ISSF INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION

ISSF Technical Report 2017-05

A SNAPSHOT OF THE LARGE-SCALE TROPICAL TUNA PURSE SEINE FISHING FLEETS as of June 2017

Ana Justel-Rubio, Lorena Recio and Víctor Restrepo / **August 2017, Version 5.0**

Suggested citation:
Justel-Rubio, A., Recio, L. and Restrepo, V. 2017. A Snapshot of the Large-Scale Tropical Tuna Purse Seine Fishing Fleets as of June 2017 (Version 5). ISSF Technical Report 2017-05. International Seafood Sustainability Foundation, Washington, D.C., USA

Topic Categories: Purse seine, Tropical tuna

Abstract

Purse seine vessels account for over 60% of the world's tuna catch. However, the number of purse seiners operating in the various oceans is not available from a single source. In this paper we estimate the number and fishing capacity of tuna purse seiners based primarily on information available from the five tuna Regional Fishery Management Organizations (RFMOs). After accounting for possible duplicate entries, we calculate that as of June 2017 there are at least 1,815 purse seiners fishing for tunas worldwide. This is likely an underestimate because many small-scale purse seiners or purse seiners operating in only one EEZ do not have to be listed on RFMO records of authorized fishing vessels. Focusing on large-scale purse seiners (defined here as having 335 m^3 fish hold volume or greater) that target tropical tunas (skipjack, yellowfin and bigeye), we calculate there are 685 such vessels with a combined fishing capacity of over 860,000 m^3. The number of these vessels decreased by about 6% during the past year. Of those 685 large scale purse seine vessels fishing for tropical tunas, 512 are registered on the ISSF Pro Active Vessel Register (PVR), which represent 75% in number and 82% in fish hold volume (FHV). About 24% of these 685 large-scale vessels are authorized to fish in more than one RFMO, which should be taken into account in any efforts to manage fishing capacity at a regional level.

August 2017

The research reported in the present Technical Report was funded by the International Seafood Sustainability Foundation (ISSF).

ISSF is a global coalition of scientists, the tuna industry and World Wildlife Fund (WWF) — the world's leading conservation organization — promoting science-based initiatives for the long-term conservation and sustainable use of tuna stocks, reducing bycatch and promoting ecosystem health. ISSF receives financial support from charitable foundations and industry sources.

To learn more, visit **iss-foundation.org**.

Table of Contents

1. Introduction

Purse seine fishing vessels catch about 64% of the 4.7 million tonnes of tunas taken annually worldwide (ISSF, 2017). Of the tropical tunas, purse seiners generally target skipjack and yellowfin, though they also catch bigeye tuna associated primarily with floating objects.

In recent years, several authors have estimated the number of vessels and fishing capacity of tropical tuna purse seine fleets either regionally (e.g., Gillett and Lewis, 2003) or globally (Joseph, 2003; Reid et al., 2005; Restrepo and Forrestal, 2012; Justel-Rubio and Restrepo, 2014-2016). The aim of this paper is to provide an updated "snapshot" of the purse seine fleet as of the end of June 2017 based primarily on the records of authorized vessels established by the five tuna RFMOs, as in Restrepo and Forrestal (2012) and Justel-Rubio and Restrepo (2014-2016). Some of the key factors taken into consideration in this series of studies are new vessels that are launched and improvements to the data contained in the RFMO records.

2. Methods

The Glossary (Appendix 1) defines acronyms used in this document.

We generally used the same sources of information and methodology used in the 2016 snapshot (Justel-Rubio and Restrepo, 2016). Vessel registers from all tuna RFMOs were consulted, as well as the IHS Sea-Web database (IMO number database) and the TURBOBAT, a database maintained by the IRD (Institut de Recherche pour le Développement), the IEO (Spanish Institute of Oceanography) and SFA (Seychelles Fishing Authority) that focuses primarily on European and associated flag vessels fishing for tropical tunas in the Indian Ocean. For this update, we also consulted the recently revised version of the Consolidated List of Authorized Vessels (CLAV).

The following steps were taken to compile the former list of vessels:

1. Retrieve the CCSBT, FFA, IATTC, ICCAT, IOTC and WCPFC lists and select purse seine vessels only.
2. Identify duplicates. This involved sorting by IMO, or by Flag and then by name, and manually identifying vessels of the same name or similar name (e.g., "No. 8 XXX" and "XXX No. 8") and the same characteristics such as size or radio call sign. The CLAV was consulted as needed.
3. Fill in missing fields (hold volume, fish carrying capacity, LOA) when data were available from the TURBOBAT file or IHS Sea-Web database.
4. Set LOA: If several vessel size measurements were available, LOA was set to the largest value. This is because usually either LOA or LBP, or both, are reported in the RFMO lists and LOA>LBP.
5. Set GRT: If several vessel tonnage values were available, GRT was set to the smallest value. This is because usually GRT and GT are recorded in the lists and GRT<GT.
6. Use relationships between different vessel attributes to calculate FHV for all vessels (see Sections 3.1 and 3.2) that are missing that information.
7. Determine large-scale purse seine vessels and quantify them by Flag, including FHV estimates.
8. Identify a subset of those large-scale vessels that likely target tropical tunas and quantify them.

