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Fishers' responses towards the banning white grouper fishery in Turkey

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Abstract
Groupers are important fishes for the coastal ecosystems because of having a key role in the functioning of marine food webs. Their populations are increasingly affected by overfishing, habitat loss, and global warming. Since a reliable scientific background is lacking, their conservation is based on precautionary approaches, the applicability, and effectiveness of which are long questioned. Changes in Turkey's grouper fishery legislation constitute an excellent example of how a precautionary approach could not gain acceptance among the stakeholders. In Turkey, fishing on white groupers was banned in 2016. Before the ban, white groupers constituted a vital resource, particularly for demersal longliners, who strongly objected to the ban. After two years of closure, the ban had to be repealed by policymakers in 2018. In this study, we assessed the fishers' opinions about these changes in legislation and investigated shifts in their fishing practices based on qualitative interviews with the stakeholders. The ban significantly affected the demersal longliners who were indignant at the late announcement after making their investment for the coming fishing season. Referring our interviews, longliners were grouped under three categories based on their reflexes towards the ban. Some of the wholly left fishing started to use gill nets or thin longlines targeting goatfishes, sea breams, and particularly invasive threadfin bream (*Nemipterus randalli*) after the ban. According to the anecdotes of fishery controllers and fishers' community leaders, illegal fishing on groupers continued even after the ban. The guestimates of the rate of illegal fishing were roughly ranged between 20 % and 40%. In conclusion, further steps are required for the conservation of groupers, and in addition to establishing a reliable biological baseline, more participatory approaches will be helpful for this purpose.

Keywords: Conservation, *Epinephelus aeneus*, Fisheries management, The eastern Mediterranean

Introduction
Groupers (Serranidae, Epinephelini) have key roles in the food webs' structure and functioning as important predators of the coastal demersal habitats. They are long-living species with late sexual maturity, sex reversal, slow growth, and site fidelity (Sadovy de Mitcheson *et al.* 2013). Such life-history traits increase groupers' vulnerability to anthropogenic factors, like

habitat loss, pollution, climate change, and particularly fisheries (Coleman *et al.* 2000). Consequently, a lot of the grouper species are classed under threatened categories of the International Union for Conservation of Nature's (IUCN) Red List, suffering from serious declines in their population size (IUCN 2017, Morris *et al*. 2000, Sadovy de Mitcheson *et al*. 2013).

So far, eight grouper species; dusky (*Epinephelus marginatus*), white (*E. aeneus*), gold-blotch (*E. costae*), dog-tooth (*E. caninus*), orange-spotted (*E. coioides*), Haifa (*Hyporthodus haifensis*) and mottled groupers (*Mycteroperca rubra*) along with African hind (*Cephalopholis taeniops*), are recorded inhabiting the Mediterranean and the Aegean coasts of Turkey (Bilecenoglu *et al.* 2014, Golani *et al.* 2017). *E. coioides* and *C. taeniops* are based on single records (Engin *et al.* 2016, Gokoglu and Ozvarol 2015, Özcan *et a*l. 2020), and their establishment statuses are still unknown. Based on IUCN's records, white and dusky groupers are classed under the threatened categories in the Red List. Although the global conservation status of dusky grouper is "Vulnerable" (VU) Pollard *et al*. 2018a), it is classified as "Endangered" (EN) for the Mediterranean Sea (Cornish and Harmelin-Vivien 2011). White grouper is classified as "Near Threatened" (NT) for both global and the Mediterranean scale (Pollard *et al.* 2018b, Sadovy *et al.* 2011).

Groupers are amongst the most economically valuable species in the Turkish fishery. Based on official landing records, annual grouper catches were between 36 and 827 tones in the last two decades (TUIK, 2019). They are target species of demersal longlines, traps, spear guns and anglers, and by-catch for bottom trawls and nets. Particularly demersal thick longlines targets white groupers constituting the primary source of fishery pressure on them. The demersal thick longline fishery is employed by polyvalent fishing vessels in spring and autumn seasons (Mavruk *et al.* 2018), so-called grouper fishing seasons, hereafter. In Turkey, the most considerable portion of grouper landings was recorded from the Gulfs of Iskenderun and Mersin, in the northeastern Mediterranean (Mavruk 2020).

