NPFC-2024-TWG CMSA09-WP02

**The data description of input data used for the sensitivity analyses of the stock assessment of chub mackerel *Scomber japonicus* in the northwestern Pacific Ocean**

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**Summary**

The details of derivation and data description of the input data for the sensitivity analyses of the stock assessment of chub mackerel in the northwestern Pacific Ocean is described. The data consists of catch-at-age and maturity-at-age since 1970. The sensitivity analyses contain three alternative catch-at-age data and two alternative maturity-at-age data.

**Introduction**

Data used for the stock assessment model is the fundamental component of stock assessment itself. The quality, quantity, availability, and coverage of the data influence the overall result of the stock assessment. In NPFC TWG CMSA, stock assessment is being conducted using State-space Assessment Model (SAM) and the input data are prepared and finalized in TWG CMSA 08 in 2024. Although the data is provided by each member: China, Japan, and Russia, the data required to calculate catch-at-age is unavailable in some years.

Table 1 shows the list of year/quarter and its unavailableness to calculate catch-at-age. During the process of data finalization,NPFC-2024-TWG CMSA08-WP15 has presented methodologies to supplement the unavailable data to construct catch-at-age for stock assessment (Manabe et al., 2024a). With the thorough discussions, TWG CMSA has agreed to take measures to supplement the missing data in -2015 for Russian catch-at-length and age-length key (ALK), CY2015 for Chinese catch-at-length and ALK, CY2016-2018 for Chinese ALK, and CY2022-2023 for Russian catch-at-length and ALK (NPFC, 2024). The detailed methodologies on supplementing catch-at-length and ALK for the agreed-to-use “base-case” data are described in Manabe et al. (2024b; NPFC2024TWG CMSA09-WP01).

Although the base case is agreed by TWG CMSA, it also acknowledged the other scenarios and agreed to use the three different scenarios of catch-at-age and two different scenarios of maturity-at-age for sensitivity analyses as each specification are presented in Table 2. In the present paper, the methodologies of deriving five different scenarios are described. Additionally, this paper defines the fishing year (FY) as the 3rd quarter (Q3) of the calendar year (CY) to the 2nd quarter of the following year.

Table 1. List of data unavailability

|  |  |  |  |
| --- | --- | --- | --- |
| Year (calendar) | Quarter | Member | Unavailable data |
| 2015 | Q2-Q4 | China | Catch at lengthALK |
| 2016-2017 | Q2-Q4 | China | ALK |
| 2014-2015 | Q2-Q4 | Russia | Catch at lengthALK |
| 2022-2023 | Q1-Q4 | Russia | Catch at lengthALK |

Table 2. List of scenarios of input data used for sensitivity analyses.

|  |  |
| --- | --- |
| Scenario | Description |
| CAA\_1 | Remove Chinese catch-at-age for CY2015 |
| CAA\_2 | Calculate Chinese catch-at-age for CY2015 using Chinese catch-at-length for CY2016 |
| CAA\_3 | Calculate Chinese catch-at-age for CY2015 using catch-at-length from Eastern Japan for CY2015 |
| MAA\_1 | Mean of Japanese and annual mean of Chinese maturity at age |
| MAA\_2 | Mean of Japanese and seasonal mean of Chinese maturity at age |

**Description of scenarios of catch-at-age**

The unavailability of catch-at-length data in the 2015 of calendar year (CY2015) for China and CY2014-2015 for Russia was critical to develop catch-at-age for fishing year (FY) 2014, FY2015, and FY2016. In (Manabe et al., 2024a), three alternative methods are presented to supplement the unavailable data; and application of average catch-at-length of CY2016-2018 of the equivalent member/quarter are agreed as well as application of the Eastern Japanese ALK from the equivalent year/quarter (details described in Manabe et al., 2024a). Other scenarios, in the other hand, are requested to be utilized for sensitivity analysis to observe the impact of different scenarios to the stock assessment. In sensitivity analyses for the catch-at-age, Chinese catch is subjected to be replaced and Russian catch remain the same as the base case due to the similarity of catch traits between Eastern Japan and Russia, in which is the reason of utilization of Eastern Japanese ALK to the Russian catch, whereas Chinese catch is conducted at the conventional area with different catch-at-length compositions. Therefore, the sensitivity analysis focusing on the Chinese catch-at-age from CY2015 is conducted to observe the effect.

**Scenario CAA\_1: Removal of Chinese catch-at-age from CY2015**

Scenario CAA\_1 is a scenario that simply removes the Chinese catch-at-age data for CY2015 from the base case scenario. Table 3 shows the quarterly catch-at-age from each member and regions (i.e., China, Eastern Japan, Western Japan, and Russia) since FY2014 to FY2022. Table 4 shows the annual catch-at-age from each member (China, Japan, and Russia) since FY1970 to FY2022. Since the scenario states removal of Chinese catch-at-age from CY2015, catch-at-age of the latter half of FY2014 and the first half of FY2015 are removed. Since China did not harvest CM in CY2014, the Chinese catch of FY2014 became zero.

**Scenario CAA\_2 : Use Chinese catch-at-length from CY2016**

Scenario CAA\_2 utilizes the most recent available data from the same member, i.e., catch-at-length of CY2016. Since the catch amounts are different in scale, the catch-at-length of CY2015 is converted using the annual catch ratio as described as below:

$$N\_{l, q, 2015, China}=N\_{l,q,2016,China}\left(\frac{C\_{2015,China}}{C\_{2016,China}}\right)$$

where $N\_{l, q}$ represents the number of fish at the size bin *l* in CY2015 from China and *C* represents the annual catch. The calculated catch-at-age is applied by the Eastern Japanese ALK of the equivalent quarter in CY2015 to calculate catch-at-age. Table 5 shows the quarterly catch-at-age from each member and regions from FY2014 to FY2022. Table 6 shows the annual catch-at-age from each member (China, Japan, and Russia) since FY1970 to FY2022. Although the overall shape of size composition of the catch is the same as CY2016, difference in ALK composition slightly alters the ratio of age composition.