All records from the previous version of the database were verified with updated versions of the tRFMO databases and missing values completed with the supporting databases available (IHS Sea-Web database and up-to-date TURBOBAT file). Strict quality control measures were applied to identify possible duplicate records. Length measures were again divided in LOA, LBP and RGL; and Gross Tonnage data grouped in GRT and GT.

For steps 6 and 7 we used the relationships between vessel attributes calculated using a likelihood-based approach that we used in the last snapshot (Justel-Rubio and Restrepo, 2016) (described in Appendix 2). These relationships are used to categorize Large-Scale purse seine vessels following the ISSF definition, that is, purse seine vessels with ≥ 335 m^3 of capacity (fish hold volume, FHV). Taking into consideration the goodness of fit (the measure of how well the response variable is explained by the model) of the various relationships, LOA and FHV missing values were filled in this order:

1. Fill in LOA:
   If GT is available, then use the **GT-LOA** relationship.
   If GT is not available but GRT is, then use the **GRT-LOA** relationship.
2. Fill in FHV:
   If FCC is available, use the **FHV-FCC** relationship.
   Otherwise, use the **FHV-LOA** relationship.

Note that, with the aim of improving the reliability of FHV estimates, the relationships between FHV and other variables (FHV-FCC, FHV-LOA) are those calculated by Restrepo and Justel-Rubio (2016), which were based only in a subset of vessels which listed at the Inter-American Tropical Tuna Commission (IATTC) Record as of April 2016. The reason to do so is that the IATTC has been the only tRFMO to verify vessels' reported FHV values up to January 2017. A more detailed

explanation on the calculation of FHV for tuna purse seine vessels following a maximum likelihood approach can be found in ISSF Technical Report 2016-10 (Restrepo and Justel-Rubio, 2016).

In doing the analyses, it became evident that some vessels are now flagged to countries that did not appear in the last snapshot (Justel-Rubio and Restrepo, 2016), and some vessel flags are no longer represented in the list of currently active vessels. We therefore updated the list of countries according to the International Monetary Fund's April 2017 World Economic Outlook[1], in two broad IMF groupings: "Advanced Economies" (Developed) and "Emerging and Developing Economies" (Other). **Table 1** summarizes the flag codes and development status of the flag states in this paper.

***Table 1**. Flag codes used in this paper. The column Economy indicates whether a given flag was treated as a developed economy in this study.*

FLAG	NAME	ECONOMY	FLAG	NAME	ECONOMY	FLAG	NAME	ECONOMY
ALB	Albania	Other	GTM	Guatemala	Other	PNG	Papua New	Other
DZA	Algeria	Other	IDN	Indonesia	Other	PER	Peru	Other
AUS	Australia	Developed	IRN	Iran	Other	PHL	Philippines	Other
BLZ	Belize	Other	ITA	Italy	Developed	SEN	Senegal	Other
CPV	Cape Verde	Other	JPN	Japan	Developed	SYC	Seychelles	Other
CHN	China, P.R.	Other	KIR	Kiribati	Other	SLB	Solomon	Other
TWN	Chinese	Developed	KOR	Korea, Rep.	Developed	ESP	Spain	Developed
COL	Colombia	Other	LBY	Libya	Other	SYR	Syria	Other
HRV	Croatia	Other	MLT	Malta	Developed	THA	Thailand	Other
CUR	Curaçao	Other	MHL	Marshall	Other	TUN	Tunisia	Other
ECU	Ecuador	Other	MAU	Mauritius	Other	TUR	Turkey	Other
EGY	Egypt	Other	MEX	Mexico	Other	TUV	Tuvalu	Other
SLV	El Salvador	Other	MAR	Morocco	Other	USA	USA	Developed
FSM	Fed. States	Other	NZL	New Zealand	Developed	VUT	Vanuatu	Other
FRA	France	Developed	NIC	Nicaragua	Other	VEN	Venezuela	Other
GHA	Ghana	Other	NOR	Norway	Developed			
GRC	Greece	Developed	PAN	Panama	Other			

[1] http://www.imf.org/en/Publications/WEO/Issues/2017/04/04/world-economic-outlook-april-2017#Statistical Appendix

3. Results and Discussion

3.1. Global list of purse seine vessels

Merging the RFMO lists, selecting purse seine vessels only and identifying likely duplicates, resulted in a total of 1,815 vessels. This is 10% more than the 1,644 purse seiners in Justel-Rubio and Restrepo (2016) and is mainly due to the addition (and re-addition) of vessels under 24 m to the authorized RFMO vessel records. In particular, many mostly medium-sized (20-25 m LOA) vessels targeting eastern Atlantic and Mediterranean bluefin tuna were not listed in ICCAT's vessel record in 2016 but are listed in 2017. There may be other causes for changes in the number of purse seine vessels, such as changes in vessel type as reported to the RFMOs (for example, fish carriers and support vessels are sometimes listed as purse seiners and vice versa).

