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Revision of fleet definition of size data of blue shark (*Prionace glauca*) collected by Japanese commercial longline fishery and longline research program in the North Pacific.[1]

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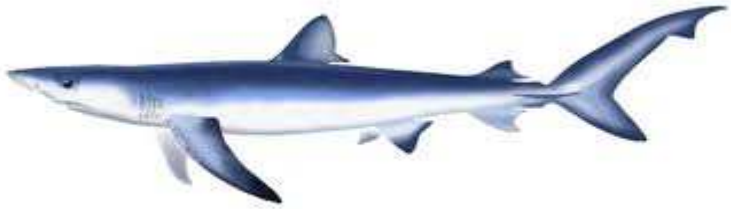

[1] Working document submitted to the ISC Shark Working Group Workshop, 1-4 March 2022, Web-meeting. **Document not to be cited without author's permission.**

Abstract

In the Shark Working Group in 2021, the size data of blue shark (*Prionace glauca*) caught by Japanese fishery and research cruise was summarized, based on the several data sources. In this summarization, size data from several sources was aggregated based on the gear configuration (e.g., night and shallow-setting or daytime and deep-setting). However, this kind of aggregation could lead to poor fitting of Stock Synthesis (SS) to the observed size data, due to the gap of operation area among sources. In this context, operation pattern including area,time period, target were re-examined for size data from Kinkai-shallow fleet (Fleet 4) and the fleet definition for the size data from Kinkai-deep (Fleet 5) and Enyo-deep (Fleet 7) was also checked.

Fleet 4 size data consists of three sources (1. shallow-set research, 2. observer data on Kinkai-shallow commercial vessel, and 3. port sampling data for the catch of commercial Kinkai-shallow vessel). The operation area of shallow-set research data (1999-2021) partly overlaped with that of commercial vessel and thus usage of this data only as representative of Kinkai-shallow fleet would bias the result. Research data between 1978 and 1982 also overlapped with commercial fishing ground after 1994, but the effort was concentrated in the northern area with targeting salmon shark and blue shark, and then shifted to the eastern area outside of Kinkai-shallow fishing ground. Size data collected from observer data was overlapped with the port sampling data. Thus, only port-sampling data for Kinkai-shallow was suggested to be representative of Fleet 4.

Regarding other fleet, 507 size data included in Fleet 5 was collected from fisshing vessel > 120 metric ton and/or outside the fishing ground of Kinkai (offshore) fishery, and thus re-assigned to F7 size data.

Introduction

For the stock assessment of North Pacific blue shark (*Prionace glauca*) based on the stock synthesis (SS), Japan has provided size data of blue shark collected from various data sources including longline and gillnet fisheries (Sippel et al. 2016, Semba 2021). For longline fisheries, size data was collected from port sampling, observer program, and research cruises conducted by several research body.

In the previous stock assessment, size data from shallow-set longline fisheries was assumed to represent the catch of “Kinkai shallow (Fleet 4)” and it included data from shallow-set research and training vessels, shallow-set longline observer program, small scale coastal shallow-set longlines, and Kinkai-shallow longliners (ISC 2017). As another longline fishery, “Kinkai deep” and “Enyo deep” was categorized. Size data categorized as “Kinkai deep” included data from deep-set research and training vessels, deep-set longline observers, and deep-set small scale longliners that fished during the day for tunas, and size data from other Japanese fisheries were categorized as “Enyo-deep” (ISC 2017). According to Kai (2021), vessel size (i.e., metric ton) of Kinkai-fleet and Enyo-fleet is 20-120 MT and >120 MT, and the definition of shallow-set and deep-set is number of hooks per basket (HPB) <6 and HPB >=6, respectively.

In advance of the stock assessment of North Pacific blue shark by SS, examination of size data from Japanese fleet was conducted based on past SS program and updated length composition data in 2021 and it was found that the updated data included data collected between 1978 and 2021 (Semba 2021), while the size data collected before 1994 was not used in the previous stock assessment. The reason for this data filtering was not described in detail in the report, but it is necessary to note the reason for the selection of

data used for the assessment, based on the characteristics of each data source.