**Scenario CAA\_3: Use Japanese catch-at-length**

Scenario CAA\_3 is a scenario that assumes the composition of catch-at-length of Chinese catch in CY2015 is the same as that of Japanese catch-at-length of the equivalent quarter to use the best available information on the size composition and strength of each cohort. The catch-at-length is converted using the Chinese and Japanese annual catch ratio as below:

$$N\_{l, q, 2015, China}=N\_{l,q,2015,Japan}\left(\frac{C\_{2015,China}}{C\_{2015,Japan}}\right)$$

The Eastern Japanese ALK of the equivalent quarter is applied to the catch-at-length to derive catch-at-age for CY2015, which are converted into fishing year basis to develop annual catch-at-age. Table 7 shows the quarterly catch-at-age from each member and regions since FY2014 to FY2022. Table 8 shows the annual catch-at-age from each member (China, Japan, and Russia) since FY1970 to FY2022. Since both catch-at-length and ALK are the same as those from Eastern Japan, the age composition of calculated Chinese catch-at-age in CY2015 is same as eastern Japanese age composition of the equivalent quarter.

**Description of scenarios of maturity-at-age**

Maturity at age is a fundamental data to calculate the spawning biomass (SB) and can link to important processes such as stock-recruitment relationship. At TWG CMSA08 meeting, The Group has agreed to use Japanese maturity-at-age since FY1970 to FY2022 (NPFC, 2024). Chinese maturity-at-age data are submitted since FY2017, however, are used for the sensitive analyses after prepared with two different methods. For the maturity-at-age data since FY1970-2016, Japanese maturity-at-age data are implemented.

**Scenario MAA\_1: Mean of Japanese and annual mean of Chinese maturity-at-age**

The original Chinese maturity at age are prepared quarterly, however single value of maturity-at-age per year is required for the SAM model. In order to prepare the maturity-at-age with Chinese and Japanese data, maturity-at-age is calculated as below:

$$M\_{a,t}=\frac{1}{2}\left(\frac{\sum\_{q=1}^{4}M\_{a,t,q,China}}{4}+M\_{a,t,Japan}\right)$$

where $M\_{a,t,q}$ is maturity-at-age *a* in year *t* and quarter *q*. The annual mean of Chinese maturity-at-age is considered to represent the maturity-at-age from China and its arithmetic mean with Japanese maturity-at-age is derived as the mean maturity-at-age for the scenario MAA\_1. Table 9 shows the annual maturity-at-age for scenario MAA\_1.

**Scenario MAA\_2: Mean of Japanese and seasonal mean of Chinese maturity-at-age**

Although the overall methodology is similar to that of MAA\_1, a “seasonal mean” is taken from the Chinese maturity-at-age. Since the spawning event is considered to occur from January to June (Watanabe 2010, Kamimura et al. 2015, 2021), maturation status from the spawning season is considered to calculate the maturity-at-age.

$$M\_{a,t}=\frac{1}{2}\left(\frac{M\_{a,t,1,China}+ M\_{a,t,2,China}}{4}+M\_{a,t,Japan}\right)$$

Table 10 shows the annual maturity-at-age for scenario MAA\_1. The overall maturity-at-age is higher than the base case in MAA\_1 and more in MAA\_2. However, the maturity at age-4 and above were same in all scenarios (base case, MAA\_1, MAA2).

Table 3. Quarterly catch-at-age of Chinese CY2015 for scenario CAA\_1 (Removal of Chinese catch-at-age from CY2015).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Scenario | Fishing year | Quarter | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| CAA\_1 | 2014 | 1 | China | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CAA\_1 | 2014 | 2 | China | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CAA\_1 | 2015 | 3 | China | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CAA\_1 | 2015 | 4 | China | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4. Annual catch-at-age for scenario CAA\_1 (Removal of Chinese catch-at-age from CY2015).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 1970 | Japan | 834153496.6 | 1201530100 | 1037301944 | 364874940.2 | 127479242.9 | 48870917.71 | 41361518.24 |
| 1971 | Japan | 334039692.2 | 814569531.2 | 888012239.1 | 288473458.4 | 103696881.1 | 56448914.05 | 18749683.38 |
| 1972 | Japan | 29022334.85 | 1846505570 | 680729020.7 | 241928130.2 | 73069935.44 | 35267621.02 | 17576606.85 |
| 1973 | Japan | 93175249.47 | 647123444.3 | 1210643871 | 547598229 | 183066072.9 | 46073495.15 | 12208770.22 |
| 1974 | Japan | 351124869.1 | 181956601.2 | 794061426.6 | 993752710.6 | 310059762.4 | 26350882.34 | 4372553.999 |
| 1975 | Japan | 1254231238 | 387855571.2 | 560121368.5 | 617525649 | 391233910 | 164578951.6 | 45867016.68 |
| 1976 | Japan | 631539246.4 | 923332728.1 | 547761974.2 | 445772190 | 251283049.5 | 41562414.46 | 3567383.274 |
| 1977 | Japan | 538985850.9 | 2083021197 | 726803278.3 | 471869021 | 236281244.2 | 81765283.23 | 15636377.15 |
| 1978 | Japan | 1039101579 | 1255785576 | 1468448951 | 640791035.4 | 338065987.2 | 172995580.5 | 16552963.17 |
| 1979 | Japan | 208231521.9 | 1918541758 | 1312222178 | 644674853.8 | 158389673.6 | 80206800.72 | 12837642.6 |
| 1980 | Japan | 198991657.4 | 472101028.7 | 286294537.8 | 419204041.7 | 309771086.9 | 126460996.9 | 11277505.13 |
| 1981 | Japan | 266173323.7 | 184459118.6 | 142036670 | 148722615.1 | 193911349 | 114759342.5 | 13402163.32 |
| 1982 | Japan | 123081551.4 | 323540250.1 | 301357210.6 | 159717361.8 | 80676186.95 | 70494102.86 | 12833282.92 |
| 1983 | Japan | 250359805 | 284122749.9 | 440153170.9 | 225430649.5 | 76212818.26 | 43563923.48 | 23247521.49 |
| 1984 | Japan | 548511344.7 | 544011504.4 | 358272089.9 | 208060588.5 | 89812337.77 | 45848979.69 | 17695953.92 |
| 1985 | Japan | 377730993.3 | 397592535.6 | 252510932.4 | 189871975.3 | 74546377.69 | 38311888.41 | 21369367.57 |
| 1986 | Japan | 182740814 | 1336026723 | 554794376.7 | 275872393.4 | 78946195.64 | 27700665.21 | 9116754.595 |
| 1987 | Japan | 72284437.16 | 315572655.7 | 351624752.7 | 170371515.3 | 41173087.46 | 19155761.28 | 6063893.97 |