After following steps 3-5 outlined above in Section 2, and updating the vessels' information with the most recent tRFMO vessel records and supporting databases, this list contained information as follows:

Data field	Restrepo and Forrestal (2012)	Justel-Rubio and Restrepo (2014)	Justel-Rubio and Restrepo (2015)	Justel-Rubio and Restrepo (2016)	This study
LOA	83%	82%	85%	84%	94%
GRT	76%	57%	47%	43%	52%
GT	N/A	48%	57%	61%	56%
FHV	33%	47%	30%	36%	35%
FCC	19%	33%	23%	29%	28%

In terms of sizes, the vessels with available data showed a bi-modal distribution (**Figure 1**), with a high peak at around 22.5 meters and a second, much less pronounced mode at around 72.5 meters (LOA). Vessel sizes ranged from 6.5 to 116 meters. There is a large drop in the frequency of registered vessels below 20 m because most RFMOs generally do not require registration below this size.

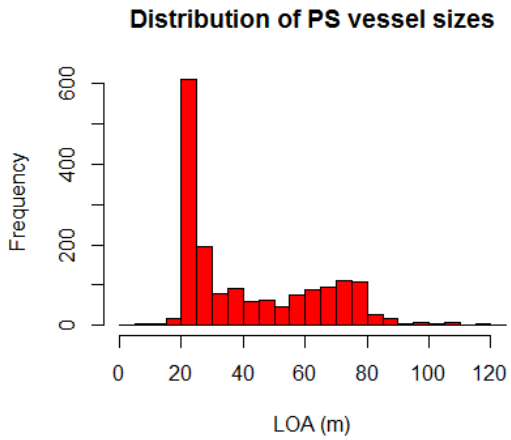

***Figure 1**. Distribution of purse seine vessel sizes (LOA in m) in the RFMO vessel records.*

3.2. Filling in missing values

The following missing values were filled using the relationships as described in Section 2. For full details of the relationships used, see Appendix 2.

1. Fill in LOA
   Using the **GT-LOA** relationship: done for 55 vessels.
   Using the **GRT-LOA** relationship: done for 46 vessels.
2. Fill in FHV
   Using the **FHV-FCC** relationship: done for 145 vessels.
   Using the **FHV-LOA** relationship: done for 1037 vessels.

3.3. The global tuna purse seine fleet

We found that 1,815 purse seine vessels were authorized by the tRFMOs to fish for tunas in June 2017. We estimate, following the methodology mentioned above, that these 1,815 vessels have a combined FHV of almost 1,100,000 m^3. The distribution by Flag is given in **Table 2**. The ratio of vessels flagged to developing versus developed countries is about 1.9:1.0. in number of vessels but only about 1.6:1.0 in capacity. The rise in this ratio compared to the 1.4:1.0 ratio calculated in Justel-Rubio and Restrepo (2016) is mostly due to the addition to the tRFMO records of a large number of medium-size vessels targeting bluefin tuna.

***Table 2**. Distribution of tuna purse seiners (all sizes) by flag at the end of June 2017. The entries represent the number of vessels and their estimated combined FHV.*

FLAG	VESSELS	FHV(m^3)	FLAG	VESSELS	FHV(m^3)	FLAG	VESSELS	FHV(m^3)
ALB	1	427	GTM	2	3702	PNG	36	42158
DZA	16	3675	IDN	18	4044	PER	14	6721
AUS	8	2620	IRN	8	11296	PHL	127	66948
BLZ	5	6400	ITA	101	21482	SEN	5	7675
CPV	1	2200	JPN	75	60441	SYC	13	26251
CHN	80	37888	KIR	12	15963	SLB	9	5944
TWN	99	71285	KOR	53	69663	ESP	157	75549
COL	14	14860	LBY	35	9360	SYR	1	121
HRV	11	3283	MLT	1	208	THA	1	216
CUR	5	9666	MHL	8	11502	TUN	38	8685
ECU	114	94141	MAU	2	3260	TUR	22	12709
EGY	2	318	MEX	49	60146	TUV	1	1937
SLV	6	11642	MAR	447	73793	USA	47	61726
FSM	19	22659	NZL	2	4447	VUT	3	6071
FRA	65	44668	NIC	7	10648	VEN	22	28594
GHA	17	24528	NOR	1	130			
GRC	15	2888	PAN	20	28003			

Total	1,815	1,092,541
Developed	624	415,109
Other	1191	677,432
Oth:Dev	1.91	1.63

3.4. The large-scale purse seine tuna fleet

There are many ways to approach the definition or categorization of large-scale fishing vessels. In various ISSF Conservation Measures, large-scale purse seiners are those with FHV of 335 m^3 or greater, which is the definition we used. Limiting the list to large-scale vessels excluded 1,028 vessels, resulting in a total of 787 large-scale purse seiners with an overall estimated FHV of 917,820 m^3 (**Table 3**). Limiting the list to large scale vessels removed about 57% of the vessels in numbers — but only removed 16% of the combined hold volume. The Developing: Developed ratio of capacity slightly decreased both in terms of number of vessels and of FHV.

