Pacific Community
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A summary of stock status and national implications for the Cook Islands

FAME
Fisheries, Aquaculture and Marine Ecosystems Division

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Introduction

Tuna stock assessments provide important information regarding the status of regional tuna stocks and the future predicted impacts of fishing on them. This information can help the Solomon Islands and other WCPFC members decide how best to collectively manage these stocks.

Albacore, bigeye, yellowfin and skipjack tuna are targeted by fisheries operating in the Solomon Islands. The SPC has assessed these stocks in the WCPFC-CA using a modeling tool called MULTIFAN-CL, which is reliant on accurate and comprehensive catch, effort, size and other fisheries data collected by all fishing nations. The assessments provide information on stock status at the WCPFC-CA scale and broad model Regions within that. SPC is working to develop models that can provide similar information at the EEZ scale. However, given that tuna are migratory and may pass through many EEZ's in their lifetime, it will never be feasible to assess and/or manage these species within individual EEZ's in isolation from what is happening in surrounding waters. However, most countries also need to know what the status of the resource is in their immediate vicinity. Therefore we provide here some information for the broad model region that surrounds your EEZ so that you can assess your country's impact on the stock and the state of the stock in your waters.

This report should be used in conjunction with the Tuna Fisheries Assessment Report published annually by the SPC (Hare et al. 2023). Tuna stock assessment results are described using a number of technical terms, and refer to a number of key indicators of stock status (reference points). The most important of these terms are described in Table 1.

Summary of tuna stock status

The most recent assessments indicate that overfishing is not occurring on albacore, bigeye, skipjack and yellowfin tuna, and these stocks are not in an overfished state (Figure 1). However, catch of each of these species have increased significantly over the past 2 to 3 decades, with corresponding reductions in stock biomass relative to the biomass that would be in the water if no fishing was occurring. The following sections provide more detail regarding the status of these stocks, implications for your national fisheries and briefly reviews assessments of other relevant species. Specific details regarding catch and stock status of each species in the WCPFC and your EEZ are presented in Table 2, to demonstrate how fishing in your EEZ and fishing by your flagged or chartered vessels in your EEZ or elsewhere compare to fishing in the wider region.

Table 1: Definitions of key terms used in describing the impact of fishing upon and the status of fish stocks

Depletion	Depletion describes the level of reduction in the fish stock since fishing first began, typically by comparing current spawning biomass to that which would occur if there was no fishing (SBcurrent/SBF =0).
Fishing mortality rate	The proportion of the stock removed by fishing in a unit of time. Growth overfished Fish are harvested at an average size that is smaller than the size that would produce the maximum yield per recruit.
Maximum Sustainable Yield (MSY)	The maximum amount of catch that can be taken from the stock per year, on average, in the long-term.
Overfished	Occurs when there are no longer enough adults in the population to produce enough young to replace those fish removed from the population by fishing. In the WCPFC, an overfished fishery is defined as one where the current spawning biomass (SBcurrent) is less than 20 of the spawning biomass in the absence of fishing (SBF =0).
Overfishing	In the WCPFC, overfishing is defined as occurring when the current fishing mortality rate exceeds the fishing mortality rate that would provide the maximum sustainable yield. Sustained overfishing leads to an overfished state.
Recruitment overfished	Occurs when the adult population is depleted to a level where it no longer has the reproductive capacity to replenish itself.

Table 2: Key stock and fishery catch statistics for the WCPFC convention area, including the recent period of , 2018 – 2022 in the SB EEZ

Summary description	Albacore	Bigeye	Skipjack	Yellowfin
WCPFC-CA catch	64,480	146,560	1,806,281	719,736
5-year WCPFC-CA catch trend	Stable	Decreasing	Stable	Increasing
WCPFC-CA Longline catch	60,545	60,872	3,497	87,227
WCPFC-CA Purse seine catch	6	65,514	1,475,630	381,359
WCPFC-CA Pole and line catch	22	2,285	160,419	23,208
WCPFC-CA Other catch	3,906	17,889	166,735	227,942
Catch in SB model regions	15,446	80,152	1,246,623	358,532
Percent of WCPFC-CA catch in SB model regions	24	54.7	69	49.8
Catch in SB EEZ	4,528	3,444	73,303	29,314
Percent of WCPFC-CA catch taken in SB EEZ	7	2.4	4.1	4.1
Percent of Catch in SB model regions taken in SB EEZ	29.3	4.3	5.9	8.2
Catch by SB flagged in WCPFC-CA	2,176	1,370	30,352	19,229
Percent of WCPFC-CA catch by SB flagged vessels	3.4	0.9	1.7	2.7

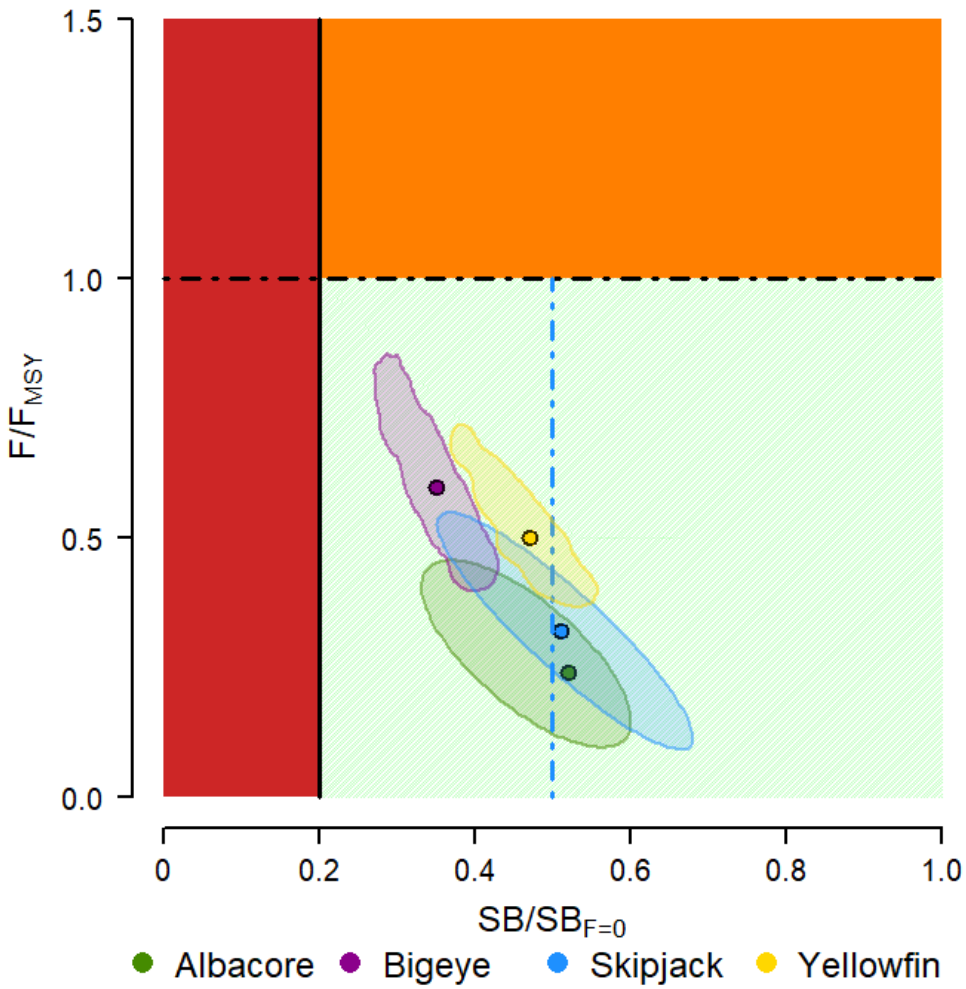

Figure 1: Majuro plot comparing the stock status of the key target tuna species caught in the WCPFC Convention Area. Where current fishing mortality rate exceeds the fishing mortality rate at MSY ($F/F_{MSY} > 1$) then overfishing is occurring. Where the current spawning biomass is less than 0.2 of spawning biomass without fishing, then the stock is overfished ($SB/SB_{F=0} < 0.2$). The large points represent the median estimated stock status in terms of fishing mortality and biomass depletion in the terminal year of the most recent assessment for each species. The error bars indicate stock status uncertainty from all models run in the grid. The blue and green dashed lines indicate the WCPFC interim target reference points for skipjack and albacore tuna, respectively.

