

A SNAPSHOT OF THE LARGE-SCALE TROPICAL TUNA PURSE SEINE FISHING FLEETS as of July 2021



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Ana Justel-Rubio and Lorena Recio / July 2021, Version 9.0

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Abstract

Purse seine vessels account for about 66% 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 authorized 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 July 2021 there are at least 1,855 purse seiners fishing for tunas worldwide. This is surely 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 m³ fish hold volume or greater) that target tropical tunas (skipjack, yellowfin and bigeye), we calculate there are 678 such vessels with a combined fishing capacity of over 865,000 m³. The number of these vessels decreased by about 2.6% during the past year, however, the fishing capacity remained at a similar level decreasing just 1%. Of those 678 large scale purse seine vessels fishing for tropical tunas, 503 are registered on the ISSF Pro Active Vessel Register (PVR), which represent 74% in number and 81% in fish hold volume (FHV). About 16% of these 678 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.

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Table of Contents

| | |
|--|-----------|
| Research Questions | 4 |
| 1. Introduction | 5 |
| 2. Methods | 6 |
| 3. Results and Discussion | 8 |
| 3.1. Global list of authorized purse seine vessels | 8 |
| 3.2. Filling in missing values..... | 9 |
| 3.3. The global tuna purse seine fleet..... | 9 |
| 3.4. The large-scale purse seine tuna fleet | 10 |
| 3.5. The large-scale tropical tuna purse seine tuna fleet..... | 10 |
| 3.5.1. Changes since 2020 | 13 |
| 3.5.2. Vessels constructed in recent years | 15 |
| 4. Conclusions | 16 |
| Recommendations | 17 |
| Acknowledgments | 18 |
| Bibliography | 19 |
| Appendix 1. Glossary | 20 |
| Appendix 2. Relationships between vessel attributes | 21 |
| 1. Gross Tonnage vs LOA..... | 21 |
| 2. FHV vs FCC | 22 |
| 3. FHV vs LOA | 23 |
| Appendix 3. Version log | 24 |

Research Questions

This study aimed at responding the following questions:

- What is the **current number and capacity of purse seine vessels authorized to target tuna worldwide?**
- What proportion of that capacity is represented by those **large-scale purse seiners that target exclusively tropical tuna?**
- How has the estimated global capacity **changed since last year?**
- Where are large-scale purse seine vessels targeting tropical tuna **authorized to fish?**
- What is the **trend in flagging changes** between developed-country economies and developing ones?
- How many large-scale purse seine vessels targeting tropical tuna have been **built in the last few years?**

1. Introduction

Purse seine fishing vessels catch about 66% of the 5.1 million tonnes of tunas taken annually worldwide (ISSF, 2021). Of the tropical tunas, purse seiners generally target skipjack (*Katsuwonus pelamis*) and yellowfin (*Thunnus albacares*), though they also catch bigeye tuna (*Thunnus obesus*) 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, 2015, and 2016; Justel-Rubio *et al.*, 2017, 2018, Justel-Rubio and Recio, 2019 and 2020). The aim of this paper is to provide an updated "snapshot" of the purse seine fleet as of July 2021 based primarily on the records of authorized vessels established by the five tuna RFMOs, as in Restrepo and Forrestal (2012) and all subsequent versions of this study. Some of the key factors considered in this series of update 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 as in the 2020 snapshot (Justel-Rubio and Recio, 2020). Vessel registers from all tuna RFMOs were consulted, as well as the International Handling Services (IHS) Sea-Web database (IMO number database) and the FFA [List of Vessels in Good Standing](#). For this update, we also consulted the five tuna RFMO Consolidated List of Authorized Vessels ([CLAV](#)).

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

1. Retrieve the CCSBT, 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 IHS Sea-Web database or FFA.
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 without that information (explained below and in sections [3.1](#) and [3.2](#)).
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, FFA Vessels in Good Standing). A standard procedure was applied to identify possible duplicate records as explained in step 2 above. Length measures were again split 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 the likelihood-based approach of the 2016 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 $\geq 335 \text{ m}^3$ 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 estimated 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 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 can be found in [ISSF Technical Report 2016-10](#) (Restrepo and Justel-Rubio, 2016).

