Evaluation on Minimum Landing Size Regulations in Turkish Marine Fisheries from Scientific Perspective#

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Abstract

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Crucial point of fishery management is to let the fish or other species reproduce at least once during their life. Therefore it is very important to determine the length at maturity (L_m) for given species before the first capture. Focus of this study is to determine the consistency between scientific results and minimum landing size (MLS) regulations in the marine fishery of Turkey. For this purpose, 4/1 communique on commercial fishery (2016/35) published by the Republic of Turkey Ministry of Agriculture and Forestry was investigated in order to expose the MLS of given species in Turkey. Literature survey on L_m was also conducted preferably on studies which were performed in Turkish waters or from the Mediterranean basin in order to avoid regional differences. While 86 marine species were reported to be landed in the official fishery statistics, only 49 of them were appointed with a MLS in the commercial fisheries regulation. It was determined that MLS of 27 species were below the L_m according to the selected literature, 7 of them require result on L_m, status of the 2 species couldn’t be decided due to different length types and 13 (27% of the decisions on MLS) of them were found to be in accordance with the scientific literature on L_m. This study shows that MLS regulation must be revised for most of the species in the surrounding waters of Turkey and comprehensive maturity studies are urgently needed in order to fulfill the scientific gap.

Article info

Introduction

Sustainability of any type of fishery depends on scientific management of fish stocks. Minimum landing size (MLS) regulation and size at maturity are two of the major components of the management strategy. Size at maturity (defined here as the length at which 50% of a population become sexually mature for the first time, L_m) is a key population parameter that is extremely important in the fisheries management of exploited stocks (Jennings et al., 2001). On the other hand MLS regulation is one of the most important and most common tool over the world in fisheries management. Crucial point of fishery management is to let the fish or other species reproduce at least once during their life. Therefore it is very important to determine the length at maturity (L_m) for given species before capture.

Total aquatic production of Turkey was 628631 tonnes (t) in 2018, with 314094 t corresponding to 50% of the total production including 86 species (65 fish and 21 crustaceans and molluscs) originating from capture fisheries (TÜİK, 2019). Engraulis encrasicolus, Sprattus sprattus, Sardina pilchardus, Merlangius merlangus euxinus, Trachurus trachurus, Sarda sarda, Trachurus mediterraneus, Boops boops, Mugil spp., Mullus surmuletus, Scomber japonicus and Pomatomus saltatrix compose more than 90% of the production (TÜİK, 2019). MLS regulation is under the control of Republic of Turkey Ministry of Agriculture and Forestry. Minimum landing size of certain species have been mentioned in the 4/1 commercial fishery regulations (2016/35).
The term “size” refers to total length in fishes, mantle length in cephalopods, carapace length in crustaceans and shell length in bivalves generally. Minimum landing weight is also applicable where it is difficult to measure the length like in octopus or where it is more practicable. Although there are studies reporting \( L_m \) values of some commercial species in Turkey (Soykan et al., 2010; Metin et al., 2011; Soykan et al., 2015a; Soykan et al., 2015b), accordance between these values and the legislations were not deeply emphasized. As mentioned above, sustainable exploitation of fish stocks require scientific attitude especially on the maturity issue in order to make decision on MLS. The goal of the present study is to determine the consistency between minimum landing size limits of the given species in Turkey and the \( L_m \) results of scientific studies. This paper is also considered to contribute the management of marine fisheries by updating the knowledge on \( L_m \) for given species.

Material and method

Landed and marketed species in the Turkish fishery were derived from official fishery statistics of Turkey (TUİK, 2018). 4/1 communiqué on commercial fishery (2016/35) published by the Republic of Turkey Ministry of Agriculture and Forestry was investigated in order to expose the MLS of given species in Turkey. Literature survey with regards to \( L_m \) was also conducted preferably on studies which were performed in Turkish waters or from the Mediterranean basin in order to avoid regional differences. A detailed table including MLS, \( L_m \) values and their references with common and scientific names of the species was presented. Scientific names of the species were revised and appointed according to Froese and Pauly (2019), Mater et al., (2003) and WoRMS (2019).