Skipjack tuna

The most recent skipjack tuna assessment was conducted in 2022 (Castillo-Jordan et al. 2022). The skipjack assessment used an eight region model, which was a change from the five region model used in the previous assessment; your EEZ is situated in region(s) 6, 7, 8 (Figure 2 - top). Between 2013 and 2022 skipjack catch averaged 1,806,281 mt in the WCPFC-CA (Figure 2 - middle). An average of 1,246,623 mt (69 % of WCPFC-CA catch) comes from region(s) 6, 7, 8.

It is estimated that skipjack spawning biomass in the WCPFC-CA and region(s) 6, 7, 8, have been reduced through fishing by **tabl2**% and **tabl2**% respectively (**??**). The greatest impacts on spawning biomass in the WCPO are equally from the FAD-associated and free school purse seine fisheries, while the FAD-associated purse seine fishery has the greatest impact in the equatorial regions (Figure 2 - bottom).

The SC18 of the WCPFC concluded that overfishing is not occurring on the skipjack stock and the stock is not overfished ((WCPFC 2022); Figure 1). The spawning biomass level is below the interim Target

Reference Point of 50% ($SB/SB_{F=0} = 0.5$), though well above the Limit Reference Point of 20%, unfished spawning biomass. Previously, the SC12 noted that fishing is having a significant impact on stock size, especially in the western equatorial region and can be expected to negatively affect catch rates. The stock distribution is also influenced by changes in oceanographic conditions associated with El Niño and La Niña events, which impact on catch rates and stock size. Additional purse-seine effort will yield only modest gains in long-term skipjack catch and may result in a corresponding increase in fishing mortality for bigeye and yellowfin tunas (WCPFC 2022).

Annual catch of skipjack in the Solomon Islands has averaged 73,303 mt between 2013 and 2022, representing 4.1 % of the skipjack catch in the WCPFC-CA and 5.9 % of the catch in region(s) 6, 7, 8. Together, skipjack catch by the Solomon Islands fleet (including chartered vessels) both inside and outside the the Solomon Islands EEZ have caught an average of 30,352 mt, which is 1.7 % of the WCPFC skipjack catch. Regional catch of skipjack tuna, including those within or by the Solomon Islands, are considered sustainable at recent average levels. However, the Solomon Islands should note that the FAD component of the regional purse seine fishery (the main fishery for skipjack tuna) catches juvenile bigeye and yellowfin tuna, and that fishery is contributing to the impact on these stocks.

Yellowfin tuna

The most recent yellowfin tuna assessment was conducted in 2023 (Magnusson et al. 2023). The yellowfin tuna assessment used a nine region model, with the Solomon Islands situated in region(s) 3, 4, 5 (Figure 4 - top). Between 2013 and 2022 yellowfin catch averaged 719,736 mt in the WCPFC-CA (Figure 4 - middle). An average of 358,532 mt (49.8 % of WCPFC-CA catch) comes from region(s) 3, 4, 5. It is estimated that yellowfin spawning biomass in the WCPFC-CA and region(s) 3, 4, 5, have declined by **tabl2** % and **tabl2** % respectively (**??**). The greatest impact on the stock is from the fisheries of the Philippines and Indonesia, along with the FAD directed purse-seine fishery in the WCPO and from the FAD directed purse-seine fishery in region(s) 3, 4, 5 (Figure 4 - bottom).

The SC19 (WCPFC 2023) concluded that overfishing is not occurring on the yellowfin stock and the stock is not overfished (Figure 1). However, fishing mortality, exploitation rates and depletion differ between regions, and exploitation rates are highest in the equatorial region (Regions 3, 4, 7 and 8), which account for **94** % of the total yellowfin tuna catch. The SC19 recommended that there be no increase in yellowfin catch and that measures be implemented to maintain current spawning biomass levels (WCPFC 2023).

The annual catch of yellowfin in the Solomon Islands have averaged 29,314 mt between 2013 and 2022, representing 4.1 % of WCPFC-CA and 8.2 % of region(s) 3, 4, 5 yellowfin catch. Together, yellowfin catch by the Solomon Islands fleet (including chartered vessels) both inside and outside the the Solomon Islands EEZ have caught an average of 19,229 mt, which is 2.7 % of the WCPFC skipjack catch. As such, the the Solomon Islands fishery does not contribute significantly to overall regional impacts on the stock. The yellowfin stock in region(s) 3, 4, 5 has low levels of depletion in Region 6 but higher in Region 4 and overall the Solomon Islands catch is a small percentage of the catch in these two regions.

Bigeye tuna

The most recent bigeye tuna assessment was conducted in 2023 (Day et al. 2023). The bigeye assessment used a nine region model, your EEZ is situated in region(s) 3, 4, 5, 8 (Figure 6 - top). Between 2013 and 2022 bigeye catch averaged 146,560 mt in the WCPFC-CA (Figure 6 - middle). An average of 80,152 mt (54.7 % of WCPFC-CA catch) comes from region(s) 3, 4, 5, 8. It is estimated that bigeye spawning biomass in the WCPFC-CA and region(s) 3, 4, 5, 8, have declined by **tabl2**% and **tabl2**% respectively (**??**). The greatest impact on spawning biomass is from the associated - FAD - purse seine fisheries in the WCPO and from the longline fishery in region(s) 3, 4, 5, 8 (Figure 6 - bottom).

The SC19 concluded that overfishing is not occurring on the bigeye stock and the stock is not overfished (Figure 1). However, the increase in juvenile bigeye catch has resulted in a considerable reduction in the potential yield of the WCPO bigeye stock. The loss in yield per recruit due to excess harvest of juvenile fish is substantial (WCPFC 2023).

Annual catch of bigeye in the Solomon Islands have averaged 3,444 mt between 2013 and 2022, representing 2.4 % of WCPFC-CA and 4.3% of region(s) 3, 4, 5, 8 bigeye catch. Together, bigeye catch by the Solomon Islands fleet (including chartered vessels) both inside and outside the the Solomon Islands EEZ have caught an average of 1,370 mt, which is 0.9 % of the WCPFC bigeye catch. Regional catch of bigeye tuna, including those within or by the Solomon Islands, are considered to be low if maintained at recent average levels. However, the Solomon Islands should note that the FAD component of the regional purse seine fishery (the main fishery for skipjack tuna) catches juvenile bigeye and yellowfin tuna, and that fishery is contributing to the impact on this stock.

Bigeye tuna is one of several species targeted in the longline fishery operating in the Solomon Islands and is also taken in the purse seine fishery in the equatorial area. The viability of the local and regional purse seine fishery is not dependent on bigeye tuna abundance. However, the prospects for long-term viability (and/or further expansion) of a longline fishery for bigeye in the Solomon Islands will be dependant, in part, on trends in both national and regional fishing mortality on the bigeye stock (and economic and other factors not discussed here).

