

# Western and Central Pacific Fisheries Commission

## The Second Decade: Evolution of Modern Management

By Svein Fougner and Mark D. Fitchett

#### **About the Authors**



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# PAGO PAGO AN SAMOA



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Cover photo of tuna purse seiners awaiting transshipment in Majuro Lagoon, Republic of the Marshall Islands (RMI) provided courtesy of Francisco Blaha.

(Inside cover photo) American Samoa longline vessels docked at Pago Pago harbor. Photo: WPRFMC.



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Tuna on display at the IUCN World Conservation Congress 2016 held in Honolulu, Hawai'i. Photo: Dean Sensui.

#### **List of Acronyms**

ССМ	Commission members, cooperating non-
	members and participating territories*
СММ	conservation and management measure
CMS	Compliance Monitoring Scheme
EEZ	exclusive economic zone
FAD	fish aggregating device
FFA	Forum Fisheries Agency
FSM	Federated States of Micronesia
HCR	harvest control rule
IATTC	Inter-American Tropical Tuna Commission
ISC	International Scientific Committee for Tuna
	and Tuna-Like Species in the North Pacific Ocean
IUU	illegal, unreported and unregulated
LRP	limit reference point
MSE	management strategy evaluation
MSY	maximum sustainable yield
mt	metric ton
PIP	Pacific Island Party**
PNA	Parties to the Nauru Agreement
RMI	Republic of the Marshall Islands
SB	spawning biomass
SB <sub>F=0</sub>	spawning biomass in absence
	of fishing mortality
SC	Scientific Committee
SSB	spawning stock biomass
SIDS	Small Island Developing States
SPC-OFP	Pacific Community, Oceanic
	Fisheries Programme
TRP	target reference point
VDS	vessel day scheme
WCP-CA	Convention Area of the Western and Central
	Pacific Fisheries Commission
WCPFC	Western and Central Pacific
	Fisheries Commission
WCPO	Western and Central Pacific Ocean
WPRFMC	Western Pacific Regional Fishery
	Management Council

#### \*Commission Members

Australia, Canada, China, Chinese Taipei, Cook Islands, European Community, Federated States of Micronesia, Fiji, France, Japan, Kiribati, Republic of the Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, South Korea, Tonga, Tuvalu, United States and Vanuatu.

#### **Cooperating Non-Members**

Belize, Ecuador, El Salvador, Indonesia, Mexico, Senegal and Vietnam.

#### **Participating Territories**

American Samoa, Commonwealth of the Northern Mariana Islands, French Polynesia, Guam, New Caledonia, Tokelau and Wallis and Futuna.

#### **\*\*Pacific Island Parties**

Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Republic of the Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, United States and Vanuatu.

#### Background

#### Introduction

In December 2010, the Western Pacific Regional Fishery Management Council (Council) published "Ten Years and Counting: The First 10 Years of the Western and Central Pacific Highly Migratory Fish Stocks Convention." This monograph summarized the formation of the Western and Central Pacific Fisheries Commission (Commission or WCPFC) and presented summary data on the catches of principal tuna species by gear in the three years before 2010 (Table 1). It also identified several issues that the WCPFC would face in the following years to achieve the goals and objectives of the Convention that established the Commission. This monograph focuses on progress from 2010 to 2019 in the following areas: conservation of the stocks; trends in fishery catch and values, and in the distribution of catch by species, gear and fleets; the expanding scope of management, including the consideration of environmental resources and values; and the adoption of a more sophisticated and complex management process that could lead to greater stability and predictability in the management of WCPFC fisheries.

On Sept. 4, 2000, 26 nations signed the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (Convention). The total catch of tuna is estimated to have been less than two million metric tons (mt) that year (WCPFC Secretariat and SPC-OFP 2020). Skipjack dominated the catch at 1.2 million mt, while yellowfin (500,000 mt), bigeye (148,000 mt) and albacore (131,000 mt) followed. By 2009, the catch had increased to 2.6 million tonsskipjack (1.75 million mt), followed by vellowfin (560,000 mt), bigeye (158,000 mt) and albacore (135,000 mt) (Williams and Terawasi 2011). The value of the catch had also increased. In 2000, there were no significant local fisheries for tropical tuna or south Pacific albacore.

By 2009, island companies began to invest in vessels. The longline fishery for south Pacific albacore had emerged as an



Workers process longline-caught tuna in Saipan, Commonwealth of the Northern Mariana Islands. Photo: WPRFMC.

important component of local fisheries. American Samoa was a major beneficiary of these developments. The two canneries relied on purse seine and longline vessels for deliveries of raw product. In addition, large amounts of fish were exported to Thailand for processing. Data on business arrangements were limited, but there were significant charter arrangements in various island countries that accounted for substantial fish deliveries to local processors and markets. In 2000, there was little management of the fisheries. Island governments controlled access to their respective exclusive economic zones (EEZs) and there were arrangements such as the Forum Fisheries Agency (FFA) and the Parties to the Nauru Agreement (PNA). The South Pacific Forum Fisheries Agency Convention established the FFA in 1979.

The FFA, which is based in Honiara, Solomon Islands, has 17 Pacific Island members: Australia, Cook Islands, Federated States of Micronesia (FSM), Fiji, Kiribati, RMI, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu and Vanuatu. The FFA was created to help countries sustainably manage the fishery resources that fall within their 200mile EEZs. The FFA is an advisory body providing expertise, technical assistance and other support to its members who make sovereign decisions about their tuna resources and participate in regional decision making on tuna management through agencies such as the WCPFC. The FFA is also the administrator of the regional observer program that conducts data collection under the South Pacific Tuna Treaty. Since 1979, the FFA has facilitated regional cooperation so that all Pacific countries benefit from the sustainable use of tuna, which is now worth more than \$6 billion a year and is important to livelihoods in the Pacific.

Table 1. Landed tuna catch (mt) by gear by year, 2007-2009Source: Williams, P. 2020. Estimates of annual catches in the WCPFC statistical area.WCPFC-SC16-2020/ST-IP-1. p 11.						
Year	Longline	Pole-and-Line	Purse Seine	Total		
2007	214,800	198,600	1,777,300	2,368,500		
2008	214,900	179,000	1,823,000	2,398,700		
2009	223,800	165,800	1,894,500	2,467,900		

The treaty that established the PNA was initiated in 1982. Members include the FSM, Kiribati, RMI, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu. The Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery is a subsidiary arrangement that provides the framework for Parties to adopt management measures to regulate effort, capacity and seasonal and area closures for their tuna fishery. Both agreements are affirmed as pre-existing arrangements under the Convention and the organizations provide a solid institutional basis for collaboration by the island Parties in the WCPFC.

In 2000, there were no regional arrangements under which all fishing nations and the nations with EEZs could carry out the functions assigned to the WCPFC. Nations that had entered into agreements on a bilateral or multilateral basis (like the South Pacific Tuna Treaty) had to meet certain obligations (e.g., observer coverage, reporting and payment of fees). Individual nations carried out fishery monitoring and management activities. But, there was no comprehensive or coordinated region-wide mechanism for such activities as stock assessments, analysis of alternative management controls, database management or establishment of measures to protect fish and non-fish stocks. There were no measures under the treaty to prevent overfishing of sharks or control the use of fish aggregating devices (FADs) or protect seabirds and sea turtles. The WCPFC Convention set the stage for comprehensive regional conservation and management of the region's living marine resources, engaging all those with interest in the fisheries and associated activities.

## The Convention: Goals and Objectives of the Commission

#### **Tuna Stock Conservation**

"The objective of this Convention is to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 Convention and the Agreement."

The primary duty of the Commission is to ensure that the fish will be there for the long term. Without healthy stocks, there would be no benefit to the island people or to distant water fishing fleets. There would be no jobs on fishing boats or in processing plants, and there would be no Western and Central Pacific Ocean (WCPO) product in global markets.



Traditional "fish payment" from a tuna vessel to a local village in the Solomon Islands for using its channel. Photo: Francisco Blaha.

The WCPFC considers historical fishing patterns, the interdependence of stocks and recommended international minimum standards for fisheries management. The Commission adopts measures that prevent or eliminate overfishing and excess fishing capacity. It also tries to ensure that levels of fishing effort do not exceed the sustainable use of fishery resources. This can occur by determining the total allowable catch or total level of fishing effort within the Convention Area of the WCPFC (WCP-CA) for the stocks and adopting other conservation and management measures (CMMs) and recommendations to ensure the long-term sustainability of the stocks. In this context, the Commission must develop criteria for the allocation of the total allowable catch or the total level of fishing effort for highly migratory fish stocks in the WCP-CA.

When setting allocations, the Commission must consider the needs of Small Island Developing States (SIDS) and territories and possessions in the WCP-CA whose economies, food supplies and livelihoods are overwhelmingly dependent on the exploitation of marine living resources. This consideration is described in Article 30 - Recognition of the special requirements of developing States. Accordingly, the Commission must consider these special needs and ensure that measures do not result in transferring, directly or indirectly, a disproportionate burden of conservation action onto SIDS, Parties, and territories and possessions.

Other factors for the Commission to consider include the following:

- Respective interests, past and present fishing patterns and fishing practices of participants in the fishery.
- Extent of the catch being used for domestic consumption.
- Historic catch in an area.
- Respective contributions of participants to conservation and management of the stocks, such as the provision of accurate data and contributions to scientific research in the WCP-CA.
- Record of compliance by the participants.
- Needs of coastal communities that are dependent mainly on fishing for the stocks.

# Recognize the Needs of the Small Island Developing States

The WCPFC considers historical fishing patterns, the interdependence of stocks and recommended international minimum standards for fisheries management. The Commission adopts measures that prevent or eliminate overfishing and excess fishing capacity. It also tries to ensure that levels of fishing effort do not exceed the sustainable use of fishery resources. This can occur by determining the total allowable catch or total level of fishing effort within the Convention Area of the WCPFC (WCP-CA) for the stocks and adopting other conservation and management measures (CMMs) and recommendations to ensure the long-term sustainability of the stocks. In this context, the Commission must develop criteria for the allocation of the total allowable catch or the total level of fishing effort for highly migratory fish stocks in the WCP-CA.