In addition, the definition of Kinaki-deep (Fleet 5) was revised and some data assigned to Fleet 5 in 2016 (e.g., data collected from deep-set research and training vessels) was re-assigned to Enyo-deep (Fleet 7) due to the large vessel size last year.

The purpose of this document is to 1) revisit the detailed operation pattern of each data source included in Fleet 4, 2) to propose appropriate dataset representative of Fleet 4, and 3) to revise the dataset for Fleet 5 and Fleet 7 based on the check of vessel size and operation area.

Materials and Method

Comparison of annual data by data sources between past and current dataset

Size data from Fleet 4 was tabulated by year and source based on the dataset compiled in the previous stock assessment and data preparatory meeting in 2021.

Fleet 4

Operation area of research vessel with shallow-set longline operatin (JRVS) and commercial vessel was compared and operation strategy of research vessel was described. For the mapping of spatial destribution of effort (i.e., hook number) from commercial Kinkai-shallow vessel, data of hook number with location of operation was extracted from Japanese longline logbook database for 1994-2020 and aggregated by 5 by 5 degrees grid. Regarding the JRVS between 1978 and 1983 and between 1999 and 2021, data of hook number and operation at noon was extracted from report by Japan Marine Fisheries Resources Research Center (JAMARC) (1978-1981) and database compiled at Fisheries Resources Institute, respectively. Information of target and fishing strategy including gear and bait of JRTV was cited from same source described above.

Fleet 5 and Fleet 7

Vessel size and HPB attributed to each size data was checked based on the database of Japanese longline observer data, Japanese research and training vessel, and research cruise.

Results and Discussion

Fleet 4

In the previous stock assessment, majority of data used was suggested to be derived from port sampling data, and the sample size between 2011 and 2014 was quite small, compared to accumulated amount of data (Table1). Although reason for this small sample size is unknown, data with rough resolution of catch location might have been filtered out from the database. Resolution of port sampling data is rough and the majority of data is with 5 degrees (latitude) by 5 degrees (longitude) and 10 by 20 resolution. Cosidering that fine spatial resolution is not necessary for SS analysis, amount of data inputted in the analysis may increase.

In the current dataset, size data collected from observer data (“JP_Obs_LL_KS”) between 2016 and 2019 was also included. Observers collect size and sex data as much as possible and resolution of location of catch and accuracy of size data is high, compared to port sampling data, but accurate resolution of location of catch was not necessarily required in SS analysis and the catch was also measured in the port sampling

after landed (double-measurement). Although the coverage of measurement for the catch within certain cruise is much lower than that of observer, there is possible double-measurement and its separation is impossible. Thus, if risk of double-measurement is problem, it is better to remove observer data from Fleet 4 size data.

Size data from research cruise with shallow-set longline operation ("JP_Res_LL_S") was collected from operation targeting various species. For data between 1999 and 2010, target of operation is bycatch species (e.g., sea bird and sea turtle), not shark and swordfish albeit similar gear configuration and setting/hauling time with commercial vessel. Operation area, hook type, and beit type used is focusing on bycatch species. Comparison of effort distribution between commercial vessel (Figure 1) and research cruise (Figure 2) suggests that operation area of research cruise during this period is limited area of that of commercial vessel and biased to the coastal area. As size data of Fleet 4 beween 1999 and 2007 was only obtained from this research cruise, the size data within this period may not be represetatibve of Kinkai-shallow fleet. For data between 1978 and 1982, target of operation is salmon shark and blue shark and HPB used is six, similar to that of commercial vessel (i.e., 4-5). The setting of longline is conducted in both nighttime and daytime in some operations, different from only night time setting in the commercial vessel. Although the operation area (Figure 3) is overlapped with Kinkai-shallow fleet between 1994 and 2019, effort between 1978 and 1980 is concentrated in higher latitude (i.e., north of 40 degrees) and then it shifted to the east of the dataline after 1981, outside of that of Kinkai-shallow fleet. This may explain small mean PCL between 1978 and 1980 and following increase after 1981 as shown in Semba (2021).

Fleet 5 and Fleet 7

Regarding Fleet 5 and Fleet 7, size data of 507 blue shark collected in the longline vessel which was larger than 120MT was mistakenly assigned to Fleet 5 and thus these data was re-assigned to Fleet 7.