South Pacific albacore tuna

The most recent south Pacific albacore (hereafter, simply "albacore") assessment was conducted in 2021 (Castillo-Jordan et al. 2021). The albacore assessment used a five region model for the entire stock, including the EPO, your EEZ is situated in region(s) 1, 2 (Figure 8 - top). Between 2013 and 2022 albacore catch averaged 64,480 mt in the WCPFC-CA (Figure 8 - middle). An average of 15,446 mt (24 % of WCPFC-CA catch) comes from region(s) 1, 2. It is estimated that albacore spawning biomass in the south Pacific and region(s) 1, 2, have declined by **tabl2**% and **tabl2**% respectively (**??**). The greatest impact on spawning biomass is from the sub-tropical longline fisheries both in the WCPO and in region(s) 1, 2 (Figure 8 - bottom).

The WCPFC SC17 concluded that South Pacific albacore spawning stock is currently above both the level that will support the MSY and the adopted spawning biomass limit reference point, and overfishing is not occurring (Figure 1). But SC17 also noted that while overfishing is not occurring, further increases in effort will yield little or no increase in long-term catch and result in further reduced catch rates. SC17 cautioned that any increases in catch or effort in sub-tropical longline fisheries are likely to lead to declines in longline catch rates relative to those currently experienced, which will impact vessel profitability (WCPFC 2021). An interim Target Reference Point is due to be decided at the commission meeting this year, and is needed to determine how current spawning biomass relates to levels that meet the objectives of the fishery.

Annual catch of albacore in the Solomon Islands has averaged 4,528 mt between 2013 and 2022, representing 7 % of WCPFC-CA and 29.3 % of region(s) 1, 2 albacore catch. Together, albacore catch by the Solomon Islands fleet (including chartered vessels) both inside and outside the the Solomon Islands EEZ have caught an average of 2,176 mt, which is 3.4 % of the WCPFC albacore catch. Regional catch of albacore tuna, including those within or by Solomon Islands vessels fishing outside your EEZ, are considered sustainable at recent average levels. But it should be noted that, projections[1] estimate that there is a moderate chance of the overall stock falling below the LRP by in future years at recent (status quo) catch and effort levels (Hare et al. 2023). While the stock remains in a biologically healthy state, the prospects for any future albacore targeted fishery in the Solomon Islands will depend on local abundance, catch rates and economics.

[1]Estimates of risk using deterministic projections are likely to be underestimated as they do not include future uncertainties such as fluctuations in recruitment.

Other species

Stock assessments are available for some other species which may interact with the fisheries in the Solomon Islands (Table 3). These include five shark and five billfish species or stocks (Figure 10).

Both north and south Pacific swordfish and blue marlin are not overfished and no overfishing was taking place (Ducharme-Barth et al. 2021; ISC 2021). The SC, has recommended that there should be no increase in fishing mortality for blue marlin and swordfish. The southwest Pacific striped marlin assessment results indicate that the stock status is very uncertain and the presence of overfishing and/or the stock being overfished cannot be ruled out (Table 3) (Ducharme-Barth, Pilling, and Hampton 2019).

For the sharks that have been assessed to date, blue sharks in the north Pacific are not considered to be overfished and no overfishing is taking place; blue sharks in the south Pacific, and north Pacific shortfin mako have a very similar status, that is, they are most likely not overfished and overfishing is most likely not taking place; silky sharks are possibly overfished and overfishing is most likely taking place; and for oceanic whitetip sharks the stock is overfished and overfishing is occuring (Table 3). It should also be noted that due to concerns expressed by the Scientific Committee regarding the steep declines in biomass of silky and oceanic whitetip shark, the Commission has adopted CMMs for these species prohibiting their retention, transshipment, storage or landing (Brouwer and Hammer 2023). In addition, in an attempt to reduce incidental catch of these species CMM2014-05 prohibits the use of either wire trace branchlines or shark lines on longline sets **this has now changed?** (Brouwer and Hammer 2023).

Table 3: Stock status and WCPFC Scientific Committee (SC) recommendations for non-key tuna species stocks caught in the WCPFC-CA. NP = North Pacific; SWPO = Southwest Pacific Ocean; SPO = South Pacific Ocean; SEPO=Southeast Pacific Ocean.

Species	Assesed	Status	SC Recommendation	Reference
Blue marlin	2021	No overfishing, not overfished	Need for improved biological data for all billfish species withinthe WCPFC convention areal	(SC19-SA-WP-16, WCPFC20-2023-SC19-01)
Striped marlin (SWPO)	2019	Stock fully exploited, not experiencing overfishing but is overfished	Need for improved biological data for all billfish species withinthe WCPFC convention areal	(SC19-SA-IP-11, WCPFC20-2023-SC19-01)
North Pacific Swordfish	2023	No overfishing, not overfished	NP SWO stock status is positive with no evidence of excess F above FMSY or substantial depletion of spawning potential	(WCPFC20-2023-SC19-01, SA-WP-16-rev-1)
Swordfish (SPO)	2021	SWPO stock - No overfishing, not overfished	Develop sex disaggregated models to account for the significant differences in life history between the sexes and relatively simple single region spatial structure represent key areas of uncertainty in the assessment.	(SA-WP-16-rev-1)
Southwest Pacific Blue shark	2022	No overfishing, not overfished	Catch and fishing effort on blue shark should be carefully monitored	(SC17-SA-WP03; SC17-SA-IP-06, SC17-SA-IP-19)
North Pacific Blue shark (NP)	2022	No overfishing, not overfished	Catch and fishing effort on blue shark should be carefully monitored	(SC18-SA-WP-06, SC19-EB-WP-06)
Oceanic whitetip shark	2019	Overfishing, overfished	Management measures to reduce fishing mortality and to rebuild spawning biomass required and mitigation to avoid capture is recommended.	(SC19-EB-WP-06)
Silky shark	2023	Overfishing occurring, however not overfished	Develop mitigation as well as measures control targeted catch.	(SC19-EB-WP-06)

References

Brouwer, S., and P. Hammer. 2023. "Shark Research Plan 2021-2025 Mid-Term Review (Project 97b) - REV.01." WCPFC-SC19-2023/EB-WP-06. Koror, Palau, 16-24 August 2023.

Castillo-Jordan, C., T Teears, J. Hampton, N Davies, J Scutt Phillips, S McKechnie, T Peatman, et al. 2022. "Stock Assessment of Skipjack Tuna in the Western and Central Pacific Ocean: 2022." WCPFC-SC18-2022/SA-WP-01 (REV5). Electronic meeting, 10–18 August 2022.

Castillo-Jordan, C., H. Xu, J. Hampton, N. Ducharme-Barth, and P. Hamer. 2021. "Stock Assessment of South Pacific Albacore." WCPFC-SC17-2021/SA-WP-02. Electronic meeting, 11–19 August 2021.

Day, J, A Magnusson, T Teears, J Hampton, N Davies, C Castillo-Jordan, T Peatman, et al. 2023. "Stock assessment of bigeye tuna in the western and central Pacific Ocean: 2023." WCPFC-SC19-2023/SA-WP-05. Koror, Palau, 16-24 August 2023.

Ducharme-Barth, N, C Castillo-Jordan, J Hampton, P Williams, G Pilling, and P. Hamer. 2021. "Stock Assessment of Southwest Pacific Swordfish." WCPFC-SC17-2021/SA-WP-04. Electronic meeting, 11–19 August 2021.

Ducharme-Barth, N, G Pilling, and J Hampton. 2019. "Stock Assessment of SW Pacific Striped Marlin in the WCPO." WCPFC-SC15-2019/SA-WP-07. Pohnpei, FSM, 12–20 August 2019.

