

Potential Pacific Fishery Management Council Response to International Overfishing of Yellowfin Tuna

Pursuant to Section 304(i) of the Magnuson-Stevens Fishery Conservation and Management Act (as Amended)

A PFMC Staff White Paper

Summary

This white paper covers the following topics:

- An **introduction** describing why and how the Council must respond to international overfishing of yellowfin tuna.
- A description of **current stock status**, which summarizes information contained in the most recent yellowfin tuna stock assessment.
- A description of **U.S. catches of yellowfin tuna** to provide perspective on the U.S. contribution to yellowfin tuna overfishing.
- Information to help the Council arrive at **recommendations for domestic regulations** in response to yellowfin tuna overfishing.
- A discussion of eight **recommendations for Council consideration** with respect to international actions that will end yellowfin tuna overfishing.

Introduction

In a letter dated October 25, 2006, the National Marine Fisheries Service (NMFS) Southwest Regional Administrator notified the Pacific Fishery Management Council (Council) that overfishing is occurring on the Eastern Pacific Ocean (EPO) yellowfin tuna stock.¹ NMFS made this determination pursuant to Section 304(e)(2) (16 U.S.C. 1854(e)) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which states that within one year of such a notification “the appropriate Council ... shall prepare a fishery management plan, plan amendment, or proposed regulations for the fishery to which the identification or notice applies...” Under the current law, the Council would have been required to amend the Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species (HMS FMP) and/or propose regulations to address overfishing of EPO yellowfin tuna. However, the MSA was amended by P.L. 109-479 (the Magnuson-Stevens Fishery Conservation and Reauthorization Act of 2006), which became effective January 12, 2007; it added Section 304(i)² to the MSA applicable to “a fishery that the Secretary determines is overfished or approaching a condition of being overfished due to excessive international fishing pressure, and for which there are no management measures to end overfishing under an international agreement to which the United States is a party.”

A second letter from the NMFS Southwest Regional Administrator, dated March 30, 2007, said this section is applicable to the EPO yellowfin tuna stock. According to Section 304(i) within one year the Council must: (1) develop recommendations for domestic regulations to address the relative impact of fishing vessels of the United States on the stock and, if developed by a Council, the Council shall submit such recommendations to the Secretary of Commerce (or in effect, NMFS); and (2) develop and submit recommendations to the Secretary of State, and to Congress, for international actions that will end

¹ For the purposes of fishery management the EPO refers to waters east of 150° W longitude.

² Note that P.L. 109-479 erroneously added two subsections to the MSA as 304(i), the other describing a new environmental review process.

overfishing in the fishery and rebuild the affected stocks, taking into account the relative impact of vessels of other nations and vessels of the United States on the relevant stock.

Based on the date of the second notification, the Council must submit such recommendations on or before March 30, 2008.

The Council is scheduled to take final action to adopt recommendations to satisfy the requirements of Section 304(i) on March 10, 2008. This paper provides background information on current stock status and U.S. catches of yellowfin tuna. It also outlines a variety of recommendations the Council could adopt as part of their action. These recommendations are consistent with recommendations previously made by the Council in a letter to the U.S. delegation to the Inter-American Tropical Tuna Commission (IATTC) and those made by the Highly Migratory Species Management Team in their report at the September 2007 Council meeting (Agenda Item F.3.b). However, the range of recommendations for international action is somewhat broader than those previous sets of recommendations. After Council action, but before March 30, 2008, separate letters need to be sent to NMFS (on behalf of the Secretary of Commerce with recommendations for domestic actions) and to Congress and the Department of State (for international actions). These letters would satisfy the obligations described in Section 304(i).

Current Stock Status

The IATTC scientific staff produces a stock assessment report for EPO yellowfin tuna on an annual basis in advance of its annual meeting in June. The October 25, 2006, letter notifying the Council that overfishing is occurring references *Status of Yellowfin Tuna in the Eastern Pacific Ocean in 2005 and Outlook for 2006* (Hoyle and Maunder 2006), which was the basis for a summary of the HMS FMP managed yellowfin tuna's stock status reported in the Council's 2006 HMS SAFE. A subsequent stock assessment (Maunder 2007) reaches similar conclusions. Some key points of the 2007 IATTC assessment, relative to management recommendations, are summarized here.³

Stock status may be evaluated in terms of stock-specific reference points related to the level of fishing effort imposed on the stock and the resulting stock size, or biomass. National Standard Guidelines pursuant to the MSA identify two thresholds relevant to such a determination, maximum fishing mortality threshold (MFMT) and minimum stock size threshold (MSST), which should be specified in the relevant FMP, and are then used as the basis for a Secretarial determination according to MSA Section 304(e). A stock may be subject to overfishing, indicating that the fishing mortality rate has exceeded the identified MFMT; be overfished, meaning the stock biomass has fallen below the MSST, or subject to both conditions. The aforementioned determination letter notes that the HMS FMP establishes the overfishing (fishing mortality) threshold as a rate for yellowfin tuna that exceeds the rate expected to produce the maximum sustainable yield (MSY). With respect to stock size, the HMS FMP establishes a default threshold that biomass should be at least half the biomass at MSY (B_{MSY}). If stock size falls below this level, then the stock would be considered overfished. The HMS FMP does not identify stock-specific reference points and the need to establish them has been identified as a high priority action. According to the most recent stock assessment, the IATTC has not yet identified a single reference point for management of yellowfin tuna that would formally guide decision making.⁴ However, a phase diagram, or "Kobe plot," is a common way of graphically summarizing stock status. The vertical axis represents

³ The Council's Scientific and Statistic Committee reviewed this stock assessment in September 2007.

⁴ The stock assessment identified possible candidates for reference points as: (1) S_{AMS_Y} , the spawning biomass corresponding to the average MSY (AMS_Y is defined as the maximum long-term yield that can be achieved under average conditions using the current, age-specific selectivity pattern of all fisheries combined); (2) F_{AMS_Y} , the fishing mortality corresponding to the AMS_Y; (3) S_{min} , the minimum spawning biomass seen in the modeling period.

the ratio of recent fishing mortality (F_{recent}) to the rate expected to produce MSY (F_{MSY}). The horizontal axis represents the ratio of current biomass (B_{recent}) to B_{MSY} . The plot is divided into four panels, indicating stock status, from not overfished and not experiencing overfishing in the lower right to overfished and experiencing overfishing in the upper left. (This assumes that the stock size threshold is B_{MSY} rather than one-half B_{MSY} .) Figure 1 shows a phase diagram for yellowfin tuna reproduced from the 2007 stock assessment report (Maunder 2007). Each small dot on the irregular line in the graph represents a 3-year running average for fishing mortality and biomass. The most recent point, the large representing 2006, indicates that both thresholds are exceeded. The horizontal and vertical lines emanating from the 2006 point represent the 95 percent confidence interval (a measure of uncertainty about the estimated value), showing that stock status could actually fall within one of the other stock status panels.

Although the phase diagram in Figure 1 suggests that EPO yellowfin $F_{\text{recent}}/F_{\text{MSY}}$ and $B_{\text{recent}}/B_{\text{MSY}}$ are near 1 (the implicit target in the diagram), it is important to bear in mind that without a reduction in fishing effort stock size could decline over time. Stock size depends on recruitment of new members into the fishable population (called recruits). A population that is more productive, with more recruits entering the fishable population, can sustain higher fishing mortality. The stock assessment posits two or possibly three recruitment regimes (1975–82, 1983–2001, and 2002–06) corresponding to low, high, and intermediate levels of recruitment and presumably resulting from varying environmental conditions. Although strong recruitment occurred from 1998 to 2001, it has subsequently declined and the large cohorts from the late '90s have moved through the population. The stock assessment predicts that “[u]nder 2006 levels of effort (2004 for the longline fisheries) the biomass is predicted to increase slightly and then decrease to around the current level...”

Another important factor is the effect of the selectivity patterns of different fisheries targeting yellowfin tuna on yield. Different fisheries catch (or select for) fish of different average size. Catching smaller fish removes more fish, in terms of numbers, from the population per unit weight caught, affecting both present and future biomass as these fish would otherwise grow to a larger size and contribute relatively more to biomass. This is partially offset by the relatively higher natural mortality rate of younger fish; thus, if those fish are not removed by fishing then a larger number are likely to die instead from natural mortality and not contribute to overall future biomass. Ideally (in the absence of technological constraints) all fish would be caught at an age that balances growth and natural mortality to produce the highest yield (this is called the critical weight).

For the purposes of the assessment, the yellowfin fishery is subdivided into 16 segments, or fisheries, defined by gear type and geographic extent.⁵ In relation to differences in the size of fish caught in different fisheries, the important distinction is between longline fisheries and purse seine fisheries setting on tuna associated with dolphins, free-swimming schools, and those associated with floating objects or fish aggregating devices (FADs).⁶ The stock assessment summarizes the selectivity pattern of the fisheries as follows:

The average weights of yellowfin taken from the fishery have been fairly consistent over time, but vary substantially among the different fisheries. In general, the floating-object, unassociated, and pole-and-line fisheries capture younger, smaller yellowfin than do the dolphin-associated and longline fisheries. The longline fisheries and the dolphin-associated fishery in the southern region

⁵ Four of these segments are used in the model to account for discards of small fish by purse seine vessels and are not fisheries in the conventional sense.

⁶ Although fishers have long observed and exploited the tendency of tropical tunas to aggregate around floating objects in the open ocean (such as logs), the past few decades has seen increasing use of artificial devices—FADs—deployed by purse seine vessels to effectively increase catch per unit of effort.

capture older, larger yellowfin than do the northern and coastal dolphin-associated fisheries. (Maunder 2007, p. 4)

Overall, the dolphin-associated fishery catches the largest proportion by weight and thus has the largest impact on the population, in terms of total biomass removed, but, as the stock assessment points out, it has the least impact per unit of weight caught. Across all fisheries, the current average weight of yellowfin in the catch is much less than the critical weight. Yield could be increased if relatively more fishing effort was deployed by fisheries that catch larger fish on average. For example, the highest yields could be obtained if all fishing was conducted by longline but it is not technically or economically feasible for the full quantity at MSY to be caught by this gear alone. Encouraging relatively more effort in the dolphin-associated fishery, or discouraging fishing effort in the FAD-associated fishery, could be a more feasible policy objective to address overfishing and increase the yield.