***Table 3**. Distribution of large scale tuna purse seiners (≥ 335 m^3 FHV) by flag at the end of June 2017. The entries represent the number of vessels and their estimated combined FHV.*

FLAG	VESSELS	FHV(m^3)	FLAG	VESSELS	FHV(m^3)	FLAG	VESSELS	FHV(m^3)
ALB	1	427	GTM	2	3702	PNG	34	41833
DZA	1	453	IDN	2	793	PER	12	6121
AUS	3	1434	IRN	8	11296	PHL	71	57848
BLZ	5	6400	ITA	15	8105	SEN	5	7675
CPV	1	2200	JPN	61	57595	SYC	13	26251
CHN	25	29170	KIR	12	15963	SLB	9	5944
TWN	46	62294	KOR	53	69663	ESP	33	56488
COL	13	14590	LBY	7	2745	TUN	9	3590
HRV	4	1760	MHL	8	11502	TUR	21	12411
CUR	5	9666	MAU	2	3260	TUV	1	1937
ECU	88	87502	MEX	47	59636	USA	37	60704
SLV	6	11642	MAR	2	1121	VUT	3	6071
FSM	19	22659	NZL	1	4179	VEN	22	28594
FRA	36	39420	NIC	7	10648			
GHA	17	24528	PAN	20	28003			
						Total	787	917,820
						Developed	285	359,883
						Other	502	557,937
						Oth:Dev	1.76	1.55

3.5. The large-scale tropical tuna purse seine tuna fleet

The tRFMO lists include purse seine vessels that fish for bluefin tuna either permanently or sporadically. In addition, the WCPFC record includes purse seiners which operate north of 20°N and do not target tropical tunas year-round.

In consultation with members from the industry and several agencies, the following vessels were excluded:

- Vessels flagged to Mediterranean countries (other than Spain and France);
- Vessels flagged to Spain and France that are only authorized on the ICCAT record and are not on the TURBOBAT database;

- Vessels flagged to Japan that are on the WCPFC record but not the FFA record.

Removing these resulted in an estimated 685 large-scale, tropical tuna purse seine vessels with a combined hold volume of 865,831 m^3 (**Table 4**). Compared to the list in the previous section (all large-scale tuna purse seiners), these are reductions of 13% and 6% in number of vessels and aggregate FHV, respectively. The Developing: Developed country ratio of capacity was 2.0:1.0 in vessel numbers and 1.6:1.0 in FHV.

Table 4*. Distribution of large-scale tropical tuna purse seiners (mostly targeting tropical tunas) by flag at the end of June 2017. The entries represent the number of vessels and their estimated combined FHV.*

FLAG	VESSELS	FHV(m^3)	FLAG	VESSELS	FHV(m^3)	FLAG	VESSELS	FHV(m^3)
AUS	3	1434	GTM	2	3702	PAN	20	28003
BLZ	5	6400	IDN	2	793	PNG	34	41833
CPV	1	2200	IRN	8	11296	PER	12	6121
CHN	25	29170	ITA	1	1790	PHL	71	57848
TWN	46	62294	JPN	31	40224	SEN	5	7675
COL	13	14590	KIR	12	15963	SYC	13	26251
CUR	5	9666	KOR	53	69663	SLB	9	5944
ECU	88	87502	MHL	8	11502	ESP	27	53937
SLV	6	11642	MAU	2	3260	TUV	1	1937
FSM	19	22659	MEX	47	59636	USA	37	60704
FRA	29	36175	NZL	1	4179	VUT	3	6071
GHA	17	24528	NIC	7	10648	VEN	22	28594
						Total	685	865,831
						Developed	228	330,399
						Other	457	535,431
						Oth:Dev	2.00	1.62

It is important to see where these 685 vessels are authorized to fish. **Table 5** shows the current RFMO authorizations (the diagonal shows the number of authorizations in each RFMO). Twenty-four percent of these vessels were registered in more than one tRFMO at the end of June 2017. The largest number of authorizations – 400 – was in the WCPFC. However, several sources suggest that the number of active large-scale tropical tuna vessels in that region was about 250 (e.g., Williams *et al.* 2017). About 150 vessels, the difference, are authorized to fish in the WCPFC area but are either not fishing there or are not required to be listed on the record (note that, in the WCPFC, vessels that fish in their own EEZ only do not need to be on the WCPFC Record). For the most part, the RFMOs maintain lists of vessels authorized to operate in the Convention Areas, but do not maintain lists of vessels that are actively fishing in the Convention Areas, so it is difficult to estimate active capacity by region at any given time.

Table 5. *Distribution of large-scale tropical tuna purse seiners (≥ 335 m^3 FHV) registered with the tRFMOs.*

	CCSBT	IATTC	ICCAT	IOTC	WCPFC
CCSBT	**3**			3	2
IATTC		**230**	29	7	42
ICCAT			**110**	43	39
IOTC				**149**	88

WCPFC					400

It is also useful to examine flagging changes between developed-country economies and developing ones. We looked at this with the available data, which does not always indicate the years when flags changed, and therefore these results reflect changes that took place over several decades. **Table 6** summarizes the available information on these vessels' previous flags: 126 flag changes (42%) were from developed to developing economies, and 149 (49%) were between developing economies. Relatively fewer flag changes (9%) were to developed countries.