Hare, S., P. G. Williams, C. Castillo-Jordan, P. Hamer, J. Hampton, P. Lehodey, J. Macdonald, et al. 2023. "The western and central Pacific tuna fishery: 2022 overview and status of stocks." Tuna Fisheries Assessment Report no. 23. Online, 20 November 2023.

ISC. 2021. "Stock Assessment Report for Pacific Blue Marlin (*Makaira Nigricans*)." WCPFC-SC17-2021/SA-WP-08. Electronic meeting, 11–19 August 2021.

Magnusson, A, J Day, T Teears, J Hampton, N Davies, C Castillo-Jordan, T Peatman, et al. 2023. "Stock assessment of yellowfin tuna in the western and central Pacific Ocean: 2023." WCPFC-SC19-2023/SA-WP-04. Koror, Palau, 16-24 August 2023.

WCPFC. 2021. "Report of the Scientific Committee seventeenth regular session." Summary Report. Online, 11–19 August 2021: Commission for the Conservation; Management of Highly Migratory Fish Stocks in the Western; Central Pacific Ocean.

———. 2022. "Report of the Scientific Committee eighteenth regular session." Summary Report. Online, 10–18 August 2022: Commission for the Conservation; Management of Highly Migratory Fish Stocks in the Western; Central Pacific Ocean.

———. 2023. "Report of the Scientific Committee nineteenth regular session." Summary Report. Koror, Palau, 16-24 August 2023: Commission for the Conservation; Management of Highly Migratory Fish Stocks in the Western; Central Pacific Ocean.

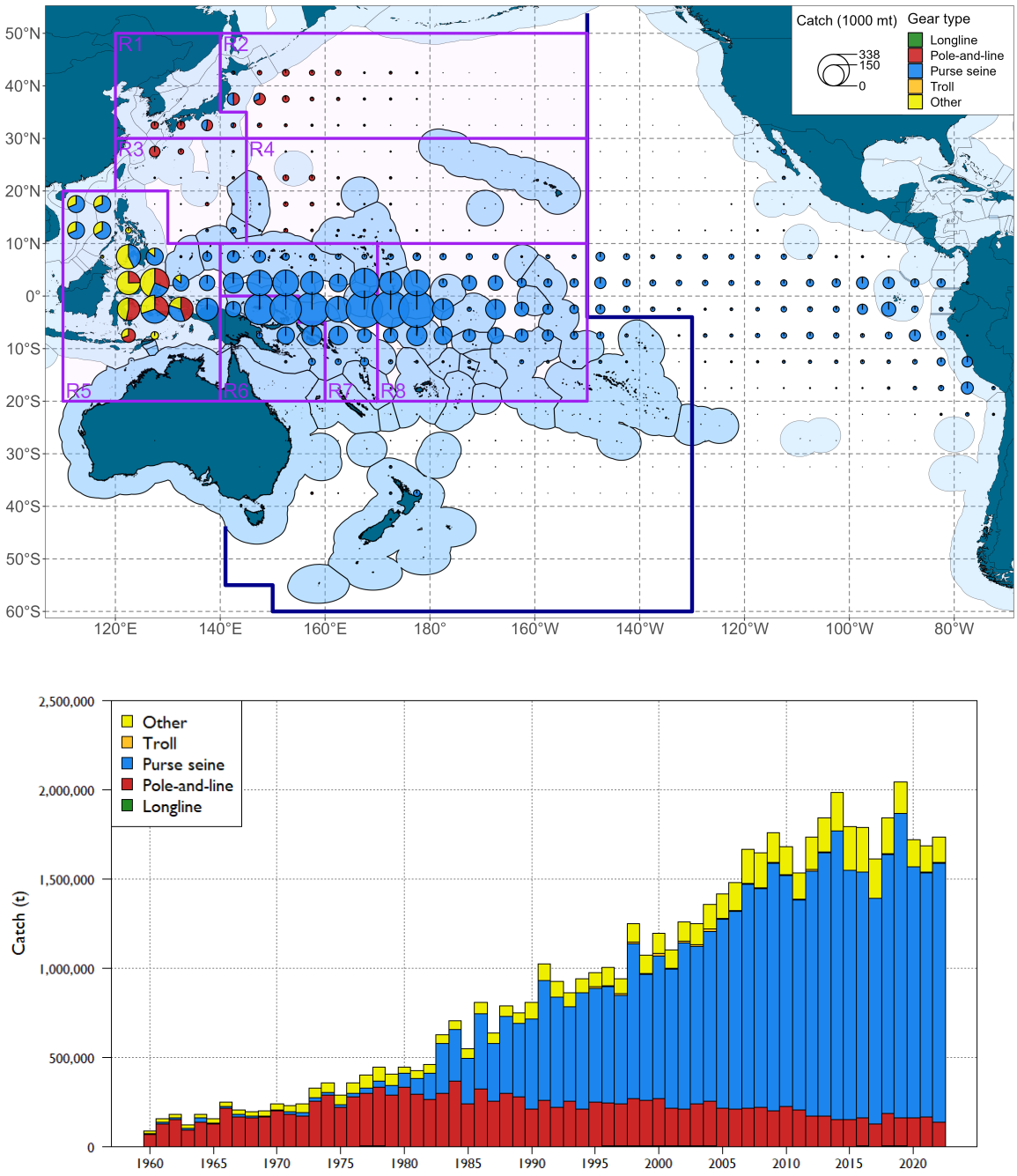

Figure 2: Distribution of total South Pacific albacore catch by fishing method 2013–2022 (Red, pole-and-line; Blue, purse-seine; Green, longline; Orange, troll; Yellow, other) (top). Annual catch of skipjack in the WCPO by fishing method (middle). Percentage impact on spawning biomass due to fishing in the WCPO (bottom - left) and the model Region/s encompassing your EEZ (bottom - right).