# Use the Best Scientific tInformation Available

Article 5 of the Convention states that effective management includes using the best scientific information available. Without good scientific information, including social and economic factors, the WCPFC is less likely to make sound management decisions. The Commission may also be unable to make determinations or criteria for setting limits of catch, effort or allocation. Thus, a solid structure for the generation and provision of good scientific information is critical. It is also critical to recognize, as Article 6 requires, that if the information is uncertain, then the Commission must act more conservatively. For example, even if data do not demonstrate stock status concerns, the Commission might reduce fishing if there is consensus that the current levels of fishing are not sustainable into the future based on biological processes or economic, social and cultural objectives. The lack of definitive information is not a justification for avoiding strong conservation and management. On the contrary, it strengthens conservative management approaches.



Participants in the Pacific Islands Disproportionate Burden Workshop, held in Honolulu, Hawai'i Sept. 19, 2014. Photo: WPRFMC.

#### Protection of Ecosystem Components

The Convention directs the WCPFC to avoid adverse impacts on the marine environment, preserve biodiversity, maintain the integrity of marine ecosystems and minimize the risk of long-term or irreversible effects of fishing operations. The Commission seeks to minimize waste, discards, catch by lost or abandoned gear, pollution originating from fishing vessels, catch of non-target species and impacts on associated or dependent species (in particular, endangered species). The Commission promotes development and use of selective, environmentally safe and cost-effective fishing gear and techniques. Data collection and sharing are critical to achieving the overarching goal of stock conservation. Implementing and enforcing CMMs through effective monitoring, control and surveillance are also critical. Measures applied in the zones of the Parties and on the high seas are to be compatible.

In summary, the Convention is designed to ensure that conservation and management decisions promote longterm sustainability of the tuna stocks in a fair, equitable and balanced manner, using the best scientific information available and considering a wide variety of environmental, economic and cultural factors.

#### **Summary**

The 2010-2019 record demonstrates that the WCPFC is achieving the primary objectives of the Convention.

- The tuna stocks are generally healthy. Tropical tuna species are not overfished nor is overfishing occurring. At the start of the decade, scientists considered bigeve tuna to be overfished. Improved scientific information, notably on size-at-age from updated growth information, informed recent stock assessments that deemed the bigeve tuna stock to be healthy. The improved stock status of tropical tunas could result from a combination of strong conservation measures, better stock assessment methods and more complete and accurate information about the stock.
- Yellowfin and skipjack are in good condition, with an interim target reference point (TRP) for the stock biomass to be 50% unfished biomass.
- While below a level that will support sufficiently high catch rates to maintain profitable island fisheries, the South Pacific albacore stock is not biologically overfished. The WCPFC has ensured through adoption of harvest strategies and a TRP that the stock will return to being profitable.



Participants of the 7th Regular Session of the WCPFC, held in Honolulu, Hawai'i, Dec. 6, 2010. Photo: WPRFMC.

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- The North Pacific albacore stock is not overfished and overfishing is not occurring.
- The WCPFC developed a rebuilding plan in cooperation with the Inter-American Tropical Tuna Commission (IATTC) for the depleted North Pacific bluefin tuna stock, with scientific advice from the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean (ISC<sup>1</sup>). The stock is expected to meet rebuilding criteria based on the most recent stock projections.
- The WCPFC also adopted a rebuilding plan the Western and Central North Pacific ("North Pacific") striped marlin stock, so that stock biomass is rebuilt to 20% unfished biomass by 2034.
- The economies of SIDS and territories have benefited from domestic fishery development leading to increased catches, increased revenues from the vessel day scheme (VDS<sup>2</sup>) (endorsed by the WCPFC as a pre-existing arrangement to be recognized by the

Commission), improvements in data collection and fishery monitoring and collaboration to ensure their special needs in the Commission.

- Measures have been strengthened to protect and conserve sharks, to protect whale sharks, mantas and mobulids, and to minimize and mitigate takes of sea turtles and seabirds.
- The amount and quality of fishery data have improved. The Scientific Services Provider and Scientific Committee (SC) have expanded the scope and quality of reports and analyses to support management decision-making.
- The Commission has adopted and follows a plan to implement the harvest strategy process for conservation and management of tuna, including setting limit reference points (LRPs) for tropical tuna species and TRPs for skipjack and South Pacific albacore. However, progress on harvest strategies has not resumed.
- The Monitoring, Control and Surveillance program has been

strengthened with advice from Technical and Compliance Committee and WCPFC staff.

- The Commission recognized the need to consider climate change in its decision-making.
- A balance of party interests has been consistent with the Convention mandate.

#### The Pre-2010 Context

In 2010, the fishery management scheme for tropical tuna fisheries was CMM 2008-01, which covered the period from 2009 to 2011 and aimed to address the likelihood of stock biomass being below maximum sustainable yield (MSY) at that time. The measure's main objective was to achieve a 30% reduction in fishing mortality for bigeye tuna over the three years through a combination of purse seine effort limits (including the VDS) and decreased longline bigeye tuna catch limits for specified longline fishing fleets (China, Japan, Chinese Taipei, Korea and the United States), based on 2001-2004 fishing and catch levels.

<sup>&</sup>lt;sup>1</sup> The ISC is an intergovernmental body dedicated to advancing fishery science of the North Pacific tuna and tuna-like fishes through cooperation and collaboration. It is voluntary rather than being established under a treaty. Members are Canada, Chinese Taipei, Japan, Republic of Korea, Mexico, Peoples Republic of China and the United States.
<sup>2</sup> The PNA developed and implemented the VDS, which has greatly increased the leverage of, and revenues to, the PNA members from the sale of purse seine vessel days.

This basic approach was first adopted in CMM 2005-01 and has continued for the past decade. The understanding was that purse seine and longline vessels would be comparably limited as each sector was considered to have (at the time) comparable impacts on the bigeye stock.

Initial CMMs for other stocks were in effect to address conservation concerns about data collection and reporting on fisheries (for Pacific bluefin tuna, South and North Pacific albacore; North Pacific and Southwest Pacific striped marlin; and Southwest Pacific swordfish) and the incidental take and use of sharks (specific species were listed but the focus was on preventing finning and reporting catches) and whale sharks. Measures were in place to minimize and mitigate the effects of takes of cetaceans, sea turtles and seabirds.

Several of these broader ecosystemoriented measures were precautionary. There was little scientific information to guide the establishment of specific gear requirements, catch limits or other elements to control fishing operations. Large-scale high seas drift gillnet fishing was already prohibited. Measures were in effect for maintaining a register of permitted vessels, ensuring full reporting of catch and effort, control of transshipments, preventing overcapacity and implementing a fishery monitoring program that includes observers, vessel monitoring systems and monitoring landings of purse seine vessels in port.

In short, much of the basic infrastructure for effective management was ready. CMMs were in place for fish stock and non-fish protection, where needed. However, there was an ongoing need to evaluate the status of stocks and establish revised management measures in response to new information and conditions. There was no consideration of climate change impacts on the stocks or the prospective need for management changes in response to such changes.

# Growth and Changes in the Fisheries

Annual total catches of the four main tuna species (skipjack, yellowfin, bigeye and albacore) in the WCP–CA increased steadily during the 1980s as the purse seine fleet expanded and remained relatively stable during most of the 1990s, with a sharp increase in catch in 1998. This steady catch increase continued into the next decade (Tables 2 and 3).

The following paragraphs give detailed descriptions of the catch data provided in Figure 1 and Tables 2 and 3:

• The total WCP–CA tuna catch in 2010 was estimated to be 2,518,691 mt, the second-highest annual catch recorded to date, and approximately 100,000 mt lower than the record in 2009 (2,617,520 mt). In 2010, the purse seine fishery accounted for an estimated 1,703,133 mt (75% of

the total catch), with pole-and-line taking an estimated 270,123 mt, the longline fishery an estimated 274,105 mt, and the rest taken by troll gear and a variety of artisanal gears, mostly in eastern Indonesia and the Philippines. The 2010 catch of skipjack (1,680,533 mt) was the third highest recorded to date, and 115,000 mt less than the previous record catch in 2009 (1,785,789 mt). The yellowfin catch in 2010 (571,688 mt) was only slightly higher than the 2009 catch level, and only 30,000 mt lower than the record catch taken in 2008 (603,801 mt). The bigeye catch in 2010 (141,568 mt) was the lowest since 2001, mainly due to a drop in the estimated catch by the longline fishery. The 2010 albacore catch (124,902 mt, North and South Pacific albacore combined) was the third highest on record, with very good catches by the longline fishery.

Of the 2010 purse seine catch (1,703,133 mt), skipjack accounted for 1,292,424 mt (76% of the total), bigeye had 57,496 mt (3%), yellowfin had 352,883 mt (21%) and albacore was a minor 3,000 mt. In the longline fishery, the catch consisted of 101,820 mt of albacore (both North and South Pacific combined), 72,721 mt of bigeye, 1,192 mt of skipjack and 98,372

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Figure 1. Annual catch of tuna by species in WCPFC Convention Area. Source: Williams, P. 2020. Estimates of annual catches in the WCPFC statistical area. WCPFC-SC16-2020/ST-IP-1. p 11.

mt of yellowfin. The pole-and-line fishery catch comprised albacore (17,957 mt), bigeye (1,400 mt), skipjack (126,273 mt) and yellowfin (37,563 mt).

