

JOINT REPORT BETWEEN THE NATIONAL MARINE FISHERIES SERVICE (NMFS)
WEST COAST REGION AND SOUTHWEST FISHERIES SCIENCE CENTER (SWFSC) ON
AMENDMENT 4: CLARIFYING AND SPECIFYING BIOLOGICAL REFERENCE POINTS

During the June 2016 Pacific Fishery Management Council (Council) meeting, the Council requested the Highly Migratory Species Management Team (HMSMT) consider publishing up-to-date values for biological reference points (BRPs) in the Highly Migratory Species (HMS) Stock Assessment and Fisheries Evaluation (SAFE) report and how to align that workload with both the Council's regularly scheduled biennial management cycle and NMFS' procedures for making stock status determinations.¹ During the September 2016 meeting, the HMSMT responded, highlighting options and recommendations for considering status determination criteria (SDC) and Maximum Sustainable Yield (MSY) proxies to inform SDCs for management unit species (MUS) and stocks in the Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species (HMS FMP). The HMSMT also provided recommendations for coordinating and prioritizing specification of biological reference points (BRPs), including proxies, between the Council and the Western Pacific Regional Fishery Management Council (WPRFMC).²

In this report, NMFS: (1) offers additional input regarding its role in determining the status of HMS stocks, (2) makes recommendations for aligning that workload with the Council's biennial management cycle, (3) provides updates on the MSY-proxies and numerical estimates used to complete recent status determinations for several HMS stocks, and (4) suggests further considerations for coordinating and prioritizing specification of BRPs for HMS stocks. This information is intended to assist the Council and its advisory bodies in developing recommendations and providing guidance on the proposed changes to the FMP under Amendment 4. In providing this information, it is NMFS understanding that the proposed changes to the FMP under Amendment 4 do not include revisions to the SDC formulas in the HMS FMP, but rather focus on reporting proxies and numerical estimates used to calculate the current SDCs, where applicable, in the SAFE report.

1. NMFS' Role in Stock Status Determinations

NMFS supports the HMSMT's recommendation to consider SDCs, their proxies, and revisions to the HMS FMP, on a case-by-case basis (see September 2016 Council [Agenda Item J.3.a Supplemental HMSMT Report 2](#)), as this allows the flexibility to account for variations in international stock assessments.

¹ This includes notifying the Council of stock status findings that trigger action under Magnuson-Stevens Conservation and Management Act (MSA) sections 304(e) and 304(i), which describe Council obligations relative to overfishing and overfished determinations.

² [Agenda Item J.3.a. Supplemental HMSMT Report 2](#)

NMFS Science Centers derive the best scientific information available (BSIA) from stock assessments, which are typically produced by the science providers to the regional fishery management organizations (RFMOs) when determining the status of HMS stocks, and ensure the information complies with National Standard 2 (i.e., has undergone peer review). The Regions then use the BSIA to compute SDCs based on the formulas in both the HMS FMP and the Pelagics Fishery Ecosystem Plan (FEP) (i.e., domestic BRPs) before recommending an official status determination. The status determination, which is approved by the Secretary, is used in determining management and conservation measures for the stock and for publishing the agency's Status of Stocks Report to Congress.

As stated in previous reports to the Council, inconsistencies often exist between domestic BRPs (i.e., those selected by the Councils) and the BRPs that are produced by the science providers to the RFMOs. However, NMFS West Coast Region (WCR) and SWFSC staff work with NMFS Pacific Islands Region and Science Center staff to reconcile such inconsistencies and to produce a single status determination for each HMS stock based on the SDCs.³

Because different international science providers are responsible for conducting different stock assessments and decide which BRPs or BRP proxies to report, it is important to allow flexibility in the selection of best-fit proxies for variables in the SDC formulas. A case-by-case approach to reviewing stock assessments and BRPs related to SDCs would provide the flexibility needed to select the most suitable BRP proxies available in assessments to calculate SDCs for a particular stock.

2. Aligning NMFS Stock Status Determination Process and the Council's Biennial Management Cycle

NMFS recommends the biennial management cycle (currently described in Chapter 5 of the HMS FMP and [Council Operating Procedures \(COP\) 9, Schedule 5](#)) shift from a June, September and November meeting schedule to a September, November and March meeting schedule (See Fig 1) to align the NMFS status determination process and the Council's biennial management cycle for HMS.

Aligning NMFS' status determination process with the Council's biennial management cycle could better streamline decision-making should new information prompt the Council's interest in selecting a best-fit proxy for computing SDCs, changing the SDC formula for HMS stocks, or making recommendations to satisfy 304(e) or (i) requirements under MSA. Figure 1 describes a schedule that would better align NMFS' stock status determination process with a regularly scheduled, three-meeting, biennial management cycle for HMS. For example, NMFS could present the BSIA derived from the latest assessments and its projections for status determinations during the Council's initial meeting in its biennial management cycle, allowing the Council to convey interest in selecting proxies, changing SDCs, or discussing changes in management and conservation measures in a timely fashion. Aligning these processes may reduce the need to adjust the Council's meeting schedule to adhere to statutory timelines associated with MSA

³ For example, data to support calculation of SDCs for the 2016 status determination for Pacific bluefin tuna were extracted from the outputs generated by the stock assessment model "Stock Synthesis." In some instances, NMFS has relied on the best available MSY-proxies (chosen by ISC in the absence of input from international managers) for determining the stock status relative to the SDCs (e.g., $1-SPR_{MSY}$ as a proxy for F_{MSY} for Pacific bluefin tuna).

304(e) or (i) requirements. As described above, NMFS' status determination process depends on the stock assessment and review schedules of science providers to the Pacific RFMOs. Therefore, subsequent notices to the Council of overfishing and overfished determinations, including the start of statutory timelines under MSA 304 (e) (i.e., 2 years) and (i) (i.e., 1 year), have not well aligned with the Council's biennial management cycle. Striving to better align NMFS' status determination process with the Council's biennial management cycle may not completely eliminate the need for scheduling adjustments in the interest of adhering to MSA 304(e) or (i) requirements; however, it would likely reduce such incidences.

Given the typical timeline for completion of international stocks assessments (see Fig. 1), shifting the timing of the biennial management cycle will allow NMFS to report assessment results to the Council in September after assessments are finalized and NMFS prepares BSIA determinations. Because the regularly scheduled biennial management cycle meetings start in an even year, the three-meeting schedule would also accommodate stock status determinations from the previous odd year. For example, in 2018, NMFS could update the Council on the results of any assessments completed in 2017 by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), the Inter-American Tropical Tuna Commission (IATTC), and the Secretariat of the Pacific Community (SPC), as well as any assessments finalized by the ISC and IATTC in 2018. Since the majority of HMS assessments of eastern Pacific Ocean (EPO) stocks are completed by July, a September meeting start to the biennial management cycle could ensure that any recommendations for management measures or adjustments to domestic BRPs are based on the latest BSIA.