The “base case” or default assumption in the stock assessment is that there is no relation between the size of the spawning population and the resulting number of fish recruited to the population. Such an assumption is often based on the lack of such a correlation between spawning stock size and recruitment in the historical data. Although counterintuitive, the lack of such a relationship can have a biological basis across a range of population sizes above some very low level. Since individual fish produce a large number of eggs, even with a reduction in the number of spawning fish the absolute number of eggs produced by the population will still be very large. Environmental conditions and the phenomenon known as compensation—whereby competition for resources is less at lower population densities—can overwhelm any effect resulting from changes in spawning stock size, making it impossible to discern a stock recruitment relationship. As a sensitivity analysis, the stock assessment also models the population under the assumption that there is a stock recruitment relationship and finds that this assumption produces more pessimistic results. From a policy perspective this suggests a higher level of precaution since the base case assumption is more optimistic.

Table 1 reproduces several stock status metrics provided in the assessment (as Table 5.1) for both the base case and stock recruitment relationship scenarios.

U.S. Catches of EPO Yellowfin Tuna

The language in Section 304(i) references the relative impact of U.S. vessels, and the relation to the relative impact of vessels of other nations when recommending both domestic regulations and international conservation and management measures. The IATTC, the principal regional fishery management organization in the EPO, is responsible for the conservation and management of fisheries for tunas and other species taken by tuna-fishing vessels in the area east of 150° W longitude between 40° N and 40° S latitudes. It is the principal repository of data on catches of tuna and tuna-like species in this region. Historically, the U.S. was a major fishing nation in the region, with purse seine vessels accounting for the overwhelming proportion of overall catch. Figure 2 shows the historical trend of EPO yellowfin catch by the U.S. and other nations as reported to the IATTC. At the beginning of this time series, U.S. catch accounted for 90 percent of the total. Since then the U.S. share has dramatically declined, with a precipitous fall in the late 1980s and early 90s in the amount of catch. This was principally due to the relative cost disadvantage of west coast based vessels and associated canneries in comparison to foreign competitors. Measures to reduce incidental mortality of dolphins may have also had an effect, both by increasing cost and prompting vessels to move into the Western Pacific and make deliveries elsewhere, such as Pago Pago in American Samoa. In the last few years the U.S. share has comprised 1 percent or less of the total. For example, in 2004, the last year for which complete data for all gear types and flags are available, the U.S. accounted for 3,698 mt out of a total of 291,471 mt, or 1.3 percent of the total.

Furthermore, with respect to domestic fisheries regulation, the Council may only make recommendations relative to fisheries and vessels that make landings on the U.S. west coast and are thus subject to the Council's HMS FMP. Although historically, because of the existence of canneries in Southern California, a large proportion of U.S. EPO catch was landed on the west coast, today no long distance tuna purse seiners make such landings. Figure 3 compares historical total commercial U.S. EPO yellowfin catch with landings on the west coast. Table 2 shows the percent value of the west coast share; it can be seen that after 1983 the proportion remained relatively constant, at about a quarter, albeit of a diminishing total. West coast commercial yellowfin landings are principally made by a small coastal purse seine fleet based in Southern California. These vessels usually target coastal pelagic species such as Pacific mackerel, Pacific sardine, and market squid. However, in years when tropical tunas are more abundant in the Southern California Bight they may advantageously target these species, including yellowfin tuna. These catches typically occur in the warmer months from May to October.

Today, recreational catch of yellowfin tuna is an important component of west coast landings. Anglers fishing on boats for hire, known as Commercial Passenger Fishing Vessels (CPFVs, also referred to as charter boats or party boats) and anglers fishing on private vessels originating from Southern California ports account for this catch. Although the IATTC catch records include an estimate of U.S. west coast recreational catch in metric tons, which is a component of the total U.S. yellowfin catch referenced above, data collected by west coast states and submitted to the Recreational Fisheries Information Network (RecFIN) are used because the source of that data is better documented. The Southern California CPFV fleet fishes both in the U.S. west coast Exclusive Economic Zone (EEZ) and adjacent Mexican waters. Although catch from Mexican waters is landed in west coast ports, for the purpose of considering recommendations for domestic regulations this catch should not be considered because Mexico has adopted management and conservation regulations that apply to these U.S. flag vessels when fishing in Mexican waters.

RecFIN reports HMS recreational catch in numbers of fish. An average weight of 5.4 kg has been used to convert these numbers into a yellowfin tuna weight value in order to make the comparison with commercial catches.⁷ Table 3 presents the counts of yellowfin tunas caught in U.S. waters reported in the 2007 HMS SAFE (PFMC 2007) for private recreational and CPFV fleets along with the converted weight and compares this information to west coast commercial landings. Because private vessel catch estimates are more uncertain before 2004, when a new recreational sampling program was implemented in California, Table 3 only reports data from 2004 onward. Furthermore, recreational catch data provided by the IATTC, which is for the CPFV fleet only, does not correspond to the CPFV catch estimates in Table 3. For these reasons, recreational catch could account for a smaller or larger proportion of west coast catches, but it still represents a tiny fraction of total EPO yellowfin catch.

Recommendations for Domestic Regulations

The HMS FMP recognizes that unilateral action may be legally required but that measures, “such as a reduction in the U.S. west coast harvest or effort, would not likely have a significant biological effect on the stock.” As discussed above, both total U.S. and west coast commercial landings of EPO yellowfin have declined substantially in the last two decades. West coast catches comprise a tiny fraction of total EPO catches—averaging two-tenths of a percent annually from 2002 to 2006. Because west coast fisheries are a negligible contributor to total fishing effort on the stock, further curtailment of these catches would have no practical effect on ending overfishing. In addition, because the language in

⁷ The 5.4 kg value was used in the HMS SAFE, Table 5–2, to estimate U.S. west coast catches by weight from recreational fisheries.

Section 304(i)(2)(A) states that regulations should address the relative impact of U.S. fishing vessels, the absolute value of any needed reduction in catch would be a very small number. The IATTC Secretariat recommends an overall reduction in yellowfin catches ≥ 20 percent (IATTC 2008). Averaging 2004-06 U.S. west coast catches (see Table3) such a reduction equates to 2,247 fish or 12 mt for the recreational fishery and 57 mt for commercial catches. Developing management measures that could effectively achieve this reduction and not be an undue regulatory burden (having a significant adverse socioeconomic impact and inadvertently reducing catch more than necessary, for example) would be difficult.

Currently, California state regulations authorize a recreational daily bag limit of 10 fish yellowfin tuna per day with a multi-trip permit option that allows for up to three daily bag limits to be possessed. There are no state or Federal regulations specifically limiting yellowfin tuna catch by commercial vessels. This reflects the modest size of west coast yellowfin catch in comparison to both overall EPO catch and stock size. However, should conditions change the framework established by the HMS FMP allows for a relatively quick response. The HMS FMP management framework allows the Council to periodically develop management measures that can be implemented through Federal rule making without the need to amend the FMP. This can allow more timely response to emerging issues, for example if the west coast fishery for yellowfin tuna expanded rapidly.

The FMP specifies a two-year cycle for the establishment of such regulations. Once Council decision making is completed, over the course of three meetings, the resulting recommendation is then implemented by NMFS for at least two years or until changed. The first biennial cycle for which the Council made such a recommendation is for the period April 2007 to March 2009 and offers an example of how this framework is used to respond to management concerns. The Council recommended, and NMFS implemented, a Federal daily bag limit for albacore and bluefin tuna, which are the main tuna species targeted by west coast anglers. This species-specific bag limit represents a response to resolutions adopted by both the IATTC and the Western and Central Pacific Fisheries Commission (WCPFC) calling for no increase of fishing effort on the stock. Although a similar measure is not being recommended for yellowfin tuna at this time (because it is a less important recreational species, in terms of the number caught) this example demonstrates that management measures can be implemented within a year of first being considered. The framework also allows the Council to establish catch limits for commercial fisheries in the form of a quota or harvest guideline.

The U.S. west coast has a robust fisheries data collection program for commercial fisheries where landings are documented and sampled and entered into a comprehensive data system (the Pacific Fisheries Information Network, PacFIN). CPFVs maintain logbooks to document catches. As noted above, data from private recreational vessels are more uncertain, but recent sampling improvements have been made through the implementation of the California Recreational Fisheries Survey. These data systems would alert fishery managers to changes in catch trends and allow initiation of the kinds of responses outlined here.

Section 304(i)(2) directs Councils to develop regulations to address the relative impact of U.S. fishing vessels. As discussed above, the impact on the stock is negligible and the current management framework allows for a timely response in the event that conditions in the fishery change such that additional measures are warranted.

Recommendations for International Actions

U.S. Trade

As noted in the section above, U.S. catch of yellowfin tuna—and tropical tunas generally—landed on the west coast has declined substantially over the past 20 years along with processing capacity. The minor role the U.S. now plays in harvesting tropical tunas in the EPO likely diminishes our influence in the IATTC. On the other hand, the U.S. continues to be a major importer of processed tuna, including yellowfin tuna. U.S. imports of all tuna species in all product forms accounts for about 6 percent of world catch over the past few years while imports of yellowfin tuna in frozen or fresh product forms accounts for about 1.5 percent of world catch (see Table 4).⁸ Canned tuna consistently ranks first or second in U.S. per capita consumption of seafood by type (National Fisheries Institute, www.aboutseafood.com/media/top_10.cfm). The U.S. also continues to be a major producer of processed tuna products. On average, 1996–2005, the U.S. accounted for 18 percent of global production (see Figure 4), although the U.S. share has been steadily declining over time, from 24.5 percent to 13.1 percent during that period (see Figure 5). In the larger context of trade, then, the U.S. remains a major player. This takes on added significance because the formula for calculating national contributions to the IATTC’s budget includes both catch and consumption. For this reason the U.S. continues to be a major contributor to the organization’s budget. Figure 6 shows imports of all tunas and yellowfin tuna from the 10 highest ranked source countries (the remainder summed under “other”). In terms of imports from IATTC member countries, for all tunas Ecuador falls within the top 10 while yellowfin tuna imports additionally include Panama, Mexico, and Costa Rica.