• The provisional total WCP-CA tuna catch in 2019 was estimated at 2,961,059 mt—the highest on record—and about 76,000 mt higher than the previous record catch in 2014 (2,885,042 mt). The skipjack catch of 2,034,230 mt was a record and approximately 45,000 mt higher than the previous record in 2014 (1,978,927 mt). The yellowfin catch (669,362 mt) was the third highest on record, only 44,000 mt less than the previous record in 2017. The high catch could relate to recent catch levels from the "other" category (primarily small-scale fisheries in Indonesia). The bigeye catch (135,680 mt) was lower than the recent 10-year average and among the lowest over the past two decades. The total albacore catch (121,787 mt) was higher than the 2018 catch but similar to the recent 10-year average. It remained approximately 26,000 mt lower than the record catch in 2002 of 147,793 mt. The South Pacific albacore catch in 2019 (86,706 mt) was near the record catch taken in 2017 (93,415 mt).

- In 2019, the purse seine fishery continued to be the largest fishery, accounting for 2,060,412 mt, an estimated 69% of the total catch.
  - » The proportion of skipjack (80%) in the purse seine tuna catch was the highest since the fishery was established in the 1960s.
  - » The purse seine catch of yellowfin tuna (364,571 mt) was more than

Table 2. Landed tuna catch (mt) by species by year, 2010-2019         Source: Williams, P. 2020. Estimates of annual catches in the WCPFC statistical area. WCPFC-SC16-2020/ST-IP-1. p 10							
Year	Albacore	Bigeye	Skipjack	Yellowfin	Total		
2010	124,902	141,568	1,680,533	571,688	2,518,691		
2011	115,766	162,922	1,524,890	534,711	2,338,289		
2012	143,215	165,203	1,739,439	626,666	2,674,523		
2013	137,770	153,882	1,826,981	572,894	2,691,527		
2014	121,772	164,446	1,978,927	619,897	2,885,042		
2015	119,716	143,551	1,779,730	599,046	2,642,043		
2016	100,132	150,581	1,789,530	666,130	2,706,373		
2017	124,467	129,753	1,618,210	713,824	2,586,254		
2018	110,915	148,880	1,846,344	704,844	2,810,983		
2019	121,787	135,680	2,034,230	669,362	2,961,059		

## Table 3: Landed tuna catch (mt) by gear by year, 2010-2019 urce: Williams P. 2020. Estimates of annual catches in the WCPEC statistical area. WCPEC-SC16-2020/ST-IP

	Year	Longline	Pole-and-Line	Purse Seine	Troll	Other	Total
	2010	274,105	270,123	1,703,133	1,320	260,010	2,518,691
	2011	261,423	275,070	1,550,492	11,973	239,331	2,338,289
	2012	274,476	242,960	1,844,078	14,018	298,991	2,674,523
	2013	242,065	229,560	1,897,359	9,484	313,059	2,691,527
	2014	264,636	206,939	2,059,006	6,677	347,784	2,885,042
	2015	270,993	214,041	1,752,755	7,552	396,702	2,642,043
	2016	238,876	198,398	1,850,479	7,206	411,414	2,706,373
	2017	245,635	171,062	1,831,891	7,978	329,688	2,586,254
	2018	256,946	231,555	1,902,340	7,462	412,680	2,810,983
	2019	273,550	183,193	2,060,412	8,116	435,788	2,961,059



Purse seine vessels moored in Majuro Lagoon, RMI. Photo: WPRFMC.

130,000 mt lower than the record catch in 2017 (498,822 mt), but still among the highest annual catches for this fishery.

- » The provisional purse seine catch estimate for bigeye tuna (50,819 mt) was the lowest since 2003. The proportion of bigeye tuna (2%) represented in the purse seine tuna catch was the lowest since 1980. The relatively low bigeye tuna catch appears to be related to a lower proportion of associated sets in 2019 and a lower proportion of bigeye tuna in the associated-set tuna species composition in 2019.
- The longline catch (273,550 mt) was near average for the past five years.
  - » The albacore longline catch (95,280 mt) was slightly higher than the recent 10-year average, and only 6,000 mt lower than the record of 101,820 mt set in 2010.
  - » The provisional bigeye longline catch (68,371 mt) was slightly lower than the recent 10-year average, and considerably less than the bigeye catch levels experienced in the 2000s (e.g., 2004 longline bigeye catch was 99,705 mt).

- » The yellowfin longline catch (104,440 mt) was the highest since 1980, but well below the record for this fishery (125,113 mt).
- » The estimated pole-and-line catch (183,193 mt) was lower than the 2018 catch (231,155 mt) and among the lowest annual catches since the mid-1960s due to reduced catches in both the Japanese and the Indonesian fisheries.
- In 2019, the "other" fisheries (including a variety of artisanal gears, mainly in eastern Indonesia and the Philippines) accounted for more than 435,000 mt, or almost 15% of total catch, the highest on record and considerably higher than the 10% in 2010. The increases since 2010 likely reflect better catch reporting rather than increased actual catches; this is being evaluated.
- In 2010, the estimated total delivered value of the tuna catch was more than \$4.5 billion. The estimated delivered value of the purse seine tuna catch in the WCPFC area in 2010 was nearly \$2.5 billion. The estimated delivered value of the total longline tuna catch (bigeye and

albacore primarily) in the WCPFC area was just under \$1.5 billion. The estimated delivered value of the catch in the pole-and-line fishery was \$340 million. The "other" fisheries accounted for the balance.

- In 2019, the total estimated delivered value of the tuna catch in the WCPFC was \$5.8 billion, slightly less than the \$6 billion estimated for 2018. The purse seine catch was valued at \$3 billion and accounted for 52% of the total value of the tuna catch. The longline fishery was valued at \$1.6 billion (28% of the total) and the pole-and-line catch at \$390 million, with catch by other gears valued at \$740 million. The 2019 WCP-CA skipjack catch was valued at almost \$3 billion, yellowfin at \$1.7 billion and bigeye at \$692 million. The albacore catch increased to \$438 million—its highest level since 2012.
- In 2019, purse seine accounted for just more than half the total value of landings, while longline accounted for approximately 30%, pole-and-line for 5% and the "other" fisheries for 15% of the total delivered value.

### THE SECOND DECADE

Until recently, most of the historic purse seine catch was made by vessels from Japan, Korea, Chinese-Taipei and the United States. Combined, their fleets had 163 vessels in 1992. However, these fleets declined to 111 vessels in 2006 (primarily due to a reduction in the U.S. fleet), before rebounding in recent yearsup to 129 vessels in 2017 and 122 vessels in 2018. At the same time, the Pacific Islands domestic and chartered fleets have grown over the past two decades to 130 vessels in 2017 and 126 vessels in 2018. The remainder of the purse seine fishery includes several fleets which entered the WCPFC tropical fishery during the 2000s (e.g., China, Ecuador, El Salvador, New Zealand and Spain).

The practices of this fishery also have changed the past 10 years. To some degree, this is a consequence of the VDS, which has greatly increased the cost of fishing in the waters of the PNA. The relatively high cost has led to greater reliance on FAD fishing, which appears to be more economical than free school fishing, but has an increased risk of incidental catch of sub-adult bigeye tuna. The level of purse seine fishing in terms of sets per year has been variable during the past 10 years, but has been stable overall. The total number of sets in 2018 (51,616) was almost the same as in 2010 (51,595). However, the number of sets on floating objects (mainly FADs) increased from 13,400 sets in 2010 to 18,500 sets in 2018. The number of unassociated sets decreased from approximately 38,300 sets in 2010 to more than 33,000 in 2018. The proportion of sets on drifting FADs in 2018 (31%) was the highest for nearly 20 years (second highest ever after 1999 at 35%), despite FAD closure periods and effort day controls. This resulted in higher bigeye catches than intended and has led fishing mortality of juvenile bigeye tuna to far exceed fishing mortality of adult bigeye tuna. As noted above, however, the relatively low 2019 bigeye tuna catch by the purse seine fishery appears to be due to a lower proportion of FAD sets in 2019 and a lower proportion of bigeye tuna in the associated-set tuna species composition in 2019. The purse seine



Participants of the Intersessional Meeting to Progress the Draft Bridging Measure for Tropical Tunas, Honolulu, Hawai'i, Aug. 22-24, 2017. Photo: WCPFC Secretariat.

bigeye catch was considerably lower than in 2018 and prior years.

Even with lower numbers of FAD sets under the CMMs, the purse seine fishery continues to have a significant impact on bigeye. Williams and Ruaia (2020) noted that in 2010, the provisional WCP-CA purse seine record high catch of bigeye to date was 50,469 mt in 2008. The provisional purse seine bigeve catch estimate for 2019 was 50,819 mt. This is almost the same level as the record prior to 2010. The proportion of bigeye tuna represented in the purse seine tuna catch was the lowest since 1980, but the total purse seine catch was at a record level. Further, there was a lower proportion of bigeye tuna in the associated-set tuna species composition in 2019. It's unclear if this reflects changes in fishing practices, bigeye abundance or some other factor.

The longline fisheries also have experienced changes in the past decade. Total longline vessel numbers dropped below 3,000 vessels for the first time since the 1960s, with a provisional estimate of 2,781 vessels in 2018. This is a 17% decrease in the fleets since 2015, mainly due to a decline in the category of non-Pacific Island fleets. The value of the WCP–CA bigeye catch (\$692 million) was the second highest since 2016 and accounted for 12% of the total value of the tuna catch. Williams and Ruaia (2020) reported, "A significant change in the WCP-CA longline fishery over the past 10 years has been the growth of the Pacific Islands domestic albacore fishery, which has risen from taking 33% of the total South Pacific albacore longline catch in 1998 to accounting for around 50-60% of the catch in recent years." The domestic South Pacific albacore longline fishery rose from taking 33% of the total South Pacific albacore longline catch in 1998 to 50 to 60% of the catch in the middle of the decade. The combined national fleets (including chartered vessels from non-Pacific Island nations) mainly active in the domestic South Pacific albacore fishery have numbered more than 500 (mainly small "offshore") vessels in recent years and catches are now at a similar level to catch by longline vessels from non-Pacfic Island countries.

