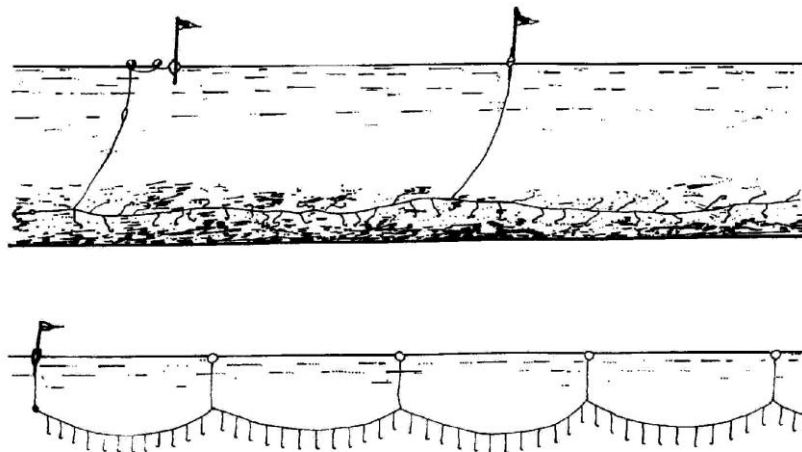


Fig. 1 – Longlines installation

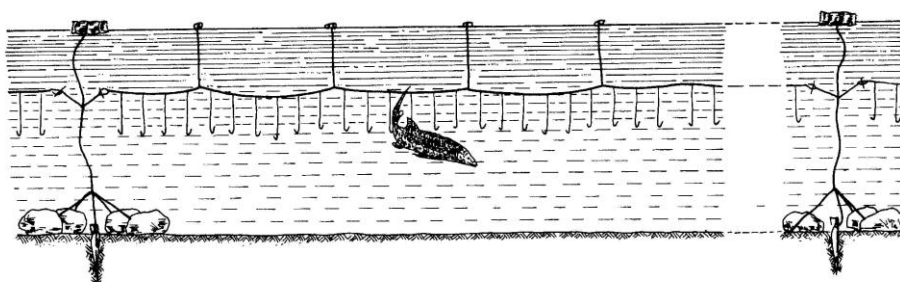


Fig.2 Bottom lines installation

Taking into consideration the way in which the bottom lines catch big fish when they try to go beyond the hook curtain, it is very likely that the dolphins can also become a prey of these fishing gears when they move about the sectors where such equipments are fixed (ANTON, 2001).

The gill nets belong to the category of fishing gears stopping the fish by catching and tangling .

The Danube shad gill nets are made of net by the mesh size $a=30$ mm and thread diameter $\varphi=0,3$ mm (Fig. 3 and 4). These fishing equipments are used for catching the Danube shad shoals off the Romanian coast, between the end of March and middle of May, when this species migrates to the spawning grounds.