IATTC Conservation Measures for Yellowfin Tuna

The IATTC works by consensus; resolutions thus adopted impose an obligation on member states to implement consistent domestic regulations applicable to their national fleets. In response to indications of overfishing on both yellowfin and bigeye tuna,⁹ the IATTC has in recent years adopted conservation resolutions for these stocks. The most recent such resolution, [C-06-02](#), was adopted in 2006, applicable to 2007 only, and replaced a multi-year resolution (2004–06) adopted in 2004. It contains measures similar to the one it replaced. The main provisions in C-06-02 include a 41-day closure of the EPO purse seine fishery and national quotas for catches of bigeye tuna by longline vessels. (For the purse seine closure, countries chose between two periods defined by specific dates in order to reflect the different seasonal patterns of fisheries in the northern and southern hemispheres.) Subsequent evaluation of the implementation and effectiveness of this proposal by IATTC staff indicated that the measures were insufficient to end overfishing. The IATTC held three meetings in 2007 in order to adopt a conservation proposal to succeed C-06-02 for 2008 and beyond. An ad hoc meeting was held February 5–6 to consider management options for bigeye and yellowfin tuna conservation measures. No agreement could be reached on conservation proposals although additional scientific work evaluating various management concepts was agreed to. ([Document IATTC-75-05a](#), prepared by IATTC staff, responded to this request.) The 75th regular meeting of the IATTC was held in Cancun, Mexico, June 25–29. Three conservation proposals—from the U.S., Ecuador and Spain, and Mexico—were tabled at this meeting but none were adopted. The IATTC met again (the 76th meeting), October 22–24, in an attempt to reach consensus on a resolution based on the proposals put forward at the June meeting. Again, no agreement could be reached. Thus, as of the beginning of 2008 the current tuna conservation resolution expired without any

⁸ Globally yellowfin is a major constituent of canned tuna. However, the import statistics used above don’t distinguish by species for various packaged product forms such as canned or foil pouch packaged tuna.

⁹ A Secretarial determination that overfishing is occurring on bigeye tuna has also been made. The Council was informed December 15, 2004. Under provisions then applicable the Council amended the HMS FMP to address overfishing.

succeeding resolution coming into force. In response the IATTC has scheduled another meeting, March 5–7, 2008, in addition to the regular meeting to be held in June, in the hope of adopting conservation measures as soon as possible. In the absence of an IATTC agreement or unilateral actions by member countries, no measures to prevent overfishing are in place.

Recommendations for Pacific Council Consideration

The Council previously considered its response to overfishing of yellowfin tuna at its November 2006, April 2007, and September 2007 meetings. Based on advice from its advisory committees (the Highly Migratory Species Management Team and Highly Migratory Species Advisory Subpanel) the Council has discussed and evaluated specific conservation proposals. In advance of the June 2007 IATTC meeting, the Council provided recommendations to the U.S. delegation to the IATTC on conservation measures that should be considered for adoption. However, given the fluidity of the situation—the inability of the IATTC to reach agreement as of this writing¹⁰ on new conservation measures, and the fact that whatever is adopted is the product of negotiation between the parties—it does not seem very useful for the Council to identify specific conservation measures. A variety of measures have been proposed (and adopted previously) to address yellowfin overfishing and the IATTC staff has proven fully capable of providing advice on the utility of specific proposals. Thus both the problem and a range of potential solutions are well understood and the difficulty rests with reaching consensus on an efficacious set of measures.

Given these circumstances, this paper describes a broader range of potential Council recommendations than previously discussed by the Council, which are also more general in nature, suggesting areas where U.S. policy could focus. These recommendations take into account potential legislative remedies and the role of Congressional oversight since Section 304(i)(2)(B) directs them to Congress as well as the Department of State. Eight potential recommendations are outlined below. They are more or less ordered from very broad national policy goals to more specific proposals affecting the IATTC and the Council's role in international HMS management. The eight potential recommendations are:

1. Raise the visibility of tuna conservation in the U.S. foreign policy agenda.
2. Consider the role of trade and aid measures to exert pressure on fishing nations.
3. Recognize geographic, stock, and fishery linkages and develop strategic policies accordingly.
4. Ratify the Antigua Convention.
5. Support an external performance review to include an evaluation of decision-making procedures.
6. Vigorously support reducing the capacity of the purse seine fleet.
7. Promote conservation proposals based on national accountability.
8. Encourage and facilitate participation by U.S. Regional Fishery Management Councils in international fishery forums.

These recommendations have been drafted for discussion purposes; the Council may use them as a starting point for their decision making, selecting and modifying the concepts presented here as they deem appropriate. They are also intended to spark comment from the U.S. tuna industry and other stakeholders that would be affected by international actions. It is important to note that although the discussion of recommendations below contains declarative statements, such as “the U.S. should...,” this language is not meant to pre-judge what the Council may finally recommend. The language merely serves as a model of how recommendations could be framed. The Council can provide guidance on how best to set the tone of any final recommendations in terms of what phrasing should be used.

¹⁰ The IATTC is scheduled to meet the week before the Council takes final action to adopt recommendations, so the situation may have changed by that time.

Raise the visibility of tuna conservation in the U.S. foreign policy agenda

Current overfishing of yellowfin tuna is but one part of a larger problem of over-exploitation by various fisheries targeting highly migratory species stocks not under the jurisdiction of any one nation. In the Pacific both the EPO and Western and Central Pacific (WCPO) yellowfin tuna stocks have been designated subject to overfishing by the Secretary of Commerce. Bigeye tuna is considered a single Pacific stock and has also been declared subject to overfishing by the Secretary. North Pacific albacore tuna is likely subject to overfishing although no Secretarial declaration has been made, principally because scientific consensus has not been reached on what reference points should be used in determining stock status. Globally, according to the FAO (Majkowski 2007), about a quarter, 5 to 6 out of 23, of HMS stocks are considered either overexploited, meaning subject to fishing above a level which is sustainable, or depleted, meaning that catches are well below the historical maximum irrespective of fishing effort exerted. Global demand for tuna is unlikely to abate, driving further high levels of exploitation. It also appears that the IATTC is not alone in having difficulty adopting adequate conservation measures in the face of such pressure on the stocks. At its December 2007 meeting the WCPFC was unable to reach agreement on a stronger conservation and management measure for bigeye and yellowfin tunas in the WCPO to succeed the current, inadequate conservation and management measure.¹¹ Likewise, in the Atlantic, bluefin tuna, managed under the auspices of the International Convention for the Conservation of Atlantic Tunas (ICCAT), is severely depleted in the western Atlantic and overexploited in the east, according to the aforementioned FAO report. NMFS has recommended that all fishing on Atlantic bluefin tuna be halted for a specified time period to give the population a chance to rebound from historic lows. To date, this recommendation has not been embraced by the ICCAT membership. These developments suggest that the governance arrangements for managing highly migratory species—regional fishery management organizations or “tuna RFMOs”—may be approaching a point of crises and their future effectiveness in avoiding overfishing and overfished conditions may be called into question.

While the U.S. is an active participant in these governance arrangements, usually supporting needed conservation measures, the global issue of conservation and management of these stocks could be given greater attention as a foreign policy issue. This should be reflected in framing of bilateral relations with respect to countries participating in international tuna fisheries. The U.S. should pay particular attention to activities under a nation’s jurisdiction (fishing, processing, trade, reporting, etc.) that are disproportionately contributing to over-exploitation of a stock. In such cases the U.S. should identify means by which pressure could be exerted bilaterally so that the nation takes appropriate measures at the national level or accedes to the adoption of effective conservation measures, including verifiable monitoring and compliance, within the relevant RFMO.

Simultaneously the U.S. should continue its financial support of tuna RFMOs. Beyond contributions obligated by treaty arrangements, Congress (with advice from the Department of State and the Department of Commerce) should evaluate the feasibility and utility of a program of special grants tied to RFMO performance and directed to specific activities that would enhance such performance.

Consider the role of trade and aid measures to exert pressure on fishing nations

As noted above, while the U.S. may have lost some leverage in the IATTC because we are no longer a major fishing nation in the EPO, the U.S. continues to be a major importer, processor, and consumer of tuna, including yellowfin tuna. This suggests that trade measures could be an instrument to pressure countries to adopt certain conservation measures or environmental standards. This has been tried before

¹¹ The WCPFC distinguishes between resolutions, which are nonbinding, and conservation and management measures which are.

when in 1984 Congress amended the Marine Mammal Protection Act to compel other nations to harvest tuna in a “dolphin safe” manner. These provisions of domestic law ran afoul of our multilateral trade obligations when Mexico brought a complaint under the General Agreement on Tariffs and Trade (the GATT, predecessor of the current World Trade Organization, or WTO) in 1991, arguing that the provisions—which allowed the U.S. to embargo the importation (directly or through intermediary countries) of tuna from countries not adhering to standards in the Act—were an unlawful restraint of trade under GATT rules.¹² According to the WTO (http://www.wto.org/english/tratop_e/envir_e/edis04_e.htm), the reasoning behind the GATT’s finding that the U.S. could not impose comparable environmental standards on exporting nations was “then any country could ban imports of a product from another country merely because the exporting country has different environmental, health, and social policies from its own. This would create a virtually open-ended route for any country to apply trade restrictions unilaterally—and to do so not just to enforce its own laws domestically, but to impose its own standards on other countries.” Thus, while Congress responded to strong public sentiment opposed to the killing of “charismatic” marine mammals during fishing operations through the Marine Mammal Protection Act provisions, the desire to “export” environmental standards through the application of trade sanctions would seem to conflict with U.S. trade policy as reflected in our accession to multilateral trade agreements. This is not to say that the unfettered application of free trade principals is uncontroversial; the argument over “leveling the playing field” by demanding comparable environmental standards from our trading partners continues.

Section 205 of the MSA allows the U.S. to prohibit importation of fish from countries based on a determination from the Secretary of State that 1) the U.S. is unable to conclude an international fishery agreement allowing U.S. vessels access on reasonable terms to HMS fisheries over which a nation has jurisdiction or prohibits U.S. vessels from fishing for tuna in accordance with such an agreement, 2) does not comply with its obligations under an existing international fishery agreement concerning fishing by U.S. vessels, or 3) seizes U.S. vessels on the high seas in violation of an international agreement or bilateral agreement or based on a jurisdictional claim not recognized by the U.S. These provisions relate only to actions by foreign nations in relation to U.S. vessels.