Using EPO bigeye tuna as an example for the schedule set out in Figure 1, NMFS would anticipate the IATTC scientific staff completing an assessment in May 2017. Following, the SWFSC would determine whether the assessment should be considered BSIA for management purposes per National Standard 2. Once a BSIA determination has been made, the WCR would recommend a stock status determination, which must be approved by the Secretary of Commerce. Thereafter, and depending on the status, NMFS would notify the Council by the following April (e.g., March 2018) whether section 304 (e) or (i) apply; if the EPO stock of bigeye were subject to overfishing, the Council would receive a notice that this is the case and likely stating that section 304(i) applies, which indicates that the Council has one year (e.g. by March 2019) to make domestic and international recommendations that address the status of the stock. Within that one year time frame, the Council could consider and make recommendations for the stock during its regularly scheduled biennial management cycle (in November 2018). However, prior to making recommendations, the Council could receive an update from NMFS during its September 2018 meeting regarding the results of the EPO bigeye assessment finalized in May 2018. This way, should the new assessment indicate a change in status or any other new information that might result in a determination that differs from that based on the assessment finalized in 2017, the Council could take this new information into consideration before making recommendations within the one-year statutory timeline (e.g. by March 2019).

As shown in Figure 1, during an even year when the Council takes up its three-meeting biennial management process for HMS, the Council could receive an update from NMFS in September 2018 on all HMS stock assessments and status determinations from 2017 and on assessments finalized in 2018 and pending status determinations. For example, NMFS anticipates a Pacific

Figure 1: A schedule to align NMFS' Stock Status Determination Process with the Council's Biennial Management Cycle for HMS

	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MARCH	APRIL
INTERNATIONAL ASSESSMENT SCHEDULE	MAY IATTC SAC & SAS meetings											
		JUNE-JULY IATTC Plenary: stock assessments finalized										
NMFS' STATUS DETERMINATION SCHEDULE (Based on international assessment schedule and PFMC Biennial cycle)			JULY ISC Stock assessments finalized									
			JULY-SEPTEMBER									
			<ul style="list-style-type: none"> • NMFS reviews assessments in relation to SDCs • NMFS coordinates with Pacific Islands on shared stocks • NMFS prepares BSIA determination(s) 									
COUNCIL'S BIENNIAL MANAGEMENT CYCLE (Starts in even years)					SEPTEMBER-NOVEMBER							
					<ul style="list-style-type: none"> • NMFS updates the Council on recent assessments, including pending status determinations • NMFS submits status determinations (based on BSIA) to Headquarters • HMSMT revises SAFE report according to status determinations 							
					SEPTEMBER							
					<ul style="list-style-type: none"> • HMSMT updates Council on status of HMS stocks & potential need to modify reference points • Biennial Scoping: Council directs HMSMT to prepare draft analysis to implement revised reference points &/or management measures 							
						NOVEMBER						
						<ul style="list-style-type: none"> • HMSMT presents draft SAFE report to Council, & analysis of changes to reference points &/or recommendations for management measures (re: MSA 304e or 304i obligations) • Biennial PPA: Council adopts preliminary recommendations for domestic regulations & international recommendations addressing stock status issues (reflected in the current year's & previous year's SAFE report) 						
											MARCH	
											Biennial FPA: Council adopts final recommendations for domestic regulations &/or international measures (to end overfishing &/or rebuild stocks) & transmits letter to NMFS, DOS, & Congress fulfilling MSA 304 (i) or (e) responsibilities.	

bluefin tuna assessment will be finalized in July 2018. Following, NMFS will make a determination as to whether that assessment constitutes BSIA for management purposes and provide an update to the Council during its September 2018 meeting. As a hypothetical example, if this update were to include a pending status determination for Pacific bluefin tuna that would trigger MSA 304(i), the Council could develop its recommendations during the three-meeting process of the biennial management cycle for HMS (September-November-March), with some room in advance of its one-year statutory timeline to add additional meetings for such decisions, if needed.

3. SDCs, Proxies to Inform SDCs, and Specification of Numerical Estimates

NMFS notes that National Standard 2 requires that detailed information needed to inform management decisions, such as SDCs, be provided in SAFE Reports and updated periodically. NMFS is prepared to provide the information to the Council as the agency completes status determinations for HMS stocks. Below, NMFS provides specific values and numerical estimates, when applicable, for reference points used to support recent status determinations so that the Council and its advisory committees' can consider them when publishing up-to-date values in the SAFE Reports.

NMFS recently completed stock status determinations for several MUS, including Pacific bluefin tuna, EPO and Western Central Pacific Ocean (WCPO) stocks of bigeye tuna, EPO yellowfin tuna, Western Central North Pacific Ocean (WCNPO) and EPO stocks of swordfish, and WCNPO striped marlin, taking the SDC formulas in the HMS FMP into account. The following list includes commonly used abbreviations for stock status determinations, and includes metrics for SDCs from the HMS FMP (see Table 1).

- B – Biomass
- BRP – Biological Reference Point
- F – Fishing Mortality Rate
- M – Natural Mortality Rate
- MFMT – Maximum Fishing Mortality Threshold
- MSST – Minimum Stock Size Threshold
- MSY – Maximum Sustainable Yield
- SPR – Spawning Potential Ratio
- SSB – Spawning Stock Biomass
- SDC – Status Determination Criteria

Table 1. Status Determination Criteria from the HMS FMP

<i>Subject to Overfishing</i>	<i>Overfished</i>
$F_{\text{current}} \text{ or } F \text{ proxy} > \text{MFMT}^*$	$B_{\text{current}} \text{ or } B \text{ proxy} < \text{MSST}^{**}$
$F_{\text{current}} > F_{\text{MSY}}$	$(B_{\text{current}} / \text{MSST}) < 1$
$(F_{\text{current}} / F_{\text{MSY}}) > 1$	

*MFMT = F_{MSY}

** MSST = cB_{MSY} where c is the difference of 1 minus the natural mortality rate (M) or 0.5, whichever is greater.

A. Pacific bluefin tuna

The [2016 ISC Pacific bluefin tuna stock assessment](#) represents the BSIA for NMFS' determination that the stock is considered overfished and subject to overfishing. Although the Pacific RFMOs have not yet adopted limit reference points for this stock, fishing effort exceeded nearly all calculated commonly used BRPs and biomass was well below calculated BRPs. While values for biomass at MSY and F, which are needed to compute the SDCs in the HMS FMP, were not included in the report, the data to compute these metrics were available from outputs of the stock assessment software, *Stock Synthesis* (see details in Table 2). Because the ISC's 2016 assessment did not evaluate catch data from years subsequent to 2014 when measures to reduce commercial and recreational catches of Pacific bluefin tuna became effective (i.e., [80 FR 38986, July 8, 2015](#) and [80 FR 44887, July 28, 2015](#)), NMFS does not consider the assessment to provide a scientific basis to suggest additional action is necessary under MSA 304(i). Nonetheless, given the status of the stock, the Council may wish to work with NMFS and the Department of State to recommend actions at the international level that will end overfishing and rebuild the stock.

Table 2. 2016 NMFS status determination for Pacific bluefin tuna

<i>Subject to Overfishing</i>	<i>Overfished</i>
$F_{MSY} = 1 - SPR_{MSY} = 0.81$	$B_{MSY} = SSB_{MSY} = 119,423$ mt
$F_{current} = 1 - SPR_{2011-2013} = 0.96$	$B_{current} = SSB_{2014} = 16,557$ mt
MFMT = 0.81	MSST = 89,567 mt; M = 0.25
F/MFMT = 1.18	$SSB_{2014}/MSST = 0.18$

B. EPO yellowfin tuna

The BSIA used to support the 2016 NMFS status determination is the [2015 IATTC Assessment](#) (see details in Table 3).