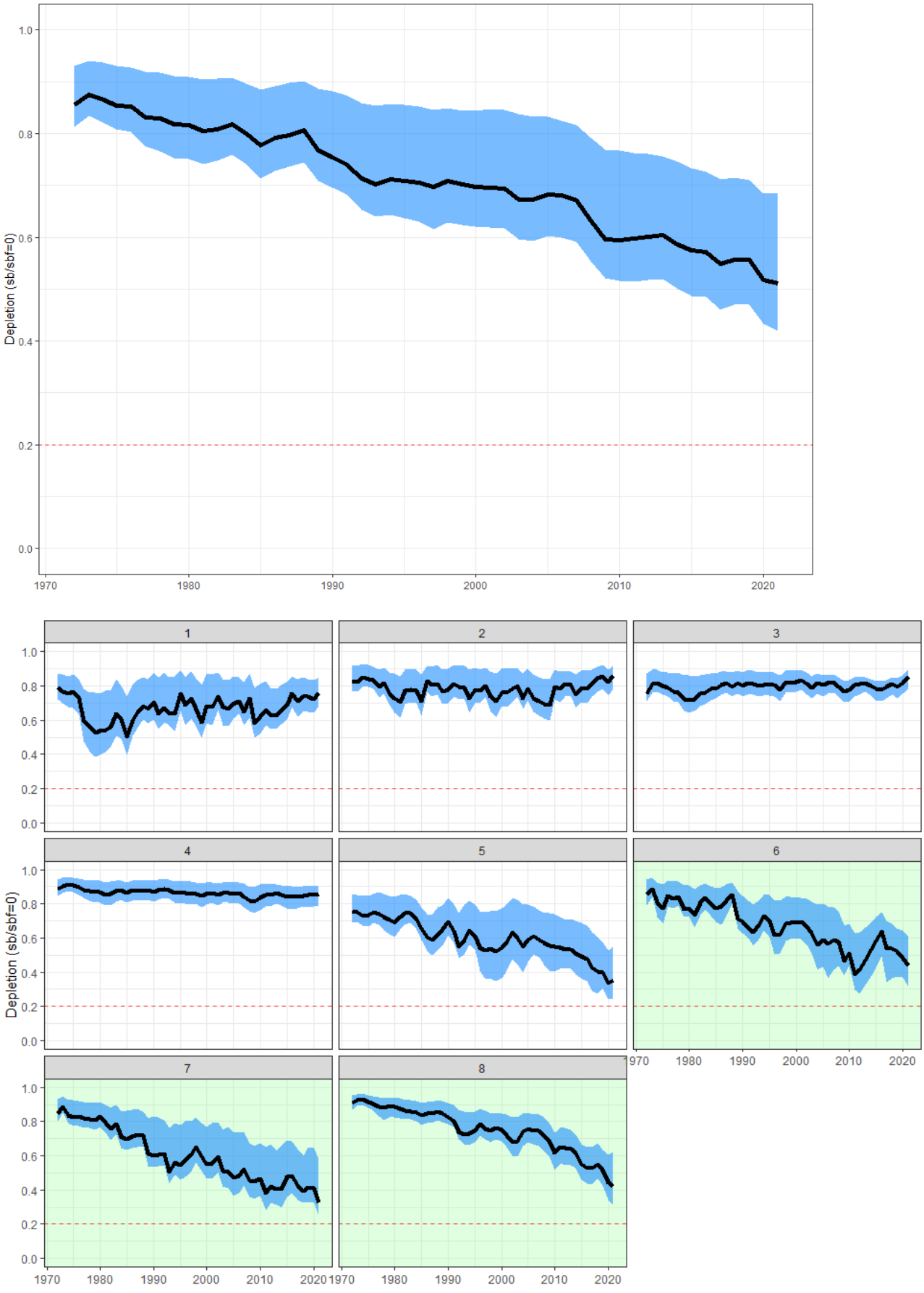

Figure 3: Depletion of skipjack at region scale.

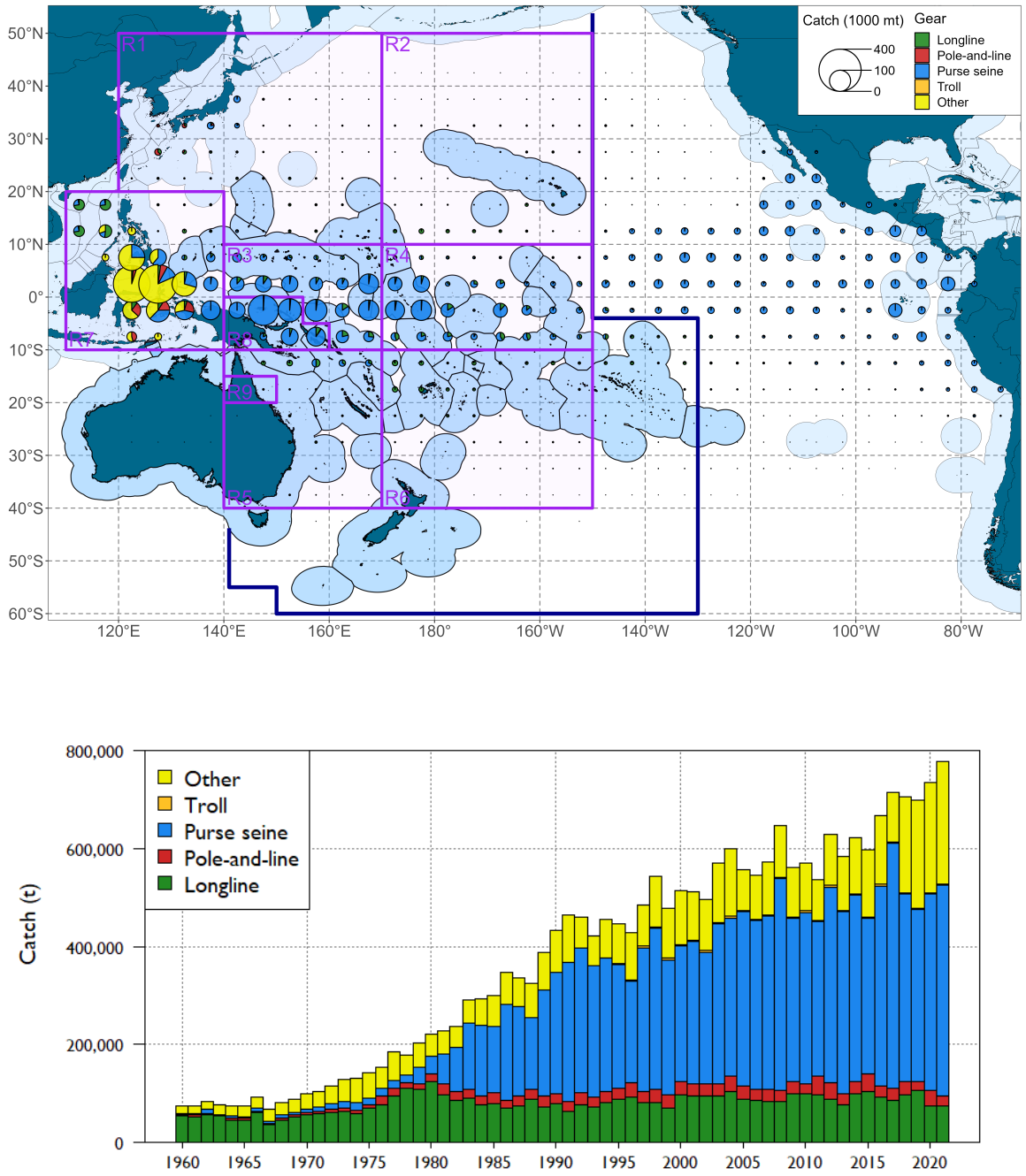

Figure 4: Distribution of total yellowfin catch by fishing method 2013–2022 (Red, pole-and-line; Blue, purse-seine; Green, longline; Orange, troll; Yellow, other) (top). Annual catch of South Pacific albacore in the WCPO by fishing method (middle). Percentage impact on spawning biomass due to fishing in the WCPO (bottom - left) and the model Region/s encompassing your EEZ (bottom - right).