Table 4. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 1988 | Japan | 66882204.85 | 106468063.5 | 252813392.3 | 253117663.9 | 26354855.28 | 4128172.511 | 1728040.695 |
| 1989 | Japan | 33836048.69 | 23892453.22 | 52950482.13 | 70542150.47 | 77178781.16 | 3990339.668 | 630576.0173 |
| 1990 | Japan | 28736252.37 | 5964878.164 | 5997831.045 | 10645710.5 | 6324489.547 | 4230907 | 834779.9009 |
| 1991 | Japan | 52516265.75 | 8069326.6 | 10700439.41 | 8123560.597 | 4722320.668 | 2126594.594 | 303106.282 |
| 1992 | Japan | 296726169.9 | 10682932.89 | 13136721.94 | 11963048.53 | 6526453.273 | 10342490.03 | 7960334.707 |
| 1993 | Japan | 96467309.07 | 957212888.3 | 239669059.5 | 39138895.57 | 5191708.57 | 1706955.102 | 1594969.076 |
| 1994 | Japan | 127952732 | 98101182.58 | 97999618.71 | 28365431.08 | 4837596.847 | 1658262.716 | 1926381.229 |
| 1995 | Japan | 362077875.9 | 123330943.7 | 48660792.05 | 27646448.45 | 8871464.602 | 3450333.624 | 1651254.524 |
| 1996 | Japan | 1578156279 | 192976851.1 | 22748912.15 | 19666171.2 | 9740970.612 | 4475685.527 | 2708251.736 |
| 1997 | Japan | 147180180.4 | 884610285.1 | 60935921.8 | 13296018.24 | 6337105.031 | 3768655.103 | 2278785.438 |
| 1998 | Japan | 31587926.46 | 68642255.08 | 177414645.2 | 13184041.21 | 1067886.156 | 344767.1957 | 61264.11701 |
| 1999 | Japan | 144587018.1 | 17202574.5 | 24129316.63 | 40583177.32 | 10051029.64 | 1268127.412 | 449628.2174 |
| 2000 | Japan | 251842271.8 | 85522163.8 | 13314977.5 | 10764169.93 | 13602948.74 | 757053.1167 | 274595.9834 |
| 2001 | Japan | 7109794.966 | 68817151.33 | 40115946.1 | 5344320.652 | 3800043.166 | 2952296.589 | 2366378.966 |
| 2002 | Japan | 243788587.2 | 16557875.09 | 5877361.313 | 6481324.575 | 3614606.892 | 3240117.534 | 1912662.764 |
| 2003 | Japan | 65721525.64 | 205574627.4 | 32326746.3 | 6511313.102 | 2014698.833 | 1050708.578 | 955564.38 |
| 2004 | Japan | 767105074.4 | 86693621.87 | 71950921.83 | 11429534.8 | 4295027.15 | 1390499.578 | 1286317.12 |
| 2005 | Japan | 41515849.2 | 522895013.7 | 52726452.95 | 31965651.15 | 13154396.2 | 918572.8361 | 1059198.305 |

Table 4. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 2006 | Japan | 6296243.25 | 61539292.71 | 376307034.6 | 24875600.37 | 7515206.446 | 1770320.442 | 481786.0045 |
| 2007 | Japan | 424936952.2 | 53165114.2 | 69503492.76 | 157128058.4 | 3684360.332 | 821495.1528 | 184879.4375 |
| 2008 | Japan | 59640311.64 | 274928168.1 | 46727735.2 | 44430957.8 | 51131380.28 | 3059030.233 | 1284798.498 |
| 2009 | Japan | 173813152.9 | 34660496.58 | 127110968.6 | 23502100.93 | 13098767.58 | 14953296.96 | 1308572.427 |
| 2010 | Japan | 79666431.75 | 162861244 | 53958139.57 | 37253510.04 | 9222520.577 | 5689821.038 | 553464.7642 |
| 2011 | Japan | 28037835.42 | 88153900.89 | 87304583.05 | 21348327.11 | 6648373.047 | 2106940.343 | 132091.2031 |
| 2012 | Japan | 62725113.69 | 51894046.2 | 90270961.4 | 66422761.64 | 20938459.94 | 4028704.029 | 589836.3061 |
| 2013 | Japan | 296564420.5 | 247763518.1 | 75483294.35 | 76526558.23 | 25140554.61 | 4972793.642 | 2338312.094 |
| 2014 | China | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2014 | Japan | 131202801.3 | 706675911.8 | 129836380.6 | 53799267.15 | 14181907.75 | 15719707.8 | 656126.3465 |
| 2014 | Russia | 63854.94895 | 28170.82109 | 37700.54981 | 6232.296106 | 268.8090276 | 972.5969555 | 13.91584531 |
| 2015 | China | 868436.3381 | 41949503.78 | 137799352.5 | 0 | 0 | 0 | 0 |
| 2015 | Japan | 26456251.26 | 117869540.3 | 985365167.2 | 72451734.68 | 15580521.56 | 9413718.197 | 8787754.947 |
| 2015 | Russia | 638082.5042 | 107407.0077 | 503368.1918 | 174178.8305 | 9105.265618 | 6083.507294 | 1933.420757 |
| 2016 | China | 243057926.2 | 226409315.4 | 104065850 | 162406838.4 | 2503199.016 | 2909102.98 | 5048344.847 |
| 2016 | Japan | 73689595.41 | 95623286.3 | 172286676.1 | 760712622.9 | 26664152.92 | 12091431.45 | 7176755.468 |
| 2016 | Russia | 59947410.54 | 3417581.747 | 839655.5892 | 6742804.179 | 99074.04076 | 28894.91308 | 9274.9941 |