Table 3. 2016 NMFS status determination for EPO yellowfin tuna

<i>Not Subject to Overfishing</i>	<i>Not Overfished</i>
$F_{MSY} = F_{mult} = 1.02$	$B_{MSY} = SSB_{MSY} = 3,528$ mt
$F/F_{MSY} = F/F_{mult} = 0.98$	$B_{current} = SSB_{2016} = 3,352$ mt; M=0.9 in FMP
	MSST = 1,764 mt
	$SSB/MSST = 1.9$

C. WCNPO and EPO swordfish

The BSIA used to support the 2015 NMFS status determination is the [2014 ISC Assessment](#), which includes an assessment for both the WCNPO and EPO stocks (see details in Tables 4 and 5).

Table 4. 2015 NMFS status determination for WCNPO swordfish

<i>Not subject to Overfishing</i>	<i>Not Overfished</i>
$F_{MSY} = 0.25$	$B_{MSY} = 60,720$ mt
$F_{current} = F_{2012} = 0.14$	$B_{current} = B_{2012} = 72,500$ mt; M=0.35
$F_{2012}/F_{MSY} = 0.58$	$B_{2012}/B_{MSY} = 1.20$
	MSST = 39,468 mt

Table 5. 2015 NMFS status determination for EPO swordfish

Subject to Overfishing	Not Overfished
$F_{MSY} = 0.18$	$B_{MSY} = 31,200$ mt
$F_{current} = F_{2012} = 0.19$	$B_{2012} = 58,590$ mt; $M = 0.35$
$F_{2012}/F_{MSY} = 1.11$	$B_{2012}/B_{MSY} = 1.87$
	MSST = 20,280 mt

D. WCNPO striped marlin

The BSIA used to support the 2016 NMFS status determination is the [2015 ISC Assessment](#) (see details in Table 6).

Table 6. 2015 NMFS status determination for WCNPO striped marlin

Subject to Overfishing	Overfished⁴
$F_{MSY} = 0.63$	$B_{MSY} = SSB_{MSY} = 2819$ mt
$F_{current} = F_{2010-2012} = 0.94$	$B_{current} = SSB_{2013} = 1,094$ mt ; $M = 0.38$ to 0.54
$F/MFMT$ of the FEP = 1.49	MSST and $B_{current}/MSST$ not determined

E. EPO and WCPO bigeye tuna

As of December 2016, NMFS decided to report the status of Pacific bigeye tuna as two separate stocks. The BSIA to support the status determinations are the [2016 IATTC assessment](#) for the EPO stock⁵ and the [2014 WCPFC Assessment](#) for the WCPO stock. NMFS determined that the EPO stock is neither overfished nor subject to overfishing and that the WCPO is not overfished, but subject to overfishing (see details in Table 7 and Table 8). Given NMFS' overfishing determination for the WCPO stock, and that current international measures are inadequate for ending overfishing, MSA Section 304(i) applies. In the past, NMFS has notified the Council of its 304(i) responsibilities for MUS stocks under the HMS FMP regardless of whether U.S. West Coast vessels fished on those stocks in recent years (e.g., [EPO swordfish](#), [WCNPO striped marlin](#)). However, NMFS sees some room for discretion as to whether the Council is the "appropriate Council" to make the recommendations for domestic and international measures to end overfishing on the WCPO stock as required under Section 304(i) because U.S. West Coast vessels do not fish for bigeye in the WCPO. Thus, the Council could provide its perspective as to whether it considers itself the "appropriate Council" for making recommendations to satisfy 304(i) requirements related to the status of WCPO bigeye tuna, despite the inclusion of bigeye tuna as MUS in the HMS FMP.

⁴ Due to the range of values provided for natural mortality (M), MSST was not specified. However, all calculations of MSST using the range of M values provided resulted MSST values lower than $B_{current}$.

⁵ The 2016 IATTC assessment reports the EPO stock as overfished based on biomass estimated as below B_{MSY} ; however, that status does not comport with NMFS recent status determination based on SDCs in the HMS FMP. According to the IATTC's interim reference points, the EPO stock is not overfished nor subject to overfishing. However, the IATTC has not formally adopted reference points for EPO bigeye tuna.

Table 7. 2016 NMFS status determination for EPO bigeye tuna

<i>Not Subject to Overfishing</i>	<i>Not Overfished</i>
F _{MSY} and F _{current} unknown *F/MFMT = 0.95	B _{MSY} = SSB _{MSY} = 95,101 mt B _{current} = SSB ₂₀₁₃₋₂₀₁₅ = 91,297 mt; M = 0.56 MSST of the FMP= 47,551 mt SSB ₂₀₁₆ /MSST of the FMP= 1.92

* The stock assessment provided a ratio of F_{current}/F_{MSY}, which was used to support the overfishing status.

Table 8. 2016 NMFS status determination for WCPO bigeye tuna

<i>Subject to Overfishing</i>	<i>Not Overfished</i>
F _{MSY} and F _{current} are not determined in assessment *F/MFMT = 1.57	B _{MSY} = SSB _{MSY} = 345,400 mt B _{current} = SSB ₂₀₁₂ = 265,599 mt; M=0.40 MSST = 207,240 mt SSB/MSST = 1.28

* The stock assessment provided a ratio of F_{current}/F_{MSY}, which was used to support the overfishing status.

4. Coordinating and prioritizing specification of reference points, including proxies, between the Council and the WPFMC

NMFS suggests that the Council consider developing a list of MUS stocks for which it considers itself the “appropriate Council” as a means to inform coordination on status determinations and management recommendations for HMS stocks.

Coordination between the Pacific and Western Pacific Councils, NMFS Science Centers, and Regional Offices when deciding on SDC and determining HMS stock status is critical given the number of shared MUS in the HMS FMP and the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region (Pelagic FMP). Currently, the formulas for SDCs in the two plans are consistent, so there has been little need to reconcile differences when computing SDCs. However, the NMFS Science Centers and Regional Offices have coordinated to avoid duplicating workload or generating multiple status determinations for each stock. However, if either Council decided to make changes to SDC formulas specified for shared stocks, or express different preferences for proxies, additional coordination would be needed to either seek consistency between the Councils or to decide which SDC (or proxy to inform the SDC) should be used to determine status in the event that SDC formulas were specified differently in the two FMPs.

Highlighting which HMS stocks the Council considers itself the “appropriate Council” for making recommendations to address stock status could also serve to streamline decisions about SDCs and/or suitable proxies and recommendations for domestic measures and international measures to address stock status, when necessary (as described in detail in September 2016 Council [Agenda Item J.3.a, Supplemental HMSMT Report 2](#)). Because National Standard 3 and section 301 of the MSA state that each species must be managed throughout its range, recommendations by both Councils for domestic and international measures may not be necessary, but should always be congruent.