In doing the analyses, we realised that some vessels are now flagged to countries that did not appear in the last snapshot (Justel-Rubio and Recio, 2020), and some vessel flags are no longer represented in the list of currently active vessels of

the RFMOs. We therefore updated the list of countries according to the International Monetary Fund's (IMF) April 2021 World Economic Outlook¹, 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 used 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 | GHA | Ghana | Other | NZL | New Zealand | Developed |
| DZA | Algeria | Other | GRC | Greece | Developed | NIC | Nicaragua | Other |
| AUS | Australia | Developed | GTM | Guatemala | Other | PAN | Panama | Other |
| BLZ | Belize | Other | IDN | Indonesia | Other | PNG | Papua New | Other |
| BRA | Brazil | Other | IRN | Iran | Other | PER | Peru | Other |
| CPV | Cape Verde | Other | ITA | Italy | Developed | PHL | Philippines | Other |
| CHN | China, P.R. | Other | JPN | Japan | Developed | SEN | Senegal | Other |
| TWN | Chinese T. | Developed | KEN | Kenya | Other | SYC | Seychelles | Other |
| COL | Colombia | Other | KIR | Kiribati | Other | SLB | Solomon | Other |
| COK | Cook Islands | Other | KOR | Korea, Rep. | Developed | ESP | Spain | Developed |
| HRV | Croatia | Other | LBR | Liberia | Other | SYR | Syria | Other |
| CUR | Curaçao | Other | LBY | Libya | Other | TUN | Tunisia | Other |
| CYP | Cyprus | Developed | MLT | Malta | Developed | TUR | Turkey | Other |
| ECU | Ecuador | Other | MHL | Marshall | Other | TUV | Tuvalu | Other |
| EGY | Egypt | Other | MAU | Mauritius | Other | USA | USA | Developed |
| SLV | El Salvador | Other | MEX | Mexico | Other | VUT | Vanuatu | Other |
| FSM | FS Micronesia | Other | MAR | Morocco | Other | VEN | Venezuela | Other |
| FRA | France | Developed | NAU | Nauru | Other | | | |

¹ <https://www.imf.org/-/media/Files/Publications/WEO/2021/April/English/text.aspx>

3. Results and Discussion

3.1. Global list of authorized purse seine vessels

Merging the RFMO lists, selecting purse seine vessels only and identifying likely duplicates, resulted in a total of 1,855 purse seine vessels. This is 8% more than the 1,721 purse seiners in Justel-Rubio and Recio (2020) and is mainly due to the addition of vessels to the ICCAT and IOTC authorized vessel records. ICCAT vessels were mostly small and medium-sized vessels (under 30 m LOA), many of them targeting eastern Atlantic and Mediterranean bluefin tuna, that were previously listed as inactive or inoperative. Likewise, most vessels added to the IOTC record were of medium size and re-listings of vessels rather than new constructions, and the majority of them flagged to Indonesia. 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), or vessels that have sunk or been scrapped.

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, the resulting database contained information as follows (the percentage of vessels with complete information is shown):

| Data field | v1.0 (2012) | v2.0 (2014) | v3.0 (2015) | v4.0 (2016) | v5.0 (2017) | v6.0 (2018) | v7.0 (2019) | v8.0 (2020) | v9.0 (2021, this study) |
|------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------------------------------|
| LOA | 83% | 82% | 85% | 84% | 94% | 94% | 95% | 96% | 96% |
| GRT | 76% | 57% | 47% | 43% | 52% | 52% | 49% | 49% | 47% |
| GT | N/A | 48% | 57% | 61% | 56% | 61% | 61% | 62% | 63% |
| FHV | 33% | 47% | 30% | 36% | 35% | 35% | 35% | 39% | 35% |
| FCC | 19% | 33% | 23% | 29% | 28% | 28% | 28% | 31% | 27% |

In terms of vessel sizes, the 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 7.1 to 116 meters LOA. There is a large drop in the frequency of authorized vessels below 20 m because most RFMOs generally do not require registration below this size.

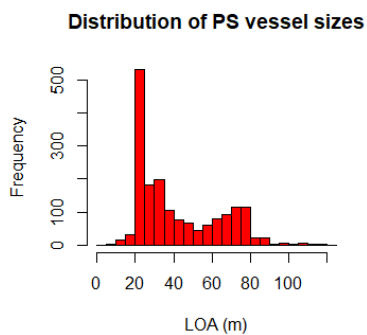


Figure 1. Distribution of purse seine vessel sizes (LOA in m) in the RFMO vessel records.