Stock reference points are an environmental standard related to the level of fishing mortality that results in overfishing. In the international HMS fisheries context, Congress could consider an expansion of the aforementioned MSA provisions that would invoke trade measures against countries that demonstrably do not comply with measures adopted by RFMOs to end overfishing on or rebuild overfished stock of highly migratory species, or substantially contribute to overfishing of such stocks as defined by generally agreed upon reference points.

Recognize geographic, stock, and fishery linkages and develop strategic policies accordingly

Overfishing of yellowfin tuna cannot be effectively addressed in isolation; commercial fisheries catching yellowfin frequently catch overfished bigeye tuna, which is considered a single, Pacific-wide stock. Any set of management measures intended to address yellowfin overfishing will affect bigeye tuna. It should be noted that the WCPO yellowfin stock has also been declared subject to overfishing by the Secretary of Commerce. While scientists consider the stocks separate, it is important to bear in mind that the species is being subjected to elevated fishing pressure throughout its range in the Pacific.

¹² GATT sanctions were never imposed because Mexico later withdrew its complaint in favor of a bilateral agreement with the U.S. A related case brought before the GATT by the European Union reached broadly similar conclusions but sanctions were not imposed for procedural reasons. Congress subsequently modified the offending provisions in the Marine Mammal Protection Act.

Furthermore, changes in catchability in the EPO could cause vessels to shift into the WCPO. This has raised concerns among some members of the WCPFC that current excess capacity of fishing vessels could be increased by such a shift. Several Latin American countries have applied for cooperating non-member status with the WCPFC. In 2007 Belize, Costa Rica, and Ecuador applied. Only Belize's application was accepted. Discussion of the applications highlighted member's concerns about the potential increased presence of vessels from nations outside the region. The situation is complicated by the ability of member nations to license foreign vessels to operate within their EEZs.

While there are interconnections in terms of the deployment of fishing effort and their effects on yellowfin and bigeye stocks across the Pacific, institutionally and jurisdictionally the EPO and WCPO are separate, covered by the IATTC and WCPFC respectively. While there are historical and sound institutional reasons for having two RFMOs, the need to coordinate policies and management measures is likely to grow as long as pressure on the stocks continues. The IATTC and WCPFC have taken an initial step through semi-annual coordination meetings between the two secretariats. On the U.S. side separate sets of commissioners are appointed for each RFMO as are the advisory committees established in domestic law to provide stakeholder input. Likewise, different NMFS Regional Administrators lead the U.S. delegations in conjunction with the Department of State. While there are sound reasons for having separate arrangements—it allows NMFS personnel and stakeholders most concerned with regional issues to participate—consideration should be given to arrangements to enhance coordination of policy in a way that remains open to public scrutiny (discussed further below).

Fostering such coordination is principally an administrative obligation exercised through the Departments of State and Commerce. Nonetheless, in support to end yellowfin tuna overfishing, Congress could monitor any such efforts and determine the need for legislative remedies. Current arrangements—such as the size, composition, and function of advisory committees and the number and role of commissioners—are established in law. This suggests a potential Congressional role if oversight indicates inadequate progress in coordinating policy.

Ratify the Antigua Convention

In 2003, the IATTC adopted the Convention for the Strengthening of the Inter-American Tropical Tuna Commission established by the 1949 Convention between the United States of America and the Republic of Costa Rica (“Antigua Convention”). The purpose of the Antigua Convention is to update the original agreement to incorporate modern principals of fishery management; more precisely define the management area; harmonize provisions with international law principals reflected in the United Nations Convention on the Law of the Sea, Food and Agriculture Organization of the United States (FAO) Code of Conduct for Responsible Fisheries, and similar agreements; and allow new membership, including the European Union (a “regional economic integration organization”) and Chinese Taipei (a “fishing entity,” which may be a member but not a Party to the Convention, affording it slightly different rights). The Antigua Convention was opened for signature in Washington on November 14, 2003. The Convention will enter into force 15 months after the deposit of the seventh instrument of ratification or accession of the Parties to the 1949 Convention. To date 12 nations, the European Union, and Chinese Taipei have signed the convention; eight have ratified it but only three of these are Parties to the 1949 Convention. The U.S. has signed the Convention but not yet ratified it.

Implementing legislation to ratify the Antigua Convention is before Congress but currently is not being acted upon. If the conditions necessary for implementation of the Convention were met, this could support the ending of overfishing of yellowfin tuna by allowing the IATTC to operate under a modern charter consistent with current international law and principals of fisheries management.

Support an external performance review to include an evaluation of decision-making procedures

The Government of Japan, with assistance from the FAO, organized a joint meeting of tuna RFMOs, January 22–26, 2007, in Kobe, Japan. One of the outcomes of this meeting is a statement of “urgent actions” the participating RFMOs should take to improve management of tuna stocks. Among these recommendations is a call for each RFMO to undertake a performance review in accordance with guidelines described in an annex to the Course of Actions statement. The annex states that these “reviews should be conducted by a team of individuals drawn from the RFMO secretariat, members of that RFMO and outside experts, with a view to ensuring objectivity and credibility.” RFMOs are expected to act on the results of such performance reviews, and to encourage such actions the results should be made public. The U.S.’s commitment to this objective is reflected in the fact that Mr. David Balton, Deputy Assistant Secretary for Oceans and Fisheries, Department of State, facilitated the session at the Kobe meeting from which the recommendation for performance reviews emerged.

The U.S. should establish as a high priority in its work with the IATTC the completion of a performance review by the organization as described in Annex 1 of the Course of Actions statement, and encourage periodic reviews as recommended in the annex. To encourage and facilitate a performance review, the U.S. should underwrite the cost of outside experts (acceptable to the Parties) with proven expertise in evaluating organizational performance. While recognizing that consensus decision-making is a bedrock principal of the IATTC (and is enshrined in the Antigua Convention), in promoting a performance review the U.S. should highlight the need to investigate procedures and processes within a consensus framework that would help the IATTC to meet its objectives, and specifically make the adoption of conservation measures necessary to end overfishing more likely.

Vigorously support reducing the capacity of the purse seine fleet

In 2000 and 2002 the IATTC adopted resolutions that seek to control total fishing capacity of the purse seine fleet (C-00-10 and C-02-03). The 2000 resolution also called on staff, in cooperation with the Parties, to prepare a plan for regional management of fishing capacity. This plan was released in 2005 (<http://www.iattc.org/PDFFiles2/IATTC-73-EPO-Capacity-Plan.pdf>). The 2002 resolution specifies that the IATTC’s Vessel Register “established by the resolution of the 66th Meeting of the Commission, as of 28 June 2002, with any subsequent modifications that do not increase the total capacity of purse-seine vessels established in the Register, as the definitive list of purse-seine vessels authorized by the participants to fish for tunas in the EPO.” New vessels cannot be added to the Register except if vessels comprising equal or greater volume are removed.¹³ Well volume was adopted as the measure of capacity and the resolution identifies a target level of 158,000 m³. Currently the Register includes 236 purse seine vessels with a total well volume of 233,660 m³ (Figure 7 shows well volume by flag state). Furthermore, the resolution allowed Costa Rica, El Salvador, Nicaragua, and Peru to add vessels to those listed in the Register in 2002, which could potentially increase capacity by 18,720 m³. (The Register does not indicate which vessels, if any, were added under that provision. However, the current list does not include any vessels from Costa Rica, which according to the provision has a reserved capacity of 9,364 m³.) An earlier, 1998 resolution (C-98-11) identifies national capacity limits, which sum to a value close to the target level identified in the 2002 resolution. Table 5 compares capacity values from the Vessel Registry to the national limits identified in 1998.

Excess capacity exacerbates current problems with overfishing. While other controls (e.g., quotas, seasons, closed areas) can sufficiently limit fishing mortality in the absence of capacity limits, it is harder to reach agreement on such limits when there is too much capacity. Excess capacity can also be thought

¹³ A vessel can be temporarily removed from the active category on the registry and another vessel substituted for the inactive period.

of as over-capitalization, a common problem with common pool resources such as fish. Because individual fishers—or within an RFMO like the IATTC, nations—are competing to catch fish, there is a tendency to increase fishing power (through vessel size and other technological investments) beyond what is needed to efficiently catch fish at the target MSY level. Other controls therefore make the invested capital all the more inefficient; within the IATTC, which is essentially a forum for negotiation under consensus rules, this makes agreement much harder.

The U.S. should make capacity reduction for the EPO purse seine fleet a high priority. This should go beyond simply pushing IATTC members to institute measures to achieve the goal identified in C-02-03 and in the plan for regional management of fishing capacity. Domestically, the U.S. has established programs that subsidize purchasing and retiring vessels along with associated fishing rights (such as permits). A 2003 program that reduced capacity in the west coast groundfish trawl fleet offers an example. Through direct subsidy and concessionary loans provided by Congressional appropriation, about a third of the vessels and associated permits were retired, which accounted for half of historic catch. (Because the fishery is subject to license limitation, permit retirement results in a permanent reduction in the number of participants.)

The U.S. should develop a similar proposal for the EPO tuna purse fleet, consistent with the IATTC capacity reduction objective and the framework outlined in the plan for regional management of fishing capacity. If a feasible program can be designed, Congress should consider an appropriation, within existing or as additional foreign aid, to help subsidize loans necessary to fund initial purchase and retirement of vessels with administration through the IATTC and resting primarily at the national government level. Any U.S. financial commitment should be tied to similar national and multilateral commitments, through public financial institutions and the like. Any such program must be contingent on meeting and maintaining a specific capacity target, such as the one identified in C-02-03. (It is apparent that the national capacity limits identified in C-98-11, and generalized to the target in C-02-03, were not sufficient to prevent them from being exceeded. Going forward, these limits must become binding.) One complication, reflected in the IATTC resolution, is the desire—expressed in the resolution as a right—for “coastal States and other States with a longstanding and significant interest in the tuna fisheries of the EPO to develop and maintain their own tuna fishing industries.” This statement reflects the concern of nations with a nascent, or non-existent, purse seine fishery to accede to a program with permanent national limits on capacity. This would have to be taken into account in program design. For example, a cap and trade system could be instituted to allow the transfer of unused capacity, which could become available if a vessel buyback program was able to bring total capacity below targets (and tradability could offer an additional financial incentive to reduce capacity beyond the target if any resulting capacity credit could be sold).