Important data gaps exist on the status of the grouper stocks in Turkey. As a consequence of this, stakeholders could not reach a mutual understanding on the regulations of grouper fishery and related legislations changed two times since 2016. Before 13.08.2016, the minimum landing size was 45 cm for white and dusky groupers. Additionally, fishery of both species was seasonally banned from 15 ^{Jun} to 31 ^{Jul} (Official Gazette 2012). Following catch statistics highlighted abrupt declines in white grouper populations, policymakers permanently banned the catch of these two species until 2020 (Official Gazette 2016). Fishers strongly objected to this regulation and demanded the repeal of the legislation (Mavruk 2020). These objections resulted in the way fishers requested, and fishery management authority repealed the legislation for white grouper in 09.10.2018, two years earlier than the planned abolishing (Official Gazette 2018). In the last legislation, dusky grouper fishery is still completely banned, whereas there is a loosening for fishing on white groupers. Recently white grouper fishery is banned in summer and its minimum landing size is 50 cm. Fishing on other groupers in the *Epinephelus* genus are also forbidden in summer, but there is no regulation on other grouper species (Official Gazette 2020) (Fig.1).

Understanding the reflexes of fishers towards the legislation changes is essential to evaluate the success of regulations and, therefore, to develop more effective management strategies. In this study, we investigated how professional and recreational fishers responded to the changes of grouper fishery regulations, what were their opinions on the current legislation and how grouper fishery can be better managed. To accomplish this, we gathered information via interviews with stakeholders; fishers, controllers and sellers working along the Mediterranean coast of Turkey.

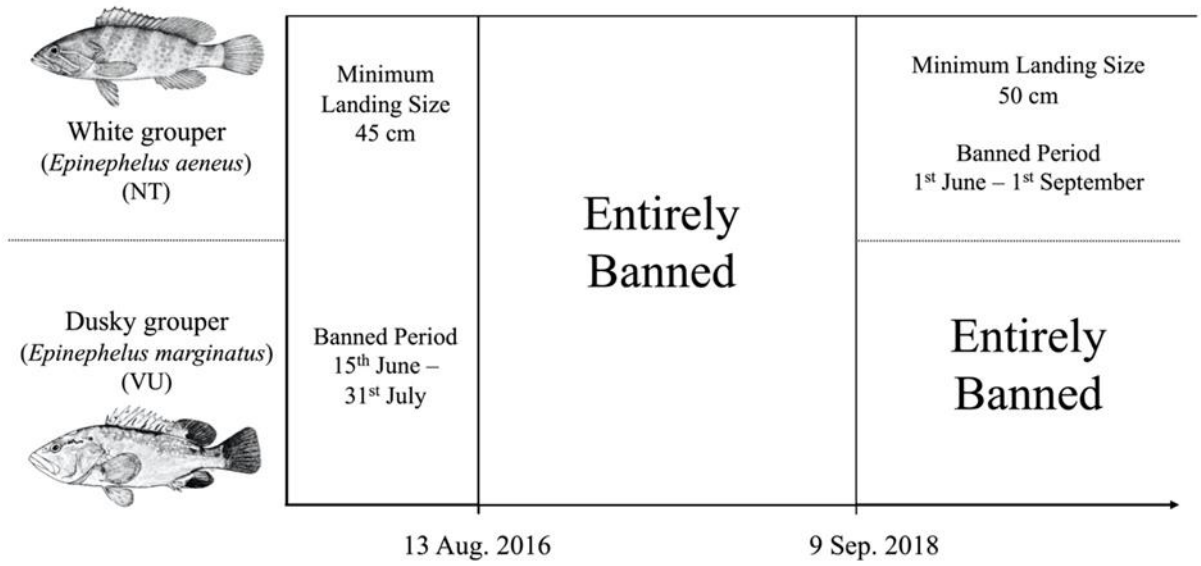

Figure 1. Timeline of legislation changes for grouper fishery in Turkey (Source for illustrations was FAO species catalog *)