For example, if the Council did not consider itself the “appropriate Council” for recommending measures to address the status of the WCPO stock of Pacific bigeye, NMFS would take this into

consideration when coordinating status determination workloads, sending notification letters, and ensuring that statutory timelines are met in obtaining recommendations from the Council, when necessary. Such a decision by the Council does not need to be specified in the HMS FMP, but rather could be expressed and archived in a Council meeting Decision Summary. As such, these decisions could be easily revisited. If at some future time the Council wished to make international or domestic recommendations regarding the status of a stock for which it previously did not consider itself the “appropriate Council,” it could do so. Similarly, should NMFS determine that the Council is an “appropriate Council” to make recommendations to address the status of a stock for which the Council did not previously consider itself the “appropriate Council” (e.g., based on new information about relative impact of U.S. West Coast vessels), NMFS could notify the Council of such requirements.

For Council consideration, NMFS provides the stock assessment boundaries for all HMS FMP MUS as well as recent landings to the U.S. West Coast for each stock. Because stock assessment boundaries and the composition of catches by U.S. West Coast vessels are subject to change, NMFS can inform the Council of any such changes that might influence their interests in being considered the “appropriate Council.”

A. EPO and WCPO swordfish stocks

Figure 2 shows the boundaries indicated in the assessments for North Pacific swordfish (*Xiphias gladius*). There is no reported U.S. West Coast fleet activity within the EPO stock area; U.S. West Coast fisheries occur within the WCPO stock area (Sippel 2015). For the years 2006 to 2015, the U.S. West Coast fleet landed approximately fourteen percent of the total reported U.S. catch for stocks in the North Pacific Ocean (ISC 2016). An average of 259 mt of swordfish are caught and landed to the U.S. West Coast region annually. The highest catch of swordfish within the last 10 years by the U.S. West Coast fleet was in 2007 at 550 mt; the lowest was approximately 100 mt in 2010. From 2006 to 2015, average annual landings to the U.S. West Coast region by the Hawaii longline fleet were comparable to levels landed by the U.S. West Coast-based fleet. (PacFIN, extracted Jan. 31, 2017).

B. EPO and Western Central North Pacific Ocean striped marlin stocks

Figure 3 shows the boundaries indicated in the assessments for striped marlin (*Kajikia audax*) in the North Pacific Ocean. Commercial harvest and landings of striped marlin in the West Coast region are prohibited by current regulations. The U.S. West Coast recreational fleet fishes on the Eastern Pacific Ocean (EPO) stock.

C. Pacific bluefin tuna stock

Figure 4 shows the assessment area for Pacific bluefin tuna (*Thunnus orientalis*). Although the species occasionally may be found in tropical waters and in the southern hemisphere, Pacific Bluefin is mainly distributed between the 20°N and 50°N latitudes. Between the years 2006 and 2015, U.S. commercial and recreational fleets harvested roughly two percent of the total catch of Pacific bluefin tuna throughout the Pacific Ocean, with an average of 378 mt per year (ISC 2016). Within this same time frame, U.S. commercial landings of Pacific bluefin tuna averaged 114 mt a year and were highest in 2009 at 415 mt, and lowest at less than one mt in 2006 (PacFIN, extracted Jan. 31, 2017).

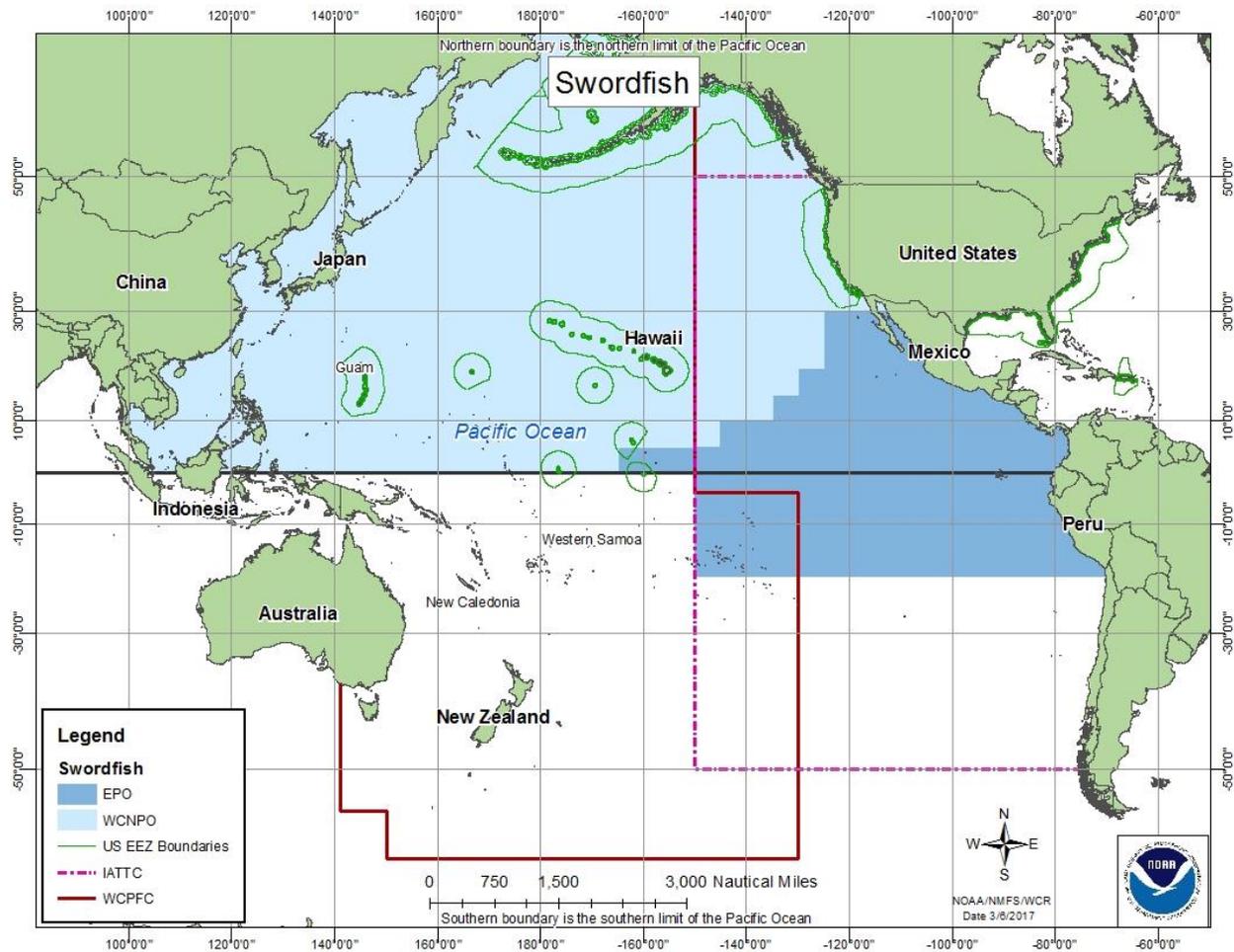


Figure 2. Swordfish (*Xiphias gladius*) in the North Pacific Ocean is assessed as two stocks that are separated by a diagonal boundary extending from the equator to Baja, California.

