

BOTTOM TRAWL SIZE SELECTIVITY METHODS IN THE TURKEY

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Abstract

Trawling is an important fishing method used by the fishermen in the Turkey. Bottom trawling fisheries in this part of Mediterranean are essentially multispecies. Commercial fishing vessels use 44 mm diamond shaped mesh for trawl cod-end s in the Mediterranean Coast of Turkey. The trawl nets (cod-end) of the fishery retain a lot of juvenile individuals, which has negative effects on the population of fish species. Currently fishing boats use very low selectivity gears. Because of this reason, fishing ground is predominantly overfished. Although there are many selectivity studies carried out in the Mediterranean coast of Turkey, selectivity experiments results have not used into practice for management of fisheries yet.

Key words: Bottom trawl, size selectivity, cod-end, Turkey

INTRODUCTION

Turkey is surrounded by three seas: the Black Sea in the north, the Aegean Sea on the west, and the Mediterranean Sea on the south. In Turkish waters, while the main fishery of coast of Black sea was targeted on small and medium pelagic fish species [12] (anchovy, herring, Atlantic bonito) demersal fish species (mullet, lizardfish etc.) are main fisheries for the Mediterranean and Aegean coast of Turkey.

Fisheries in Turkey are characterized as multi-species, multi-gears and targeted both demersal and pelagic fish stocks as in most of other Mediterranean countries [20]. Trawling, purse seine, and trammel netting are three common commercial fishing methods in the Mediterranean coast of Turkey. Trawl and small-scale fisheries (gill net, trammel net, long line, trap etc.) are exploiting demersal fish stocks, while purse seiners are concentrating on small or large pelagic fish stocks. Lagoon fisheries also exist in the region focusing on sea bass, sea bream, eel and mullet [6]. Natural fish resources of Turkish waters have been damaged for a long time and most of fish stocks are fully fished and some are overfished [10]. Besides these, according to the Food and Agriculture

Organization 33% of the Mediterranean and Black Sea fish stocks were fully exploited, 50% were overexploited. The main stocks of sole, most sea breams, and all hake and red mullet are over exploited during 2009, in the Mediterranean Sea [10].

In the Turkey, fishing regulations are based on minimum mesh size, minimum landing size or weight, closed area and terms for specified fishing gears and vessels, closed season, ban on catch to some species, gear restriction for identified species, gear or fishing method restrictions and some restrictions concerning pollutants [11].

Trawling is a method of fishing that involves actively dragging or pulling a trawl through the water behind one or more trawlers. Trawling methods is the most important capture method for exploitation of the demersal fish stocks around the Turkish coasts. Approximately 90% of demersal fish production is harvested by trawlers in Turkey [20].

There are many selectivity methods used in the world. These methods are:

- (i) Covered cod-end method
- (ii) Trousers trawl method
- (iii) Parallel haul method
- (iv) Twin trawl method
- (v) Alternate haul method

(vi) Special selective devices

In this list, while special selective devices and covered cod-end method can be used only for a part of trawl net, trousers trawl method, parallel haul method, twin trawl method and alternate haul method can be used for whole trawl selectivity [22].

In this paper, bottom trawl size selectivity methods carried out in Turkey were presented. Also the structures of selectivity gears and cod-ends were summarized detailed.

MATERIALS AND METHODS

Traditional Mediterranean bottom trawl cod-end

Currently, Turkish Fisheries Regulations defines a minimum cod-end mesh size of 40 mm for the Black Sea, 44 mm for the Aegean Sea and the Mediterranean for demersal trawls [1]. Many published studies were showed the selectivity of commercially used cod-ends is rather poor in Turkish demersal trawl fisheries [20](Figure 1).

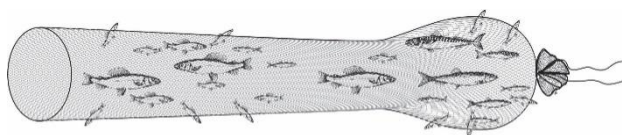


Fig. 1. A traditional diamond mesh cod-end used in the Mediterranean coast of Turkey

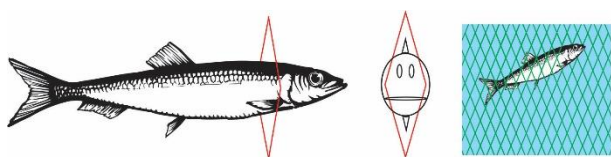


Fig. 2. Meshes stayed tightly closed during the haul

Because the rate of fish species retain in the cod-end were immature and smaller than the minimum landing size or first maturity size. In the traditional diamond shaped cod-ends, during the haul meshes stay tightly closed and individuals that try to escape through these meshes may squeeze (Figure 2) and this leads to an increase in the mortality rate [17, 18].

There are many selectivity studies carried out in the Mediterranean coast of Turkey, but only trousers trawl method and covered cod-end method (diamond and square shaped

mesh cod-ends) were used in these experiments.

Covered cod-end method (Hooped covered cod-end)

In this method, a small – meshed bag, called as the “cover”, fix surrounds the main cod-end in order to retain all of the specimens that escape through the main cod-end meshes (Figure 3). According to [22], the fully extended width of a cover should be at least 1.5 times larger than that of the main cod-end and the length of the cover is advised to be two times longer than the extended length of the main cod-end. The construction of the cover should ensure that the water flow in and around the main cod-end is affected as little as possible. The cover cod-end is usually attached to hoops or kites to avoid masking effects with the main cod-end [14].