*:FAO species catalog. Vol.16. Groupers of the world (Family Serranidae, Subfamily Epinephelinae). An annotated and illustrated catalog of the grouper, rock cod, hind, coral grouper, and lyretail species known to date. http://www.fao.org/fi/oldsite/eims_search/advanced_s_result.asp?JOB_NO=T0540

Material and methods

Asking questions about an illegal activity may irritate fishers and can cause biased results. Therefore, rather than performing a fisherman survey, we gathered information from fishery cooperatives managers, leaders of fisher' communities, fishery controllers, fish mongers, and fish market clerks via face to qualitative face interviews performed by the authors of the study. For this purpose, fishing stores, diving clubs, fish markets, and fishery ports were visited between September 2016 and December 2018. In this context, interviews were held in five cities and 19 fishery ports along the Mediterranean coast of Turkey (Fig. 2). At the beginning of the interviews, the purpose of the study was explained, and an introduction was given on the data gaps, the importance of their reflexes, and opinions on the applicability of management strategies. In each interview, we directed our questions based on an unstructured interview form and recorded fishers' anecdotes in response to each question. Then, we asked the opinions of fishers about the current legislation and what should have been changed for better management.

Results

In the context of the study, a total of 50 interviews were conducted with the managers of fishery cooperatives and leaders of fishers' community (n= 25), fishmongers, fish market owners, and workers (n= 10), fishery controllers (n= 8), leaders of recreational fishing groups (n= 5), and sport fishing store owners (n= 2),.

The grouper fishery ban in 2016

In 13.08.2016, just before the grouper fishing season, fishing of white and dusky groupers was announced to be banned entirely until 2020 (Official Gazette 2016). Based on interviews, longliners had already made their investment for the coming fishing season when the ban was announced, and they were indignant at the timing.

The reactions of the longliners towards grouper ban can be deemed under three different categories, which were: altogether quitting fisheries, changing fishing gear or continuing thick longlining, and, therefore, illegally fishing on groupers during the banned period. The ones who completely quit fishing were mostly in the northern coasts of Iskenderun

Bay, where there were industrial facilities providing alternative employment opportunities.

Figure 2. Map of investigation area and positions of visited fishery ports (Basemap were obtained from Google Earth)

The second group of fishers was changed thick longlines to gill nets or thin longlines during grouper fishing seasons. The main targets of the gill nets were goatfishes (Mullidae spp.) and sea breams (Sparidae spp.). Thin longline is similar to the thick longlines but differs in size of the hooks, which means that they target smaller individuals. Based on fishers' anecdotes, the thin longline fishery is employed on both sandy and rocky bottoms. On sandy bottoms, the main target is an invasive species threadfin sea bream (*Nemipterus randalli*), and fishers state that they can catch 80 to 100 kg of this species per fishing day. Therefore, an important amount of fishery effort was apparently directed towards an invasive species as a consequence of the ban. On the other hand, thin longlines can also catch groupers even at smaller sizes. According to fishers, when this gear is used on the rocky bottoms, they frequently encounter gold-blotch and mottled groupers. White and dusky groupers can also be caught by thin longlines, even though fishers do not mention it. In accordance with this, small individuals of both species were seen in the market observations. Fish market workers also admit the existence of these species on sale on occasion.

Several longliners confessed that they continued thick longlining targeting white groupers even during the ban. Based on the guestimates of fishers' community leaders, fish dealers, and fishery controllers, the rate of illegal fishing on groupers were roughly between 20% and 40%. In addition to this, bottom trawlers and net fishers reported that they did not change their fishing behavior and continued selling groupers after the ban. Groupers were by-catch for these fishers, and they stated that most of the individuals caught were already dead when the gear is collected back. Therefore, they believed that releasing the groupers back is useless for conservation. The reflexes of recreational fishers were similar to the professional ones. Some of spear gun fishers and anglers were reported to have left catching banned groupers or released them in case of an incidental encounter. On the other hand, some anglers and spear gun fishers said that recreational grouper fishing illegally continued even after the ban.