Table 6. *Summary of current and previous flags for large-scale tropical tuna purse seiners (≥ 335 m^3 FHV).*

		Current Flag	
		Developed	**Other**
Previous Flag	**Developed**	12	126
	Other	15	149

A considerable number of the large-scale tropical tuna purse seiners discussed in this section are registered in ISSF's Proactive Vessel Register (PVR). ISSF created the PVR to give vessel owners an opportunity to identify themselves as active participants in meaningful tuna sustainability efforts. At the same time, the PVR provides validated information to tuna purchasers and interested stakeholders that reflects the positive steps each vessel is taking in implementing a series of commitments designed to improve tuna fishing practices (more info is at http://iss-foundation.org/knowledge-tools/databases/proactive-vessel-register/). The number of large scale PS vessels targeting tropical tuna that have registered in the PVR keeps increasing. Specifically, 512 vessels, with a combined FHV of 709,600 m^3 are now registered in the PVR; which represents 75% of the global fleet in number and an 82% in FHV of the total of 685 large scale purse seine vessels fishing for tropical tunas.

3.5.1. CHANGES SINCE 2016

Justel-Rubio and Restrepo (2016) estimated that there were 728 large-scale vessels fishing for tropical tunas in May 2016. The estimate of 685 in June 2017 represents a 6% decrease. One of the main reasons for this reduction is due to the quality control work that all tuna RFMOs have continuously performed in their records of authorized vessels under the umbrella of the CLAV update carried out since March 2015. **Table 7** summarizes all changes that took place in the interim.

Twelve recently-constructed (between 2012 and 2017) large-scale vessels have been added to the tropical tuna authorized purse seine lists since 2016 (**Table 7**). There are also 15 large-scale purse seiners that were constructed prior to 2012 which were not listed in the RFMO Records until now (six vessels) or had been inactive for some time (9 vessels). Using the available data, it is not possible to determine the fisheries in which the six vessels not registered in RFMO Records until now participated before, if any.

As shown in Section 3.2, there is considerable variability in the relationships between different vessel dimensions used here to determine if a vessel is large-scale or not in terms of FHV. The tRFMO records are updated regularly, and reported dimensions can change, or missing dimensions can be reported when they were not reported before. Because of these newly reported data, a number of vessels were re-classified (**Table 7**): Seven vessels that were estimated to be large-scale in Justel-Rubio and Restrepo (2016) were no longer so in this study. And, vice-versa for eight vessels that we estimated now to be 335 m^3 or greater in FHV.

Several other factors explain the differences between the estimates in the previous snapshot (Justel-Rubio and Restrepo, 2016) and this study. Seventy-two vessels either sank or somehow are no longer authorized in the RFMO records (most of them were previously registered to the WCPFC). Twenty-three vessels changed name and/or flag (**Table 7**). And we added one vessel that is now listed as a purse seiner in the RFMO vessel records.

Without Unique Vessel Identifiers (UVIs), it is difficult to track vessel changes. Fortunately, the situation is improving since organizations like ISSF have been advocating for the use of UVIs such as the IMO number. The number of large scale tropical tuna purse seiners with publicly-known IMO numbers increased from 12% in 2012 to 95% in 2017. The four tropical tuna RFMOs (IATTC, ICCAT, IOTC and WCPFC now require mandatory use of UVIs, such as IMO numbers.

Table 7. *Changes between large-scale tropical tuna vessels estimated in the three versions of the snapshot.*

	2014	**2015**	**2016**	**2017**
Vessels deleted				
Sank or no longer found in tRFMO records	39	23	40	72
No longer classified as Large	12	16	7	7
No longer classified as targeting trop. tuna	13	1	5	-
Duplicate records	3	-	-	-
Different vessel type	-	1	13	-
Total	**67**	**41**	**65**	**79**
Vessels added				
New in the RFMO records and built before 2012	24	46	2	15
New in the RFMO records and built in 2012 or after	24	33	30	12
New in the RFMO records (year unknown)	12	12	1	-
Now classified as Large	22	2	1	8
Now classified as targeting trop. tuna	-	14	-	-
Different vessel type	-	-	-	1
Total	**82**	**107**	**34**	**36**
Vessels changed				
Changed flag	49	24	19	13
(Of which changed flag AND name)	(30)	(12)	(11)	(6)
Changed name only	11	10	6	10
Total	**60**	**34**	**25**	**23**
IMO#				
Percentage of vessels with IMO# in 2011				12%
Percentage of vessels with IMO# in 2014				88%
Percentage of vessels with IMO# in 2015				87%
Percentage of vessels with IMO# in 2016				91%
Percentage of vessels with IMO# in 2017				95%

3.5.2. VESSELS CONSTRUCTED IN RECENT YEARS

The number of large-scale tropical tuna purse seine vessels constructed during the 2010-2017 period according to tRFMO records is summarized in **Table 8**. It is worth noting that the total number of new vessels by year more than doubled from 2013 to 2014.

Table 8. *Large-scale tropical tuna purse seine vessels built in recent years grouped by flag and development status of the flag states.*

		2010	2011	2012	2013	2014	2015	2016	2017	
Developed	Chinese Taipei	1		3	4	3	3			14
	France	2		2				2		6
	Japan		1		2	2				5
	Korea, Rep.	1	2	2	1	4	2		1	13
	Spain				1	3				4
	USA						1			1
Other	Cape Verde					1				1
	China, P.R.		3	3		3	4	1		14
	Curaçao						1			1
	Ecuador	1				1	1			3
	Fed. States Micronesia	3[2]			1[3]			3		7
	Kiribati					1				1
	Marshall Islands	2								2
	Mauritius			2						2
	Mexico			1	4	1	2			8
	Panama					2				2
	Papua New Guinea				2	11				13
	Philippines	1		1	1	1	2	3		9
	Seychelles					4	3			7
	Solomon Islands					1	2			3
	Venezuela					1				1
	Grand Total	**11**	**6**	**14**	**16**	**39**	**21**	**9**	**1**	**104**

[2] Of these three vessels, one was originally flagged to Japan and two were originally flagged to Republic of Marshall Islands.