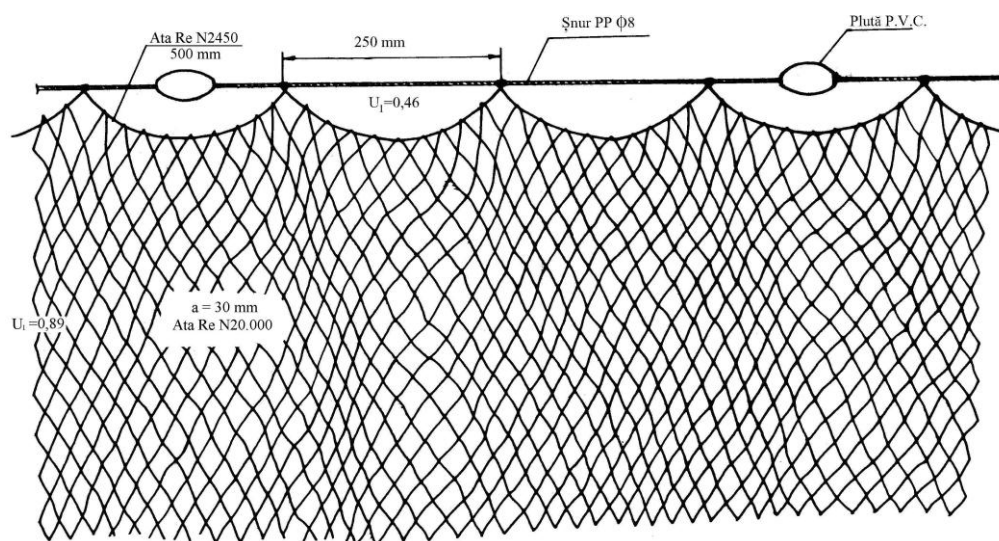


Fig.3 – Danube shad gill net – upper rope hanging detail

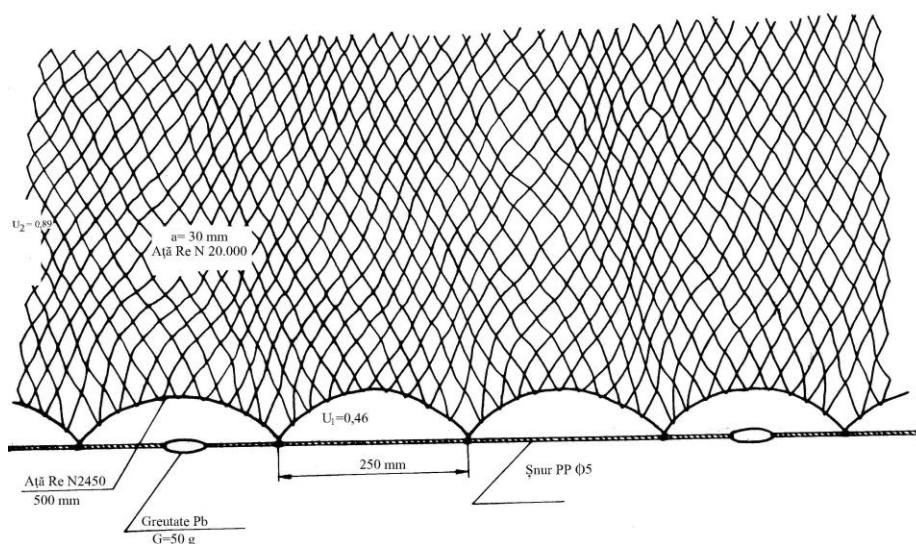


Fig.4 - Danube shad gill net – lower rope hanging detail

The Danube shad gill nets are made of net by the mesh size $a=200$ mm and threa diameter $\varphi \leq 0,5$ mm (Fig. 5). The turbot is especially caught during the spring season (March – June) when it migrates to the spawning grounds. The Danube shad gill nets are installed perpendicular to the shore, while the turbot gill nets are placed parallel to the shore, at a greater depth at the beginning of the season and gradually at smaller depths.

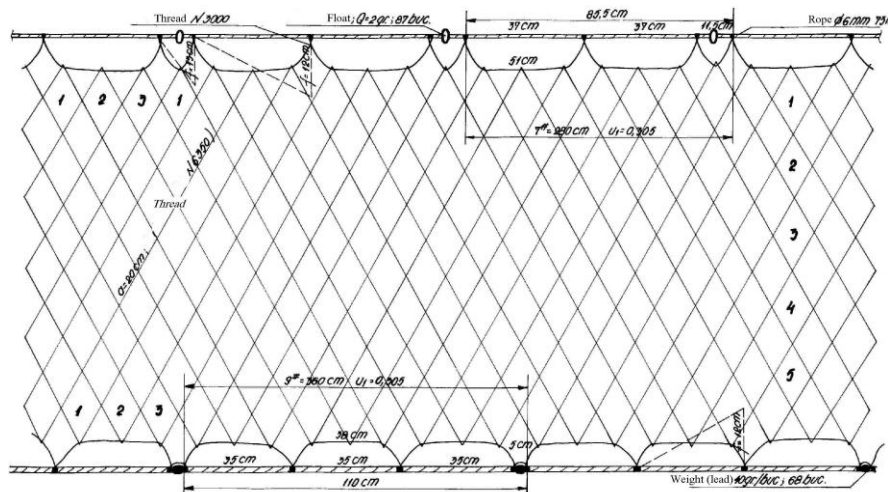


Fig. 5 - Turbot gill net - hanging details

The gill nets for sturgeons are made of one sheet, with a thread having $\varphi \leq 0,8$ mm and the mesh size exceeding 100 mm as per the legislation in force, depending on the target species.

The gill nets (turbot, sturgeon and Danube shad) are considered fishing gears causing victims among the dolphins. These fishing gears are made of thin, less visible and elastic threads, which facilitate the catching and tangling of the specimens crossing these nets.

The sea pound nets are trap type fishing gears, with big dimensions, placed at depths of 5 -12 m (Fig. 6). The concentration and stopping enclosures are parallel to the shore and reach a length of 70 m. A leader long of 300-500 m and perpendicular to the shore is used for guiding the fish to the trap.