D. Pacific dolphinfish (dorado) stock

Dorado (*Coryphaena hippurus*) is considered to be a Pacific-wide stock (see Figure 4). About two metric tons of dorado were caught and landed annually by the U.S. West Coast commercial fleet from 2006 to 2015 (PacFIN, extracted Jan. 31, 2017).

E. EPO and WCPO bigeye tuna stocks

Figure 5 shows the boundaries indicated in the assessments for Pacific bigeye tuna (*Thunnus obesus*). For the years 2006 to 2015, an average of 86 mt per year of commercially caught bigeye tuna were landed in the U.S. West Coast region, the majority of which are attributed to the Hawaii longline fleet. Due to there being fewer than three participants fishing under HMS permits, landings data for those vessels are confidential. Typically, the U.S. West Coast fleet fishes in the assessment area of the EPO bigeye stock and not in the area of the WCPO stock.

F. EPO and WCPO yellowfin tuna stocks

Figure 5 shows the boundaries indicated in the assessments for Pacific yellowfin tuna (*Thunnus albacares*). For the years 2006 to 2015, an average of 191 mt per year of commercially caught yellowfin tuna were landed in the west coast region. Landings by the U.S. West Coast fleet comprise the majority of these yellowfin landings (PacFIN, extracted Jan. 31, 2017). Typically, the U.S. West Coast fleet fishes in the assessment area of the EPO yellowfin stock and not in the area of the WCPO stock.

G. EPO and WCPO skipjack tuna stocks

Similar to Pacific bigeye and yellowfin tuna, Pacific skipjack tuna (*Katsuwonus pelamis*) is assessed as two stocks. The assessment areas for these stocks are depicted in Figure 5. For years 2006 to 2015, an average of 19 mt per year of commercially caught yellowfin tuna were landed in the U.S. West Coast region. Landings by the U.S. West Coast fleet comprise the majority of these yellowfin landings (PacFIN, extracted Jan. 31, 2017). Due to limited vessel participation in certain years, landings data for U.S. West Coast-based vessels are confidential. Typically, the U.S. West Coast fleet fishes in the assessment area of the EPO skipjack stock and not in the area of the WCPO stock.

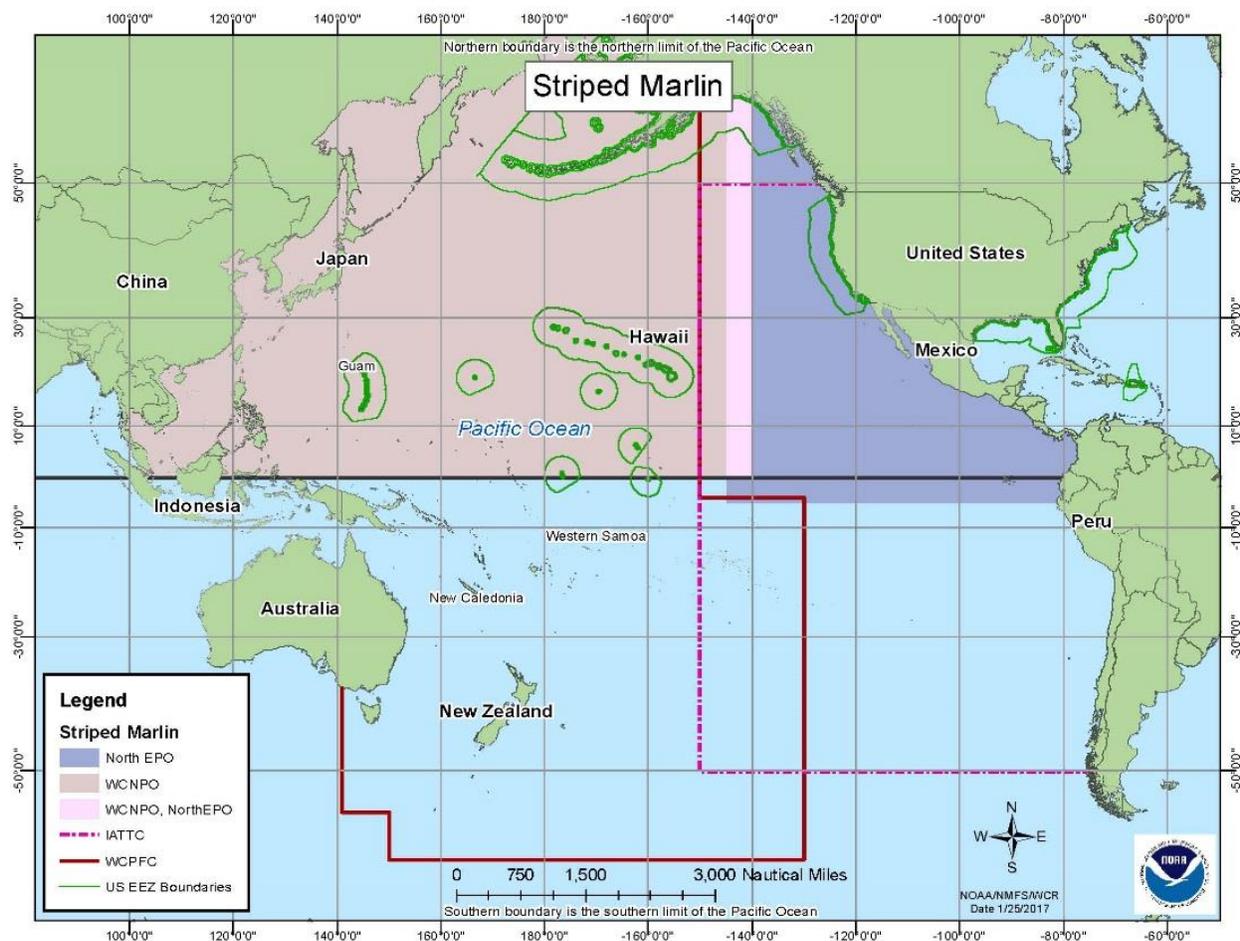


Figure 3. Striped marlin (*Kajikia audax*) in the North Pacific Ocean is assessed as two stocks that overlap, the Western and Central North Pacific Ocean and north Eastern Pacific Ocean stock.