Prior to 2001, South Pacific albacore catches ranged from 25,000 to 44,000 mt, although a significant peak was reached in 1989 (49,076 mt) when a driftnet fishery was active. Since 2001, catches have greatly exceeded this range, primarily because of the growth in several Pacific Island domestic longline fisheries. The South Pacific albacore catch in 2010 (88,919 mt) was the highest on record (12,000 mt higher than the previous record set in 2009 at 76,500 mt). The WCP–CA total albacore longline catch (95,280 mt) for 2019 was slightly higher than the recent 10-year average, and only 6,000 mt lower than the record of 101,820 mt attained in 2010. More recently:

- Total provisional South Pacific albacore catch in 2019 was 86,706 mt, a 5% increase from 2018 and a 6% increase from the 2014-2018 average. Of this total, longline catch was 82,070 mt, a 4% increase from 2018 and a 4% increase from the 2014-2018 average.
- For the southern WCP-CA, total albacore catch was 71,956, a 6% increase from 2018 and a 9% increase from the 2014-2018 average.
- Longline catch in this subregion was 67,320 mt, a 4% increase from 2018 and a 6% increase from the 2014-2018 average.
- Catch by other gear (mostly troll catch) was 4,593 mt, a 48% increase from 2018 and 64% increase from the average catch in 2014-2018. (Hare et al. 2020).

Several other tuna fisheries are active in the region. One sector is large fish handline fisheries in the Philippines, Indonesia and Hawai'i, where the target is mainly large yellowfin tuna (also bigeye tuna in Hawai'i). Over the past two decades, annual catch estimates for the large fish handline fishery have been in the range of 20,000–57,000 mt, although the estimates prior to 2014 are acknowledged to exclude the catches from the Indonesian fishery (i.e., estimates for Indonesia have only been compiled since 2014).

Another sector is the small-scale troll and hook-and-line fishery comprising small crafts that, due to their size and concerns about safety, conduct trips that do not usually exceed one day and are restricted to coastal waters, rarely venturing beyond territorial seas or archipelagic waters (where relevant). Small skipjack and yellowfin tuna are the main species taken and most coastal states in the tropical and sub-tropical WCP-CA have vessels in this fishery. The highest catches are reported from the Indonesia and Philippines domestic fisheries, followed by Kiribati, Japan, French Polynesia and Tuvalu (catches from some countries, while only minor, have yet to be compiled and provided to the WCPFC). The catch from this fishery is typically for subsistence or sold at local markets. Over the past two decades, annual catch estimates from the small-scale troll and hook-and-line fishery have ranged from 120,000 to 300,000 mt.

Small-scale gillnet fisheries operate in coastal waters of Vietnam and Indonesia, with smaller catches from this gear in Japan and in the archipelagic waters of the Philippines. These vessels target skipjack tuna but also take small amounts of other pelagic species. The total tuna catch from the drift gillnet fishery has ranged from less than 40,000 mt to 64,000 mt over the past seven years.

Data for these fisheries have improved through the efforts of the Scientific Services Provider, relevant nations and other members' support. The reported increases in catch from the past 10 years might reflect better data collection and not higher actual catches. Also, individually, none of these fisheries is substantial enough to warrant special management measures. Cumulatively, their catches are large (more than 400,000 mt of tropical tuna), and there may be a future need to deal more specifically with them, or for the Commission to promote additional management action by the nations with those fisheries.

Longline fisheries' bigeye catches by the limited fleets have been reduced and island Parties' catches of bigeye have increased in the past 10 years, as intended by CMM 2008-01. However, total fishing impact of the combined purse seine and longline fisheries on bigeye has been limited (as shown in Table 4), with total catch peaking in 2012 and then declining through 2019.

There have also been significant changes in total catches by several national fleets (see Table 5).

Table 4: Bigeye tuna catch by gear (mt), 2010-2019           Source: Pacific Community, Oceanic Fisheries Programme. Tuna Fishery Yearbook 2020. p 21.									
Year	Year Longline Pole-and-Line Purse Seine Other Total								
2010	72,721	7,027	56,341	4,324	140,413				
2011	77,566	5,655	72,132	5,851	161,204				
2012	83,971	3,934	63,890	13,092	164,887				
2013	65,637	5,009	72,201	12,273	155,120				
2014	75,335	4,714	65,519	15,323	160,891				
2015	71,621	5,687	49,877	14,982	142,167				
2016	62,714	3,932	61,129	21,589	149,364				
2017	58,100	2,215	58,273	11,156	129,744				
2018	68,518	4,174	63,836	11,437	147,985				
2019	68,371	1,400	50,819	14,778	135,368				

Table 5: Total tuna landings (mt) by flag for selected fleets, 2010-2018         Source: Pacific Community, Oceanic Fisheries Programme. Tuna Fishery Yearbook 2020. p 15-18.							
Year	FSM	China	Kiribati	Korea	RMI	Japan	US
2010	24,130	83,240	38,947	300,213	57,225	431,352	256,977
2011	28,785	105,274	59,611	231,571	90,544	369,727	214,923
2012	38,983	91,302	74,108	290,293	72,422	397,608	272,718
2013	27,053	121,299	77,782	245,372	77,768	378,875	265,120
2014	42,710	89,368	114,156	292,011	75,896	355,845	323,364
2015	61,207	72,794	142,623	289,434	86,869	334,108	249,172
2016	77,144	41,494	169,593	299,174	61,786	305,356	212,667
2017	87,521	60,276	157,890	265,540	67,010	301,541	176,648
2018	118,712	53,846	193,749	289,324	74,580	311,983	207,383

### 2010-2019 Conservation and Management of Tropical Tuna

The WCPFC has given primary attention to conservation of the tropical tuna stocks since its establishment in 2005. The first Commission controls for tropical tuna fisheries were in CMM 2005-01 and primarily consisted of purse seine effort limits and longline catch limits. The intent was to ensure that total fishing effort for yellowfin and bigeye did not increase beyond current levels. This included fishing rights authorized under existing regional or multilateral fisheries arrangements or agreements, if these were registered with the Commission and that the number of licenses authorized under such arrangements did not increase. The measure provided that the PNA would implement purse seine effort limits through the VDS, which limited total days fished in the EEZs of PNA members to no more than 2004 levels (i.e., 33,600 days).

Other Commission members, cooperating non-members and participating territories (CCMs) controlled their fisheries consistent with historic effort levels. Longline bigeye catch limits were set for specific fleets (the United States, China, Chinese Taipei, Korea and Japan). Exemptions from longline limits were initially provided to allow SIDS and territories with little or no bigeye longline fishing to develop such fisheries up to 2,000 mt annually. An exemption was provided for the development of skipjack purse seine fisheries, which could demonstrate minimal catch of bigeye and yellowfin through control of FAD fishing, 100% observer coverage and an adequate monitoring, control and surveillance program, consistent with a legitimate development plan that had been submitted to the Commission for comment (though not approved). This measure attempted to establish a balance of interests between gears and various fishery interests.

Balancing the interests of distant water fisheries (both purse seine and longline) and developed and developing nations has been difficult. Purse seine fishing primarily involves fishing for skipjack, a very productive stock. It is in the interest of Pacific Island nations and some distant water fishing fleets to allow heavy exploitation of this stock. Skipjack is the primary species caught by purse seine vessels that bought vessel days to fish in Pacific Island nations' waters.

The use of FADs is an important component of this fishery as FAD fishing is economically more efficient than fishing on free schools. A FAD set is almost guaranteed to result in a catch, while unassociated school fishing involves the time and fuel cost searching for fishable schools of tuna and can result in zero catch days or unsuccessful sets. Purse seine fishing is also critical to many SIDS who

rely on revenue from the sale of access to tuna in their EEZs, including under the PNA VDS for purse seine fishing. FAD fishing days support higher fishing day values and prices. On the other hand, limits on purse seine fishing, especially FAD fishing, are important to fleets that explicitly target bigeye and yellowfin tuna, especially longline fleets. Juvenile bigeye and yellowfin are caught in large quantities in association with skipjack in purse seine sets, especially by FAD sets. In fact, the purse seine fishery's impact on the bigeve stock is almost exclusively through FAD fishing; the incidental catch of bigeye in free school fishing for skipjack and yellowfin is very low. Longline fleets are dependent on bigeye and yellowfin stocks being healthy, and to the extent that excessive catches of juveniles risk the sustainability of the stock, it also threatens these fleets with reduced availability of marketable adult bigeye tuna.

The WCPFC has struggled to find ways to mitigate any adverse effects on bigeye and yellowfin through management measures (e.g., allocations of catch or effort limits) that achieve the stock conservation objectives for those species, while not disadvantaging the islands that are dependent on profitable purse seine fisheries for skipjack to support the revenue flow from the sale of fishing days. This search for an acceptable balance has led to complicated approaches. The objective was initially to limit bigeye tuna fishing mortality so the stock could rebuild to the stock biomass levels associated with MSY. In recent years, as the stock has not been considered likely to be overfished or experiencing overfishing, the objective has shifted to reducing overfishing risks into the future and to maintain biomass at or above some historical level. There have been periodic adjustments as the Commission struggled to control purse seine fishing, especially FAD fishing, to limit juvenile bigeye and yellowfin mortality, without adversely affecting the SIDS and territories. Overall, purse seine effort limits were not sufficient to achieve the intended reduction in fishery impacts on bigeye, in part because the fleets shifted effort from unassociated sets to FAD sets that caught larger amounts of bigeye. Longline bigeye catch limits were reduced gradually for several fleets with the aim of reducing that fishery's impact on bigeye.