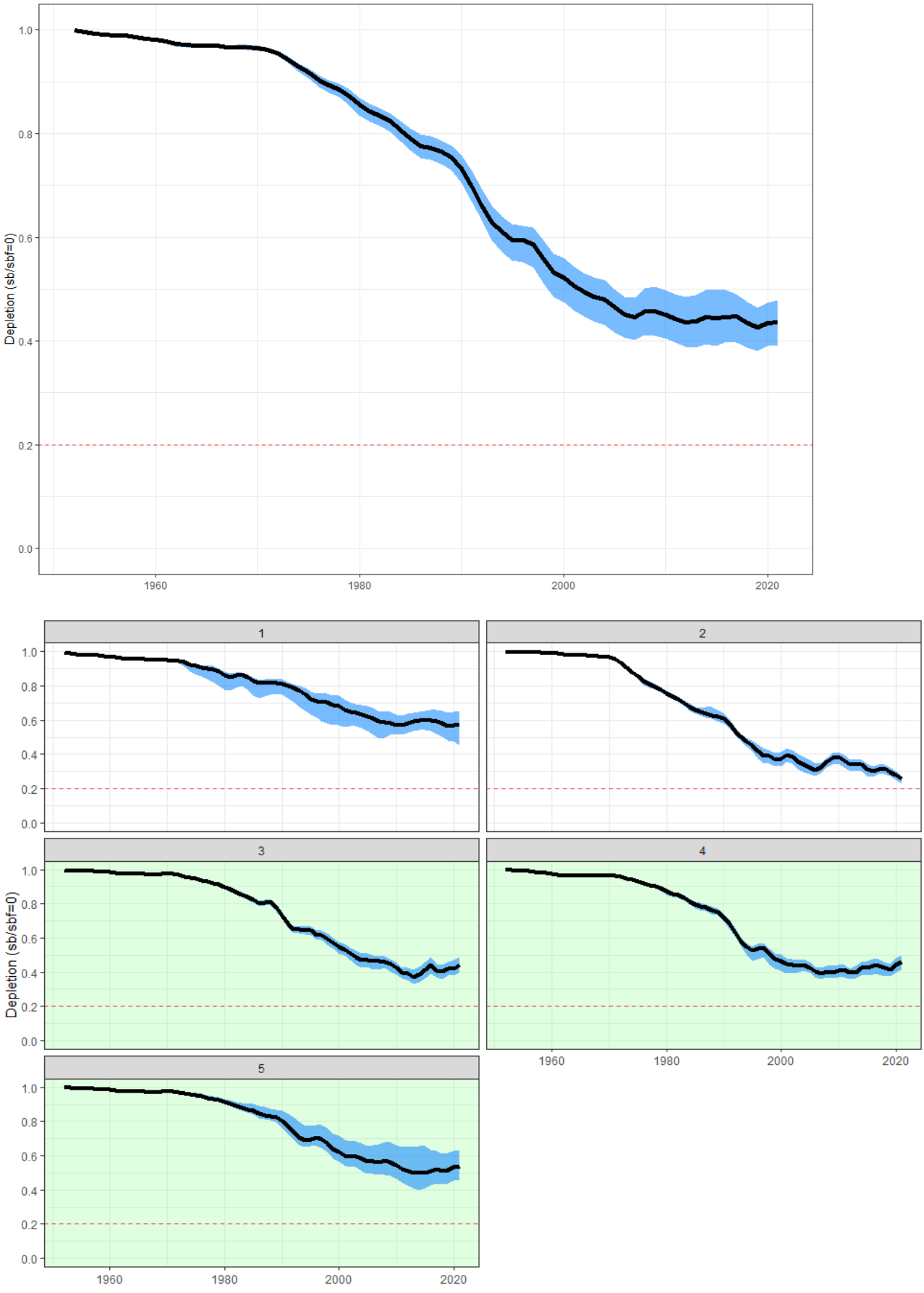

Figure 5: Depletion of yellowfin at region scale.

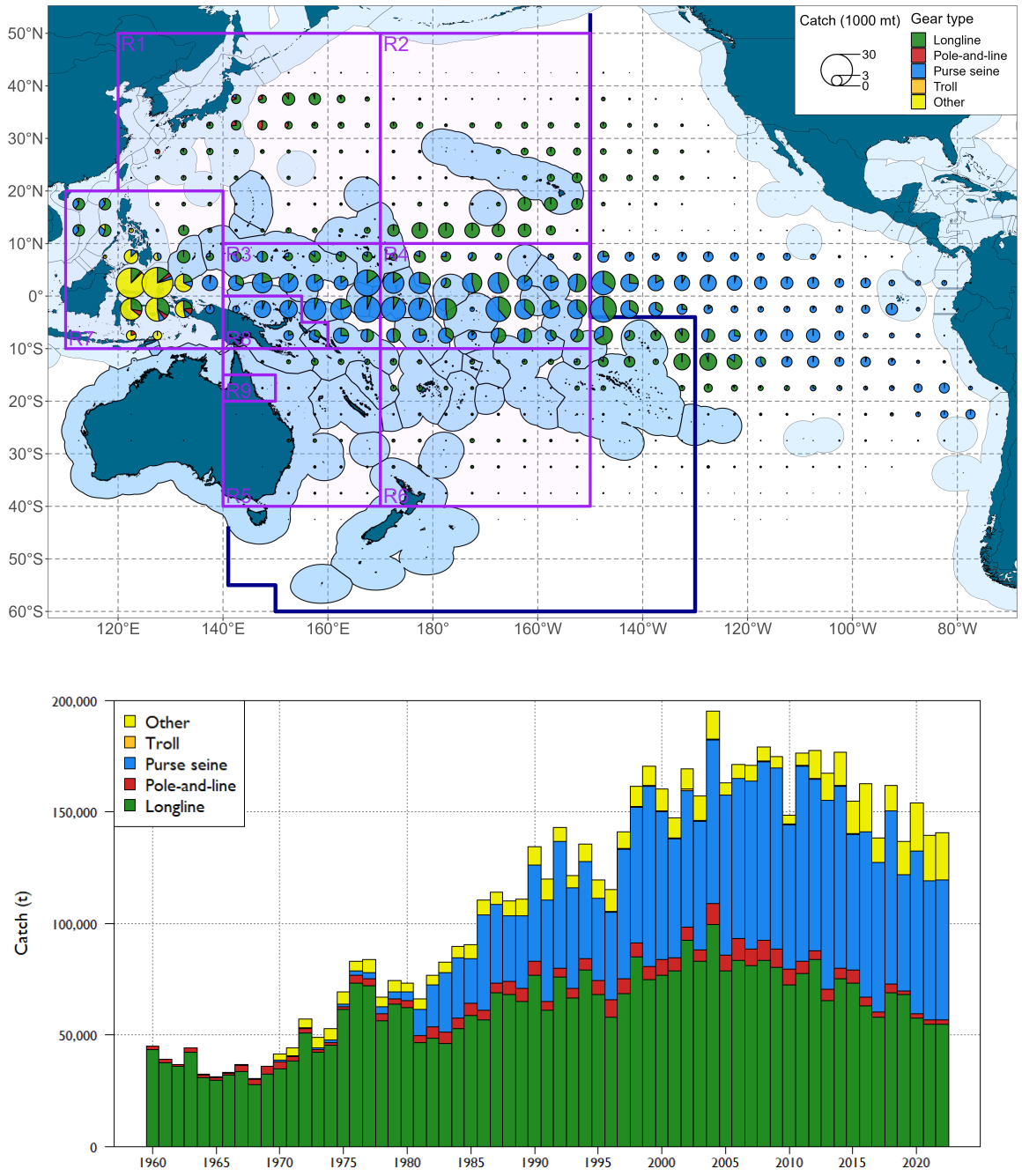

Figure 6: Distribution of total bigeye catch by fishing method 2013–2022 (Red, pole-and-line; Blue, purse-seine; Green, longline; Orange, troll; Yellow, other) (top). Annual catch of South Pacific albacore in the WCPO by fishing method (middle). Percentage impact on spawning biomass due to fishing in the WCPO (bottom - left) and the model Region/s encompassing your EEZ (bottom - right).