[3] This vessel was originally flagged to Papua New Guinea.

4. Conclusions

Using updated information available from both the tRFMOs and the supporting databases, we estimate that — towards the end of June 2017 — there were 1,815 purse seine vessels authorized to fish for tunas worldwide, with a combined FHV of almost 1,100,000 cubic meters. This represents a 10% increase in the number of vessels since the previous snapshot report by Justel-Rubio and Restrepo (2016), due in great part to the addition of a large number of vessels to the tRFMO authorized vessels lists, predominantly of medium size and targeting bluefin tuna. Restricting the list to large-scale vessels, defined here as ≥335 m^3 FHV, reduces the number of purse seiners to 787, with a combined FHV of over 917,000 m^3.

Focusing on large-scale purse seine vessels that target tropical tunas brings the number down to 685 vessels with about 866,000 m^3 of combined FHV. Nearly twice as many of these vessels are flagged to developing countries than are flagged to developed countries. A large proportion of these vessels (75% in number, 82% in FHV) are registered in ISSF's Proactive Vessel Register. About 24% of these vessels are authorized to fish in two or more RFMOs, indicating a large potential mobility of these fleets at a global level. We recommend that RFMOs consider extending their authorized vessel records to include information about the RFMO area in which each individual vessel is active each year. This will facilitate the monitoring of active fishing capacity by region.

A comparison with the estimates obtained one year ago (Justel-Rubio and Restrepo, 2016), using updated data, shows that, once more, there were numerous changes in the tRFMO vessel records (**Table 7**). Several vessels that appeared on the records in 2016 can no longer be found. Other (older) vessels that were not on the records are now listed, and some vessels changed in reported dimensions. The quality of the data in tRFMO records has been undoubtedly improving in recent years, but there are still substantial gaps and opportunities for improvement. We recommend that RFMO members exercise greater quality control of the data they submit to the tRFMOs for the vessel records.

Since Justel-Rubio and Restrepo (2016), 12 recently-constructed (between 2012 and June 2017), large-scale purse seine vessels have been added to the tRFMO records.

Bibliography

Gillett, R. and A. Lewis. (2003). A Survey of Purse Seine Fishing Capacity in the Western and Central Pacific Ocean, 1988 to 2003. Gillett, Preston and Associates, 59 pages.

ISSF. (2014). Report of the Workshop on Options for Transferring Fishing Capacity to Developing Coastal States in the Context of Managing the Capacity of the Tropical Tuna Purse Seine Fishery. Barcelona, Spain, 3-5 March 2014.

Restrepo, V. and A. Justel-Rubio. 2016. A maximum likelihood approach for calculating fish hold volume for tuna purse seine vessels. ISSF Technical Report 2016-10. International Seafood Sustainability Foundation, Washington, D.C., USA.

ISSF. (2017). Status of the world fisheries for tuna. Feb 2017. ISSF Technical Report 2017-02. International Seafood Sustainability Foundation, Washington, D.C., USA.

Joseph, J. (2003). Managing fishing capacity of the world tuna fleet. FAO Fisheries Circular No. 982. Rome, FAO.

Justel-Rubio, A. and V.R. Restrepo (2014). A Snapshot of the Large-Scale Tropical Tuna Purse Seine Fishing Fleets at the Beginning of 2014. ISSF Technical Report 2014-07. International Seafood Sustainability Foundation, McLean, Virginia, USA.

Justel-Rubio, A. and V.R. Restrepo (2015). A Snapshot of the Large-Scale Tropical Tuna Purse Seine Fishing Fleets at the Beginning of 2015. ISSF Technical Report 2015-05. International Seafood Sustainability Foundation, McLean, Virginia, USA.

Justel-Rubio, A. and V.R. Restrepo (2016). A Snapshot of the Large-Scale Tropical Tuna Purse Seine Fishing Fleets as of May 2016. ISSF Technical Report 2016-12. International Seafood Sustainability Foundation, McLean, Virginia, USA.

Reid C., J.E. Kirkley, D. Squires and J. Ye. (2005). An analysis of the fishing capacity of the global tuna purse-seine fleet. Pages 117-156 *In*: Bayliff W. H., J.I. de Leiva-Moreno, and J. Majkowski, editors. Second meeting of the Technical Advisory Committee of the FAO project: Management of tuna fishing capacity: conservation and socio-economics, Madrid, Spain, 15-18 March 2004. FAO Fisheries Proceedings, 2; 2005. p. 335.

Restrepo, V.R. and F. Forrestal. (2012). A Snapshot of the Tropical Tuna Purse Seine Large-Scale Fishing Fleets at the End of 2011. ISSF Technical Report 2012-01. International Seafood Sustainability Foundation, McLean, Virginia, USA.