Admittedly, there are a host of other problems and challenges in implementing such a program, such as the disposition of bought back vessels, which if not addressed allows their displacement into other regions and fisheries. However, the biggest constraint is one of U.S. resolve reflected in where a commitment to addressing the status of EPO stocks falls on the national policy agenda, as discussed above.

Promote conservation proposals based on national accountability

The IATTC has under its auspices many of the elements of an effective international fishery management program. The major target stocks are subject to regular and reliable assessment, making it possible in most cases to identify (at least candidate) reference points and targets. The Commission also has a well-developed program for fishery monitoring and data gathering (which supports stock assessment). This makes possible the identification and development of effective management measures, supported by accurate evaluation by Commission staff. As already discussed, the problem lies with the adoption of effective management measures. Although difficult in any national or sub-national program (as

participants in regional fishery management councils can attest to), a forum of sovereign nations reliant on consensus compounds the difficulty when interests significantly diverge. Rather than proposing specific measures, which are likely to become obsolete with the next negotiation, recommendations are made here on the types of management measures that should receive priority.

An output control, in the form of total allowable catch limit (TAC) should have highest priority. The IATTC in fact already applied a TAC to the longline fishery for bigeye tuna in the expired conservation resolution (C-06-02) and both the U.S. and Ecuador/Spain proposals tabled in 2007 included a yellowfin tuna TAC for the purse seine fishery. A TAC is a more direct, transparent method to control catch than effort controls (such as seasons and area closures) that limit inputs. Furthermore, given the long history of IATTC port samplers—who work in member countries to gather fisheries-dependent data, along with landing quantities—a TAC may be a more accurate method to potentially manage overfishing in comparison to a time/area closure. (This is not to say that other types of controls are unnecessary; a TAC cannot address some problems, such as the effect of catching smaller fish on total yield, excess capacity, and “derby” fisheries where individual fishers are competing against one another to catch a share of the available TAC). If feasible, once a TAC is established, additional measures should focus on accountability. Accountability can be achieved by assigning catch limits to vessels (the tabled U.S. proposal included a 500 mt purse seine vessel limit for bigeye tuna). National quotas are an intermediate form of accountability that would allow national governments to design programs for the allocation of fishing privileges (quota) to its flag vessels. Document IATTC-75-05a, *Staff Response to Requests from Ad Hoc Meeting, February 2007*, includes a discussion of the issues surrounding the use of national quotas and individual fishing quotas.¹⁴ The paper notes that allocation would likely be controversial (as it almost always is at the sub-national level) because national quotas are “often seen as unfair by states that have aspirations to develop their tuna industries.” Individual vessel quotas, unless tradability is introduced, are likely to reduce flexibility and efficiency since vessels vary in their effective fishing power or capacity to catch fish (effectiveness is meant to include both human and physical capital, or differences in knowledge and skill that differentiate “highliners” from underperformers). Nonetheless, the U.S. should continue to advocate for TAC-based approaches with an accountability element.

As discussed above, a factor contributing to overfishing, because it reduces yield, is the reduction in the average size of fish caught. (This is a problem for both yellowfin and bigeye tuna.) The increased use of FADs is implicated in this reduction because smaller-sized fish seem to be attracted to these devices. FADs also increase fishing power by concentrating fish in predictable ways. (A vessel can deploy multiple FADs knowing that it can rotate amongst the FADs, returning to each after sufficient time has passed for new fish to have been attracted.) Thus FADs can be viewed as another dimension of the overcapacity problem. Although the IATTC has the Registry and various systems to monitor vessel activity, no equivalent program exists to monitor the number of FADs being deployed, a prerequisite to any agreement to limit their use. The U.S. should promote a program like the Vessel Registry for FADs that would allow accounting for the number being used with some information on their characteristics. Like vessels, FADs should be appropriately marked to enhance monitoring, and ultimately enforcement, if limits are agreed to. Once an effective monitoring program has been instituted, the U.S. should promote an evaluation to see if limits need to be placed on their deployment.

¹⁴ Individual fishing quotas (IFQs) have found wide application in fishery management. Explaining the benefits of and issues surrounding IFQ programs is beyond the scope of this report. Briefly, IFQs assign divisible catch privileges (quota shares) to individuals (effectively, to vessels); the shares can be traded among program participants. The total catch limit is set externally and determines the actual quantity associated with a share. Tradability generally promotes economic efficiency because those with higher profits (lower costs, higher per unit revenue) will purchase shares from less efficient operators, who are thus compensated for not participating.

Encourage and facilitate participation by U.S. Regional Fishery Management Councils in international fishery forums

Unlike the Atlantic, where U.S. HMS fisheries are managed directly by NMFS through a Secretarial FMP, in the Pacific both the Pacific and Western Pacific Councils have developed HMS FMPs. The Councils serve as co-management forums, where state and Federal officials and resource stakeholders work together to develop policies and specific management proposals, which are then implemented by NMFS. Because effective HMS management must involve international action through tuna RFMOs, the Councils can serve as a conduit for domestic interests to play a role in shaping U.S. policy and positions subsequently represented at the RFMOs (and through any related bilateral arrangements). The Western and Central Pacific Fishery Convention Implementation Act (Title V of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006) provides for participation by the Councils with regard to the WCPFC. The Act designates two of the five U.S. Commissioner seats for representatives of the Pacific and Western Pacific Councils. It establishes an advisory committee and designates one seat for a representative from the Western Pacific Council advisory committee (no equivalent designation is made for the Pacific Council). It also directs the Secretary of Commerce, in cooperation with the Secretary of State, to conclude a memorandum of understanding (MOU) with the Pacific, Western Pacific, and North Pacific Councils. The MOU “clarifies the role of the relevant Council or Councils with respect to—

- (1) participation in U.S. delegations to international fishery organizations in the Pacific Ocean, including government-to-government consultations;
- (2) providing formal recommendations to the Secretary and the Secretary of State regarding necessary measures for both domestic and foreign vessels fishing for these species;
- (3) coordinating positions with the U.S. delegation for presentation to the appropriate international fishery organization; and
- (4) recommending those domestic fishing regulations that are consistent with the actions of the international fishery organization, for approval and implementation under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.)”

These provisions reflect Congress’s intent that the Councils play an active role in formulating U.S. positions and policies with respect to international management of HMS. Subsequent to adoption of the MOU, the Secretary of State and Secretary of Commerce should act in good faith to ensure that the objective of effectively involving the Councils—as a conduit to elevate the concerns of domestic stakeholders to the RFMO arena—is met. Good faith is necessary because the heads of the IATTC and WCPFC delegations, who articulate U.S. positions in bilateral and multilateral discussions, are Federal officials. It is the responsibility of government that the heads of these delegations faithfully and accurately takes account of the views expressed by Councils in representations made at the international level.

In particular, the U.S. representatives to the RFMOs should work with the Councils on the timing of Council and RFMO meetings to facilitate the provision of Council positions. Currently, for example, the Northern Committee, an ancillary body of the WCPFC responsible for species occurring principally north of 20° N latitude (including species important to west coast fisheries), holds its annual meeting during the same week as one of the Pacific Council’s regularly scheduled meetings.

The Secretary of State and Secretary of Commerce should ensure adequate representation of the Councils on the advisory bodies for the RFMOs established in domestic law, beyond the Western Pacific Council

designated position referenced above.¹⁵ In doing so, it is important to distinguish between representation by those involved in the Council process, but expressing their own views, and advisory committee members who would represent positions formally adopted by the Councils.

Mechanisms, mentioned above, to enhance coordination of U.S. policy with respect to the IATTC and WCPFC should also involve the Councils and encourage coordination between the Pacific and Western Pacific Councils with respect to the provision of advice. This could include NMFS, working above the regional level, on measures to coordinate policy that facilitate the two Councils working together to develop a common policy agenda and the organization of joint meetings of the advisory committees for the IATTC and WCPFC.

Congress should monitor the implementation of the MOU and any other measures to enhance stakeholder involvement and at some future date assess the need for additional legislation. Such legislation could:

- Designate IATTC Commissioner seats for the Pacific Council, Western Pacific Council, or both Councils, similar to the current arrangement for WCPFC Commissioners;
- Designate additional seats on the RFMOs advisory bodies for Council representatives;
- Provide for compensation of expenses for IATTC advisory committee members, similar to the terms established for the WCPFC advisory committee;
- Further specify the Councils' role in U.S. delegations to the RFMOs.

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¹⁵ Nominations to the newly-established WCPFC advisory committee were solicited in 2007 and are currently under review. Nominations for new terms on the existing IATTC advisory committee were solicited in 2006. The Pacific Council did not submit any nominations at that time.

Table 1. Stock status metrics under the base case and stock recruitment relationship scenarios and applying the recent level of fishing mortality. (Source: Maunder 2007, see description below.)

	Base case	Stock recruitment relationship assumed	Average <i>F</i> 2004-2006
AMSY	289,140	301,867	288,569
B_{AMSY}	417,813	550,277	416,324
S_{AMSY}	4,738	6,539	4,712
Crecent/AMSY	0.59	0.56	0.59
B_{recent}/B_{AMSY}	0.96	0.73	0.96
S_{recent}/S_{AMSY}	0.94	0.68	0.95
$S_{AMSY}/S_{F=0}$	0.36	0.42	0.36
<i>F</i> multiplier	0.88	0.59	0.96

Caption for table 5.1 (Maunder 2007): AMSY and related quantities for the base case and the stock-recruitment relationship sensitivity analysis, based on average fishing mortality (*F*) for 2004 and 2005. The quantities are also given based on average *F* for 2004-2006. *B*recent and B_{AMSY} are defined as the biomass of fish 2+ quarters old at the start of the second quarter of 2007 and at AMSY, respectively, and *S*recent and S_{AMSY} are defined as indices of spawning biomass (therefore, they are not in metric tons). Crecent is the estimated total catch from the second quarter of 2006 through the first quarter of 2007.