Conclusions

Regarding Fleet 4, size data collected by observer program and research cruisebetween 1999 and 2021 is better to be removed, because of the double-measurement and limited representativeness of commercial Kinkai-shallow fleet, respectively. The representativeness of size data collected between 1978 and 1981 was not fully confirmed due to the limited information of operation area of commercial vessel in this period and there is possibility that operation area is outside that of commercial vessel at least for some years. Thus, it is appropriate to use the size data collcted in the port sampling as Fleet 4 in the base case, until the adequateness of assignment of this size data as Fleet 4 is confirmed in the further data exploration. Regarding Fleet 5 and Fleet 7, it is appropriate to use the revised data for the assessment.

References

ISC 2017. Annex13. STOCK ASSESSMENT AND FUTURE PROJECTIONS OF BLUE SHARK IN THE NORTH PACIFIC OCEAN THROUGH 2015. REPORT OF THE SHARK WORKING GROUP. Available at: http://isc.fra.go.jp/pdf/ISC17/ISC17_Annex13-Stock_Assessment_and_Future_Projections_of_Blue_Shark.pdf

Japan Marine Fisheries Resources Research Center (JAMARC) (1978-1981) Report on the studies for the development of new fishery resources for sharks. Present Marine Fisheries Research and Development Center, JAMARC, FRA, Yokohama, Japan.

Kai, M. 2021. Update of Japanese annual catches for blue shark caught by Japanese offshore and distant longliner in the North Pacific Ocean from 1994 to 2020. ISC/21/SHARKWG-2/04. 12pp.

Sippel, T., Y. Semba, K. Shiozaki, F. Carvalho, J. L. Castillo-Geniz, W.-P. Tsai, K.-M. Liu, Y. Kwon, Y. Chen and S. Kohin. 2016. Size and sex structure of blue sharks in the North Pacific Ocean. ISC/16/SHARKWG-1/14. 47pp.

Semba, Y. 2021. Size distribution of blue shark (Prionace glauca) collected by Japanese fleet and research program in the North Pacific. ISC/21/SHARKWG-2/11. 15pp.

Table 1. Number of size data assigned for fleet 4 in the (a) past stock assessment and (b) current dataset compiled in 2021 (by each data sources).

(a)

Data Source	Fleet Definition	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Kinkai-shallow	F4																	1,042	15,088	11,403	1,873	140	243	177		

(b)

Data Source	Fleet Definition	1978	1979	1980	1981	1982	1983	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	<NA>	Sum
JP_LL_KS	F4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	981	14,253	13,470	8,276	82,581	63,839	65,181	57,616	56,637	71,805	54,103	48,980	31,009	0	9,326	578,057
JP_Obs_LL_KS	F4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,039	9,016	9,079	7,169	0	0	0	24,287
JP_Res_LL_S	F4	2,640	2,593	6,947	5,343	970	0	0	0	0	0	0	0	0	3	42	22	167	163	335	271	98	49	325	63	182	16	244	265	411	194	0	1,006	40	506	295	35	0	23,225