Repeal of legislation in 2018

In October 2018, the prohibition on white groupers has been repealed by the Turkish fishery management authority, although dusky groupers' fishing is still banned. Since then,

white grouper fishery is permitted except for summer months and a minimum size limitation of 50 cm (Official Gazette 2018). Most of the fishers find the current policy on dusky groupers is proper. On the other hand, fishers found 50 cm minimum landing size restriction on white groupers was unnecessary because groupers were usually caught with barotrauma (Demirci and Bayraktar 2019) post-release survival was believed to below. According to fishers, increasing hook size does not reduce the catch of small-sized fishes either. Therefore, they requested a reconsideration of the minimum landing size restriction. On the other hand, there is no data on the length at first maturity and sex reversal of white grouper populations inhabiting the eastern Mediterranean. This gap limits evaluation from the scientific point of view.

Putting a minimum size limit can be of help in controlling supply and demand in the market. Based on fish market owners and workers' statements, the customers mostly prefer serving size fish from 0.5 to 3 kg. This is probably because the fish is usually consumed freshly and cooked as a whole body in Turkish cuisine. Therefore, the market demand and price of smaller sizes are higher. Unfortunately, these sizes are shorter than the length at first maturity for most grouper species (Aronov and Goren 2008, Marino *et al.* 2001).

Discussion

Two years of ban on the grouper fishery provided us a unique opportunity to understand fishers' reflexes against taking rigid conservation actions without reaching a mutual understanding among stakeholders. Before the ban was announced in 13.08.2016, grouper fishery was quite important in the Gulf of İskenderun, where three quarters of small-scale fishers were targeting groupers (Ozyurt and Kiyaga 2016). As expected, longliners' reflexes to this ban depended on the presence of alternative fishery resources or employment opportunities. This further supports the idea that fishers' community's socioeconomic aspects are an important factor in advancing an effective management strategy.

In general, grouper fishery is performed by polyvalent small scale fishers (Mavruk et al. 2018), who can change their fishing gears seasonally based on available resources and profitability. Most of this artisanal fleet use trammel nets targeting soles in winter, and shrimps in summer in the Iskenderun Bay (Ozyurt and Kiyaga 2016), where is the most important grouper fishery ground in the Northeastern Mediterranean (Mavruk 2020). During spring and autumns seasons, sole and shrimps are not available in the area, and the fleet turns towards thick longlines to catch groupers (Mavruk *et al.* 2018). Accordingly, the ban appeared to force thick longliners to find alternative resources and reallocated existing fishery effort from white groupers to the other potential resources during grouper fishery season. Although the biological consequences of this are largely unknown, both positive and negative effects should be expected. For example, threadfin sea bream, an invasive species in the Eastern Mediterranean (Mavruk *et al.* 2017), became a target of thin longliners during the ban. Adversely, other grouper species like gold-blotch and mottled groupers were also subjected to this residual effort.

Longliners usually make their investments for the lines, hooks, etc. before the grouper season starts. After the investment has been made, there is no chance to shift to a different gear and consequently a target species for the upcoming fishing season. Unfortunately, this was the case for the white grouper ban which was announced on 13th August just before the grouper fishing season. This decreased the applicability of the prohibition in the field and caused indignation among fishers. Although the polyvalent fleet has the elasticity to change their fishing practices, there are limits to this elasticity. Therefore, this fact should be considered in the planning of future regulations for more effective implementation.

Groupers are usually caught with barotrauma

(Demirci and Bayraktar 2019), and there is no practical and effective way to release them alive. Therefore, fishers believe that an entire banning strategy or size limitations are not practical approaches to conserve such a species since its post-release survival is suspicious in both cases. On the other hand, establishing marine protected areas with fishing forbidden zones (no-take zones) can be a better strategy for the recovery and conservation of grouper populations (Coleman *et al*. 2000, Hackradt *et al*. 2014).