Table 2. Comparison of yellowfin tuna landings on the U.S. west coast to total U.S. landings in the EPO, 1981-2006. (Note: 2005–06 IATTC data reportedly incomplete.)

Year	West Coast	Total U.S. EPO	West Coast, % of Total
1981	76,091	97,534	43.8%
1982	61,769	93,114	39.9%
1983	55,482	57,909	48.9%
1984	35,063	49,185	41.6%
1985	15,025	75,912	16.5%
1986	21,517	68,098	24.0%
1987	23,201	64,957	26.3%
1988	19,520	65,188	23.0%
1989	17,615	83,877	17.4%
1990	8,509	110,005	7.2%
1991	4,178	126,827	3.2%
1992	3,350	91,315	3.5%
1993	3,795	143,235	2.6%
1994	5,056	154,170	3.2%
1995	3,038	146,188	2.0%
1996	3,347	131,549	2.5%
1997	4,775	162,299	2.9%
1998	5,799	115,775	4.8%
1999	1,353	96,223	1.4%
2000	1,158	108,708	1.1%
2001	655	92,897	0.7%
2002	544	92,829	0.6%
2003	465	72,987	0.6%
2004	488	47,158	1.0%
2005	285	58,874	0.5%
2006	77	84,815	0.1%

west coast landings from 2007 HMS SAFE, Table 4-4; Total U.S. EPO landings from IATTC catch report data available at <http://www.iatcc.org/CatchReportsENG.htm>.

Table 3. Comparison of recreational and commercial yellowfin tuna catch on the west coast. Recreational catch is given in numbers of fish and converted to metric tons using an average weight of 5.4 kg. Note that CPFV catch is for the U.S. EEZ and does not include catches made in Mexican waters. (Source 2007 HMS SAFE)

Year	Recreational Catch			Commercial (mt)	Recreational, % total
	Private	CPFV	MT		
2004	4,100	8,330	67.12	488	12.09%
2005	4,200	5,630	53.08	285	15.70%
2006	6,200	5,255	61.86	77	44.55%

Table 4. U.S. imports of all tunas (all product forms) over total world catch, mt, and U.S. imports of yellowfin tuna (fresh and frozen) over total world catch, mt. (Sources: U.S. imports from NMFS Office of Science and Technology, foreign trade statistics, <http://www.st.nmfs.noaa.gov/st1/trade/index.html>; total production from Food and Agriculture Organization FishStat Plus database, <http://www.fao.org/fishery/topic/16073>.)

	2000	2001	2002	2003	2004	2005
All Tunas*						
U.S. imports	268,996	232,992	249,671	296,992	284,388	287,736
Total catch	4,421,367	4,408,320	4,742,835	4,898,751	4,982,464	5,004,199
	6.1%	5.3%	5.3%	6.1%	5.7%	5.7%
Yellowfin						
U.S. imports	16,443	19,531	20,585	20,879	21,457	23,067
Total catch	1,185,804	1,335,636	1,349,466	1,437,057	1,323,694	1,296,137
	1.4%	1.5%	1.5%	1.5%	1.6%	1.8%

*For U.S. imports all product forms (all tunas) are shown aggregated; for total production the following species are shown aggregated: Albacore, Atlantic bluefin tuna, Bigeye tuna, Black skipjack, Blackfin tuna, Bullet tuna, Dogtooth tuna, Frigate and bullet tunas, Frigate tuna, Kawakawa, Little tunny(=Atl.black skipj), Longtail tuna, Pacific bluefin tuna, Skipjack tuna, Southern bluefin tuna, Yellowfin tuna,

Table 5. Comparison of vessel capacity listed in IATTC Vessel Registry and national limits identified in IATTC resolution C-98-11. Blank entries under C-98-11 indicate countries for which limits were not identified.

Country	Current Registry	National limits in C-98-11	Excess*
Belize	0	1,877	-1,877
Bolivia	222		222
Colombia	12,974	6,608	6,366
Costa Rica	0	6,000	-6,000
Ecuador	61,804	32,203	29,601
El Salvador	7,415	1,700	5,715
Guatemala	7,337		7,337
Honduras	1,700	499	1,201
Mexico	57,896	49,500	8,396
Nicaragua	6,023	2,000	4,023
Panama	33,978	3,500	30,478
Peru	542		542
Spain	6,955	7,885	-930
United States	4,775	8,969	-4,194
Vanuatu	3,609	12,121	-8,512
Venezuela	28,430	25,975	2,455
Total	233,660	158,837	74,823

*Negative value indicates below resolution limit

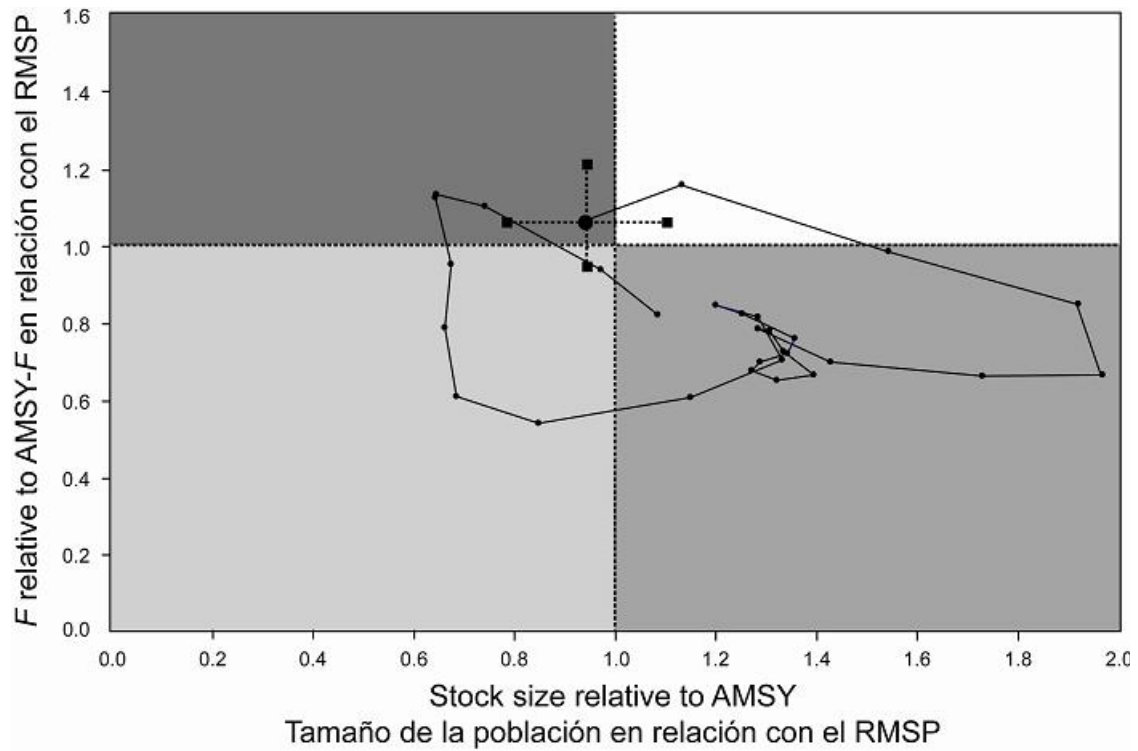


Figure 1. Phase plot for yellowfin tuna. (Reproduced from Maunder 2007)

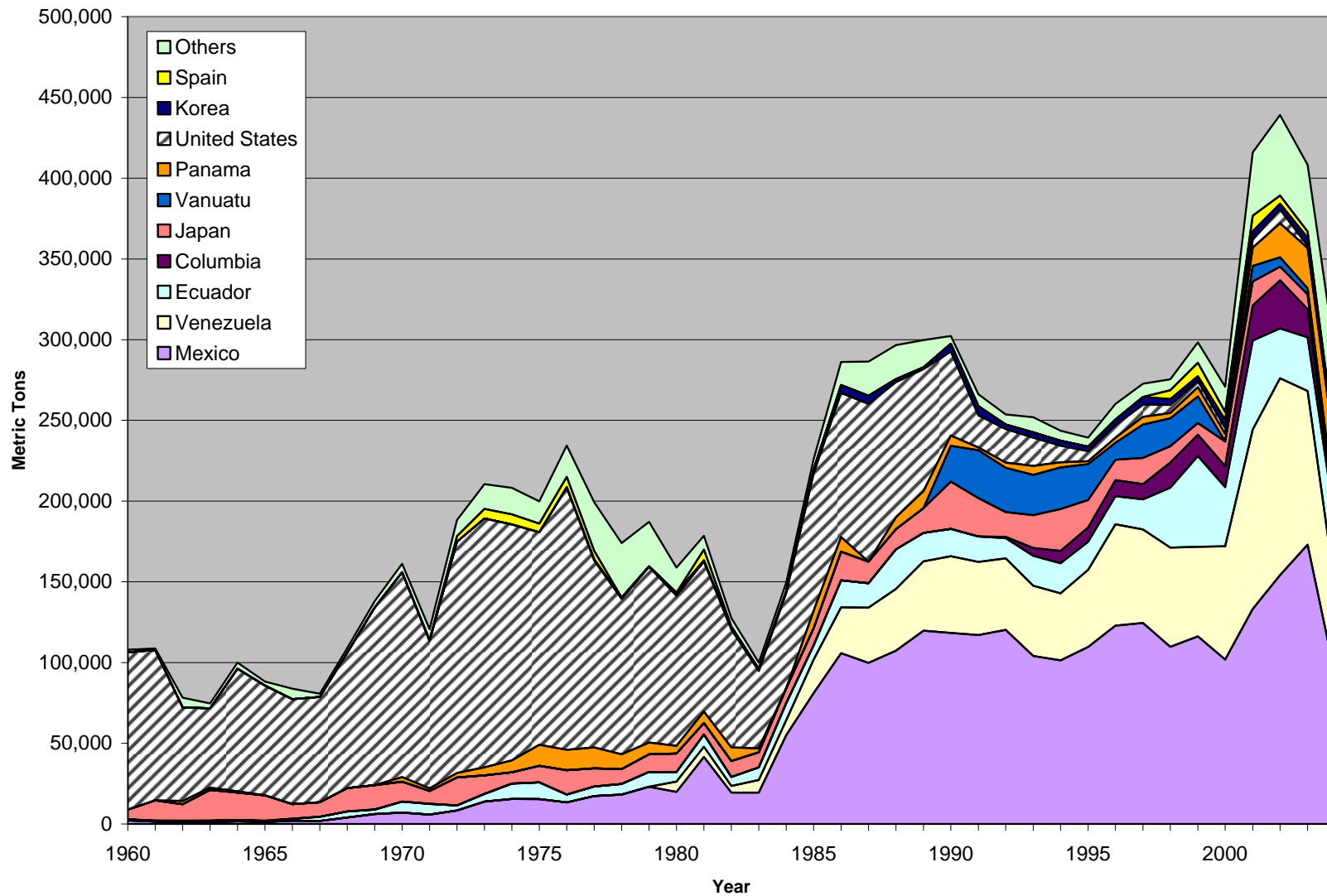


Figure 2. Catch of yellowfin tuna in the EPO (mt), by nation, 1960-2004. The top ten countries for average landings, 1994- 2004, are shown. The following are grouped under other: El Salvador, Chinese Taipei, China, Honduras, Costa Rica, Belize, French Polynesia, Peru, Chile, Nicaragua, Guatemala, Bermuda, Canada, Cayman Islands, Netherlands, Senegal, Other (IATTC category). (Source: IATTC catch report data, available at <http://www.iattc.org/CatchReportsENG.htm>)