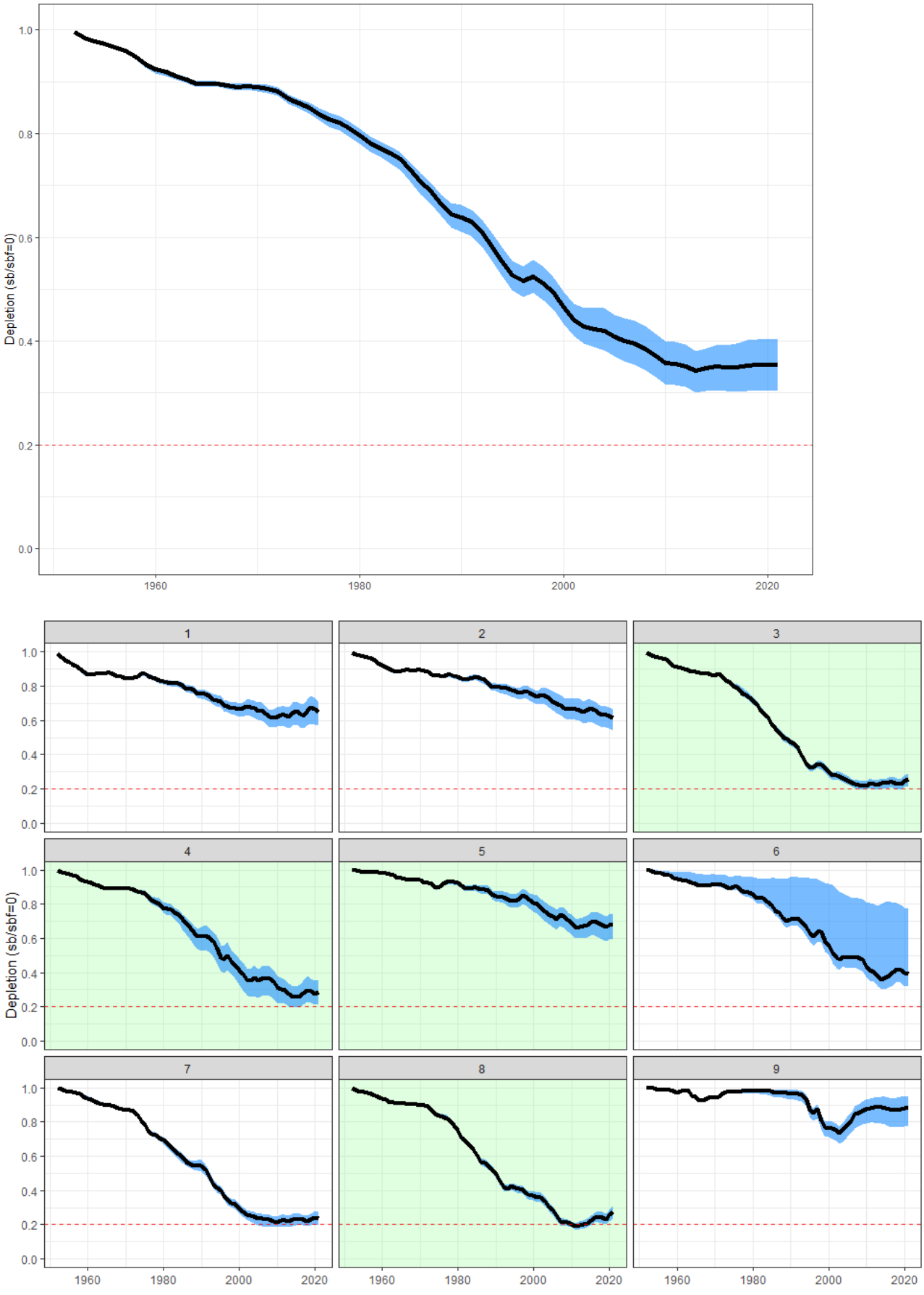

Figure 7: Depletion of bigeye at region scale.

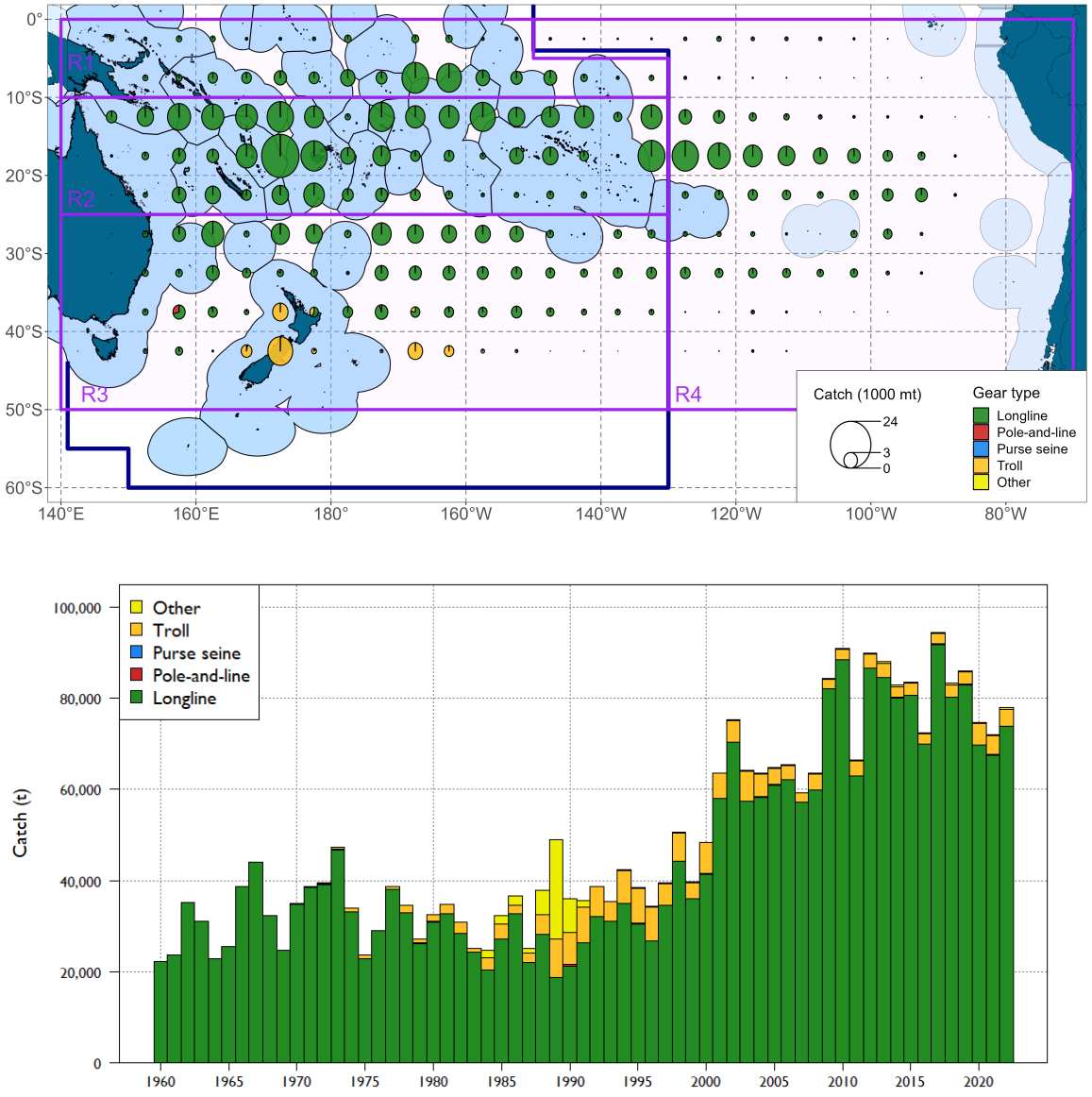

Figure 8: Distribution of total South Pacific albacore catch by fishing method 2013–2022 (Red, pole-and-line; Blue, purse-seine; Green, longline; Orange, troll; Yellow, other) (top). Annual catch of South Pacific albacore in the WCPO by fishing method (middle). Percentage impact on spawning biomass due to fishing in the WCPO (bottom - left) and the model Region/s encompassing your EEZ (bottom - right).