As the marine pound net is made of nets with a small mesh size, it does not facilitate dolphin tangling or catching. This fishing gear is also a big one, so that some extreme situations can occur and dolphin specimens can enter these installations in search for food. In such a case, the dolphins can become captive, especially in the pound nets installed on stakes, because at that type of pound net the aerial wall can be rather high above the water and thus

constitutes a real barrage for the dolphins which entered the catching enclosure of the pound net.

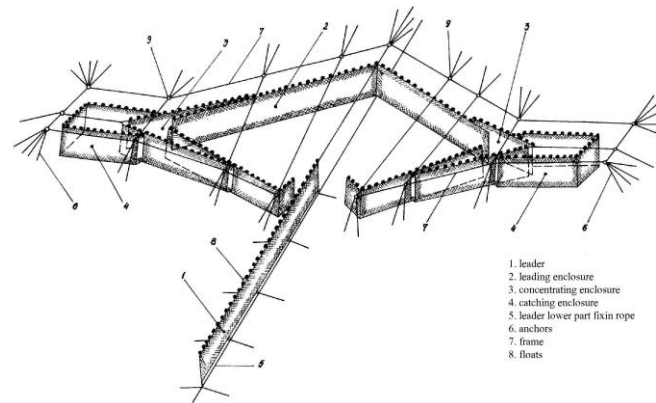


Fig. 6 - Giant pound net to be installed at 9-12 m depth

Another category of fishing equipments used in the Romanian coastal zone includes the active fishing gear; sea seine and pelagic trawl (Adam *et al.*, 1981).

The beach seine is an enclosing filtering fishing gear which catches the fishing object by reducing the enclosed surface and keeping the fish and other aquatic organisms in the enclosed perimeter.

The enclosing fishing gears are in general vertical nets enclosing a certain water surface, up to a certain depth or up to the pool bottom.

The building and keeping capacity of the beach seine do not endanger directly the dolphin populations.

But there is an indirect disturbing effect of these fishing gears as they affect some links of the trophic chain specific for the benthic and pelagic fish, which in turn are feeding resources for dolphins.

The trawl is an active fishing gear towed by a vessel and provided with a rigging system ensuring it a geometric shape optimum for filtering a water volume as large as possible during fishing (Fig. 7).

The coastal fishing fleet was established in 1982 and it increased until 1988 up to a number of 21 coastal trawlers, after which their number has dramatically decreased up to 6 units in 2001.

The active fishery has been based on the prospective research showing the existence of fish resources for commercial exploitation .

The marin fishery is conducted along the Romanian littoral in the sectors with depths of about 60 m because of the autonomy and sailing features of these vessels.

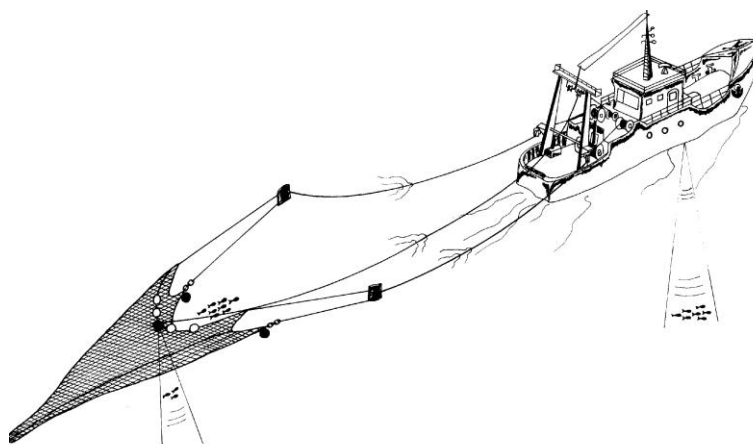


Fig.7 - Fishing vessel with trawl

The catches include mainly sprat (85 – 90%), whiting and dogfish (8 – 13%), and Black Sea horse mackerel (2%), from March to October.

One can state the active trawl fishery in the Black Sea has a seasonal characteristic owing to the limited period when the fish is present in the area covered by the Romanian coastal trawlers.

The trawl can be considered a fishing equipment directly and indirectly influencing the dolphin populations. Taking into consideration these equipments have large filtering surface (about 300 m²), it is possible for some dolphin specimens to enter the trawl, but due a small speed of equipment, the probability of entrance in codent is very reduced (ANTON, 2001).

The trawl can indirectly influence the dolphin populations owing to its functioning effects on the biocoenosis components, finally leading to the diminution of food sources as a consequence of the intensive and destructive fishing causing the degradation of the environmental conditions.

RESULTS

The data concerning the status of accidental dolphin catches in the commercial fishing gears have been based either on own studies and observations, and on the information received from the specialists in that field from the Black Sea coastal states.