Although sometimes precautionary and overprotective approaches are necessary for fast and effective decision-making (Kılıç 2014) in the conservation of threatened fishes, this may not conclude satisfactory results without all stakeholders' participation. To accomplish a participatory management approach, all stakeholders -from consumers to fishers- should be convinced of the necessity of conservation measures. In this case, resource users, fishers, have a crucial role because any regulation in the legislation directly interests their livelihood. Their perception of fishery resources status and fish populations also generate their opinion on conservation policies (Pomeroy and Douvere 2008, Horowitz *et al.* 2018). Therefore, their perceptions should be directed towards a conservational point of view via raising awareness activities. This was partially succeeded in Gökova Bay fishery (southern Aegean Sea) using including grouper fishers in the data collection procedures (Ünal *et al.* 2009).

The experience gained by the grouper fishery ban in Turkey revealed that a non-participatory approach fails to manage fish stocks. Here, fishers forced policymakers to repeal the ban in a short while as a result of a disapproved management action. Moreover, fishing pressure partly remained even after the measure was taken (e.g., Froese *et al*. 2018). The illegal and unreported fishery is an important threat to grouper populations worldwide (Sadovy de Mitcheson *et al*. 2013). Therefore, it can be concluded that bans and limitations are not enough for "ceasing the fishing pressure" on threatened fishes unless all stakeholders approve the actions. To this aim, fishers should be actively included in the data collection, investigation, and decision-making processes. Additionally, raising awareness among the local community, as potential customers, will also contribute to preventing demand on illegally caught individuals. Otherwise, governmental regulations can only provide limited protection for the fish populations.

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References

Aronov A., Goren M. 2008. Ecology of the Mottled Grouper (*Mycteroperca rubra*) in the Eastern Mediterranean. Electronic Journal of Ichthyology 2:43–55

Bilecenoglu M., Kaya M., Cihangir B., Cicek E. 2014. An updated checklist of the marine fishes of Turkey. Turkish Journal of Zoology 38:901–929.

Coleman F.C., Koenig C.C., Huntsman G.R., Musick J.A., Sedberry G.R., Chapman R.W., Grimes C.B. 2000. Long-lived Reef Fishes: The Grouper-Snapper Complex. Fisheries 25:14–21.

Cornish A., Harmelin-Vivien M. 2011. *Epinephelus marginatus*. The IUCN Red List of Threatened Species 2011: e.T7859A12856576. In: IUCN Red List. Mediterr. https://www.iucnredlist.org/species/7859/12856576

Demirci A., Bayraktar O. 2019. Barotrauma treatment performance of fish release devices and its effects on fishing operations. Ege Journal of Fisheries and Aquatic Sciences 36:145–154.

Engin S., Irmak E., Seyhan D. 2016. New record of the thermophilic *Cephalopholis taeniops* (Osteichthyes: Serranidae) in the Aegean Sea. Zoology in the Middle East 62:184–186.

Froese R., Winker H., Coro G., Demirel N., Tsikliras A.C., Dimarchopoulou D., Scarcella G., Quaas M., Matz-Lück N. 2018. Status and rebuilding of European fisheries. Marine Policy 93:159–170.

Gokoglu M., Ozvarol Y. 2015. Epinephelus coioides (Actinopterygii: Perciformes: *Serranidae*)- A new Lessepsian migrant in the Mediterranean coast of Turkey. Acta Ichthyologica et Piscatoria 45:307–309.

Golani D., Massutí E., Quignard J.-P., Dulčić J., Azzurro E. 2017. CIESM atlas of exotic fishes in the Mediterranean. http://www.ciesm.org/atlas/appendix1.html . Accessed in 01 Sep 2017

Hackradt C.W., García-Charton J.A., Harmelin-Vivien M., Pérez-Ruzafa Á., Le Diréach L., Bayle-Sempere J., Charbonnel E., Ody D., Reñones O., Sanchez-Jerez P., Valle C. 2014. Response of rocky reef top predators (Serranidae: Epinephelinae) in and around marine protected areas in the Western Mediterranean Sea. PLoS One 9 (6):e98206.https://doi.org/10.1371/journal.pone.0098206

Horowitz J., Pressey R.L., Gurney G.G., Pahang K.A. 2018. Investigating Stakeholder Perceptions of Fish Decline : Making Sense of Multiple Mental Models. Sustainability 10:1–26.

IUCN 2017. The IUCN Red List of Threatened Species. Version 2017-3. <www.iucnredlist.org>.