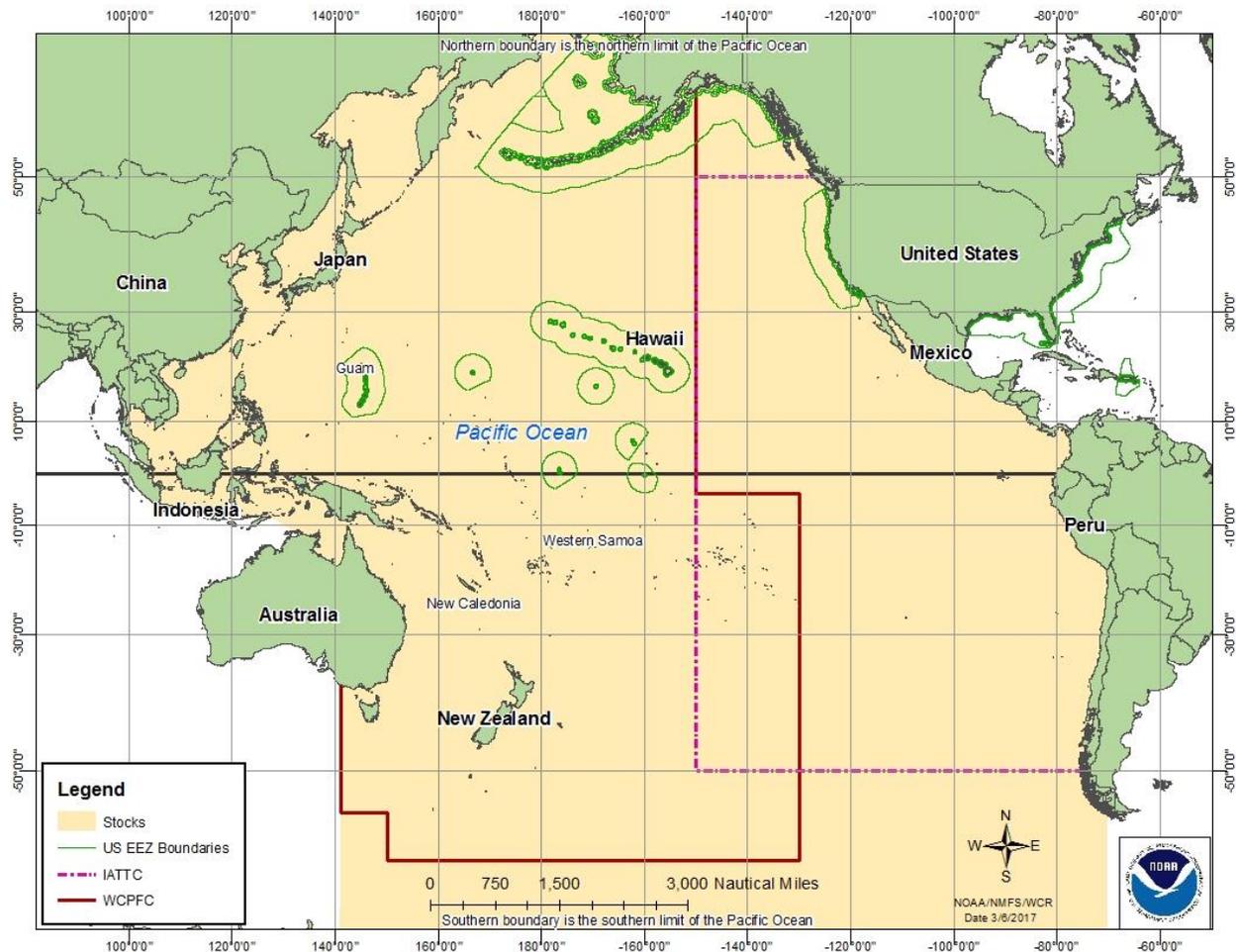


Figure 4. Pacific bluefin tuna (*Thunnus orientalis*) and dorado (*Coryphaena hippurus*) are considered Pacific-wide stocks.

H. North and South Pacific blue shark stocks

Figure 6 shows the assessment areas of the North and South Pacific blue shark stocks. The U.S. West Coast fleet fishes in the assessment area of the North Pacific blue shark stock. From 2006 to 2015, average landings of blue shark by the U.S. West Coast fleet were 1 mt per year; however, a peak of 10 mt reported in 2007 skews the annual average high (ISC 2016). In seven of the last 10 years, fewer than 0.5 mt were landed by the U.S. West Coast fleet. The lowest amount blue shark landings occurred in 2013 at approximately 0.1 mt (PacFIN, extracted Jan. 31, 2017).

I. North and South Pacific shortfin mako shark stocks

Shortfin mako shark is also assessed as a North Pacific and South Pacific stock (see Figure 6). The U.S. West Coast fleet fishes in the North Pacific assessment. From 2006 to 2015, U.S. catch averaged 27 mt per year. The highest recorded catch in those years was 46 mt in 2006, followed by a decline in landings to 12 mt in 2015 (ISC 2016). Of the total U.S. catch of shortfin mako shark from 2006 to 2015, the U.S. West Coast fleet landed over ninety percent (PacFIN, extracted Jan. 31, 2017).

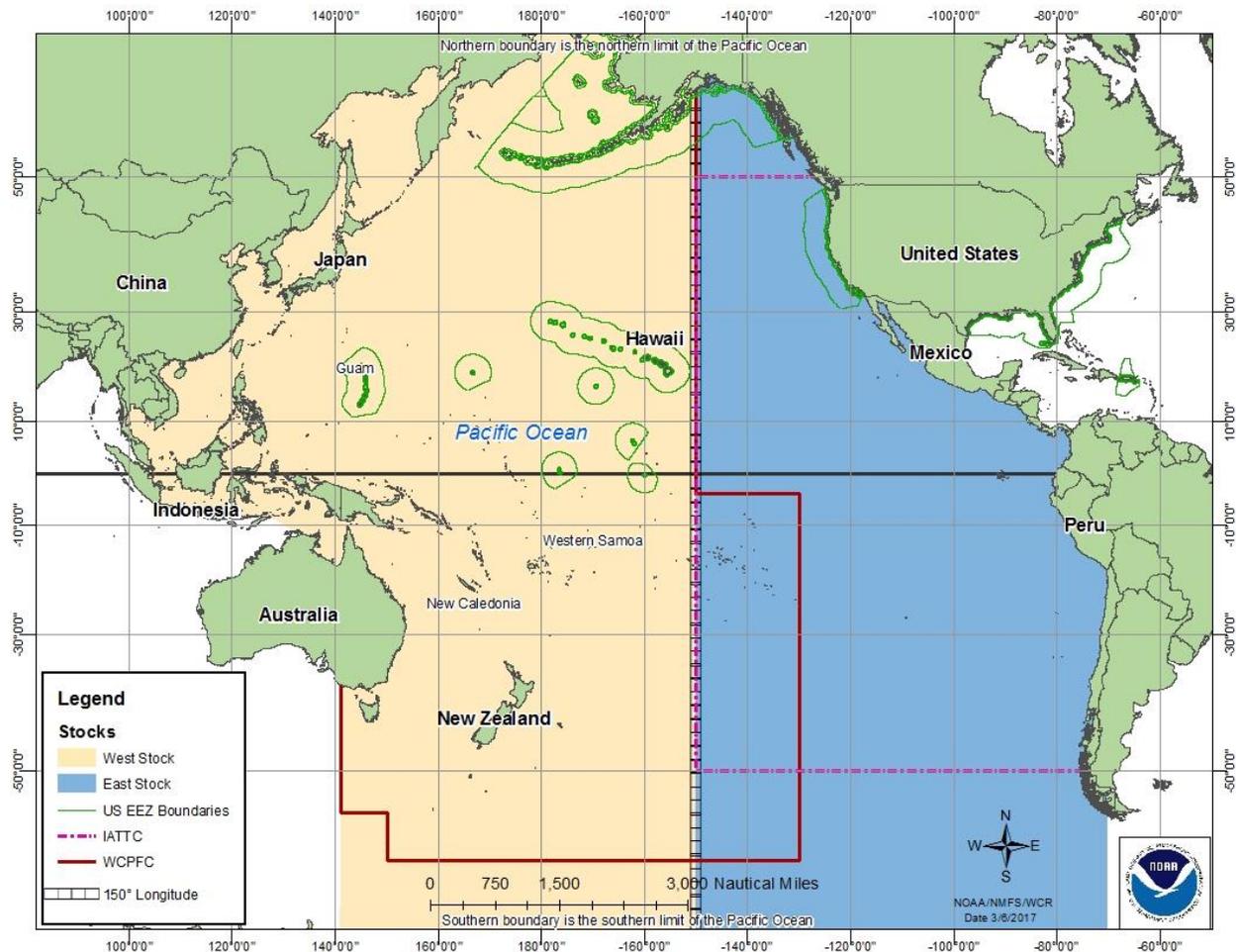


Figure 5. Pacific bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*), and skipjack tuna (*Katsuwonus pelamis*) are assessed as EPO and WCPO stocks, separated by 150° longitude.

