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IMPACT OF INDUSTRIAL FISHING GEARS ON THE HEALTH STATUS OF COMMERCIAL FISH POPULATIONS AT THE ROMANIAN BLACK SEA COAST

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ABSTRACT

The aim of this paper is to analyse the impact of fishing gears on the health status of commercial fish populations industrially caught at the Romania Black Sea coast. Fishing gears used for industrial capture of fish may negatively impact fish stocks, this impact causing immediate or delayed effects. In the Romanian marine fishery, the following fishing methods are used: water filtering and fish retaining, fish tangling and hanging, blocking the direction of movement and directing the fish in a reduced space, pruning and hanging fish with armed hooks with natural or artificial baits or with unarmed hooks. From all the methods mentioned, the ones with the highest potential negative impact are: longlines, gill nets, hooks, pound nets, beach seine, pelagic trawl, bottom trawl. During the actual operation of fishing gears, fish specimens within their action range can be hooked, speared/punctured or crushed. All these mechanical actions cause skin lesions, thus favoring the penetration of infectious pathogenic agents (viruses, bacteria, fungi). The contamination of these fish individuals may cause the extension of infections to other individuals of the same species, as well as to other marine living resource. Moreover, the overall habitat in the area where fishing gears are deployed and act can be affected, along with other areas where specimens carrying various infections and parasites migrate. The health status of fish populations is highly important for spawning, growth and exploitation of commercial fish species.

Key-Words: fishing gears, health status, industrial fishing, lesions, diseases

AIMS AND BACKGROUND

In the last decades, the Black Sea ichthyofauna has experienced severe and often unpredictable changes. The cause of this is mainly due to degradation of environmental conditions in coastal areas, and especially in the northwest area, the main area for breeding and growth for commercial fish species.

Fishing is a traditional activity that over the years has played an essential role in the economy of Black Sea riparian countries, the fishing being industrial and handcraft. The fish resource was the most important resource exploited at the Black Sea. Marine living resources are not inexhaustible, even if they are restored, fishing must be done under certain conditions and depending on the state of fish stocks in order to minimize the risks which can be generated, such as considerable reduction of stocks for fish species of commercial interest and qualitative reduction of the ichthyofauna from the Romanian seaside. The gears and fishing techniques which are used have an important role in industrial fishing,

The use of non-selective and destructive gears can have a negative impact on the juveniles, affecting the restoration of the population or the benthic habitats with a trophic role. Apart from this impact, the fishing gear has an impact on the health fish populations, generating immediate or in time effects. To ensure sustainable exploitation of fisheries resources, exploitation must be done on the basis of ecosystem principles that take account of all interactions target stock with predators, competing species or prey, hydroclimatic effects and hydrochemical interactions, fish and habitat interactions, fishing effect on fishery resources and habitat, etc. (Anton & Adam, 2004).

The aim of this paper is to analyse the impact of fishing gears on the health status of commercial fish populations industrially caught at the Romania Black Sea coast.

EXPERIMENTAL

The analyzed biological material was represented by fish captured by experimental fishing, in the expeditions performed by NIMRD (2014-2017) (Fig. 1).

The working method consisted of direct observation during experimental fishing, using different fishing equipment, and of direct and microscopic analysis of affected fish.