From 2010-2019, the WCPFC gradually built on the foundation of CMM 2005-01. At the start, fisheries were managed under CMM 2008-01. In 2008, the SC advised the Commission about the probability that the bigeye stock was overfished and the yellowfin stock was being fished at capacity. The Commission reaffirmed its commitments from 2006 and 2007 to reduce juvenile bigeye and yellowfin mortality through the control of FAD fishing. The Commission adopted

CMM 2008-01 with the objective of reducing bigeye fishing mortality by 30% from the annual average of 2001 to 2004 (or 2004 for some CCMs), over a period of three years. Longline catch limits set previously were subject to reductions during that time. CCMs whose fisheries caught more than 2,000 mt of bigeye would be subject to reductions. SIDS and territories would not be subject to catch limits if they were engaged in the development of longline bigeye fisheries.

In the purse seine fishery, CCMs needed to ensure that the level of purse seine fishing effort in days fished by their vessels in areas of the high seas did not exceed 2004 levels or the average of 2001-2004 levels. For the CCMs who belonged to the PNA, the measure was to be implemented through their domestic processes and legislation, including the PNA's VDS, which limited total days fished in the EEZs of PNA members to no greater than the 2004 level (30,548 days, excluding archipelagic waters) (WCPFC Secretariat and SPC-OFP 2020). The purse seine fishery in EEZs and on the high seas in the area bounded by 20°N and 20°S would be closed for three months each year. Non-PNA



Longline vessels in port at Pier 38, Honolulu, Hawai'i. Photo: WPRFMC.



Pole-and-line fishing in the Solomon Islands. Photo: Francisco Blaha.



Participants from the 14th Regular Session of the WCPFC, held in Honolulu, Hawai'i, December 2018. Photo: WPRFMC.

CCMs were to implement compatible measures to reduce purse seine fishing mortality on bigeye tuna in their EEZs. As in CMM 2005-01, developing skipjack purse seine fisheries between 20°N and 20°S that could provide verifiable evidence of minimal yellowfin and bigeye bycatch (cumulative <2%), with 100% observer coverage and with a legitimate development plan, could be exempted.

Purse seine operators were required to retain all fish brought on board the vessel with some exceptions (e.g., insufficient well space). This was intended to reduce the incentive to catch and discard small fish and encourage technology development that would prevent the capture of juveniles. CCMs with "other" fisheries taking more than 2,000 mt of bigeye were to limit those fisheries to the average catch of 2001-04. Overall, this measure maintained the balance of interests in prior measures.

At the end of 2011, when CMM 2008-01 was expiring, the Commission extended the term of the measure through CMM 2012-01, explicitly noting that the VDS would limit purse seine effort in the EEZs of PNA members to less than the 2010 level (45,905), an increase from the 30,548 days previously agreed upon. This

gave full recognition to the fishing effort permitted under the existing South Pacific Tuna Treaty. Other measures remained in effect.

CMM 2012-01 contained a significant new element; there was agreement to limit the maximum fishing mortality rates for tropical tunas to rates that would produce MSY. This was the first move into setting reference points under a harvest strategy evaluation process for managing the tuna fisheries consistent with the United Nations Fish Stocks Agreement and Article 6 of the Convention. CMM 2014-06 committed the Commission to a work plan by 2015 to adopt or refine harvest strategies for skipjack, yellowfin, bigeye, South Pacific albacore, Pacific bluefin and North Pacific albacore tuna.

Thus, in CMM 2012-01, the Commission set fishing mortality rate LRPs for the tropical tuna species. However, the measure did not significantly change the specific control elements in effect for tropical tuna fisheries. Interim controls (purse seine effort limits and longline bigeye catch limits as before) were set for 2013. The Commission committed to developing a comprehensive new measure for 2014 and beyond. There was added emphasis on the need for more complete information on the "other" fisheries taking tropical tuna species and the potential need for tighter controls on these fisheries. Further, the Commission called on CCMs (other than SIDS and territories) to not increase their fleets in the future.

CMM 2013-01 set controls for 2014-2017. As before, agreeing on FAD set limits and FAD closure periods and overall purse seine set limits was difficult. They agreed to close the FAD fishery for four months, or apply a FAD set limit as listed in the measure for 2014. For 2015 and 2016, a CCM would either observe a five-month FAD closure or a limit on FAD sets as listed in the measure. The PNA would limit total sets to no more than the number of sets in 2010 in the EEZs of the members. Other states with EEZs in the WCP-CA with effort greater than 1,500 sets were to limit their purse seine sets to either the 2001-2004 average or the 2010 level. High seas purse seine effort limits were also set in this measure. In addition, the high seas were to be closed to FAD fishing in 2017 unless the Commission decided otherwise.

This measure further reduced the longline bigeye catch limits for the

specified CCMs (the United States, China, Japan and Chinese Taipei) while the limit for Indonesia was unchanged. CCMs that had caught less than 2,000 mt of bigeye by longline gear were limited to 2,000 mt per year. The Commission was committed to an annual review of the measure, and in 2014, 2015 and 2016 made technical changes to CMM 2013-01, but the basic structure remained in place for the full period of application of the measure. The high seas FAD closure did not go into effect. However, a significant element was added—an effort to manage fishing capacity. Only SIDS and territories were permitted to increase their large-scale purse seine vessels and longline fleets. This measure also committed the Commission to develop a scheme to reduce overcapacity without preventing SIDS and territories from increasing their participation in the fisheries and to transfer capacity to them. It also called on CCMs to jointly develop a scheme to reduce the capacity of large-scale purse seine vessels to the Dec. 31, 2012, levels.

CMM 2017-01 set controls for 2018-2020. This measure was to serve as a transitional management regime to ensure the sustainability of the stocks pending the establishment of harvest strategies. This measure advanced the harvest strategies process by affirming the LRPs for yellowfin and bigeye with the spawning biomass depletion ratio (SB/  $SB_{F=0}$ ) to be maintained at or above the average  $SB/SB_{F=0}$  for 2012-2015; and for skipjack, the spawning biomass is to be maintained on average at  $SB/SB_{F=0}$ , as agreed upon in CMM 2015-06. The Commission had been advised by the SC that bigeye were no longer overfished, alleviating some of the pressure to further reduce fishing mortality of bigeye from current levels.

Still, the WCPFC knew it needed to control catch of juvenile bigeye and yellowfin by controlling FAD fishing and maintaining longline catch limits to prevent any increase in adult fishing mortality by that gear. The Commission was also concerned about other impacts of FAD fishing, such as incidental entangling of sea turtles and other animals and the potential for damages from large amounts of plastic and other materials from lost or abandoned FADs. This measure added initial language encouraging the use of non-entangling material in FADs and committing to the consideration of specific measures in 2018. Longline catch limits remained in effect for 2017 only, with the limits to be reviewed in 2018. The Commission committed to agreeing on longline fishing limits for bigeye and a framework to allocate those limits among all members and participating territories.

Purse seine effort limits were set separately for EEZ waters (the PNA allocation was for all members' EEZs combined) and the high seas, though for some CCMs, limits were set for skipjack catch rather than purse seine effort limits. A three-month FAD fishing closure was established for all waters, and an added two months of closure were applied to the high seas, with exceptions for Kiribati and the Philippines. The measure also directed flag CCMs to ensure that each of their purse seine vessels would not have more than 350 drifting FADs with activated instrumented buoys deployed at sea at any one time. This was to be reviewed in 2018.

**CMM 2018-01** extended most of the terms of CMM 2017-01. It added specific limits for FAD materials, calling on CCMs to implement some specifications to limit the use of mesh net in FADs or allow only mesh net meeting the size criteria specified in the measure.

## Other Conservation and Management Measures in 2010-2019

CMMs were in effect in 2010 for North Pacific albacore, Southwestern Pacific striped marlin, Southwestern Pacific swordfish, key shark species in the Central and Western Pacific (to prohibit shark finning and improve data collection on takes of blue sharks, silky sharks, oceanic whitetip sharks, mako sharks and thresher sharks) and Pacific Bluefin tuna (being managed cooperatively with the IATTC). These had few actual fishing controls, though the shark measures supported no finning, fin to carcass retention ratios and nonretention for purse seine fishing. They set the stage for better data collection and consideration of amendments in the coming years. Some of these other measures (bluefin, South Pacific albacore, North Pacific albacore and sharks) were amended one or more times in the 2010-2019 period, including a consolidated CMM that was adopted in 2019 to incorporate several separate measures for shark protection and conservation. These consolidated measures include the non-retention of oceanic whitetip sharks and silky sharks, requiring retained sharks fins to be accompanied by a carcass, and reducing the impacts of longline fisheries by prohibiting the simultaneous use of



Longline-caught albacore sold at Honolulu auction. Photo: David Itano.

both wire leaders and "shark lines" in those fisheries. One measure effective at the beginning of 2010 (Southwestern Pacific swordfish) remained as originally adopted.

The conservation effect of these measures is limited. Much of the emphasis is on not increasing fishing mortality or effort and better data reporting for assessing the stocks and fisheries. There is also emphasis in the measures for these other species to prevent overcapacity by: 1) directing that fleets of the non-SIDS targeting these species do not increase their effort, and 2) that measures restricting fisheries in one area (e.g., South Pacific) are not undermined by the transfer of capacity to another area.

South Pacific albacore presents a unique management situation for the Commission. Development of the domestic longline fishery for this species has been important to several South Pacific Island members. The Commission's first management decision was recorded in CMM 2005-02, calling on CCMs fishing for this species to not increase the number of vessels in their fisheries. CMM 2010-05 then required reporting of the number of vessels of each CCM that fished for South Pacific albacore. With CMM 2015-02, the WCPFC obliged CCMs fishing for this species to not increase their effort south of 20°S more than 2005 levels or recent 2000-2004 levels, and to report their catch and number of vessels to the Commission.