Table 4. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 2017 | China | 241575796.5 | 494637019.9 | 99329058.54 | 77656897.73 | 78214900.79 | 3972401.661 | 0 |
| 2017 | Japan | 96043008.87 | 113382558.4 | 160112309.1 | 266049164.8 | 372870436.1 | 34352284.63 | 11298839.87 |
| 2017 | Russia | 8964228.917 | 22095147.96 | 14409173.78 | 14683599.47 | 30641833.28 | 4559941.181 | 591444.1506 |
| 2018 | China | 73803565.46 | 62693923.82 | 94659217.36 | 50185207.53 | 99385677.5 | 27017894.95 | 2444570.071 |
| 2018 | Japan | 249781031.5 | 51325218.13 | 142465698.1 | 191071181.6 | 189138142.7 | 152784435.2 | 30180879.27 |
| 2018 | Russia | 129065310.3 | 45538105.77 | 40294613.53 | 41611901.15 | 40052748.72 | 32908761.1 | 2816812.722 |
| 2019 | China | 18918934.27 | 34714643.6 | 74162625.27 | 22100718.81 | 54940608.22 | 9101067.972 | 0 |
| 2019 | Japan | 60387635.33 | 199733193.7 | 130182588.4 | 138294593.7 | 100522122.2 | 77308610.76 | 138104435.5 |
| 2019 | Russia | 5566828.421 | 36763810.4 | 15873801.36 | 13562793.29 | 7870410.705 | 8211165.126 | 21651445.7 |
| 2020 | China | 77613172.94 | 54534567.48 | 154219112.2 | 146274798.5 | 16078187.5 | 12548331.71 | 1345062.726 |
| 2020 | Japan | 285179124.4 | 95040632.67 | 306489770.4 | 141519193.3 | 94010955.98 | 60848520.26 | 79038110.77 |
| 2020 | Russia | 3280683.41 | 2910186.045 | 18541917.03 | 12381170.01 | 15016441.83 | 11955082.54 | 13983861.14 |
| 2021 | China | 120835783.5 | 122539022.5 | 255188899 | 47441090.65 | 15714387.48 | 2479772.542 | 1139916.658 |
| 2021 | Japan | 220643727.8 | 167885837.3 | 85701768.34 | 136623163.9 | 63770800.6 | 39372135.78 | 51431361.53 |
| 2021 | Russia | 24679472.24 | 51934540.08 | 23121873.58 | 45353356.3 | 23557214.51 | 15684924.75 | 17921987.67 |
| 2022 | China | 195817739.5 | 228165873.8 | 90392540.32 | 88683245.68 | 9698940.382 | 2427894.359 | 1388223.511 |
| 2022 | Japan | 102527380.5 | 102480351.3 | 59272004.89 | 40332955.28 | 41032772.56 | 20825336.11 | 24310703.49 |
| 2022 | Russia | 37182949.62 | 38609982.35 | 20188197.59 | 14533676.5 | 14226023.82 | 6796774.911 | 9078931.755 |

Table 5. Quarterly catch-at-age of Chinese CY2015 for scenario CAA\_2 (Use Chinese catch-at-length from CY2016).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Scenario | Fishing year | Quarter | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| CAA\_2 | 2014 | 1 | China | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CAA\_2 | 2014 | 2 | China | 0 | 14579736.54 | 162197026.7 | 4027124.875 | 0 | 0 | 0 |
| CAA\_2 | 2015 | 3 | China | 334170447.3 | 45842605.81 | 82333110.42 | 4967719.431 | 183996.0749 | 0 | 367948.5022 |
| CAA\_2 | 2015 | 4 | China | 8229866.52 | 8767464.085 | 105748047.7 | 4900292.665 | 5237321.262 | 2710541.118 | 1516094.781 |

Table 6. Annual catch-at-age for scenario CAA\_2 (Use Chinese catch-at-length from CY2016).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 1970 | Japan | 834153496.6 | 1201530100 | 1037301944 | 364874940.2 | 127479242.9 | 48870917.71 | 41361518.24 |
| 1971 | Japan | 334039692.2 | 814569531.2 | 888012239.1 | 288473458.4 | 103696881.1 | 56448914.05 | 18749683.38 |
| 1972 | Japan | 29022334.85 | 1846505570 | 680729020.7 | 241928130.2 | 73069935.44 | 35267621.02 | 17576606.85 |
| 1973 | Japan | 93175249.47 | 647123444.3 | 1210643871 | 547598229 | 183066072.9 | 46073495.15 | 12208770.22 |
| 1974 | Japan | 351124869.1 | 181956601.2 | 794061426.6 | 993752710.6 | 310059762.4 | 26350882.34 | 4372553.999 |
| 1975 | Japan | 1254231238 | 387855571.2 | 560121368.5 | 617525649 | 391233910 | 164578951.6 | 45867016.68 |
| 1976 | Japan | 631539246.4 | 923332728.1 | 547761974.2 | 445772190 | 251283049.5 | 41562414.46 | 3567383.274 |
| 1977 | Japan | 538985850.9 | 2083021197 | 726803278.3 | 471869021 | 236281244.2 | 81765283.23 | 15636377.15 |
| 1978 | Japan | 1039101579 | 1255785576 | 1468448951 | 640791035.4 | 338065987.2 | 172995580.5 | 16552963.17 |
| 1979 | Japan | 208231521.9 | 1918541758 | 1312222178 | 644674853.8 | 158389673.6 | 80206800.72 | 12837642.6 |
| 1980 | Japan | 198991657.4 | 472101028.7 | 286294537.8 | 419204041.7 | 309771086.9 | 126460996.9 | 11277505.13 |
| 1981 | Japan | 266173323.7 | 184459118.6 | 142036670 | 148722615.1 | 193911349 | 114759342.5 | 13402163.32 |
| 1982 | Japan | 123081551.4 | 323540250.1 | 301357210.6 | 159717361.8 | 80676186.95 | 70494102.86 | 12833282.92 |
| 1983 | Japan | 250359805 | 284122749.9 | 440153170.9 | 225430649.5 | 76212818.26 | 43563923.48 | 23247521.49 |
| 1984 | Japan | 548511344.7 | 544011504.4 | 358272089.9 | 208060588.5 | 89812337.77 | 45848979.69 | 17695953.92 |
| 1985 | Japan | 377730993.3 | 397592535.6 | 252510932.4 | 189871975.3 | 74546377.69 | 38311888.41 | 21369367.57 |
| 1986 | Japan | 182740814 | 1336026723 | 554794376.7 | 275872393.4 | 78946195.64 | 27700665.21 | 9116754.595 |
| 1987 | Japan | 72284437.16 | 315572655.7 | 351624752.7 | 170371515.3 | 41173087.46 | 19155761.28 | 6063893.97 |