Marino G., Azzurro E., Massari A., Finola M.G., Mandich A. 2001. Reproduction in the dusky grouper from the southern Mediterranean. Journal of Fish Biology 58:909–927.

Mavruk S. 2020. Trends of white grouper landings in the Northeastern Mediterranean: reliability and potential use for monitoring. Mediterranean Marine Science 21:183–190.

Mavruk S., Bengil F., Yeldan H., Manasirli M., Avsar D. 2017. The trend of Lessepsian fish populations with an emphasis on temperature variations in Iskenderun Bay, the Northeastern Mediterranean. Fisheries Oceanography 26:542–554.

Mavruk S., Saygu İ., Bengil F., Alan V., Azzurro E. 2018. Grouper fishery in the Northeastern Mediterranean: an assessment based on interviews on resource users. Marine Policy 87:141–148.

Morris A. V., Roberts C.M., Hawkins J.P. 2000. The threatened status of groupers (Epinephelinae). Biodiversity and Conservation 9:919–942.

Official Gazette 2012. Commercial Fishery Regulation Rescripts of Republic of Turkey (No: 2012/65). Off. Gaz. Repub. Turkey

Official Gazette 2016. Commercial Fishery Regulation Rescripts of Republic of Turkey (No: 2016/35). Off. Gaz. Repub. Turkey

Official Gazette 2018. Rescript (No: 2018/19) of Changes in the Commercial Fishery Regulation Rescripts (No:2016/35) of Republic of Turkey. Off. Gaz. Repub. Turkey

Official Gazette 2020. Commercial Fishery Regulation Rescripts of Republic of Turkey (No: 2020/20). Off. Gaz. Repub. Turkey

Özcan G., Ergüden D., Özcan T. 2020. First record of the African hind , *Cephalopholis taeniops* (Valenciennes , 1828), in the Mediterranean Sea coast of Turkey. Acta Biologica Turcica 33:168–171

Ozyurt C.E., Kiyaga V.B. 2016. Fisheries in Iskenderun Bay Fishing Gears, Catching Methods and Their Main Problems. In: Turan C, Salihoglu B, Ozbek Ozgur E, Ozturk B (eds) The Turkish Part of the Mediterranean Sea. Marine Biodiversity,

Fisheries, Conservation and Governance. Turkish Marine Research Foundation, Istanbul, pp 353–365

Pollard D.A., Afonso P., Bertoncini A.A., Fennessy S., Francour P., Barreiros J. 2018a. *Epinephelus marginatus*. The IUCN Red List of Threatened Species 2018: e.T7859A100467602. In: IUCN Red List

Pollard D.A., Francour P., Fennessy S. 2018b. *Epinephelus aeneus*. The IUCN Red List of Threatened Species 2018: e.T132722A100459597. In: IUCN Red List.

Pomeroy R., Douvere F. 2008. The engagement of stakeholders in the marine spatial planning process. Marine Policy 32:816–822.

Sadovy de Mitcheson Y., Craig M.T., Bertoncini A.A., Carpenter K.E., Cheung W.W.L., Choat J.H., Cornish A.S., Fennessy S.T., Ferreira B.P., Heemstra P.C., Liu M., Myers R.F., Pollard D.A., Rhodes K.L., Rocha L.A., Russell B.C., Samoilys M.A., Sanciangco J. 2013. Fishing groupers towards extinction: A global assessment of threats and extinction risks in a billion dollar fishery. Fish Fish 14:119–136.

Sadovy Y., Rhodes K., Smith J. 2011. *Epinephelus aeneus*. The IUCN Red List of Threatened Species 2011: e.T132722A3432713. In: IUCN Red List. Mediterranean

TUIK 2019. Dataset: Fishery Production Statistics of Tukey. In: Turkish Statistics Insitute. www.tuik.gov.tr

Ünal V., Erdem M., Göncüoğlu H., Güçlüsoy H., Tosunoğlu Z. 2009. Management paradox of groupers (Epinephelinae) fishing in the Gökova Bay (Eastern Mediterranean), Turkey. Journal of Food Agriculture Environment 7:904–907.