The WCPFC is aware of this fishery's importance, and that the fishery is dependent on high catch rates to be profitable. The Commission has prioritized the need to support stock size at a level higher than MSY to maintain catch rates high enough to make the fishery economical and beneficial to SIDS and participating territories. The Commission adopted an interim TRP of 56%  $SB_{F=0}$  in 2018. The Commission wanted to ensure that the South Pacific albacore fishery will remain profitable for the domestic fleets of the participating nations through maintaining a stock biomass level supporting sufficient availability of the migratory resource into island waters, resulting in high catch rates. This is the first direct, explicit application of an economic profitability objective for a fishery TRP in a Commission management scheme. This is in contrast to the VDS, which addresses implicit economic objectives for SIDS through balancing fishing privileges between the high seas and Pacific Island national waters. It is also one of the measures especially important to American Samoa, a participating territory with an albacore longline fishery and a canning industry dependent on continuing deliveries of albacore and tropical tuna for processing.

Pacific bluefin tuna present another unique management challenge. This stock is seriously depleted well below its LRP and biomass associated with MSY. It originates in waters off Japan, and juveniles are caught in significant numbers by vessels from Japan, Korea and Chinese Taipei. After some growth, bluefin move from west to east and are captured as sub-adults and adults by fisheries in the Eastern Pacific Ocean and later in the Western Pacific as they return to spawning grounds. Both the WCPFC and the IATTC have a role in the conservation of this stock. The WCPFC has a Northern Committee that considers the scientific advice from the ISC and submits proposals for WCPFC action, which is either to accept or deny the proposal. Given the shared interest in the stock, the two commissions have formed a joint Northern Committee-IATTC Working Group to make recommendations for measures to manage these fisheries. The WCPFC has accepted Northern Committee proposals which have been implemented in CMMs over the years, including a plan for rebuilding the stock with interim and long-term objectives. The current information indicates that the stock is rebuilding faster than the agreed timeline but management continues to tightly control fish catch.

In addition, CMMs were in effect in 2010 to prevent and mitigate takes of sea turtles and seabirds. In the following years, the Commission added measures to prohibit sets on cetaceans and whale sharks, and amended the measures addressing sea turtles and seabirds, as well as adding guidelines for the safe release of sea turtles, seabirds, whale sharks, and mantas and mobulids. These efforts demonstrate the Commission's commitment to avoiding substantial adverse impacts on species taken as bycatch or incidental to tuna fishing. The record reflects the Commission's increasing consideration of the broader ecosystem in which the tuna fisheries operate.

Finally, in 2019, the WCPFC adopted a resolution recognizing the risk that global climate change poses for the region. The Pacific Islands Forum leaders have indicated that climate change is the single greatest threat to the livelihoods, security and wellbeing of the peoples of the Pacific. Climate change and its implications will be among the critical elements considered in the development and approval of CMMs in the future. The Commission also has recognized that climate change may have dramatic impacts on the tuna stocks and the fisheries for tuna. The 14th Regular Session of the SC reviewed a study that indicated, through multi-decadal projections of stock biomass distributions, that likely climate scenarios will redistribute tuna resources away from several Pacific Island countries (Senina et al., 2018). This may have profound impacts on the economic viability of fisheries and food security of SIDS, particularly those in tropical waters. The Commission Resolution 2019-01 aimed to address the longer-range concern about the impacts of global climate change on the abundance, productivity and distribution of tropical tuna stocks and the ensuing changes that could occur with respect to fishing in and beyond the members' EEZs.

At the start of the decade, CMMs were in place for several administrative and implementation issues. As early as 2005, the Commission had expressed concern about overcapacity with a resolution that called on members who expanded their fleets in the 1999-2005 period to work together to ensure that any overcapacity caused by such expansion be reversed. CMMs dealing with a variety of compliance elements also were in place for vessel monitoring systems, the regional observer program, establishing the list of illegal, unreported and unregulated (IUU) vessels, and establishing the WCPFC Compliance Monitoring Scheme (CMS). The CMS is a complex measure laying out a detailed process for assessing



Participants in the WCPO Longline Fishery Management Meeting held in Honolulu, Hawai'i April 7, 2015. Photo: WPRFMC.

compliance by the CCMs (note: not compliance by fishery participants).

A CMM has been adopted to set minimum standards for processes and procedures for CCMs to request that port inspections be undertaken on fishing vessels suspected of engaging in IUU fishing or fishing-related activities in support of IUU fishing. Most of these measures have gradually been refined and improved over the past 10 years. Further, the Commission adopted CMM 2016-03 to protect observers from harm, calling on CCMs to require vessels to take various actions depending on a specific event involving an observer, e.g., falling off a vessel or becoming seriously ill.

#### Changes in the Scope and Processes of Management

When the WCPFC adopted CMM 2014-06, it was making a commitment to implement the harvest strategy process for management of WCPO fisheries. This measure laid out the principles and provisions for use of harvest strategies, which are frameworks that specify predetermined management actions in a fishery for defined species (at the stock or management unit level) necessary to achieve agreed biological, ecological, economic or social management objectives. They are proactive and adaptive, and they provide a framework for taking the best available information about a stock or fishery and applying

an evidence and risk-based approach to setting harvest levels. They provide a more certain operating environment where management decisions relating to the fishery or stocks are more consistent, predictable and transparent.

Harvest strategies are not simple to develop and implement because they require: 1) agreement on objectives, 2) specification of TRPs and LRPs, 3) acceptable levels of risk of breaching reference points, 4) a monitoring strategy using best available information to assess performance against reference points, and 5) harvest control rules (HCRs, or pre-agreed decision rules) that adjust management as needed to recover to a TRP and avoid the LRP. This requires ongoing evaluation of the performance of the proposed HCRs against management objectives, including risk assessment using a management strategy evaluation (MSE) approach. The Commission has embarked on MSE for some stocks and is finding that this step alone is complex and time consuming. It involves considerable engagement with fishing interests and governmental bodies in an open and transparent process.

Since 2014, the Commission has made considerable progress. Management objectives have been noted, performance indicators have been identified and LRPs have been agreed upon for the four primary tropical tuna stocks. Interim TRPs have been identified for skipjack tuna and South Pacific albacore. There are ongoing discussions on acceptable levels of risk and LSPs for yellowfin and bigeye.

Implementing harvest strategies for bigeye and yellowfin may require more time than currently scheduled in the work plan. Thus far, work has focused on a single-species approach, and multi-species modeling will be more complicated. Finding common objectives for skipjack, the principal target of the purse seine fishery, and for yellowfin and bigeye, which are targets for longline fishing but are also taken in large amounts by the purse seine and other fisheries, will be challenging. There has not been agreement on appropriate risk levels, but it has been agreed that risk levels greater than 20% should be considered inconsistent with the purpose of a LRP, and that a range between 0% and 20% should be considered when determining the acceptability of potential HCRs. There has been little discussion about pre-agreed actions under HCRs in case of significant changes in stock conditions that would require significant changes in management controls.

As work proceeds, the Commission and CCMs will benefit from more open discussion about tradeoffs that arise with different specifications of reference points, risk levels and the impacts and distribution of impacts from different responses to events such as stock changes. The Commission reviews progress on the harvest strategy plan annually and sets objectives for establishing various components by specific dates.<sup>3</sup> Demonstrating progress in harvest strategies and their development also fulfill requirements for certification of fisheries under the Marine Stewardship Council. Certification is extremely important for fisheries to have their product and associated supply chain reach select global markets that may prefer or require this certification.

#### **Monitoring and Compliance**

The WCPFC has slowly moved to a stronger focus on monitoring and compliance, but this has been difficult. Part of the challenge is that compliance occurs at two levels: 1) compliance by

<sup>&</sup>lt;sup>3</sup> Pacific Community, Oceanic Fisheries Programme. 2019 Dec 5-11. An overview of progress in developing WCPFC Harvest Strategies. WCPFC Sixteenth Regular Session, Port Moresby, Papua New Guinea. WCPFC16-2019-09.

the Parties in terms of meeting national obligations under the CMMs of the Commission, and 2) compliance by vessel operators with the rules adopted at the national level to implement CMMs of the Commission.

The focus of the Technical and Compliance Committee has been the former. Evaluations of CCMs' performance have been carried out, though not fully in public, and occasionally, a CCM is found to be noncompliant. The concern of some participants, however, is the degree to which the Parties are enforcing regulations implementing Commission CMMs within their own waters as well as in the WCP-CA. It is also not clear how they determine if various participants have been operating in compliance with all relevant regulations and penalizing any violators. Some CCMs (e.g., the United States) are strict in enforcing regulations; the same may not be true for others. It is not clear from publicly available information that all Parties are equally diligent in monitoring their fisheries and enforcing their rules. This reduces the level of confidence of some fishery participants in the fairness of the management system and the credibility of the Commission and its CCMs. There also are implications for the data being used by the Commission and its Scientific Services Provider to support decision-making when it is not clear that all members are providing complete and accurate data on their fishing in the WCP-CA. Further steps are needed to validate catch reporting data with other sources such as port sampling.

It would also be beneficial to promote high compliance and high performance with a reward system, for example, increased fishing days or higher bigeye catch limits for a CCM that has implemented higher than required observer coverage.

#### **Science and Data**

The scope and amount of information being used by the Scientific Services Provider (Oceanic Fisheries Programme of the Pacific Community) for consideration by the SC and for use by the WCPFC have increased steadily in the past 10 years. The scientists involved have long histories of distinguished achievements in stock assessments and related research. The records of SC meetings reflect the widening range of issues associated with meeting the goal and objectives of the Convention, with large amounts of time spent not just on tuna stock assessments and related science, but also on bycatch and ecosystems. The records also show the wide range of interests that participate in the meetings and scientific analyses to support Commission decision-making. The SC is acutely aware of its scientific advisory role and that management decision-making is the responsibility of the Commission. The SC focuses on providing the Commission with information about the stocks, fisheries, tradeoffs among different management decisions and the implications of accepting higher or lower risk levels. On occasion, the SC may encourage the Commission to consider a particular course of action but not recommend it explicitly.