Table 6. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 1988 | Japan | 66882204.85 | 106468063.5 | 252813392.3 | 253117663.9 | 26354855.28 | 4128172.511 | 1728040.695 |
| 1989 | Japan | 33836048.69 | 23892453.22 | 52950482.13 | 70542150.47 | 77178781.16 | 3990339.668 | 630576.0173 |
| 1990 | Japan | 28736252.37 | 5964878.164 | 5997831.045 | 10645710.5 | 6324489.547 | 4230907 | 834779.9009 |
| 1991 | Japan | 52516265.75 | 8069326.6 | 10700439.41 | 8123560.597 | 4722320.668 | 2126594.594 | 303106.282 |
| 1992 | Japan | 296726169.9 | 10682932.89 | 13136721.94 | 11963048.53 | 6526453.273 | 10342490.03 | 7960334.707 |
| 1993 | Japan | 96467309.07 | 957212888.3 | 239669059.5 | 39138895.57 | 5191708.57 | 1706955.102 | 1594969.076 |
| 1994 | Japan | 127952732 | 98101182.58 | 97999618.71 | 28365431.08 | 4837596.847 | 1658262.716 | 1926381.229 |
| 1995 | Japan | 362077875.9 | 123330943.7 | 48660792.05 | 27646448.45 | 8871464.602 | 3450333.624 | 1651254.524 |
| 1996 | Japan | 1578156279 | 192976851.1 | 22748912.15 | 19666171.2 | 9740970.612 | 4475685.527 | 2708251.736 |
| 1997 | Japan | 147180180.4 | 884610285.1 | 60935921.8 | 13296018.24 | 6337105.031 | 3768655.103 | 2278785.438 |
| 1998 | Japan | 31587926.46 | 68642255.08 | 177414645.2 | 13184041.21 | 1067886.156 | 344767.1957 | 61264.11701 |
| 1999 | Japan | 144587018.1 | 17202574.5 | 24129316.63 | 40583177.32 | 10051029.64 | 1268127.412 | 449628.2174 |
| 2000 | Japan | 251842271.8 | 85522163.8 | 13314977.5 | 10764169.93 | 13602948.74 | 757053.1167 | 274595.9834 |
| 2001 | Japan | 7109794.966 | 68817151.33 | 40115946.1 | 5344320.652 | 3800043.166 | 2952296.589 | 2366378.966 |
| 2002 | Japan | 243788587.2 | 16557875.09 | 5877361.313 | 6481324.575 | 3614606.892 | 3240117.534 | 1912662.764 |
| 2003 | Japan | 65721525.64 | 205574627.4 | 32326746.3 | 6511313.102 | 2014698.833 | 1050708.578 | 955564.38 |
| 2004 | Japan | 767105074.4 | 86693621.87 | 71950921.83 | 11429534.8 | 4295027.15 | 1390499.578 | 1286317.12 |
| 2005 | Japan | 41515849.2 | 522895013.7 | 52726452.95 | 31965651.15 | 13154396.2 | 918572.8361 | 1059198.305 |

Table 6. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | age-1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 2006 | Japan | 6296243.25 | 61539292.71 | 376307034.6 | 24875600.37 | 7515206.446 | 1770320.442 | 481786.0045 |
| 2007 | Japan | 424936952.2 | 53165114.2 | 69503492.76 | 157128058.4 | 3684360.332 | 821495.1528 | 184879.4375 |
| 2008 | Japan | 59640311.64 | 274928168.1 | 46727735.2 | 44430957.8 | 51131380.28 | 3059030.233 | 1284798.498 |
| 2009 | Japan | 173813152.9 | 34660496.58 | 127110968.6 | 23502100.93 | 13098767.58 | 14953296.96 | 1308572.427 |
| 2010 | Japan | 79666431.75 | 162861244 | 53958139.57 | 37253510.04 | 9222520.577 | 5689821.038 | 553464.7642 |
| 2011 | Japan | 28037835.42 | 88153900.89 | 87304583.05 | 21348327.11 | 6648373.047 | 2106940.343 | 132091.2031 |
| 2012 | Japan | 62725113.69 | 51894046.2 | 90270961.4 | 66422761.64 | 20938459.94 | 4028704.029 | 589836.3061 |
| 2013 | Japan | 296564420.5 | 247763518.1 | 75483294.35 | 76526558.23 | 25140554.61 | 4972793.642 | 2338312.094 |
| 2014 | China | 0 | 14579736.54 | 162197026.7 | 4027124.875 | 0 | 0 | 0 |
| 2014 | Japan | 131202801.3 | 706675911.8 | 129836380.6 | 53799267.15 | 14181907.75 | 15719707.8 | 656126.3465 |
| 2014 | Russia | 63854.94895 | 28170.82109 | 37700.54981 | 6232.296106 | 268.8090276 | 972.5969555 | 13.91584531 |
| 2015 | China | 343268750.1 | 96559573.68 | 325880510.6 | 9868012.096 | 5421317.337 | 2710541.118 | 1884043.284 |
| 2015 | Japan | 26456251.26 | 117869540.3 | 985365167.2 | 72451734.68 | 15580521.56 | 9413718.197 | 8787754.947 |
| 2015 | Russia | 638082.5042 | 107407.0077 | 503368.1918 | 174178.8305 | 9105.265618 | 6083.507294 | 1933.420757 |
| 2016 | China | 243057926.2 | 226409315.4 | 104065850 | 162406838.4 | 2503199.016 | 2909102.98 | 5048344.847 |
| 2016 | Japan | 73689595.41 | 95623286.3 | 172286676.1 | 760712622.9 | 26664152.92 | 12091431.45 | 7176755.468 |
| 2016 | Russia | 59947410.54 | 3417581.747 | 839655.5892 | 6742804.179 | 99074.04076 | 28894.91308 | 9274.9941 |