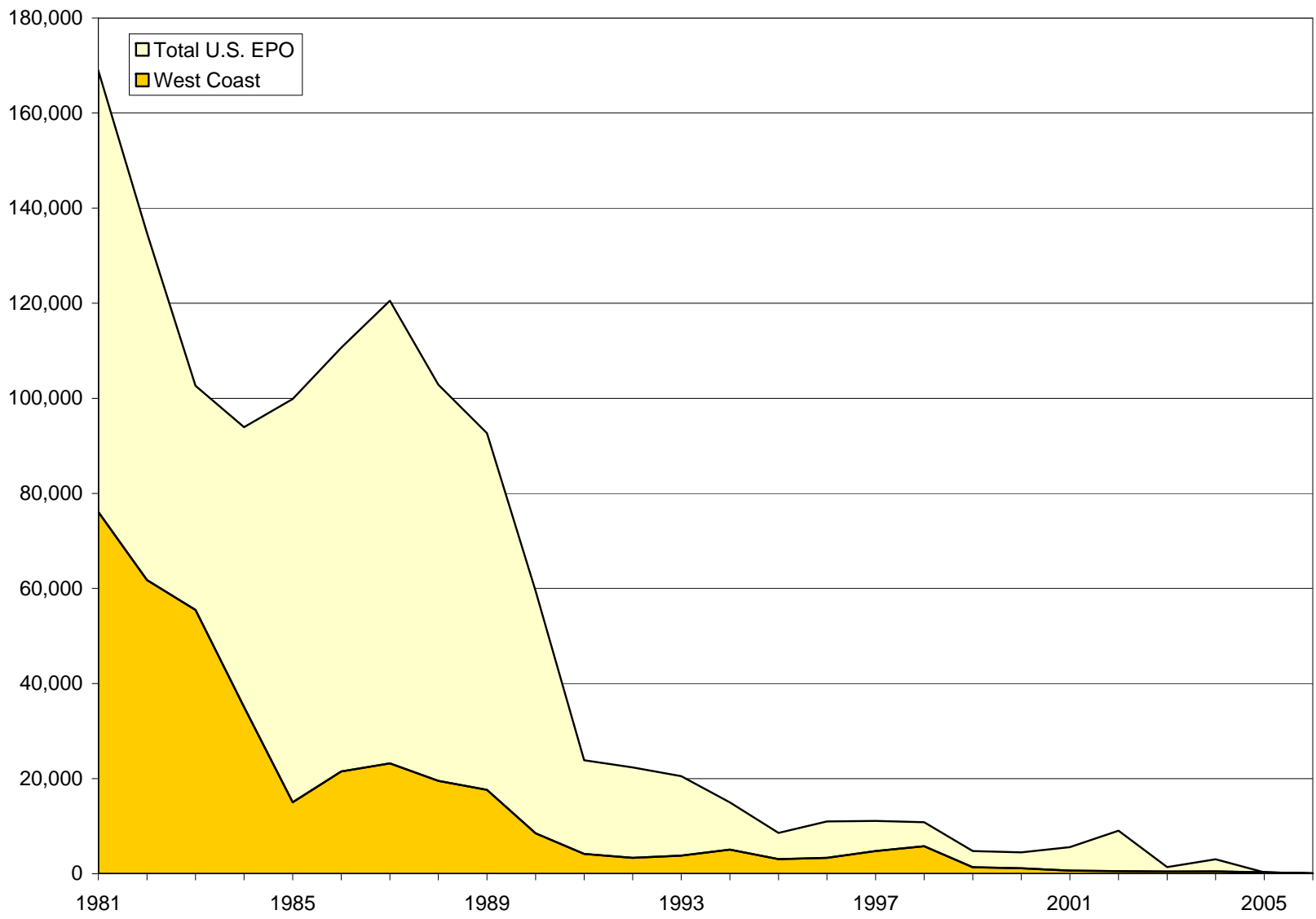


Figure 3. Comparison of total U.S. EPO yellowfin catch with west coast landings (sources: IATTC catch data and 2007 HMS SAFE).

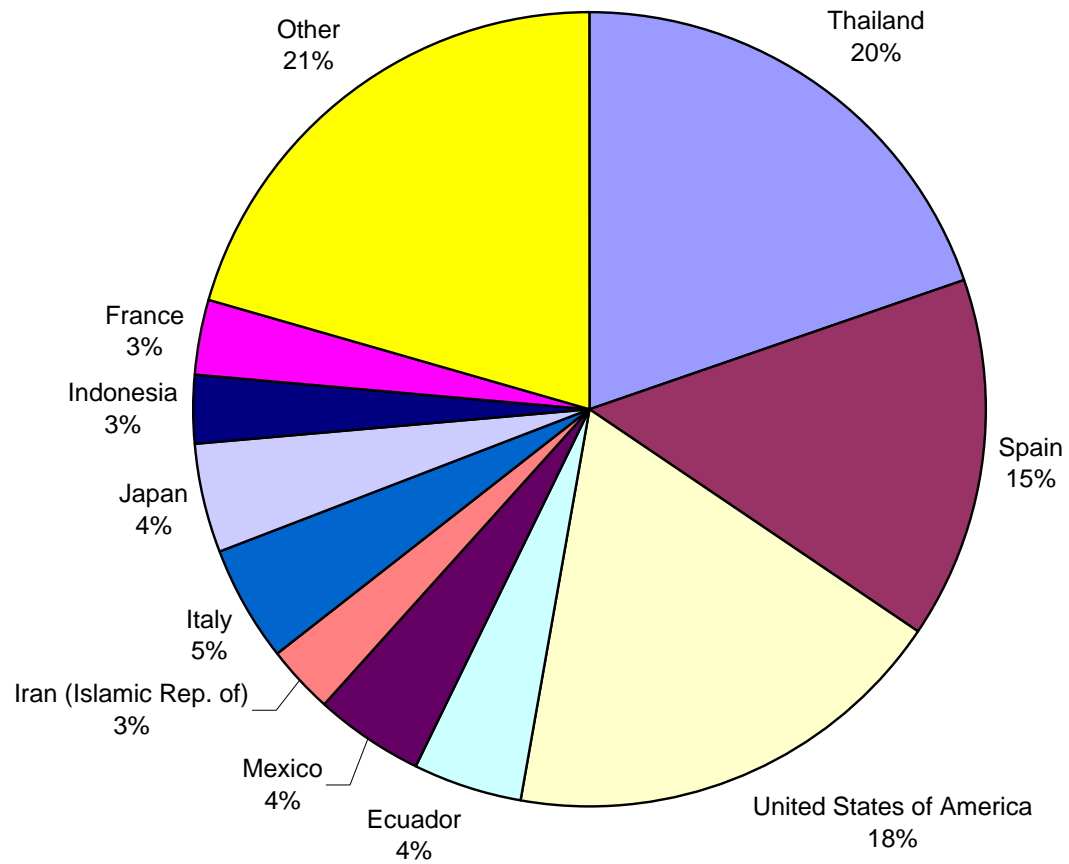


Figure 4. Average production of tuna products by country, 1996–2005. (Source: FAO FishStat Plus)