The continental shelf is considered as a zone where the stock biomass increases. Many fish are pelagic in their young stages, when they mainly eat pelagic food in the offshore area. They come to the shelf for spawning and

feeding in the older stages and become the object of an intensive fishing, which is illustrated by the catch statistics in that area.

Some towed fishing equipments (seine, trawl) can have either direct and indirect effects on the fish stocks and other marine biota, as they can affect the substratum and the organisms populating those biotopes. The data recorded have shown the beach seine is not a direct threat for the dolphin populations. If we consider the exploitation technique of this type of fishing gear, we can say these equipments can have an indirect influence on those populations (distribution, development etc.). It is well known that the seines approach the sea bottom causing the catching, dislocation and collection of the biocoenosis components found in their way, and this causes the diminution of the food sources specific for the dolphins.

The trawl is a complex fishing gear and it has either an indirect and a direct influence on dolphins. The gradual increase of the filtering surface of the pelagic trawls used in the Black Sea coastal fishery has unfortunately caused accidental dolphin catches.

As already said, the trawl has also an indirect influence on the dolphin populations, through its impact on the biocoenosis elements, when the following situations can occur:

- disturbance of biocoenosis components by dislocation;
- partial destruction by breaking, crushing, catching;
- penetration of infections with pathogenic agents (bacteria, fungi) at the level of skin injuries produced by the mechanical – pressing action of the net;

The haulings on the sea bottom muddy the water owing to driving of fine sedimentary particles, the so called "pelite" fraction. The volume of "pelite" particles raising to the sea water surface is to have a major impact on the Black Sea ecosystem, as they include minerals, organic matter to be added to the eutrophication of the area and contain toxic substances from the bottom deposits. The geological studies have shown that the particles driven by the trawls in the eastern regions are carried by sea currents for 150 to 200 km and stored on a surface exceeding 500 sq.km, at depth of 10 to 15 m. The thickness of the sedimentary layer varied in some areas from 2 to 5 cm to 40 to 50 cm, which finally caused the diminution of the diversity in the muddy areas (ZAITSEV, 1992)

One can state the indirect influence of the fishing equipment of the trawl type can produce the decrease of the food sources for dolphins owing to environmental conditions degradation.

The most dangerous fishing gears for dolphins are considered the gill nets for turbot and sturgeons and trammel nets for the Danube mackerel, because of their big catching capacity.

Considering the fishing effects on dolphins, ALVERSON (1992) reviewed the possible interactions which can occur in this situation. He considers the gill nets were more utilized in the past and no considerable decrease of dolphin populations was recorded as a consequence of gill net exploitation. ALVERSON notified a few cases in which dolphin specimens tangled in the net and died.

Many fishing gears, especially gill nets, can be lost in the storm. In the '60s there was an idea that those fishing gears on the sea bottom go on catching fish and cause considerable damages to the fish and mammal stocks. Recent studies on this problem have shown that the effects of such "ghost fishing gears" are small, most of them twist in the water under the influence of sea currents, collect sea grass and other organisms and drop on the sea bottom.

The Ukrainian specialists (BIRKUN, 2001) determined the catching index of dolphins for the turbot and dogfish gill nets, for 100 km installed gill nets. For the turbot gill nets this index was 9 dolphins caught at 100 km gill nets, and for the dogfish gill nets - 12 dolphins at 100 km of gill nets.

Either the experts and the fishermen consider the data on the accidental dolphins catches are not entirely known.

The first among the main causes of dolphin mortalities is the illegal fishing carried on by foreign fishermen in the territorial waters of other states with turbot gill nets. In April, 1991, 14 Turkish vessels having 6,414 turbot gill nets with a total length of 640 km were arrested in Ukraine. Besides several fish species, 194 dolphins were caught in these fishing gears.

In May, 1994, 24 Turkish vessels installed turbot gill nets in Skadovoka sector, only one vessel was arrested and it had 20 dolphins in its gill nets.

A similar situation recorded too in the Romanian territorial waters. Thus, in 2002, in a short period (April-May) registered about 100 dolphins cached in fishing gear type gill net, as effect of a illegal fishing practiced by Turkish vessels. In this occasion have been arrested 7 vessels by Border Police.

Owing to the poor information from the fishing companies carrying on fishery activities with active and passive gears at the Romanian littoral, there are only a few data concerning the accidental dolphin catches.

However, one can say the accidental dolphin catches were recorded every year and their number was directly proportional to the fishing effort.