Table 6. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 2017 | China | 241575796.5 | 494637019.9 | 99329058.54 | 77656897.73 | 78214900.79 | 3972401.661 | 0 |
| 2017 | Japan | 96043008.87 | 113382558.4 | 160112309.1 | 266049164.8 | 372870436.1 | 34352284.63 | 11298839.87 |
| 2017 | Russia | 8964228.917 | 22095147.96 | 14409173.78 | 14683599.47 | 30641833.28 | 4559941.181 | 591444.1506 |
| 2018 | China | 73803565.46 | 62693923.82 | 94659217.36 | 50185207.53 | 99385677.5 | 27017894.95 | 2444570.071 |
| 2018 | Japan | 249781031.5 | 51325218.13 | 142465698.1 | 191071181.6 | 189138142.7 | 152784435.2 | 30180879.27 |
| 2018 | Russia | 129065310.3 | 45538105.77 | 40294613.53 | 41611901.15 | 40052748.72 | 32908761.1 | 2816812.722 |
| 2019 | China | 18918934.27 | 34714643.6 | 74162625.27 | 22100718.81 | 54940608.22 | 9101067.972 | 0 |
| 2019 | Japan | 60387635.33 | 199733193.7 | 130182588.4 | 138294593.7 | 100522122.2 | 77308610.76 | 138104435.5 |
| 2019 | Russia | 5566828.421 | 36763810.4 | 15873801.36 | 13562793.29 | 7870410.705 | 8211165.126 | 21651445.7 |
| 2020 | China | 77613172.94 | 54534567.48 | 154219112.2 | 146274798.5 | 16078187.5 | 12548331.71 | 1345062.726 |
| 2020 | Japan | 285179124.4 | 95040632.67 | 306489770.4 | 141519193.3 | 94010955.98 | 60848520.26 | 79038110.77 |
| 2020 | Russia | 3280683.41 | 2910186.045 | 18541917.03 | 12381170.01 | 15016441.83 | 11955082.54 | 13983861.14 |
| 2021 | China | 120835783.5 | 122539022.5 | 255188899 | 47441090.65 | 15714387.48 | 2479772.542 | 1139916.658 |
| 2021 | Japan | 220643727.8 | 167885837.3 | 85701768.34 | 136623163.9 | 63770800.6 | 39372135.78 | 51431361.53 |
| 2021 | Russia | 24679472.24 | 51934540.08 | 23121873.58 | 45353356.3 | 23557214.51 | 15684924.75 | 17921987.67 |
| 2022 | China | 195817739.5 | 228165873.8 | 90392540.32 | 88683245.68 | 9698940.382 | 2427894.359 | 1388223.511 |
| 2022 | Japan | 102527380.5 | 102480351.3 | 59272004.89 | 40332955.28 | 41032772.56 | 20825336.11 | 24310703.49 |
| 2022 | Russia | 37182949.62 | 38609982.35 | 20188197.59 | 14533676.5 | 14226023.82 | 6796774.911 | 9078931.755 |

Table 7. Quarterly catch at age of Chinese CY2015 for scenario CAA\_3 (Use Japanese catch-at-length).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Scenario | Fishing year | Quarter | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| CAA\_3 | 2014 | 1 | China | 8292384.338 | 142767088.4 | 12582949.47 | 3529766.964 | 2766401.632 | 613232.3369 | 180693.3314 |
| CAA\_3 | 2014 | 2 | China | 7291428.135 | 36911745.3 | 1133072.787 | 774943.7868 | 540985.6297 | 249566.6864 | 15150.83157 |
| CAA\_3 | 2015 | 3 | China | 185593.8958 | 813120.5714 | 24911050.3 | 1730084.856 | 66059.6067 | 0 | 23365.44697 |
| CAA\_3 | 2015 | 4 | China | 1074976.875 | 12455986.05 | 173779247.1 | 16355271 | 3133574.321 | 1986478.874 | 401155.5193 |

Table 8. Annual catch at age for scenario CAA\_2 (Use Japanese catch-at-length).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 1970 | Japan | 834153496.6 | 1201530100 | 1037301944 | 364874940.2 | 127479242.9 | 48870917.71 | 41361518.24 |
| 1971 | Japan | 334039692.2 | 814569531.2 | 888012239.1 | 288473458.4 | 103696881.1 | 56448914.05 | 18749683.38 |
| 1972 | Japan | 29022334.85 | 1846505570 | 680729020.7 | 241928130.2 | 73069935.44 | 35267621.02 | 17576606.85 |
| 1973 | Japan | 93175249.47 | 647123444.3 | 1210643871 | 547598229 | 183066072.9 | 46073495.15 | 12208770.22 |
| 1974 | Japan | 351124869.1 | 181956601.2 | 794061426.6 | 993752710.6 | 310059762.4 | 26350882.34 | 4372553.999 |
| 1975 | Japan | 1254231238 | 387855571.2 | 560121368.5 | 617525649 | 391233910 | 164578951.6 | 45867016.68 |
| 1976 | Japan | 631539246.4 | 923332728.1 | 547761974.2 | 445772190 | 251283049.5 | 41562414.46 | 3567383.274 |
| 1977 | Japan | 538985850.9 | 2083021197 | 726803278.3 | 471869021 | 236281244.2 | 81765283.23 | 15636377.15 |
| 1978 | Japan | 1039101579 | 1255785576 | 1468448951 | 640791035.4 | 338065987.2 | 172995580.5 | 16552963.17 |
| 1979 | Japan | 208231521.9 | 1918541758 | 1312222178 | 644674853.8 | 158389673.6 | 80206800.72 | 12837642.6 |
| 1980 | Japan | 198991657.4 | 472101028.7 | 286294537.8 | 419204041.7 | 309771086.9 | 126460996.9 | 11277505.13 |
| 1981 | Japan | 266173323.7 | 184459118.6 | 142036670 | 148722615.1 | 193911349 | 114759342.5 | 13402163.32 |
| 1982 | Japan | 123081551.4 | 323540250.1 | 301357210.6 | 159717361.8 | 80676186.95 | 70494102.86 | 12833282.92 |
| 1983 | Japan | 250359805 | 284122749.9 | 440153170.9 | 225430649.5 | 76212818.26 | 43563923.48 | 23247521.49 |
| 1984 | Japan | 548511344.7 | 544011504.4 | 358272089.9 | 208060588.5 | 89812337.77 | 45848979.69 | 17695953.92 |
| 1985 | Japan | 377730993.3 | 397592535.6 | 252510932.4 | 189871975.3 | 74546377.69 | 38311888.41 | 21369367.57 |
| 1986 | Japan | 182740814 | 1336026723 | 554794376.7 | 275872393.4 | 78946195.64 | 27700665.21 | 9116754.595 |
| 1987 | Japan | 72284437.16 | 315572655.7 | 351624752.7 | 170371515.3 | 41173087.46 | 19155761.28 | 6063893.97 |