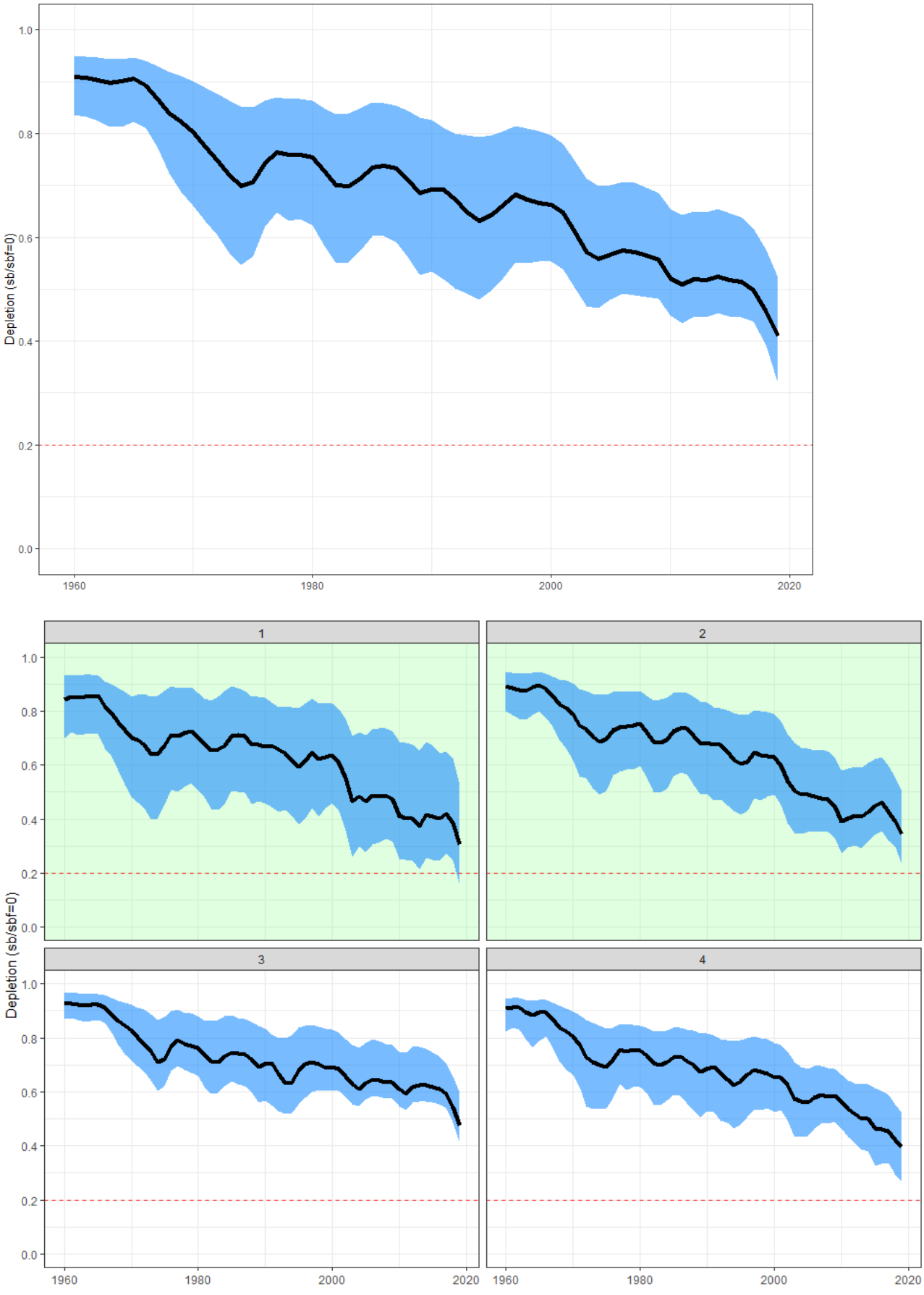

Figure 9: Depletion of albacore at region scale.

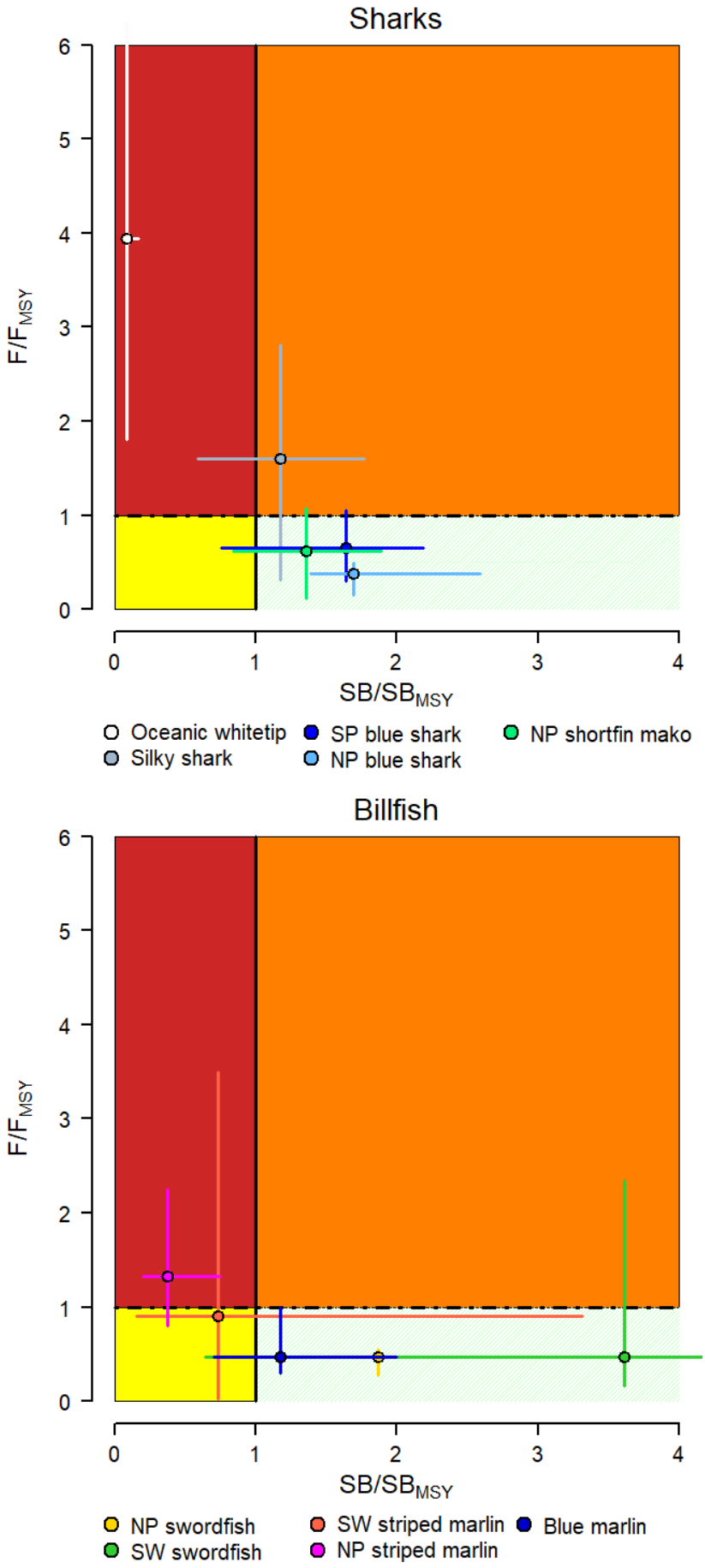

Figure 10: Kobe plots comparing the stock status of the key bycatch species caught in the WCPFC Convention Area. Where current fishing mortality rate exceeds the fishing mortality rate at MSY ($F/F_{MSY} > 1$) then overfishing is occurring. Where the current spawning biomass is less than the spawning biomass that would produce MSY, then the stock is overfished ($SB/SB_{MSY} < 1$).