The stock assessment results have sometimes been confounding. Some members suggested that it seemed illogical that bigeye were determined to be overfished and yet the stock never collapsed, even as the fisheries' total bigeye catch never declined by the 30% target set based on the scientific advice. To their credit, the stock assessment and tuna scientists have improved and refined the stock assessment models through integration of validated biological information otherwise assumed or internally estimated in stock assessment models. The Scientific Services Provider obtained additional and better data from the fishing nations such that recent assessments are considered more reliable. For example, the scientists now have access to more longline fishery operational data to support scientific analyses. In this context, however, while the longline fishing CCMs submit catch and effort data, a validation process would be beneficial. Also, the levels of observer coverage are very low for most longline fleets and transshipment records are not clearly linked to catch and effort data. As a result, there is considerable uncertainty about the levels of catch, especially of bigeye, and of protected species' interactions in the fishery.

In summary, the amount and range of data available to and being used by the Scientific Services Provider, and the number and quality of scientific analyses from the provider, have all increased.



Crew in the hold of a purse seine vessel with skipjack tuna in the RMI. Photo: Francisco Blaha.

## IS THE COMMISION ACHIEVING ITS OBJECTIVES?

## **Conservation of the Stocks**

The Commission is meeting the stock conservation objective. The tropical tuna stocks (skipjack, yellowfin and bigeye tuna) are not overfished and are not subject to overfishing. In fact, the bigeye stock has recovered from a likely overfished condition in 2010, though it is not certain if this is due to the effectiveness of CMMs, higher than anticipated stock recruitment, adoption of improved stock assessment methodology or a combination of these factors. However, this has benefited all fishery sectors in the WCP-CA.

Neither the South and North Pacific albacore stocks are overfished or subject to overfishing. The South Pacific albacore stock may be considered overfished in relation to the stock size needed to support economically practical local longline fisheries in the island countries. The Commission has set a higher interim TRP than the level associated with MSY to support high enough catch rates to support economically viable local fisheries.

While Pacific bluefin tuna is severely depleted, the SC has noted that the stock is likely to reach rebuilding targets and provisions based in current management. The ISC recently reported that this stock is overfished compared to the potential biomass-based reference points (SSB<sub>MED</sub><sup>4</sup> and 20%  $SSB_{F=0}$ ) adopted for other tuna species by the WCPFC, and that recent fishing mortality is above the level producing 20% spawner per recruit ratio. As noted earlier, the Commission (through its Northern Committee) is working with IATTC to ensure that the stock will rebuild, with tight limits on catch. To date, assessments indicate that the stock size is increasing and is projected to meet rebuilding targets, perhaps even faster than first anticipated.

North Pacific striped marlin is categorized as overfished, and an interim rebuilding plan is in place. However, there is insufficient information about the stock structure of this species, and incomplete information about how much



Papua New Guinea Fisheries Enforcement officer boarding for a vessel inspection in Rabaul, Papua New Guinea. Photo: Francisco Blaha.

is caught, where and when it is caught and by what gears. Stock productivity is not clearly established and a reliable stock assessment is elusive. A substantial portion of the catch appears to be incidental to targeted fishing for tuna, so catch per unit effort may not be ideal for assessing the condition and trends in the stock. Additional data collection and reporting are promoted in both the Eastern and Western Pacific and there is international cooperation in assessing the stocks. The Scientific Services Provider and the ISC are addressing this problem so they can provide advice to the Commission regarding possible measures to rebuild this stock. Limits on the retention of incidental catch may be a key part of future management.

The status of several species of sharks is concerning. Catch data are incomplete (amount, gear, locations, seasonality, etc.) and life history data are limited. Most of the high seas catch is incidental to fishing for tuna, and avoidance of shark bycatch is nearly impossible. A consolidated CMM adopted in 2019 reinforced the need for improved data to address concerns about excessive catch and mortality of sharks. In the short term, it is not clear that anything more than non-retention and good handling and release practices will conserve these species. It is critical that the fleets that take sharks collect and submit accurate and complete catch and disposition data by species to the Commission or CCMs. This will be used in future stock assessments and for evaluating further measures to conserve these stocks. Small scale coastal fisheries in the WCP-CA may have an impact on some shark stocks as well.

There is insufficient information to confirm whether stocks of whale sharks or mobulids and mantas are being adversely and significantly affected by WCPFCmanaged tuna fisheries. Measures are in place to obtain better information and to prevent and mitigate the effects of interactions with the fisheries.

While the full harvest strategy process is not yet in place for the tropical tuna stocks, the Commission has integrated consideration of risk and uncertainty into the process of selecting management controls, which has incorporated a precautionary approach into the management decision-making process. However, in order for fisheries to retain or be afforded Marine Stewardship Council certification, the WCPFC must continue to make progress on implementing harvest strategies for the key tuna stocks.

<sup>&</sup>lt;sup>4</sup> Median of estimated historical spawning stock biomass

## Benefits to Pacific Island Parties, Including Small Island Developing States and Territories

As previously noted, one of the basic principles for the WCPFC is recognition of the special requirements of developing states in the WCP-CA, particularly SIDS and territories. A fundamental goal is to support actions to improve the share of the benefits from the tuna fisheries to the island communities. The Commission accepted the FFA and PNA as pre-existing subregional arrangements, and these have provided a strong foundation for the island countries in negotiations leading to CMMs.<sup>5</sup>

Through such mechanisms as the VDS and provisions relating to observer coverage requirements and inport transshipment controls, the island countries' revenues from fishing and support industries has grown significantly, as has employment in the fisheries and support industries. In early measures for tropical tuna, SIDS and territories were exempted from some elements, such as the longline bigeye catch limits, if they were developing their own fisheries. SIDS have also been the beneficiaries of special assistance from developed countries for staff development, travel to meetings and other expenses. A special action was adoption of CMM 2013-07, which requires the proponent of any new management control to prepare an assessment demonstrating that there would not be a disproportionate burden on SIDS through its implementation.

Overall, the Commission's actions have strongly supported the objective of enhancing returns to the PIPs from the tuna fisheries. The VDS, while not a Commission initiative, resulted in a substantial revenue increase from the sale of increased number of days of fishing opportunities to distant water fishing nations. Over the course of the decade, the Commission accepted the positions of the PNA to allow an increase in purse seine effort limits from 33,600 days (the 2004 level) to 44,900 days (the 2010 level). Islanders' domestic purse seine fleets have grown, while the purse seine fleets of industrial nations have shrunk. In addition, the relative shares of the total catch have shifted away from the major foreign fleets (China, Japan, Chinese Taipei, Korea and the United States) to the island-based fleets. The catch of the foreign fleets fell from approximately 1.33 million mt in 2010 to 1.1 million mt in 2018; the catch by the Pacific Islands' fleets (including the Philippines and Vietnam) grew from approximately 1.2 million mt in 2010 to 1.7 million mt in 2018.

Actual effort in PNA waters has been lower than the limit in recent years, but the fishery has generated significant benefits to the Pacific Island SIDS over the last decade. Many of the benefits (increased domestic fleets, increased revenues from fishing, etc.) might have occurred without the Commission, but the efforts by the Commission likely facilitated and supported the flow of these benefits.

### Protection of Ecosystem Components

The WCPFC has addressed environmental concerns, especially bycatch reduction and the mitigation of fishery impacts on sensitive species. CMMs have been in effect for many years, and additional measures are considered each year to reduce and mitigate interactions with, or takes of, sea turtles, seabirds, sharks, skates and rays, and whales. One CMM promotes minimum discards by requiring full retention of all fish brought on board in purse seine fishing.

The Commission has promoted the development and use of materials and designs for FADs that have lower interaction rates with protected species or that will not result in large amounts of plastics or other materials remaining in the water column for many years. In 2019, the Commission consolidated separate measures into a comprehensive measure to address shark conservation concerns. The Commission has adopted guidelines for efficacious handling and release techniques for some shark species. At the same time, fishing by vessels under the Commission's rules may not be the activity resulting in the most severe threats to some species. Sea turtles, for example, are threatened by loss of habitat, harvest of eggs from nests and takes in artisanal coastal fisheries. The ability of the Commission to protect some species to recovery levels is limited.

#### **Science and Data**

The Commission is using the best scientific information available. The amount and quality of that information has improved steadily over the past decade. The Scientific Services Provider and the SC have responded to requests for additional analyses, often on short notice. The challenge has been to reduce the degree of uncertainty in stock assessments and projections of future conditions under varying management scenarios. The Commission has agreed that it is impractical to expect high quality stock assessments every year. The three-year assessment cycle has allowed scientists to address additional scientific questions in between stock assessments and to incorporate new information in a systematic manner. This is an area of strong performance.

#### Compliance

There has been progress in the implementation of a robust monitoring and compliance program. However, some CCMs report a lack of transparency in the process. There is little information about the extent to which Parties are implementing measures in their own EEZs or enforcing the measures against their own fleets. This is an area with limited progress to date.

The lack of data on some fishing operations (such as charters) hinders a full evaluation of compliance with some measures. The degree to which some protected species are receiving the protection intended by CMMs is unknown. The Technical and Compliance Committee process for evaluating CCMs compliance is not fully transparent as some activities are not open to the public. This presents a credibility problem that needs to be resolved.

The South Pacific Tuna Treaty also was recognized as a pre-existing arrangement though it had no conservation objectives; it was an access agreement and not a conservation and management agreement.

## THE FUTURE: WHAT HAPPENS NEXT?

#### **Conservation of the Stocks**

The Commission is committed to fully adopting the harvest strategy process and implementing HCRs for tropical tuna fisheries. This is a major challenge. To date, the focus has been on single species fishing (e.g., skipjack, North Pacific albacore). Applying the harvest strategy process to the mixed-species and mixedgear tropical tuna fisheries will be more complicated and will take longer, but progress is needed.

First, there will have to be agreement on objectives. An objective to maximize the catch of skipjack tuna may not be fully compatible with an objective to minimize or limit the catch of bigeye and yellowfin tuna to sustain the stocks at desired levels. An objective to maximize purse seine vessel days in zones of the island CCMs probably cannot be achieved without reductions in fishing opportunities for fleets that have historically fished on the high seas as well as in the EEZs. An objective to allow higher catches or fishing effort by one fleet may not be possible without reductions in the catches or fishing effort by another fleet. Management objectives may also include region-specific biomass depletion levels to account for the balance of stock impacts by fishery and for adaptability purposes to address climate change.