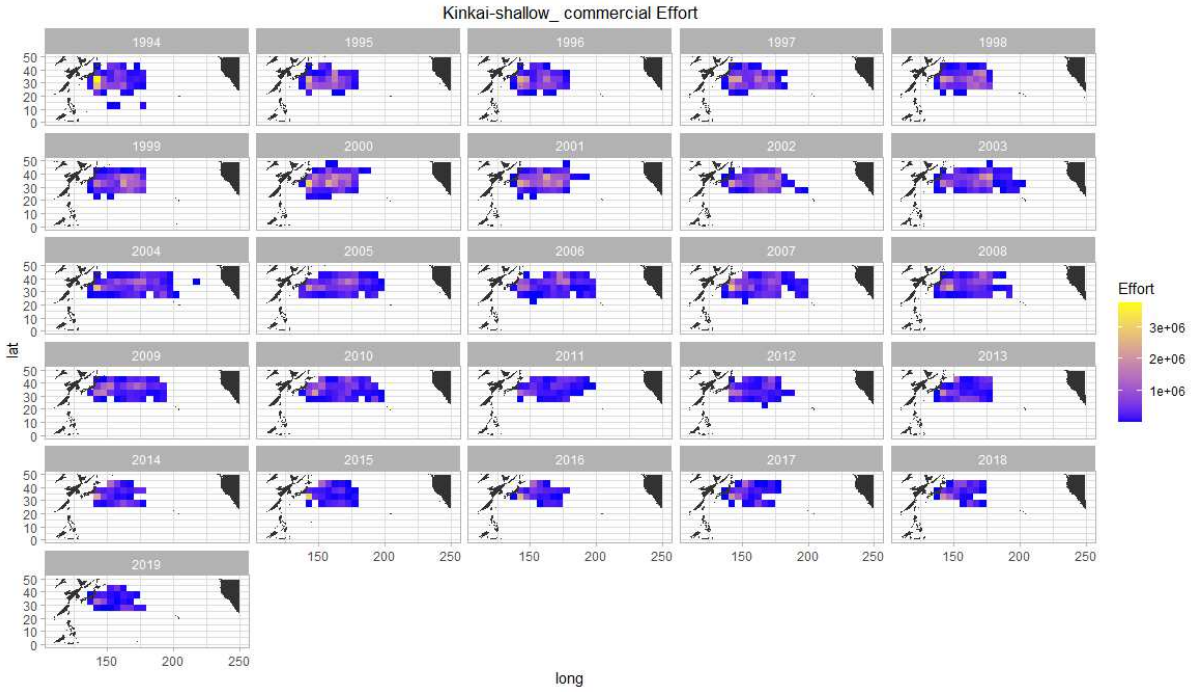

Figure 1. Spatial distribution of effort (i.e., hook number) by commercial Kinkai-shallow longline vessel between 1994 and 2019.

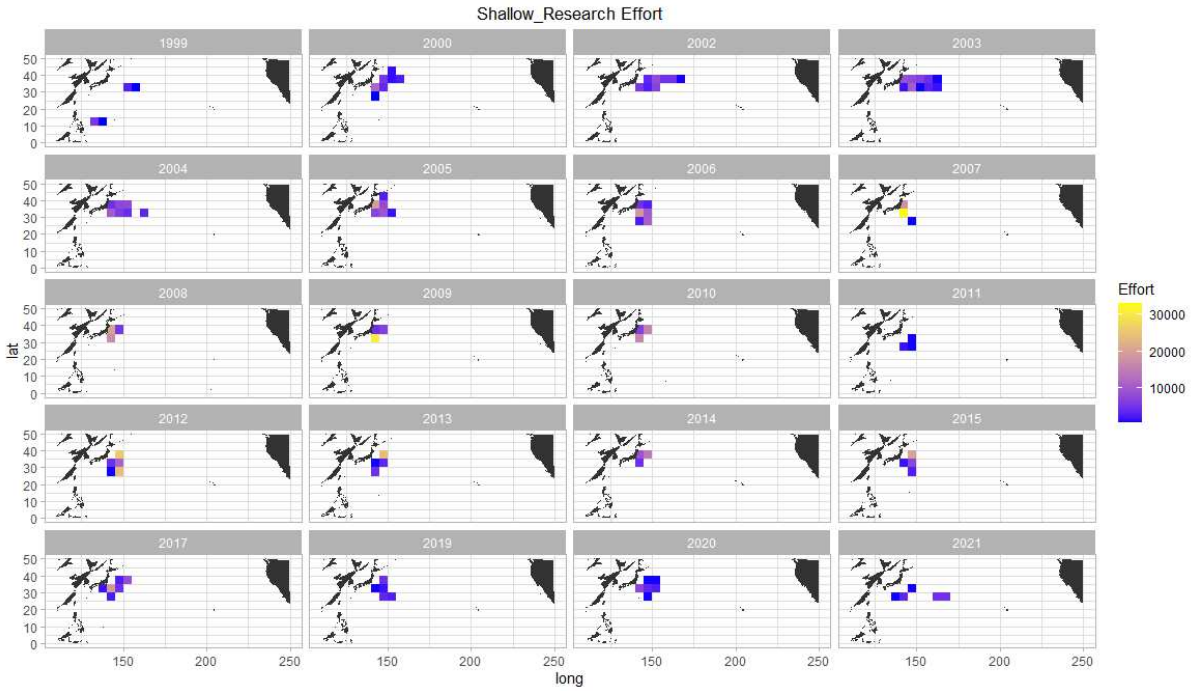

Figure 2. Spatial distribution of effort (i.e., hook number) by research vessel which operated shallow-set longline between 1999 and 2021.