Results and Discussion

86 marine species were reported to be landed in the Turkish official fishery statistics. On the other hand only 49 of them were appointed with a MLS in the commercial fisheries regulation. It was determined that MLS of 27 species were below the length at maturity according to the selected literature. 7 of them require result on \( L_m \), status of the 2 species couldn’t be decided due to different length types and 13 (27% of the decisions on MLS) of them were found to be in accordance with the scientific literature on LFR.

Table 1 summarizes the consistency between scientific results on \( L_m \) and minimum landing size (MLS) regulations in the marine fishery of Turkey. *Merluccius merluccius* and *Solea solea* which are highly valuable demersal fishes are not well managed. According to projection of this review, MLS of these species must be over 26 and 23 cm TL respectively. Besides that, MLS of *Trachurus mediterraneus* which is one of the major pelagic fishes of Turkish waters should be increased to 20 cm TL. Another disconformity was observed in mullet species. While *Mugil cephalus* and *Lisa aurata* were in accordance with the given literature, MLS of 4 other mullets were below the \( L_m \) and accurate finding are required for *Mugil labeo*. It is revealed that updated data are required for mullet species. Regarding the family scombridae, only MLS of *Thunnus thynnus* were found to be over the \( L_m \). *Euthynnus alleteratus*, *Scomber scrombus*, *Scomber japonicus* and *Sarda sarda* were appointed with improper MLS according to literature. MLS of some other high commercials, *Pomatomus saltatrix*, *Dentex dentex*, *Mullus surmuletus* and *Dicentrarchus labrax* were also below the scientific limits. Ceyhan et al. (2007) reported the \( L_m \) value of *Pomatomus saltatrix* to be 25.4 cm FL. Depending on their finding, 26 cm FL or 30 cm TL would be appropriate as MLS. One of the important negative situation belonged to *Sardina pilchardus*, the third important capture fish, with improper MLS appointment (Table 1).

\( L_m \) value for *Sardina pilchardus* was given to be 12.1 cm TL by Akyl et al. (1996) in the Aegean Sea. Tsikliras and Kourakis (2013) revealed the \( L_m \) of *Sarina pilchardus* as 11.65 cm in the Greek coast of the Aegean Sea and recommended MLS to be 12 cm TL. Comparison of over mentioned studies showed that 12.5 cm TL MLS would be quite suitable for the species. *Boops boops* which is documented as an industrial species in the fishery statistics has no MLS. According to Soykan et al. (2015), \( L_m \) value was calculated to be 12.96 cm TL for females. Therefore a minimum 13 cm TL MLS is recommended for *Boops boops* in the Turkish waters. Although \( L_m \) value for *Sprattus sprattus* was reported to be 9 cm TL in the Black Sea (De Silva, 1973), MLS for this species is missing in Turkish waters. So recommendation on MLS for sprat would be no less than 9 cm in Turkey. Status of the rest of the species were presented in Table 1.

During the investigation of the official fishery statistics, it was observed that the document exclude scientific names of the landed species which brings a difficulty in describing the species. Another deficiency of the mentioned document is the misuse of common names. One of the basic benefits of this study is considered to be the revision of scientific and common names of the species mentioned in the minimum landing size regulation of Turkey. MLS of missing 37 species (species which were not assigned a MLS) must urgently be appointed according to scientific results in order to make sustainable exploitation of the stocks. Comprehensive studies including stock estimation and monitoring should especially be focused on *Engraulis encrasicholus*, *Sprattus sprattus*, *Sardina pilchardus*, *Merlangius merlangus eurinus*, *Trachurus trachurus*, *Sarda sarda*, *Trachurus mediterraneus*, *Boops boops*, *Mugil spp.*, *Mullus surmuletus*, *Scomber japonicus* and *Pomatomus saltatrix* which are the major species of the capture production. Among those, missing MLS values for *Sprattus sprattus* and *Boops boops* must be decided. Furthermore, \( L_m \) values of *Sardina pilchardus*, *Merlangius merlangus eurinus*, *Sarda sarda*, *Trachurus mediterraneus*, *Mullus surmuletus*, *Scomber japonicus* and *Pomatomus saltatrix* must be updated in the light of scientific studies in Turkish waters and after that MLS’s should be decided for sustainable exploitation of the stocks. Finally, this study shows that MLS regulation must be revised for most of the species in the surrounding waters of Turkey and comprehensive maturity studies are urgently needed in order to fulfil the scientific gap.
## Table 1: Comparison between the scientific results on Lm and MLS regulation in Turkey.