3.2. Filling in missing values

The following LOA and FHV 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 43 vessels.
 - Using the **GRT-LOA** relationship: done for 24 vessels.
2. Fill in FHV
 - Using the **FHV-FCC** relationship: done for 110 vessels.
 - Using the **FHV-LOA** relationship: done for 1087 vessels.

3.3. The global tuna purse seine fleet

We found that 1,855 purse seine vessels were authorized by the tRFMOs to fish for tunas in July 2021. We estimate that these 1,855 vessels have a combined FHV of over 1,125,000 m³. The distribution by Flag is given in **Table 2**. The ratio of vessels flagged to developing versus developed countries is 2.8:1.0 in number of vessels but about 2.2:1.0 in capacity. Both ratios are similar although higher than those calculated in Justel-Rubio and Recio (2020).

Table 2. Distribution of tuna purse seiners (all sizes) by flag as of July 2021. 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 | 2 | 633 | GHA | 17 | 26557 | NZL | 1 | 1273 | |
| DZA | 21 | 5218 | GRC | 30 | 4554 | NIC | 5 | 7681 | |
| AUS | 10 | 3001 | GTM | 2 | 3702 | PAN | 30 | 42253 | |
| BLZ | 8 | 8483 | IDN | 164 | 47120 | PNG | 14 | 15005 | |
| BRA | 1 | 362 | IRN | 5 | 8566 | PER | 16 | 7749 | |
| CPV | 2 | 2653 | ITA | 112 | 24314 | PHL | 75 | 50730 | |
| CHN | 75 | 36807 | JPN | 69 | 57776 | SEN | 7 | 10436 | |
| TWN | 33 | 57973 | KEN | 6 | 3386 | SYC | 13 | 26280 | |
| COL | 14 | 14860 | KIR | 8 | 11690 | SLB | 9 | 5257 | |
| COK | 1 | 1160 | KOR | 48 | 60458 | ESP | 94 | 67994 | |
| HRV | 19 | 5479 | LBR | 2 | 3076 | SYR | 2 | 235 | |
| CUR | 4 | 8308 | LBY | 15 | 3834 | TUN | 42 | 8632 | |
| CYP | 1 | 142 | MLT | 1 | 208 | TUR | 74 | 35271 | |
| ECU | 109 | 87117 | MHL | 11 | 16824 | TUV | 6 | 9525 | |
| EGY | 2 | 410 | MAU | 3 | 4730 | USA | 35 | 29560 | |
| SLV | 6 | 11511 | MEX | 53 | 62836 | VUT | 6 | 11500 | |
| FSM | 27 | 37038 | MAR | 452 | 75205 | VEN | 23 | 30557 | |
| FRA | 50 | 40188 | NAU | 20 | 30808 | | | | |
| | | | | | | | Total | 1,855 | 1,126,923 |
| | | | | | | | Developed | 484 | 347,441 |
| | | | | | | | Other | 1,371 | 779,482 |
| | | | | | | | Oth:Dev | 2.83 | 2.24 |

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 ISSF Conservation Measures, large-scale purse seiners are considered those with FHV of 335 m³ or greater, which is the definition we used. Limiting the list to large-scale vessels excluded 1,029 vessels, resulting in a total of 826 large-scale purse seiners with an overall estimated FHV of ~941,400 m³ (Table 3). Limiting the list to large-scale vessels removed about 55% of the vessels in numbers — but only removed 16% of the combined hold volume. The Other: Developed ratio of capacity decreased both in terms of FHV and in number of vessels.