Table 8. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 1988 | Japan | 66882204.85 | 106468063.5 | 252813392.3 | 253117663.9 | 26354855.28 | 4128172.511 | 1728040.695 |
| 1989 | Japan | 33836048.69 | 23892453.22 | 52950482.13 | 70542150.47 | 77178781.16 | 3990339.668 | 630576.0173 |
| 1990 | Japan | 28736252.37 | 5964878.164 | 5997831.045 | 10645710.5 | 6324489.547 | 4230907 | 834779.9009 |
| 1991 | Japan | 52516265.75 | 8069326.6 | 10700439.41 | 8123560.597 | 4722320.668 | 2126594.594 | 303106.282 |
| 1992 | Japan | 296726169.9 | 10682932.89 | 13136721.94 | 11963048.53 | 6526453.273 | 10342490.03 | 7960334.707 |
| 1993 | Japan | 96467309.07 | 957212888.3 | 239669059.5 | 39138895.57 | 5191708.57 | 1706955.102 | 1594969.076 |
| 1994 | Japan | 127952732 | 98101182.58 | 97999618.71 | 28365431.08 | 4837596.847 | 1658262.716 | 1926381.229 |
| 1995 | Japan | 362077875.9 | 123330943.7 | 48660792.05 | 27646448.45 | 8871464.602 | 3450333.624 | 1651254.524 |
| 1996 | Japan | 1578156279 | 192976851.1 | 22748912.15 | 19666171.2 | 9740970.612 | 4475685.527 | 2708251.736 |
| 1997 | Japan | 147180180.4 | 884610285.1 | 60935921.8 | 13296018.24 | 6337105.031 | 3768655.103 | 2278785.438 |
| 1998 | Japan | 31587926.46 | 68642255.08 | 177414645.2 | 13184041.21 | 1067886.156 | 344767.1957 | 61264.11701 |
| 1999 | Japan | 144587018.1 | 17202574.5 | 24129316.63 | 40583177.32 | 10051029.64 | 1268127.412 | 449628.2174 |
| 2000 | Japan | 251842271.8 | 85522163.8 | 13314977.5 | 10764169.93 | 13602948.74 | 757053.1167 | 274595.9834 |
| 2001 | Japan | 7109794.966 | 68817151.33 | 40115946.1 | 5344320.652 | 3800043.166 | 2952296.589 | 2366378.966 |
| 2002 | Japan | 243788587.2 | 16557875.09 | 5877361.313 | 6481324.575 | 3614606.892 | 3240117.534 | 1912662.764 |
| 2003 | Japan | 65721525.64 | 205574627.4 | 32326746.3 | 6511313.102 | 2014698.833 | 1050708.578 | 955564.38 |
| 2004 | Japan | 767105074.4 | 86693621.87 | 71950921.83 | 11429534.8 | 4295027.15 | 1390499.578 | 1286317.12 |
| 2005 | Japan | 41515849.2 | 522895013.7 | 52726452.95 | 31965651.15 | 13154396.2 | 918572.8361 | 1059198.305 |

Table 8. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 2006 | Japan | 6296243.25 | 61539292.71 | 376307034.6 | 24875600.37 | 7515206.446 | 1770320.442 | 481786.0045 |
| 2007 | Japan | 424936952.2 | 53165114.2 | 69503492.76 | 157128058.4 | 3684360.332 | 821495.1528 | 184879.4375 |
| 2008 | Japan | 59640311.64 | 274928168.1 | 46727735.2 | 44430957.8 | 51131380.28 | 3059030.233 | 1284798.498 |
| 2009 | Japan | 173813152.9 | 34660496.58 | 127110968.6 | 23502100.93 | 13098767.58 | 14953296.96 | 1308572.427 |
| 2010 | Japan | 79666431.75 | 162861244 | 53958139.57 | 37253510.04 | 9222520.577 | 5689821.038 | 553464.7642 |
| 2011 | Japan | 28037835.42 | 88153900.89 | 87304583.05 | 21348327.11 | 6648373.047 | 2106940.343 | 132091.2031 |
| 2012 | Japan | 62725113.69 | 51894046.2 | 90270961.4 | 66422761.64 | 20938459.94 | 4028704.029 | 589836.3061 |
| 2013 | Japan | 296564420.5 | 247763518.1 | 75483294.35 | 76526558.23 | 25140554.61 | 4972793.642 | 2338312.094 |
| 2014 | China | 15583812.47 | 179678833.7 | 13716022.25 | 4304710.751 | 3307387.261 | 862799.0233 | 195844.163 |
| 2014 | Japan | 131202801.3 | 706675911.8 | 129836380.6 | 53799267.15 | 14181907.75 | 15719707.8 | 656126.3465 |
| 2014 | Russia | 63854.94895 | 28170.82109 | 37700.54981 | 6232.296106 | 268.8090276 | 972.5969555 | 13.91584531 |
| 2015 | China | 2129007.109 | 55218610.4 | 336489649.9 | 18085355.85 | 3199633.928 | 1986478.874 | 424520.9662 |
| 2015 | Japan | 26456251.26 | 117869540.3 | 985365167.2 | 72451734.68 | 15580521.56 | 9413718.197 | 8787754.947 |
| 2015 | Russia | 638082.5042 | 107407.0077 | 503368.1918 | 174178.8305 | 9105.265618 | 6083.507294 | 1933.420757 |
| 2016 | China | 243057926.2 | 226409315.4 | 104065850 | 162406838.4 | 2503199.016 | 2909102.98 | 5048344.847 |
| 2016 | Japan | 73689595.41 | 95623286.3 | 172286676.1 | 760712622.9 | 26664152.92 | 12091431.45 | 7176755.468 |
| 2016 | Russia | 59947410.54 | 3417581.747 | 839655.5892 | 6742804.179 | 99074.04076 | 28894.91308 | 9274.9941 |