J. Pacific common thresher shark stock

In 2015, NMFS completed a status review of Pacific common thresher shark and referred to a geographic range for a concentration of common threshers along the west coast of North America (see Figure 7), among other concentrations reported to occur off of Chile and other areas of the Pacific (Young et al. 2015). More recently, in 2016, NMFS completed stock assessment of common thresher shark along the west coast of North America (Teo 2016). From 2006 to 2015, the U.S. West Coast fleet landed an average of 102 metric tons per year. Annual landings during those years ranged between 40 to 204 mt, with the highest amount recorded in 2006 and the lowest recorded in 2014 (Source: PacFIN, extracted Jan. 31, 2017).

K. North Pacific albacore stock

Figure 8 shows the assessment areas of the North Pacific and South Pacific albacore stocks. North Pacific albacore is the stock specified as an MUS in the HMS FMP. The U.S. West Coast fleet primarily fishes in the geographic area of the North Pacific stock; however, once in a while,

vessels travel to fish in the area of the South Pacific stock. From 2006 to 2015, the total U.S. catch of North Pacific albacore tuna was 133,974 mt ([ISC 2016](#)), 86 percent of which was landed in California, Oregon, or Washington. Landings by the U.S. West Coast fleet comprised 95 percent of the landings to the U.S. West Coast region ([PacFIN](#)).

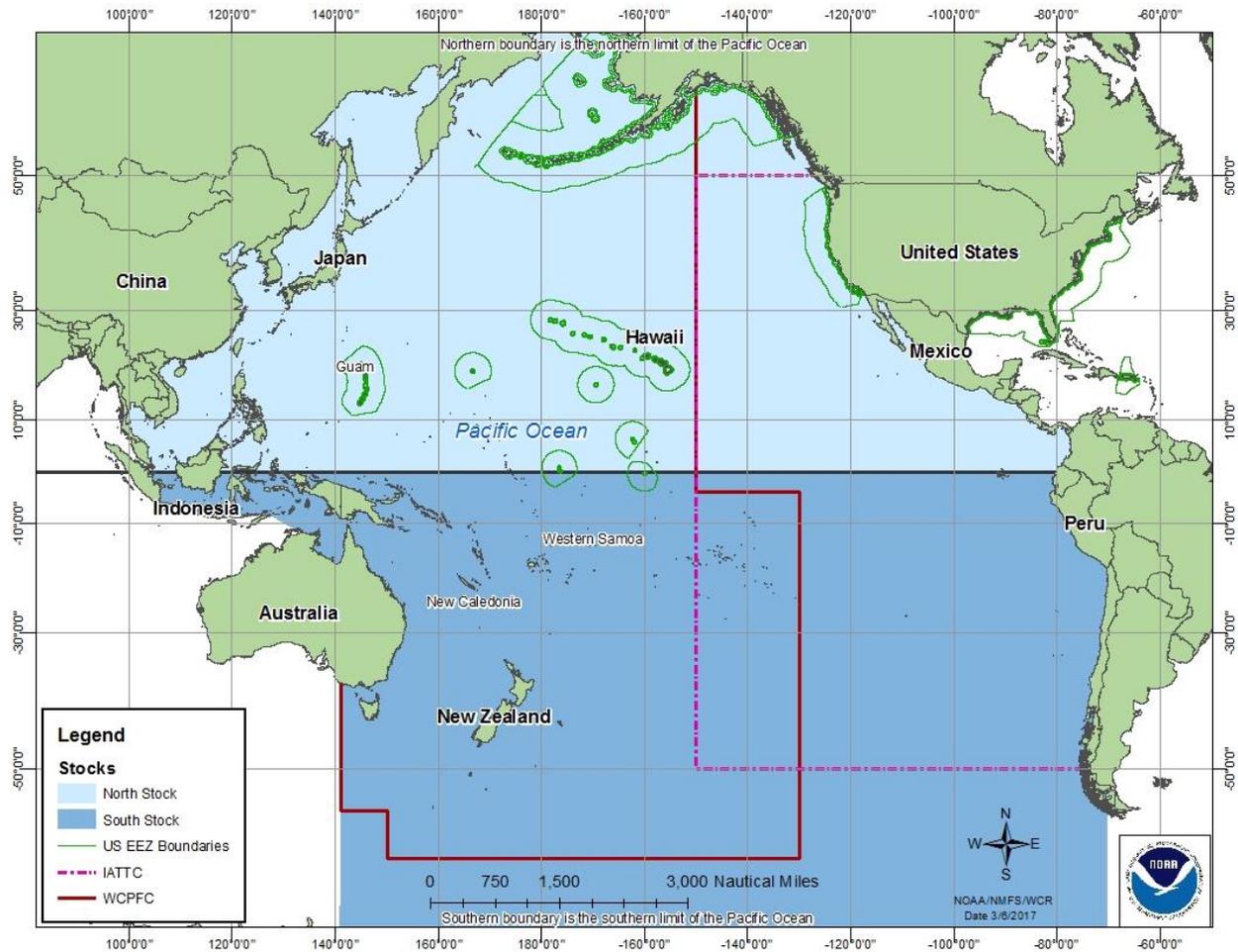


Figure 6. Blue shark (*Prionace glauca*) and shortfin mako shark (*Isurus oxyrinchus*) are assessed as North Pacific and South Pacific stocks that are separated by the equator.