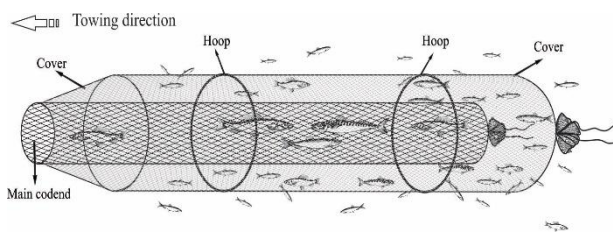


Fig. 3. Covered cod-end method

The main aim of using the covered cod-end method is to calculate selectivity parameters based on the proportion of fish that remain in the catches compared to the ones those escapees [16]. In this method, caught fishes from both inside and outside main cod-end analyze separately. Length measurements of all individuals use for the estimation of the selectivity parameters [7].

Trousers trawl method

The trouser trawl was developed as an alternative product to the covered cod-end and alternative haul methods and came into widespread use in the mid-1980s [5]. In this method, a sorting grid fixes end of the tunnel before the trousers shaped cod-ends. In front of sorting grid, a guiding panel, made from netting should be stretched. This panel helps the fish directly to swim the sorting grid. When designing a sorting grid, it is important to develop a system that ensures that most fish come into contact with the grid and thereby have a chance to escape through it [12].

The sorting grid consists of two parts. Upper part of sorting grid is without any grid and the length of this part should be 40% of the total length. Other part of sorting grid consist 60% contain grids. The space between grids can be set according to height of targeted fish species body shape. Trousers shaped cod-end fixes behind the sorting grid (Figure 4). The form of sorting grid (using horizontal or vertical grids) is depending on targeted fish body form.

During haul, small fish that pass through the grid direct towards the escapees and larger fish (that couldn't pass through the grid) direct towards the catches. The fish totally retained in catches, and escapees use to estimate the selectivity parameters [15].

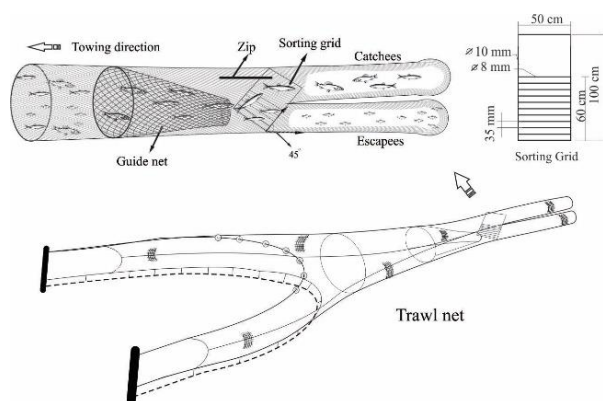


Fig. 4. Design of the sorting grid systems used in Turkey [15]

Square mesh cod-end

In this method, square mesh shaped cod-end fixed trawl net use instead of diamond mesh cod-end (Figure 5). The shape of square meshes keep continuously remain open unlikely diamond mesh during the haul. Because of this reason, square mesh cod-end is more selective than the diamond shaped mesh cod-end s, as it increases the 50% selection lengths of most target species and reduces discards [3].

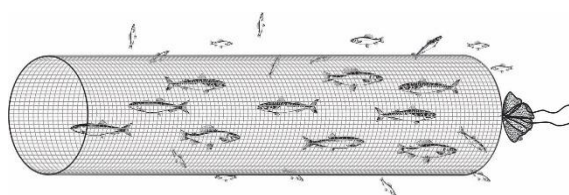


Fig. 5. Square mesh cod-end

RESULTS AND DISCUSSIONS

The fisheries in the Turkish Mediterranean coasts are very diverse, both in terms of the fishing methods, fishing gears used and the species caught. Demersal fishery in Turkey mainly constitutes 41 fish species [19]. Demersal fish production was 3% of the total fish production in 2015 [8]. The aim of ecosystem based fisheries management is to provide the maximum sustainable take of target organisms with the minimum impact on other ecosystem components. Trawling and dredging are responsible approximately half of the total discarded fish worldwide. Bottom trawling causes seriously chronic and widespread problems on the demersal zone with the removal of growing epifauna, damaging and shifting the habitat and benthic community and demersal fish fauna [8]. According the [4], every 1 kg of targeted catch responded 1.5 kg of discarded species in the catch composition [8]. The main goal of selectivity studies is to improve minimizing the capture of juveniles by regulating the size at first capture, increasing the yield per recruit of targeted species, and reducing the discards and hence the impact of fishing on ecosystems [2].

Up to now, there are many studies established differences in selectivity of mesh size (diamond, square, and hexagonal meshes) different selectivity methods (covered cod-end, trousers cod-end method) and gears (grids, hoops etc.) to provide better reducing discard ratio [4, 9, 15]. After all of these experiments, very important results published by the researchers.

Although there are many selectivity studies carried out in the Mediterranean coast of Turkey, selectivity experiments results have not used into practice for management of fisheries yet.

CONCLUSIONS

The European Union and the General Fisheries Commission for the Mediterranean proposed 40 mm square mesh cod-end in all demersal trawl fisheries to improve the overall exploitation pattern in 2008. The

studies result showed that covered cod-end method, trousers cod-end method, using sorting grid or using square mesh cod-end instead of diamond mesh cod-end have many advantages and disadvantages. According to these results a single method will not to be suitable for all species to decrease or minimize the discard or to catch juveniles in the Turkey as in the world.

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