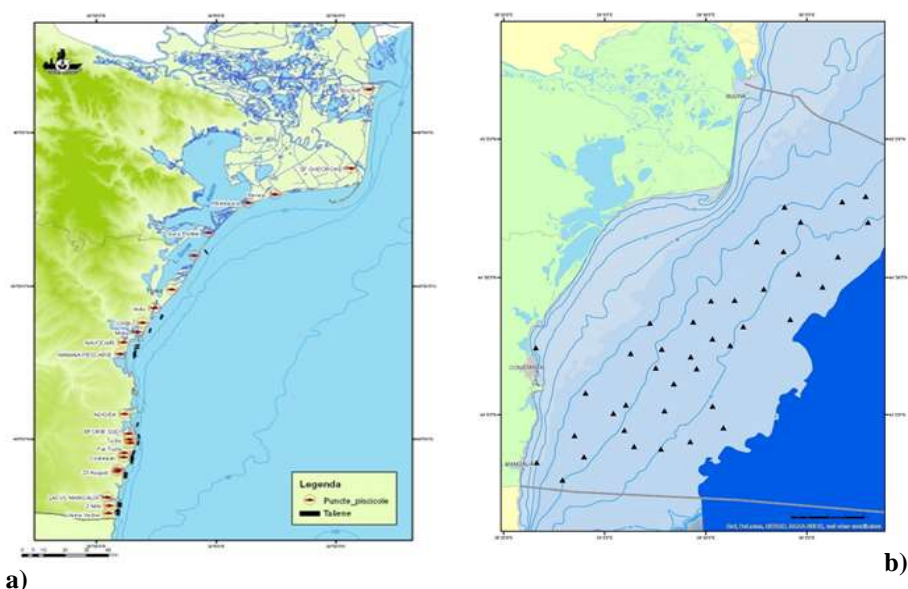


Fig. 1. Distribution of stationary sampling points (a) and trawling points (b).

RESULTS AND DISCUSSION

To ensure a sustainable exploitation of fishery resources on the Romanian Black Sea coast, it is necessary to carry out researches to assess the effects of fishing gears and technologies used in Romanian fisheries, on fishery resources and their specific habitats.

This paper presents the cases of injuries that can be caused by fishing gears during operation. These illnesses occur because of physical agents of mechanical nature.

Pathological conditions caused to fish populations by these physical agents during industrial fishing may be aggression and traumas, which are source of stress and illness that can alter the health status of fish populations.

During the operation and action of fishing gears, a state of stress is created on the fish populations in the fishing zone. Under the action of these stressful environmental conditions, the resistance of fish organisms decreases, thus favoring the emergence of infectious, parasitic or other diseases. Stress can slow down the growth of fish and, in some cases can generate death. Regardless of the factors that cause stress, there is an excitation of the central nervous system that cause various dysfunctions of the affected organisms.

Fishing gears through their mechanical action can act on the entire body or parts of fish body, by pressure, punching, sectioning or traction.

The effects of trauma can be multiple and with various degrees of severity, the most important ones being: destruction of the skin integrity, compression, tissue and organs injuries and bleeding.

During industrial fishing, the mechanical action of the used tools can destroy the integrity of the fish body within their range of action. This trauma facilitates the penetration of pathogenic bacteria that adhere to the surface of their body or are present in marine water, together with the stress created, representing the starting point of septicemia.

These traumas can occur outside the body of the fish, leading to fish scale lose. Depending on the affected area, the consequences of the health condition may be lighter or more severe. If scales have detached from more than half of the surface of the fish body, this can lead in a few hours to death as a result of removing the protective layer of the body and exposing it to the attack of microbial agents (Fig. 2).

As a result of the action of mechanical agents, by affecting organs or tissues, wounds are produced, these may be superficial or profound, representing a way of entrance for pathogens (Amlacher, 1981; Munteanu & Bogatu 2003).



Fig. 2. Injuries caused to fish populations by fishing gears
(www.google.ro/search=wounded+fish&oq=wounded+fish&gs).

In the Romanian marine industrial fishery, the following fishing methods are used, influencing the health status of the fish population:

- ✚ by filtering water and retaining the fish;
- ✚ by tangling and hanging fish;
- ✚ by blocking the direction of movement and directing the fish in a reduced space;
- ✚ by pruning and hanging fish with armed hooks with natural or artificial baits or with unarmed hooks.

Effects of fishing gear operated by water filtration

During operation, the lower part of trawls, bottom trawl, pelagic trawl, beam trawl (Fig. 3) and beach seine (Fig. 4) have permanent contact with the bottom of the sea (Radu, E.& Maximov, V., 2006).