Table 3. Distribution of large-scale tuna purse seiners (≥ 335 m³ FHV) by flag as of July 2021. 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 | 409 | GHA | 17 | 26557 | NZL | 1 | 1273 |
| DZA | 3 | 1149 | GTM | 2 | 3702 | NIC | 5 | 7681 |
| AUS | 3 | 1434 | IDN | 42 | 15014 | PAN | 29 | 42113 |
| BLZ | 8 | 8483 | IRN | 5 | 8566 | PNG | 14 | 15005 |
| BRA | 1 | 362 | ITA | 20 | 10416 | PER | 14 | 7149 |
| CPV | 2 | 2653 | JPN | 52 | 54258 | PHL | 44 | 45882 |
| CHN | 20 | 28088 | KEN | 6 | 3386 | SEN | 7 | 10436 |
| TWN | 33 | 57973 | KIR | 8 | 11690 | SYC | 13 | 26280 |
| COL | 13 | 14590 | KOR | 48 | 60458 | SLB | 9 | 5257 |
| COK | 1 | 1160 | LBR | 2 | 3076 | ESP | 34 | 59350 |
| HRV | 6 | 2637 | LBY | 1 | 384 | TUN | 6 | 2233 |
| CUR | 4 | 8308 | MHL | 11 | 16824 | TUR | 59 | 32170 |
| ECU | 86 | 81096 | MAU | 3 | 4730 | TUV | 6 | 9525 |
| SLV | 6 | 11511 | MEX | 49 | 61921 | USA | 17 | 27718 |
| FSM | 27 | 37038 | MAR | 4 | 1955 | VUT | 6 | 11500 |
| FRA | 35 | 36635 | NAU | 20 | 30808 | VEN | 23 | 30557 |
| Total | | | | | | | 826 | 941,398 |
| Developed | | | | | | | 243 | 309,515 |
| Other | | | | | | | 583 | 631,884 |
| Oth:Dev | | | | | | | 2.40 | 2.04 |

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

The tRFMO lists include purse seine vessels that fish for other tuna species like bluefin tuna² 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.

Vessels were excluded following these criteria:

- Vessels flagged to Mediterranean countries (other than Spain and France) that are not authorized to fish tropical tuna by ICCAT;

² Atlantic bluefin (*Thunnus thynnus*), Pacific bluefin (*Thunnus orientalis*) or Southern bluefin (*Thunnus maccoyii*)

- Vessels flagged to Spain and France that are only authorized on the ICCAT record to fish bluefin tuna or other species but not tropical tunas;
- Vessels flagged to Japan that are on the WCPFC record but not on the FFA record.
- Vessels authorized by IOTC & CCSBT and flagged to Australia but considered to target only Southern bluefin tuna.
- Vessels on the IOTC Authorized vessel record but not on the Active list of vessels targeting tropical tuna for recent years (2019-2020), and not authorized by any other RFMOs³. Newly discovered vessel records were not excluded as those vessels may have been actively fishing for tropical tunas in 2020/2021 but not yet added to the IOTC Active list.

Removing these vessels resulted in an estimated 678 large-scale, tropical tuna purse seine vessels with a combined hold volume of 865,390 m³ (**Table 4**). Compared to the list of all large-scale tuna purse seiners above, these correspond to 18% and 8% reductions in number of vessels and aggregate FHV, respectively. The Other: Developed country ratio of capacity is estimated around 2.8:1.0 in vessel numbers and 2.1:1.0 in FHV.

Table 4. Distribution of large-scale tropical tuna purse seiners targeting tropical tunas by flag as of July 2021. 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) |
|------|---------|----------------------|------|---------|----------------------|-----------|---------|----------------------|
| BLZ | 8 | 8483 | IDN | 38 | 13715 | NIC | 5 | 7681 |
| BRA | 1 | 362 | IRN | 5 | 8566 | PAN | 29 | 42113 |
| CPV | 2 | 2653 | ITA | 1 | 1790 | PNG | 13 | 14139 |
| CHN | 20 | 28088 | JPN | 28 | 38353 | PER | 14 | 7149 |
| TWN | 33 | 57973 | KEN | 6 | 3386 | PHL | 44 | 45882 |
| COL | 13 | 14590 | KIR | 8 | 11690 | SEN | 7 | 10436 |
| COK | 1 | 1160 | KOR | 48 | 60458 | SYC | 13 | 26280 |
| CUR | 4 | 8308 | LBR | 2 | 3076 | SLB | 9 | 5257 |
| ECU | 85 | 80689 | MHL | 11 | 16824 | ESP | 28 | 56791 |
| SLV | 6 | 11511 | MAU | 3 | 4730 | TUV | 6 | 9525 |
| FSM | 27 | 37038 | MEX | 49 | 61921 | USA | 17 | 27718 |
| FRA | 21 | 30705 | MAR | 4 | 1955 | VUT | 6 | 11500 |
| GHA | 17 | 26557 | NAU | 20 | 30808 | VEN | 23 | 30557 |
| GTM | 2 | 3702 | NZL | 1 | 1273 | | | |
| | | | | | | Total | 678 | 865,390 |
| | | | | | | Developed | 177 | 275,061 |
| | | | | | | Other | 501 | 590,329 |
| | | | | | | Oth:Dev | 2.83 | 2.15 |