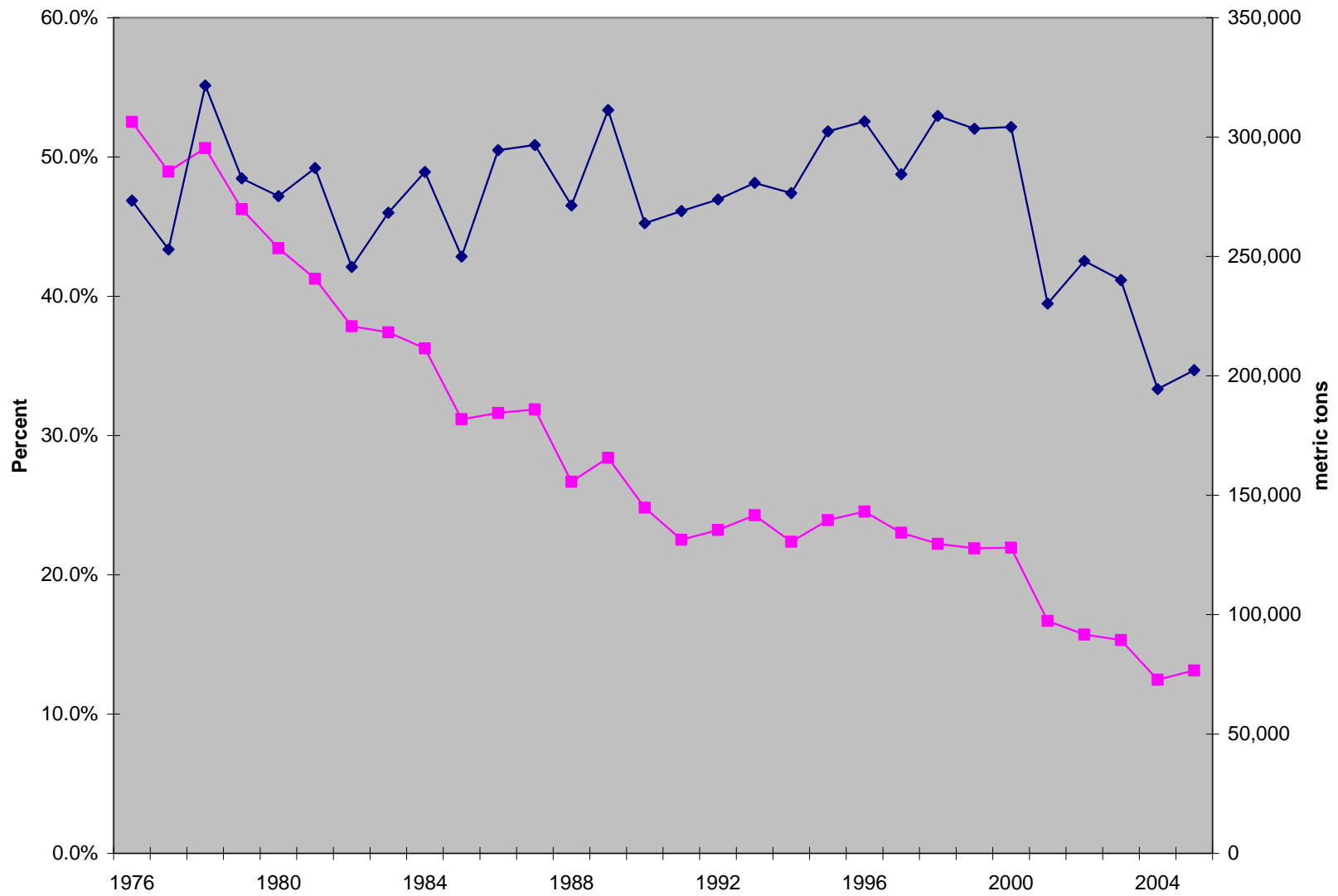


Figure 5. U.S. production of tuna products, mt, (blue line) and share of global production (red line), 1976–2005. (Source: FAO FishStat Plus.)

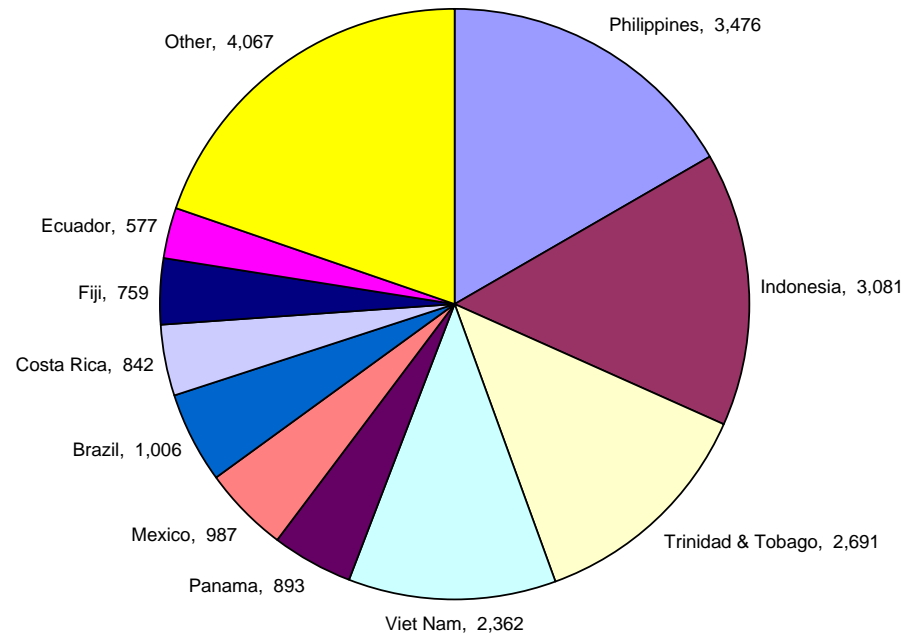
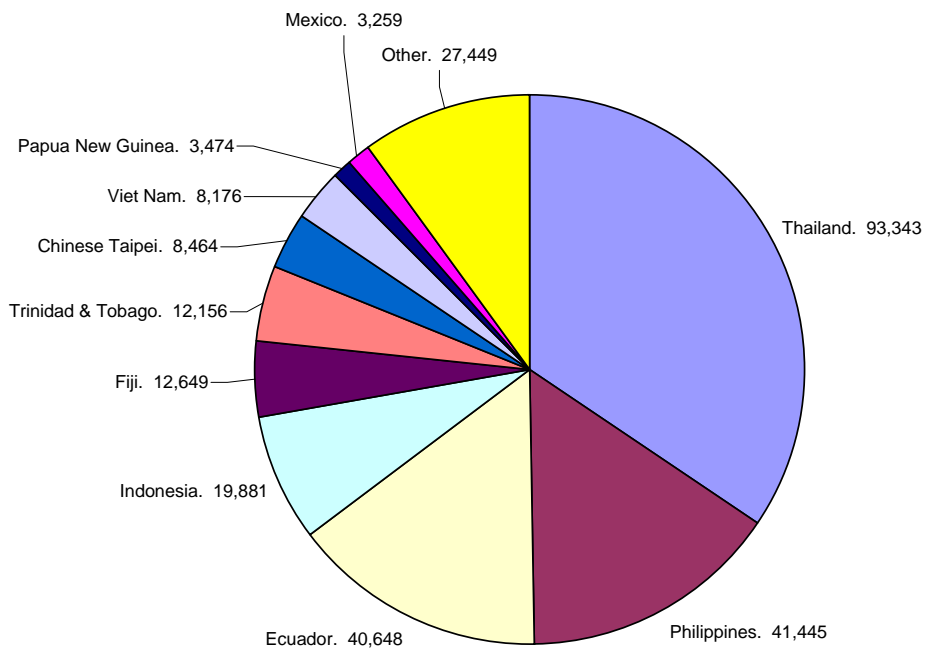


Figure 6. U.S. imports, mt, by country for all tunas (left) and yellowfin tuna (right), average 2000–06. (Source NMFS Office of Science and Technology, foreign trade statistics, <http://www.st.nmfs.noaa.gov/st1/trade/index.html>)

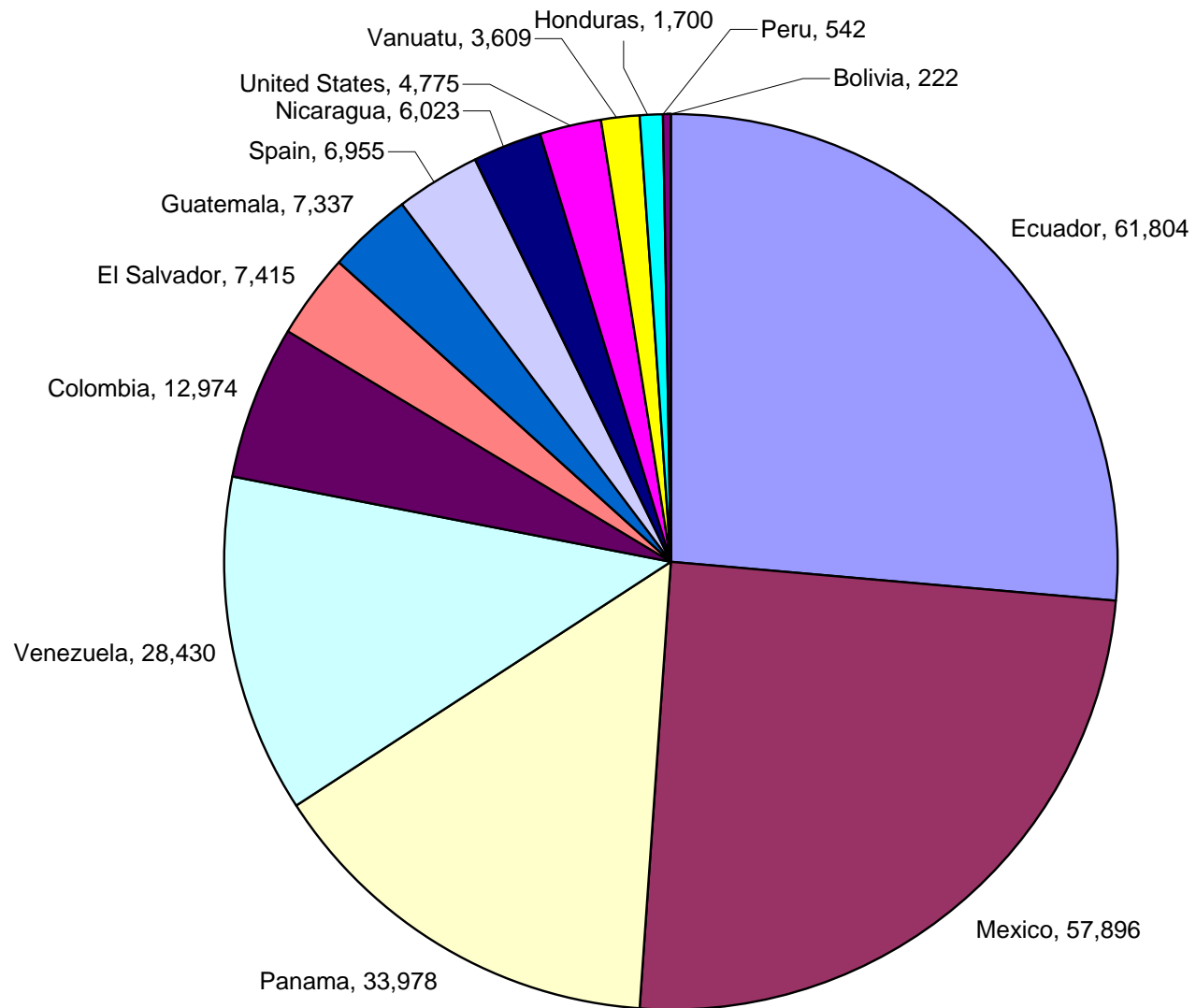


Figure 7. Well volume (cubic meters) of vessels on the Vessel Registry, by country. (Source: IATTC)