The impact of such equipment on fish populations is primarily manifested by the mechanical action of scraping systems that can cause stress and trauma, and thus favors the emergence of infectious pathogens (bacteria, fungi etc.).

In this type of gear, undersized fish (with a body length smaller than that allowed in fishing) is crushed, loses a large part of the scales and when it is discharged into the water it may become infected, bearing infectious factors that can lead to mass illnesses.

Another impact of this type of gear is that this direct contact with the bottom of the sea generates immediate effects on fishery resources and their specific habitats through sedimentation and, implicitly, entrainment under the action of currents of fine sediments (particles containing both mineral substances as well as organic and toxic substances deposited on the bottom of the sea), which may give rise to dysfunctions of the immune system of fish (Nicolaev & Anton, 1998; Anton et al., 2004).



Fig. 3. Pelagic trawl (photo NIMRD).



Fig. 4. Beach seine (photo NIMRD).

Effects of fishing gear operated by tangling and hanging fish

The method consists of blocking the direction of fish movement with a vertical net in which the fish remains hanging and entangled when attempting to pass. These fishing gears that hold fish by hanging and tangling are called gillnets. (Radu, E. & Maximov V., 2006).

The effects of this type of gear are characterized by the action of physical agents of mechanical nature that can cause trauma by destroying the integrity of the skin on some fish specimens, thus forming pathways for penetration of bacteria, fungi and eggs / parasites larvae.

Specimens below the minimum size allowed in fishing to be released into the water may have injured gills or broken skin representing pathogens infestation gateways.



Fig. 5. Gillnet fishing gear (photo NIMRD).

Effects of fishing gear operated by blocking the direction of movement and directing the fish in a reduced space

The pound net is a stationary fishing gear (Fig. 6), fixed by the substrate to operate under certain working conditions, which binds the road of the fish moving, guiding it in a bounded space (Radu, E. & Maximov, V., 2006).

This type of gear can cause a state of stress to populations in the area where it is located and the retention of young populations belonging to the fish species in that area.

By rubbing young specimens (under the minimum allowable size in fishing), which will be discharged, they lose some of their scales or are injured being infected with pathogens.



Fig. 6. The pound net in the Romanian Black sea area (photo NIMRD).

Effects of fishing gear operated by pruning and hanging fish with unarmed or armed hooks

The longline is a fishing tackle with natural bait boats (Fig. 7). This type of fishing gear can cause wounds by stinging fish specimens, injuries representing infestation pathways and sometimes lead to appearance of septicemia. The lingering of specimens can lead to the spread of infections to several species of living marine resources and damage to the habitat of the lying area and other areas where these infected and parasitic species carry out different feeding and reproduction migrations.



Fig. 7. Bottom and pelagic longlines (<https://www.google.ro/search/paragat+pentru+peste>).

CONCLUSIONS

To ensure the sustainable exploitation of fishery resources on the Romanian Black Sea coast, it was necessary to carry out research for assessing the effects of fishing gears and technologies used in Romanian fisheries on fishery resources and their specific habitats. The action of mechanical factors on fish populations can cause major trauma, triggering bacterial or fungal diseases. Stress caused to fish populations while fishing gear are used can have a negative impact. Conservation of the coastal area involves measures to conserve biological resources and their habitats by banning inappropriate technologies and diminishing activities that by their nature can lead to worsening the existing imbalances. Excessive, uncontrolled fishing and the destruction of habitats by using inappropriate fishing gears and techniques that can negatively affect some elements of the marine environment and the interrelations created within the biocenosis, are important factors that have contributed to a severe impact over the biological diversity of the Black Sea.

Assessing the health status of major commercial fish species is an important element in developing measures and recommendations for the implementation of the responsible fishing concept, a concept according to which fisheries harmonize respect for ecosystems and biodiversity on the one hand consumers' needs and their interest in quality fishery products.

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