TRFMO. (2011). Draft Chair's report of the Third Joint Meeting of the Tuna Regional Fisheries Management Organizations (Kobe III). La Jolla, California, USA, July 12-14, 2011. Available from http://www.tuna-org.org.

Williams, P., Terawasi, P. and Reid, C. (2017). Overview of tuna fisheries in the Western and Central Pacific Ocean, including economic conditions-2016. WCPFC document WCPFC-SC13-2017/ GN-WP-01.

Appendix 1. Glossary

FCC. Fish Carrying Capacity. The amount of fish, in tonnes, that a vessel can carry. This is related to the size of the fish wells. However, the actual tonnage carried may vary depending on the size of the fish and how they are stored. FCC is often measured as the maximum landings observed for a given vessel.

FHV. Fish Hold Volume: The total measured cubic content of the fish wells, in cubic meters.

GRT. Gross Register Tonnage: The total measured cubic content of the permanently-enclosed spaces of a vessel, with some allowances or deductions for exempt spaces such as living quarters (1 gross register ton = 100 ft^3 = 2.83 m^3).

GT. Gross Tonnage: The volume of all ship's enclosed spaces (from keel to funnel) measured to the outside of the hull framing.

LBP. Length between perpendiculars: The length of a vessel (loaded) along the waterline from the forward surface of the stem, or main bow perpendicular member, to the after surface of the sternpost, or main stern perpendicular member.

LOA. Length overall: The maximum length of a vessel from the two points on the hull measured perpendicular to the waterline.

RGL. Registered length: The length of the vessel as registered with the national authorities. Different countries have different requirements, so RGL could be LOA, LBP, or other measurements.

Appendix 2. Relationships between vessel attributes

1. GROSS TONNAGE VS LOA

a) GRT vs LOA

The relationship between GRT (tonnes) and LOA (m) estimated using a MLE approach followed a function of the form (**Figure 1a**):

$GRT = 0.0497*LOA^{2.3382}$ $\hat{\sigma}_*^2 = 1045.15$ $\varphi = -3466.65$ $(n=510, R^2=0.80)$

There is considerable variability in the relationship, especially for the larger vessels.

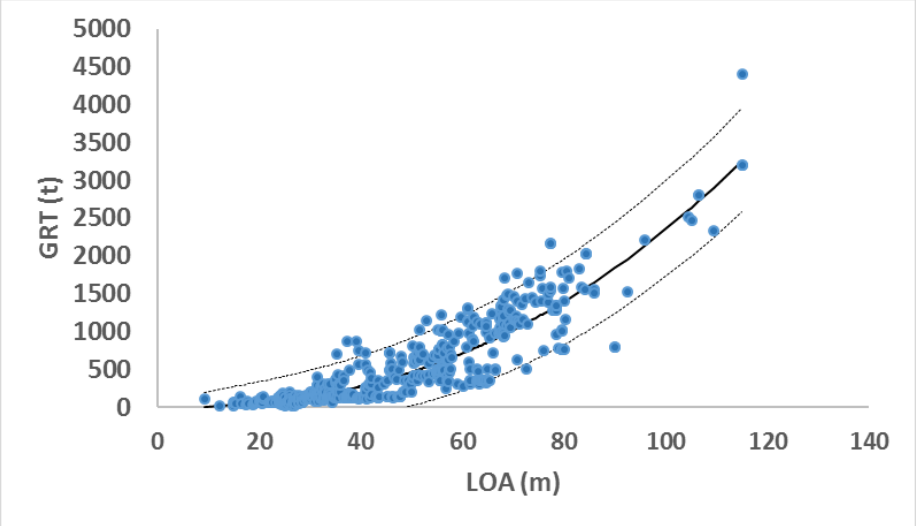

***Figure 1a**. Relationship between GRT (tonnes) and LOA (m) and 95% confidence intervals.*

b) GT vs LOA

The relationship between GT (tonnes) and LOA (m) estimated using a MLE approach followed a function of the form (**Figure 1b**):

$GT = 0.0380*LOA^{2.4789}$ $\hat{\sigma}_*^2 = 624.26$ $\varphi = -6125.12$ $(n=942, R^2=0.97)$

LOA is more strongly correlated to GT than it is to GRT.