Table 8. continued.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Member | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 2017 | China | 241575796.5 | 494637019.9 | 99329058.54 | 77656897.73 | 78214900.79 | 3972401.661 | 0 |
| 2017 | Japan | 96043008.87 | 113382558.4 | 160112309.1 | 266049164.8 | 372870436.1 | 34352284.63 | 11298839.87 |
| 2017 | Russia | 8964228.917 | 22095147.96 | 14409173.78 | 14683599.47 | 30641833.28 | 4559941.181 | 591444.1506 |
| 2018 | China | 73803565.46 | 62693923.82 | 94659217.36 | 50185207.53 | 99385677.5 | 27017894.95 | 2444570.071 |
| 2018 | Japan | 249781031.5 | 51325218.13 | 142465698.1 | 191071181.6 | 189138142.7 | 152784435.2 | 30180879.27 |
| 2018 | Russia | 129065310.3 | 45538105.77 | 40294613.53 | 41611901.15 | 40052748.72 | 32908761.1 | 2816812.722 |
| 2019 | China | 18918934.27 | 34714643.6 | 74162625.27 | 22100718.81 | 54940608.22 | 9101067.972 | 0 |
| 2019 | Japan | 60387635.33 | 199733193.7 | 130182588.4 | 138294593.7 | 100522122.2 | 77308610.76 | 138104435.5 |
| 2019 | Russia | 5566828.421 | 36763810.4 | 15873801.36 | 13562793.29 | 7870410.705 | 8211165.126 | 21651445.7 |
| 2020 | China | 77613172.94 | 54534567.48 | 154219112.2 | 146274798.5 | 16078187.5 | 12548331.71 | 1345062.726 |
| 2020 | Japan | 285179124.4 | 95040632.67 | 306489770.4 | 141519193.3 | 94010955.98 | 60848520.26 | 79038110.77 |
| 2020 | Russia | 3280683.41 | 2910186.045 | 18541917.03 | 12381170.01 | 15016441.83 | 11955082.54 | 13983861.14 |
| 2021 | China | 120835783.5 | 122539022.5 | 255188899 | 47441090.65 | 15714387.48 | 2479772.542 | 1139916.658 |
| 2021 | Japan | 220643727.8 | 167885837.3 | 85701768.34 | 136623163.9 | 63770800.6 | 39372135.78 | 51431361.53 |
| 2021 | Russia | 24679472.24 | 51934540.08 | 23121873.58 | 45353356.3 | 23557214.51 | 15684924.75 | 17921987.67 |
| 2022 | China | 195817739.5 | 228165873.8 | 90392540.32 | 88683245.68 | 9698940.382 | 2427894.359 | 1388223.511 |
| 2022 | Japan | 102527380.5 | 102480351.3 | 59272004.89 | 40332955.28 | 41032772.56 | 20825336.11 | 24310703.49 |
| 2022 | Russia | 37182949.62 | 38609982.35 | 20188197.59 | 14533676.5 | 14226023.82 | 6796774.911 | 9078931.755 |

Table 9. Maturity-at-age for scenario MAA\_1 (Chinese annual mean and Japanese MAA)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 1970 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1971 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1972 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1973 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1974 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1975 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1976 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1977 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1978 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1979 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1980 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1981 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1982 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1983 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1984 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1985 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1986 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1987 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1988 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1989 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1990 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1991 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1992 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1993 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1994 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1995 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1996 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1997 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1998 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1999 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |

Table 9. continued.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 2000 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2001 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2002 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2003 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2004 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2005 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2006 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2007 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2008 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2009 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2010 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2011 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2012 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2013 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2014 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2015 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 2016 | 0 | 0 | 0 | 0.3 | 1 | 1 | 1 |
| 2017 | 0 | 0 | 0.075 | 0.65 | 1 | 1 | 1 |
| 2018 | 0 | 0 | 0.05 | 0.4375 | 1 | 1 | 1 |
| 2019 | 0 | 0 | 0.0375 | 0.425 | 1 | 1 | 1 |
| 2020 | 0 | 0 | 0.0417  | 0.3667  | 1 | 1 | 1 |
| 2021 | 0 | 0.0033  | 0.0833  | 0.3833  | 1 | 1 | 1 |
| 2022 | 0 | 0.0043  | 0.0167  | 0.3833  | 1 | 1 | 1 |

Table 10. Maturity-at-age for scenario MAA\_2 (Chinese seasonal mean and Japanese MAA)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 1970 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1971 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1972 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1973 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1974 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1975 | 0 | 0 | 0.2 | 0.8 | 1 | 1 | 1 |
| 1976 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1977 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1978 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1979 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1980 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1981 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1982 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1983 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1984 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1985 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1986 | 0 | 0 | 0.3 | 0.9 | 1 | 1 | 1 |
| 1987 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1988 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1989 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1990 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1991 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1992 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1993 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1994 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1995 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1996 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1997 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1998 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |
| 1999 | 0 | 0 | 0.4 | 1 | 1 | 1 | 1 |

Table 10. continued.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Fishing year | Age\_0 | Age\_1 | Age\_2 | Age\_3 | Age\_4 | Age\_5 | Age\_6+ |
| 2000 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2001 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2002 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2003 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2004 | 0 | 0.05 | 0.8 | 1 | 1 | 1 | 1 |
| 2005 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2006 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2007 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2008 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2009 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2010 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2011 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2012 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2013 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2014 | 0 | 0 | 0.5 | 1 | 1 | 1 | 1 |
| 2015 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 2016 | 0 | 0 | 0 | 0.3 | 1 | 1 | 1 |
| 2017 | 0 | 0 | 0.075 | 0.65 | 1 | 1 | 1 |
| 2018 | 0 | 0 | 0.1 | 0.65 | 1 | 1 | 1 |
| 2019 | 0 | 0 | 0.075 | 0.65 | 1 | 1 | 1 |
| 2020 | 0 | 0 | 0.125 | 0.65 | 1 | 1 | 1 |
| 2021 | 0 | 0.01 | 0.25 | 0.65 | 1 | 1 | 1 |
| 2022 | 0 | 0 | 0.05 | 0.65 | 1 | 1 | 1 |

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