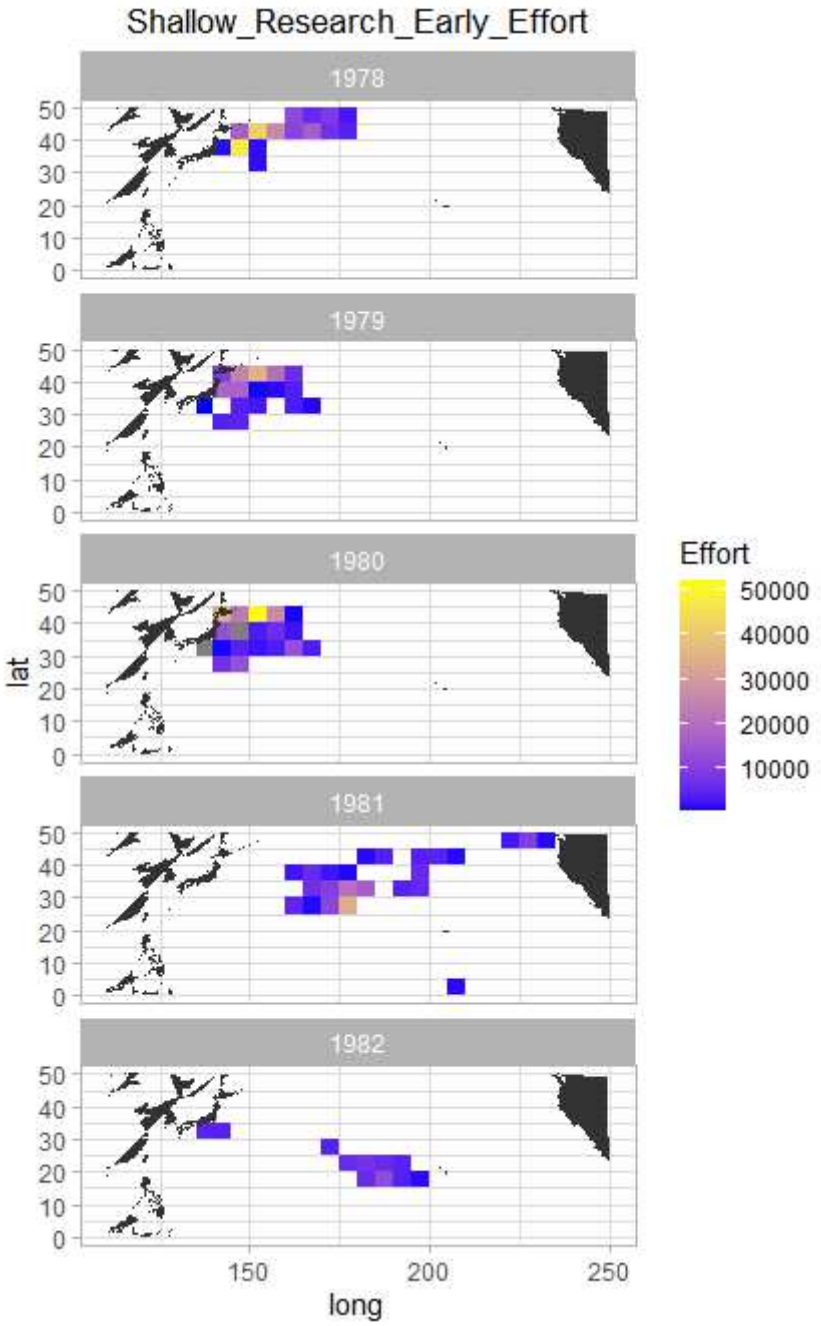

Figure 3. Spatial distribution of effort (i.e., hook number) by research vessel which operated shallow-set longline between 1978 and 1982.