| Common name (T/E) | Scientific name | MLS / MLW | Lm-LT | Reference | A |
|-------------------|-----------------|------------|-------|-----------|---|
| **Fish**          |                 |            |       |           |   |
| Akya/Lee fish     | Lichia amia     | 40-TL      | Required | Soykan et al., 2015a | - |
| Bakalyaro/European hake | Merluccius merluccius | 20-TL | 25.6 cm-TL | Soykan et al., 2015a | - |
| Barbunya/Red mullet | Mullus barbatus | 13-TL | 10.9 cm-TL | Erdem, 2018 | + |
| Çipura/Gilthead sea bream | Sparus aurata | 20-TL | 18.5 cm-TL | Kınacıgil et al., 2008 | + |
| Dil/common sole | Solea solea | 20-TL | 22.7 cm-TL | Kınacıgil et al., 2008 | + |
| Eşkına/Brown meagre | Sciaena umbra | 25-TL | 22.0 cm-TL | Engin and Seyhan 2009 | + |
| Hamsi/Anchoy | Engraulis encrasicolus | 9-TL | 8 cm-TL | Bingel et al., 1996 | + |
| Istavrit/Atlantic horse mackerel | Trachurus trachurus | 13-TL | 11.6 cm-TL | Kınacıgil et al., 2008 | + |
| Istavrit/Mediterranean horse mackerel | Trachurus mediterraneus | 19.1 cm-TL |  | Karlıou-Riga, 1995 | - |
| Kalkan/Turbot | Psetta maxima | 45-TL | 24.7 cm-TL | Eryilmaz and Dalyan, 2015 | + |
| Karagöz/Two banded sea bream | Diplodus vulgaris | 18-TL | 13.4 cm-TL | Soykan et al., 2015b | + |
| Kefal/Sof-iuy mullet | Mugil soiuy | 35-TL | 47.8 cm-TL | Okumuş and Başçınar, 1997 | - |
| Kefal/Boxlip mullet | Mugil labeo | | Required | | |
| Kefal/Thicklip grey mullet | Chelonia labrosus | 36.0 cm-TL | Brusle and Brusle, 1977 | - |
| Kefal/Thinlip grey mullet | Liza ramada | 20-TL | 29.0 cm-TL | Ergene, 2000 | - |
| Kefal/Leaping mullet | Liza saliens | 25-TL | 25.1 cm-TL | Kouttrakis, 1994 | - |
| Kefal/Flathead grey mullet | Mugil cephalus | 30-TL | 29.1 cm-TL | McDonald et al, 2005 | + |
| Kefal/Goze grey mullet | Liza aurata | 30-TL | 24.9 cm-TL | Rotos, 1999 | - |
| Köşk/Sword fish | Xiphias gladius | 125-LJFL | 149.0 cm-LJFL | Orsi Relini et al., 2003 | - |
| Kirlangıç/Tub gurnard | Chelidonichthys lucerna | 18-TL | 12.1 cm-TL | Kınacıgil et al., 2008 | + |
| Kırmızı mercan/common pandora | Pagellus erythrinus | 15-TL | 16.5 cm-TL | Metin et al., 2011 | - |
| Kilyoz/Chub mackerel | Scomber japonicus | 18-TL | 23.0 cm-TL | Techetach et al., 2010 | - |
| Levrek/Box bass | Dicentrarchus labrax | 25-TL | 30.1 cm-TL | Kara, 1997 | - |
| Lipsöze/Red scorpionfish | Scorpaena scrofa | 15-TL | 21.0 cm-TL | Kaim-Malka and Jacob, 1985 | - |
| Lüfer/Blue fish | Pomatomus saltatrix | 18-TL | 25.4 cm-FL | Ceyhan et al., 2007 | - |
| Mezeğ/Whiting | Merlangius merlangus | 13-TL | 14.5 cm-TL | Genc et al., 1999 | - |