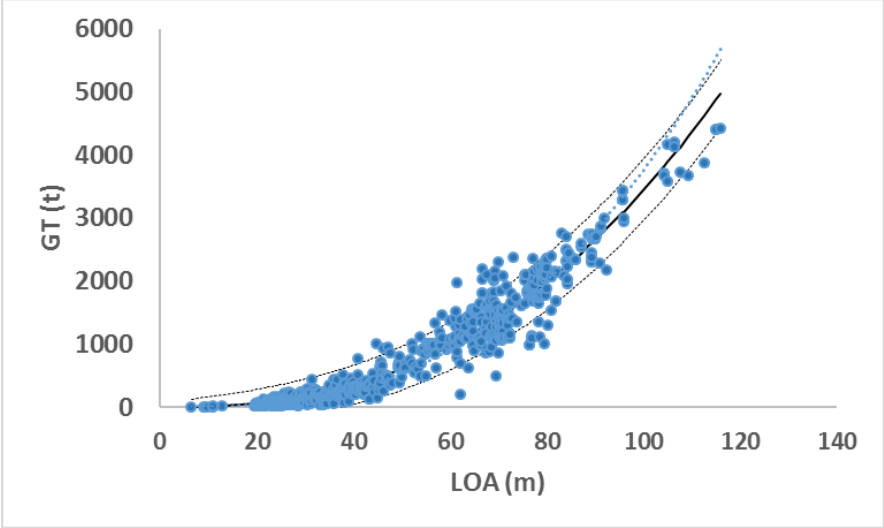

***Figure 1b**. Relationship between GT (tonnes) and LOA (m) and 95% confidence intervals.*

2. FHV VS FCC

The relationship between FHV (m^3) and FCC (tonnes) estimated using a MLE approach on the IATTC vessels subset was linear (**Figure 2**):

FHV=1.2839*FCC $\hat{\sigma}_*^2$ = 19.83 φ = -1679.53 (n=277, R^2=0.95)

Fish Carrying Capacity and Fish Hold Volume are highly correlated.

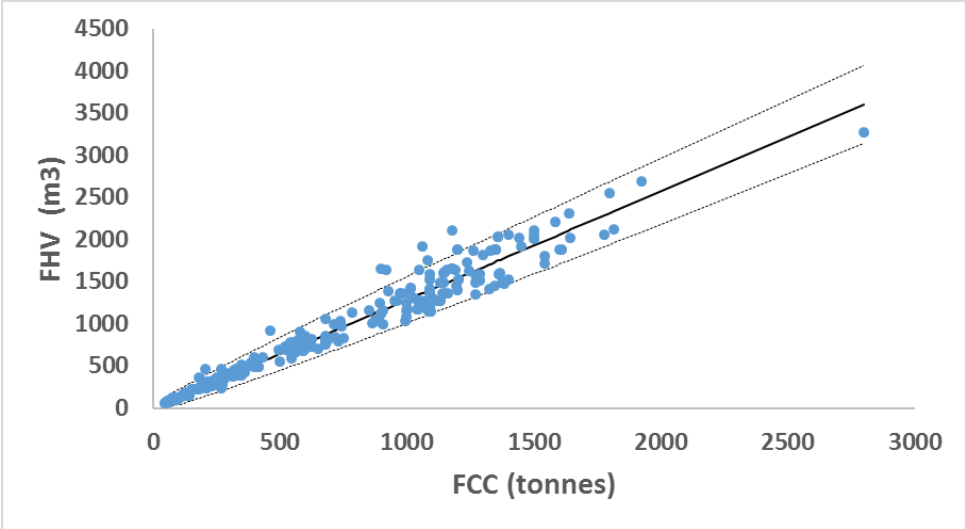

***Figure 2**. Relationship between FHV (m^3) and FCC (tonnes) and 95% confidence intervals.*

3. FHV VS LOA

The relationship between FHV (m^3) and LOA (m) estimated using a MLE approach on the IATTC vessels subset followed a power function of the form (**Figure 3**):

$FHV = 0.3043*LOA^{1.9806}$ $\hat{\sigma}_*^2 = 688.13$ $\varphi = -1727.30$ ($n=259$, $R^2=0.89$)

Using only those vessels for which FHV values are verified reduced substantially the variability in this relationship.

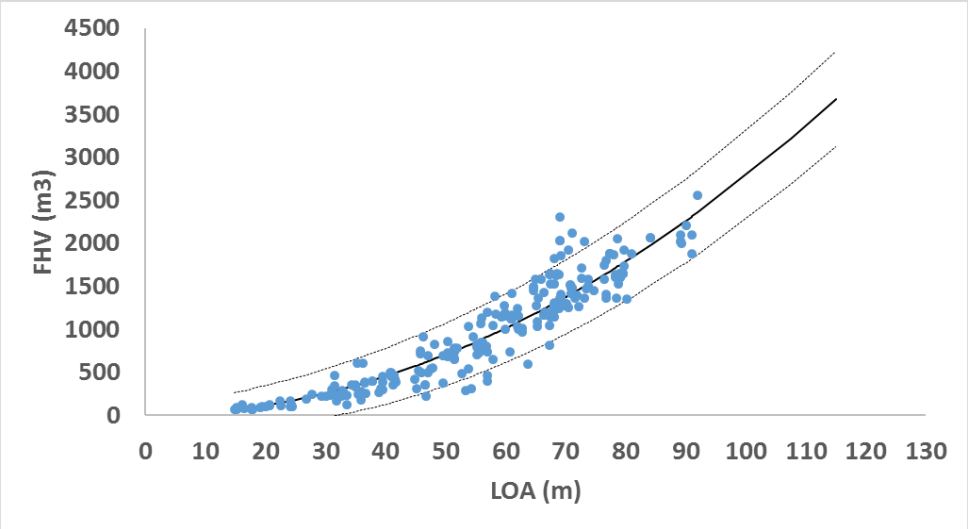

Figure 3. Relationship between FHV (m^3) and LOA (m) and 95% confidence intervals.

ISSF INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION

www.iss-foundation.org

1440 G Street NW
Washington D.C. 20005
United States

Phone: + 1 703 226 8101
E-mail: info@iss-foundation.org