There will be tradeoffs between approaches to ensure the long-term sustainability of the stocks. If HCRs result in a need to reduce total fishing mortality, there will have to be agreement on sharing the burden associated with fishery cutbacks. This can only be achieved if there is agreement on the objectives of management and criteria for assigning the costs of management responses in a fair and equitable manner.

It may become more difficult to consider the cutback of domestic islanders' fisheries as a disproportionate burden now that those fisheries have grown and have a level of impact on the stocks that is comparable to fisheries with a long history of activity in the region. Domestic islanders' fisheries may have to be reduced to the same degree as

Record number of purse seine vessels waiting to transship in Majuro Lagoon, RMI, June 2019. Photo: Gerry Venus, courtesy of Francisco Blaha

non-islanders' fisheries, or the amount of foreign fishing opportunities being sold by island governments will have to be reduced. Objectives should be agreed to in advance so that there is a sound basis for determining responses to changes in fish stock conditions.

Second, there will need to be agreement on acceptable levels of risk of breaching TRPs and LRPs. Presumably, there is less concern about risk regarding a TRP knowing that stock abundance can vary considerably, so an assessment concluding that a 10% risk of a stock declining below a TRP might not be viewed as requiring a major change in management. However, an assessment showing that a stock is declining, and that there is a 10% risk of breaching a LRP if no changes were made in management, might be viewed as an unacceptably high risk by some Parties. Those promoting stability in the fisheries would be expected to push for adoption of low levels of risk of any breaches, but some fishery participants might be willing to accept a higher level of risk in hopes of maximizing benefits from the stock in the short term and of a better stock assessment in the next cycle that would reduce the need for dramatic reductions in fishing. Also, if a stock was below a TRP or LRP, alternative responses would need to be considered, requiring agreement on a risk (or probability) of not achieving a stock recovery in each period under the various measures. These will not be easy decisions, but if the harvest strategy process is to work in full, they are critical decisionsdecisions that demand an understanding of the differing interests and objectives of the participants and agreement on how to balance these interests or distribute the costs of new fishery limits.

Further progress on the harvest strategy process can provide a basis for clear understanding of the objectives and concerns of the participating fisheries and governments, which in turn should lead to negotiation of measures that provide the best overall benefit to the CCMs. The more the management process can have pre-agreed objectives, risk levels and other elements, the less conflict there will be when tighter fishery controls are needed. The WCPFC has embarked on activities like MSE, which provides a means to develop agreement on these elements outside the pressure of a Commission meeting facing a real conservation risk. The principal tropical tuna stocks are now healthy, and the current controls are believed to be strong enough that the fishing mortality levels do not pose a high risk of any stock becoming overfished or being subject to overfishing. The optimistic view is that the agreement on objectives, performance indicators, risk levels and HCRs under the harvest strategy process will reduce the need for some potentially difficult negotiations.

However, implementing the harvest strategy process for the multi-species, multi-gear tropical tuna fisheries will take time, and there are immediate issues to resolve. An example is the commitment of the Commission to SIDS and territories to establish longline bigeye catch limits on the high seas. Historic longline fisheries for bigeye tuna have been limited for years, but there have been no significant limits on islanders' longline fisheries in the past. No PIP has yet been prohibited by a CMM from developing a longline fishery on the high seas, but no such fishery has been developed. The purpose of specific allocations to PIPs is not clear, but such a measure could result in further reductions in the catch limits of some of the existing fisheries. Island Parties might "sell" their catch limits rather than establish fleets to catch their allocations. It will be critical to reach agreement on total allowable catches and on the criteria for allocating shares to the various interests, as called for in the Convention.

## Benefits to Pacific Island Parties, Including Small Island Developing States and Territories

The management regime under the Commission has led to improved benefits for SIDS and territories. For many, revenues under the PNA VDS have grown considerably. Purse seine days



in PNA waters (including archipelagic waters) averaged approximately 31,000 days in 2001-2004, and approximately 39,000 days in 2015-2018; total purse seine days averaged approximately 42,000 days per year in 2001-2004 and almost 45,000 days per year in 2015-2018. Island fleets and the Philippines pursue much of the purse seine fishing on the high seas, reflecting some of the growth of the domestic fleets. Similarly, Pacific Islands' domestic longline fleets now catch approximately 11,000 mt of bigeye tuna, up from less than 6,000 mt in 2004. The bigeye catches by the catch-limited fleets dropped from almost 84,000 mt in 2004 to just under 47,000 mt in 2018. Meanwhile, total longline catches of bigeye went from nearly 94,000 mt in 2004 to less than 63,000 mt in 2018. The CMMs (and perhaps economic factors as well) have resulted in catch reductions by fleets with a long history in the fishery, without curtailing the gains to the developing domestic island fleets.

This is consistent with the intent of the measures and the Convention, which is to increase the share of the economic value of the fisheries accruing to SIDS and other PIPs. If the Commission's basic control structure (i.e., purse seine effort controls and longline bigeye catch limits) remains in place, these gains will remain in place. SIDS and territories should also continue to receive aid and assistance as provided in the Convention. We still don't know if hard longline catch limits on the high seas with specific allocations to PIPs will result in any significant gain to those Parties. The establishment of such limits on the high seas to SIDS and territories could provide another source of revenue to those CMMs from either developing domestic longline fleets or from arrangements (including sale) by which other fleets would catch those limits.

#### **Science and Data**

The harvest strategy process will require complete and accurate data and sound models to project the effects and effectiveness of alternative actions responding to new stock conditions. In addition, some CCMs will continue to seek additional analyses to support management decisions. For example, the United States has been promoting an impact analysis of managing the bigeye stock on a geographic basis, e.g., adjusting catch limits if fishing is in areas of low impact on the bigeye stock.

An analysis is needed of whether particular limits in-zone and on the high seas-such as longline catch or purse seine effort-are consistent with the objective of limiting fishing mortality. The limits of confidence in longline fishery data cause concerns that measures may not be having the intended effect or that compliance is not uniform. Data from longline fisheries are submitted, but there is little validation of those data. The levels of observer coverage are very low for the Asian longline fleets. Transshipment records need to be clearly linked to catch and effort data or subsequent landings data. A result is lack of confidence in the use of these data for stock assessments and other analyses.

### Compliance

As indicated earlier, there are two dimensions of compliance: 1) members' compliance in terms of meeting obligations under the CMMs adopted by the WCPFC, and 2) compliance by fishermen and members' responses to violations. One of the aspects that has led to discussion and disagreement is the extent to which the members' reports to the Commission are full and public so that all interested parties can have confidence in the process. It is not clear that all members report (at least not publicly) what measures they have applied to fishing in their EEZs to implement measures adopted by the Commission, which are supposed to apply in all waters of the WCP-CA. There are no public reports on the extent to which measures of the coastal states have been enforced in their EEZs and in relation to their licensed vessels, and how many alleged violations were investigated and the disposition of these cases. This results in low confidence that all members exercise comparable levels of control.

The Commission must continue progressing in the CMS to improve: 1) the degree of public reporting, 2) the evaluation of compliance with respect to meeting obligations of the CCMs and 3) full implementation of Commission CMMs in all waters.

There must be a commitment to strengthening fishery monitoring elements, such as observer programs, which could be a combination of human observers and electronic monitoring. On the latter, there is a great deal of work being done throughout the world, for Regional Fishery Management Organizations and for national programs. The Commission needs to identify and implement in the WCPO the best practices for comparable fisheries. Data submission requirements with validation programs would be helpful to monitor compliance and confirm that reported catch and effort data are complete and accurate.

## **Tropical Tunas Conservation and Management Measure**

While the WCPFC adopts CMMs with associated expiration dates, some measures have not changed significantly or adapted much with the incorporation of new scientific information. Specifically for tropical tunas, this new information includes the use of improved contemporaneous biological parameters used in their stock assessments that changed SC management advice, and projected impacts of climate change on tropical tuna stocks that have regional implications. The SC's advice noted that the tropical tuna stocks have low risk of breaching LRPs, regional depletion of tropical tunas is greatest in tropical regions, there is a need to reduce juvenile fishing mortality of bigeye tuna in tropical regions and the bigeve tuna stock is buffered by less severe depletion in temperate regions (including 10°N). CMM 2018-01 was to expire at the beginning of 2021, with the opportunity for new management objectives to possibly account for such advice and adapt the CMM. While some members were satisfied with the performance of CMM 2018-01, other members felt fishing opportunities were limited. The Commission agreed to hold a series of workshops throughout 2021 for the purpose of revising a tropical tuna CMM.

#### CONCLUSION

Establishment of the WCPFC was a major accomplishment, achieved through the hard work of many dedicated fishery and diplomatic corps experts. The first 10 years were remarkable in demonstrating that the Commission approach can work, though there were growing pains in those early years. The Commission is now mature. Stock conservation will continue to be challenging as the objectives of the Convention have some implied conflicts. For example, with a fixed tuna stock, an increase in allocations to support bigger island fisheries means smaller amounts available to long established fisheries that might be dependent on continued access to the WCP-CA. However, the WCPFC is the only tuna regional fishery management organization that has all its principal tuna stocks considered neither overfished nor experiencing overfishing, while its fisheries produce approximately 60% of the global tuna supply. Progress on the harvest control process should facilitate more open discussion and agreement on clear criteria for making allocation decisions which can be quantitatively evaluated for determination of actual winners and losers and possible mitigation steps to minimize losses. With good faith and mutual respect among the nations and territories involved, the problems will be resolved. If the past 10 years are representative, there is reason for optimism.



**Figure 2**. Catch by species for each major tuna Regional Fishery Management Organization with corresponding stock status. Source: Hare S et al., 2021.

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