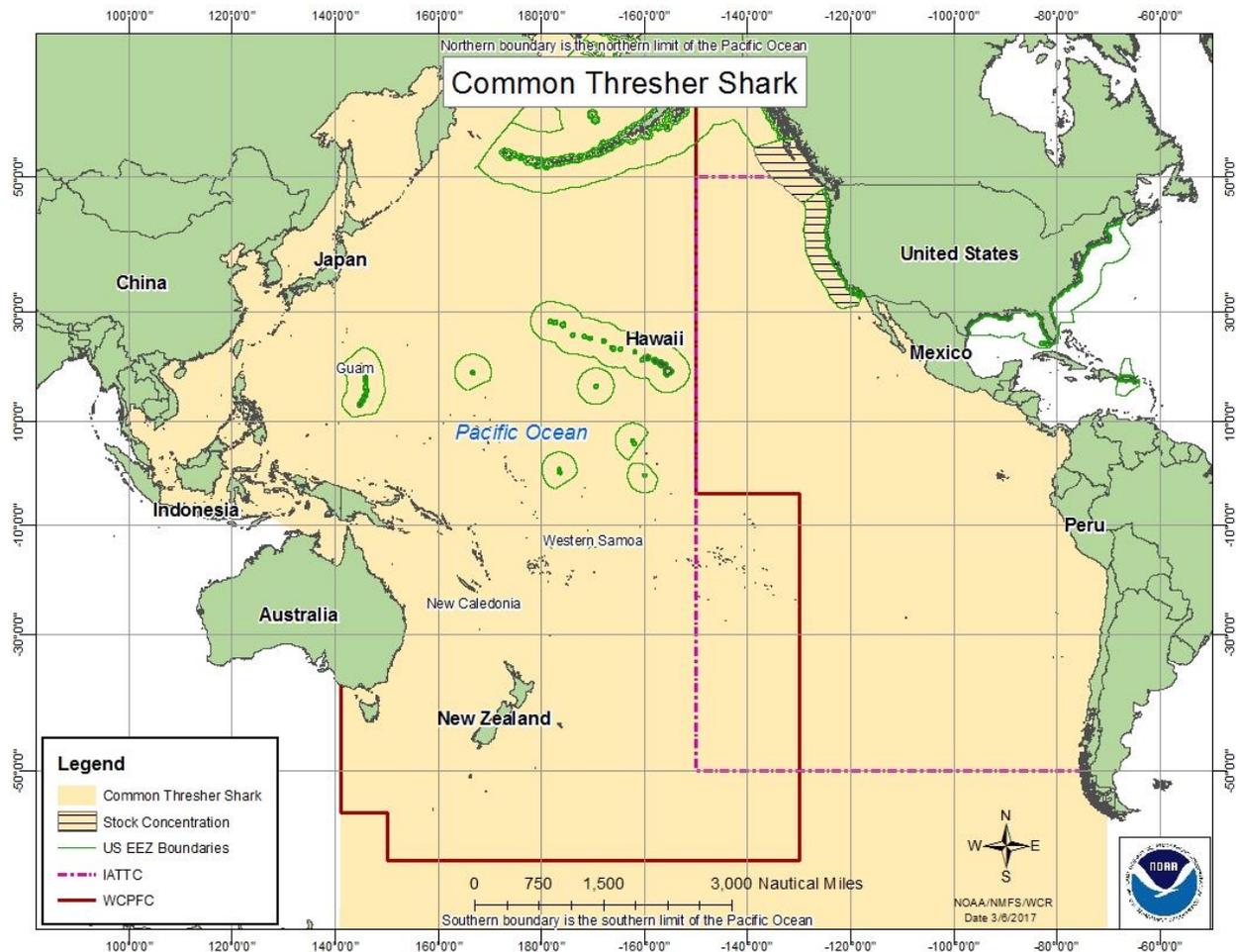


Figure 7. A status review of Pacific common thresher describes the geographic range of Northeast Pacific common thresher shark to span from Goose Bay, British Columbia, Canada to the Baja Peninsula, Mexico and extends from the coast to about 200 miles (Young et al., 2015)⁶.

⁶ Original Source: Goldman, K.J. (2009) Common thresher shark *Alopius vulpinus* Bonnatere, 1788. pp. 1-4.

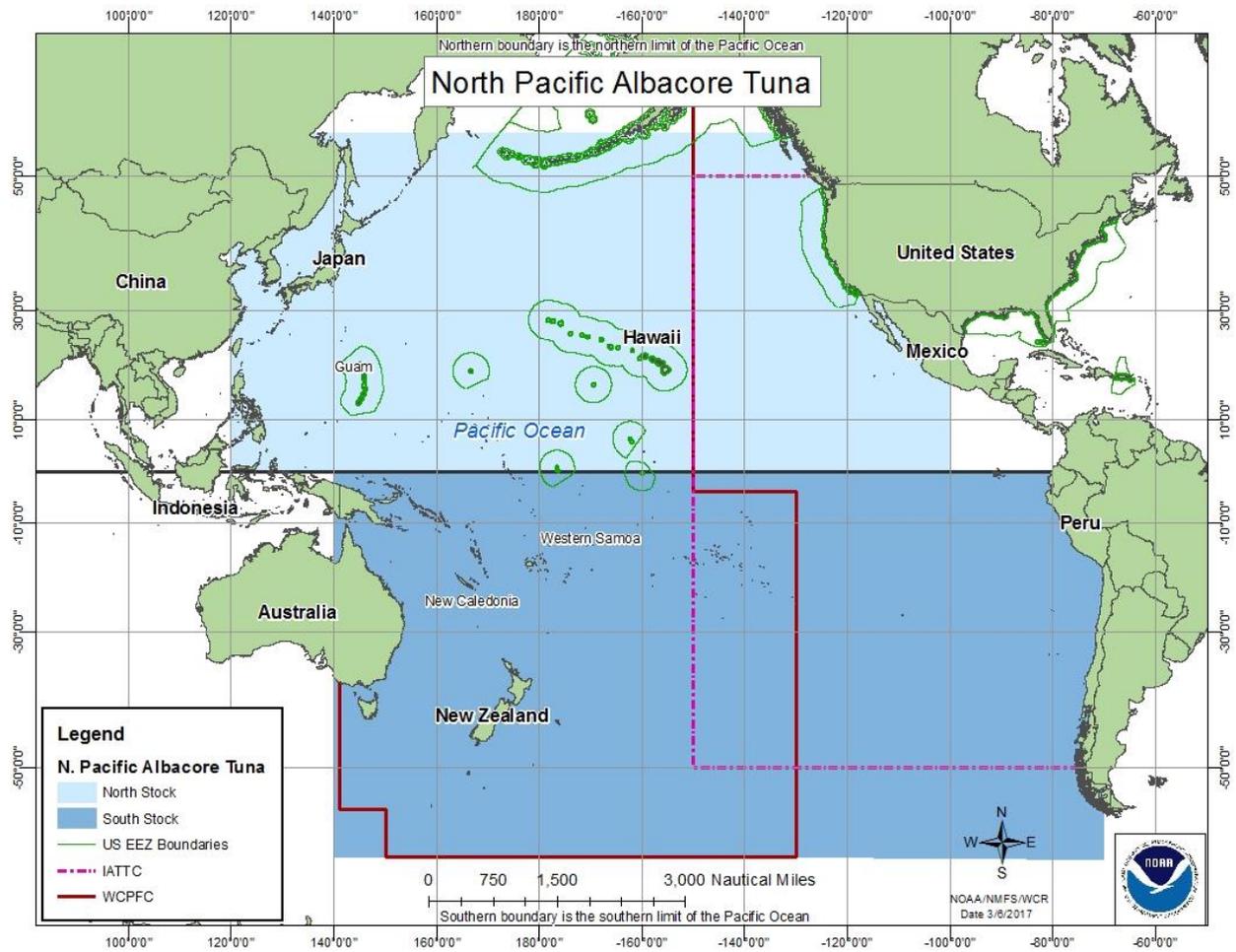


Figure 8. North Pacific albacore tuna (*Thunnus alalunga*) is assessed separately from South Pacific albacore, as shown in the highlighted areas (ISC, 2014; Harley et al., 2015).