| Minekopi/Shi drum | Umbra cirrhosa | 25-TL | Required | | |
| Nİl barbunya/Goldband goatfish | Upenus moluccensis | 10-TL | 11.0 cm-FL | Özval et al., 2010 | - |
| Palamut/Bonito | Sarda sarda | 25-TL | 37.0 cm-TL | Cayrè et al., 1993 | - |
| Pisi/F louder | Pleuronectes spp | 20-TL | 22.5 cm-TL | Kısor et al., 1996 | - |
| Sardalya/Sardine | Sardina pilchardus | 11-TL | 12.1 cm-TL | Akyol et al., 1996 | - |
| Tırsı/Round sardine | Sardina aurita | 11-TL | 16.8 cm-TL | Türkılars and Antonopoulou, 2006 | - |
| Sargos/White seabream | Diplodus sargus | 21-TL | 23.5 cm-TL | Cetin et al., 2002 | - |
| Sartergiz/Meagre | Argyrosomus regius | 25-TL | 57.2 cm-TL | Gil et al., 2013 | - |
| Sarkuyruk/Greater amberjack | Seriola dumerili | 30-TL | 113 cm-FL | Marino et al., 1995 | - |
| Sinagri/ Common dentex | Dentex dentex | 35-TL | 52.0 cm-TL | Morales-Nin and Moranta, 1997 | - |
| Tekir/Surmullet | Mullus surmuletus | 11-TL | 13.7 cm-TL | Kınacıgil et al., 2008 | - |
| Mavi Yüzgeç Toni (Orkino)*/Bluefin tuna | Thunnus thynnus | 115-TL/30 | 111.4 cm-FL | Corriero et al., 2005 | + |
| Uskurum/Atlantic mackerel | Scomber scombrus | 20-TL | 22.8 cm-TL | Çikès Kec and Zorica, 2012 | - |
| Yazılı orkinos/Little tunny | Enorthynus allateratus | 45-TL | 47.3 cm-FL | Hajge et al., 2011 | - |
| **Mollusc**       |                 |            |       |           |   |
| Akivades/Grooved carpet shell | Rudipates decussatus | 2.4-ShL | Required | | |
| Beyaz yum kudiyesi/Striped venus clam | Chamelea gallina | 1.7-ShL | Required | | |
| Istriyide/Edible oyster | Ostrea edulis | 6.0-ShL | Required | | |
| Kidonya/Warty venus | Venous verrucosa | 3.0-ShL | Required | | |
| Kum uçlanı/Truncate donax | Donax trunculus | 2.5-ShL | 1.8 cm-ShL | Zeichen et al., 2002 | + |
| Ahtapot/ Common octopus | Octopus vulgaris | -1/kg | 2023 kg | Silva et al., 2002 | - |
| **Crustacea**     |                 |            |       |           |   |
| Böcek/Common spiny lobster | Palinurus elephas | 25-TL | 10 cm-CL | Goni et al., 2003 | ? |
| Istakoez/European lobster | Homarus gammarus | 25-TL | 11 cm-CL | Lizaragaga-Cubedo et al., 2003 | ? |
| Mavi yenegey/Blue crab | Callinectes sapidus | 13-CL | 11.9 cm-CL | Sümer et al., 2013 | + |

**A:** Accordance, MLS: Minimum landing size (cm) – LT: LT, MLW: Minimum landing weight (kg), Lm: Length at maturity, LT: Length type, TL: Total length, FL: Fork length, SL: Standart length, LPIFL: Lower jaw fork length, ShL: Shell length, CL: Carapace length. *One of the measures shall be considered; - Inconvenient, +: Convienient, ?: Length type difference

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