In 1988, when the Romanian coastal fishing fleet consisted of 21 vessels, the first catches of dolphins were recorded (1 to 2 specimens a year). The number of dolphins caught in the trawl can be considered insignificant

when compared with the catches in the stationary fishing gears (gill nets or pound nets) which are now the main gears in the marine fishery.

According to the information received, in 1995-2000 the mean of the accidental dolphin catches was of 4 to 5 specimens.

A special case was recorded in July, 1988, when a number of 8 dolphins *Delphinus delphis* were caught in the pound nets installed by the Romanian Marine Research Institute (VASILIU and DIMA, 1990).

There are no information on the accidental dolphins catches in other types of fishing gear (bottom lines, longlines and seines), but some isolated cases are presumable.

CONCLUSIONS

The research works had the goal to establish the consequences of fishing gears functioning on the marine living resources and their specific habitats.

* The consequences of towed fishing gears functioning

Because in the functioning time, the lower part of the towed fishing gears of the type bottom trawl, pelagic trawl (with demersal rigging system) and beach seine have a permanent and continue contact with the bottom, generate adverse functional effects on marine living resources and their specific habitats, through disturbing sediments and benthic organisms.

○ The consequences on the benthic biocoenosis

- disturbance of biocoenosis components by dislocation;
- partial destruction by breaking, crushing, catching;
- penetration of infections with pathogenic agents (bacteria, fungi) at the level of skin injuries produced by the mechanical – pressing action of the net;

Through disturbing and harvesting of some components of benthic biocoenosis are directly affected the biomasses of their components and, indirectly fishery resources on dolphin population, through determining some tears in the trophic chain specific to those.

- The consequence of turbulence

Towing of this fishing equipments on the bottom determine the disturbance of the substratum and implicitly distribution in the environment, under currents action, of the fine sediments.

After water disturbance and coverage with fine sediments of biotops, peopled by benthic organisms, can be affected both food sources and the status of specific habitats for fishery resources and dolphin population.

Through the large filtering surface (about 300sq.m), the pelagic trawl used in marine fishery by the Romanian trawlers can accidentally catch the dolphins present in zone for search and pursuance of the food.

- * The effects of working stationary fishing gears

- ◇ Long lines

Being stationary fishing gears, installed on bottom, having a static position in the functioning time, the long lines do not produce functional adverse effects on fishery resources, dolphin populations and their specific habitats.

- ◇ Bottom lines

Knowing the way in which the bottom line catch the big fish (sturgeons) which are crossing the barrage of hooks, it is possible that the dolphins become victims of this fishing gears when they moves in the area where are installed this installations.

- ◇ Gill nets

From ours data has resulted that the gill nets are the most dangerous fishing gears for dolphins which are moving in the area where are installed this gears.

Being made of thin, less visible and elastic threads, which facilitate the catching and tangling of the specimens crossing these nets, the gill nets have a big capacity for retention of dolphins which, in the searching of the food, are crossing these nets.

- ◇ Sea pound nets

Because of small mesh size, the sea pound nets does not facilitate dolphin tangling or catching. This fishing gear is also a big one, so that some extreme situations can occur and dolphin specimens can enter these installations in searching for food. In such a case, the dolphins can become captive, especially in the pound nets installed on stakes, because at that type of

pound net the aerial wall can be rather high above the water (0.5-0.75m) and thus constitute a real barrage for dolphins, which entered the catching enclosure of the pound net. From the pound net catching enclosure, the captive dolphins can be alive returned in the environment, through lowering of lateral wall when the fishermen control the fishing gear.

MEASURES AND RECOMMENDATIONS

Analysis and interpretation of data have evidenced some problems of which solution we propose several measures and recommendations:

◀ At regional level

- Accelerate the signing of the Fishery Convention and Conservation of Black Sea Living Resources.
- Harmonization of legal and institutional framework at the regional level aimed at sustainable use of living resources.
- Assessment of the efficiency of fisheries management system and impact of the existing fisheries practices.
- Promotion the fisheries methods and practices for decrease dolphin by-catch.
- Develop of projects and programs for protection and rehabilitation of marine living resources and their specific habitats.
- Achieve of a Regional Data Basis.
- Approval of some strictly actions for control of illegal fishing practices.

► At national level

- Elaborate of rules concerning fishing activity with stationary and towed gears.
- Special protection for spawning, feeding and wintering areas of fisheries resources and marine mammals.
- Elaborate of settlements concerning the protection of habitats.
- Include critical habitats in marine protection areas.
- Periodical completion of Prohibition Order with measures and recommendations resulted from research activities.
- Intensification of control actions in the fishing areas by Fisheries Inspection and Border Police.

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