It is important to note where these 678 vessels are authorized to fish. **Table 5** shows the current number of authorized vessels by RFMO (the diagonal shows the number of authorizations in each RFMO). Sixteen percent of these vessels were registered in more than one tRFMO in July 2021. The largest number of authorizations – 341 – was in the WCPFC. However,

³ Given the caveats of the Active list as described by IOTC (“the lists of active vessels recorded for each year may be incomplete due to: a) The list includes only ships reported by their flag countries, b) Incomplete reports from IOTC CPC’s; c) IOTC CPC’s not having reported lists of active vessels for one or more years; d) Active vessels operating under the flag of non IOTC CPC that are not included in the record, e) Fields containing “Unknown” values may also indicate that the field is “Not applicable”); national reports to IOTC from the vessel flag CPCs were used to contrast information in this list.

several sources suggest that the number of active large-scale tropical tuna vessels in that region is about 250 (e.g., Williams *et al.* 2017). Thus, about 100 vessels despite being authorized to fish in the WCPFC area might be either not fishing there or not required to be listed on the record (note that, in the WCPFC, vessels that fish solely in their own EEZ do not need to be on the WCPFC Record).

Tuna RFMOs have public lists of vessels authorized to operate in their Convention Areas, but not all tRFMOs maintain up-to-date 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. In this study we have used ICCAT's active list to exclude vessels that are currently authorized to fish but inactive or inoperative (for which ICCAT keeps separate lists). We have also consulted IOTC's list of active vessels, which has been used, given its shortcomings identified by IOTC Secretariat, with a conservative approach to identify vessels that may not be actively fishing for tropical tuna, as described above.

Table 5. Distribution of large-scale tropical tuna purse seine (≥ 335 m³ FHV) tRFMO authorizations. Numbers in yellow represent the total number of vessels authorized in that tRFMO (including both vessels authorized by that tRFMO only and vessels authorized also in other tRFMOs).

| | CCSBT | IATTC | ICCAT | IOTC | WCPFC |
|-------|-------|-------|-------|------|-------|
| CCSBT | 0 | | | | |
| IATTC | | 231 | 15 | 2 | 30 |
| ICCAT | | | 106 | 20 | 30 |
| IOTC | | | | 124 | 45 |
| WCPFC | | | | | 341 |

It is also useful to examine flagging changes between developed-country economies (“Developed”) and emerging and developing ones (“Other”). The available data does not always indicate the year of flag change and, therefore, these results reflect changes that took place over several decades. **Table 6** summarizes the available information on these vessels’ previous flags: 121 flag changes (38%) were from developed to developing economies, and 174 (54%) were between developing economies. Relatively fewer flag changes (8%) were to developed countries.

Table 6. Summary of current and previous flags for large-scale tropical tuna purse seiners (≥ 335 m³ FHV).

| | | Current Flag | |
|---------------|-----------|--------------|-------|
| | | Developed | Other |
| Previous Flag | Developed | 16 | 121 |
| | Other | 11 | 174 |

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 complying with ISSF's Conservation Measures and 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 <https://iss-foundation.org/knowledge-tools/public-vessel-lists/proactive-vessel-register/>). The number of large-scale PS vessels targeting tropical tuna that have registered in the PVR keeps increasing. Specifically, 503 large scale purse seine vessels, with a combined FHV of 701,170 m³ are now registered in the PVR; which represents 74% in number and an 81% in FHV of the total estimated of 678 large scale purse seine vessels fishing for tropical tunas.

3.5.1. CHANGES SINCE 2020

Justel-Rubio and Recio (2020) estimated that there were 696 large-scale vessels fishing for tropical tunas in June 2020. The estimate of 678 in July 2021 represents a 2.6% decrease. The number of large-scale purse seine vessels targeting tropical tuna fluctuates from year to year due to several factors like vessels that are no longer active (e.g. sunk or scrapped), construction of new vessels, etc. **Table 7** summarizes all changes that have taken place annually since 2014.

Twenty-seven large-scale vessels built after 2012 have been added to the tropical tuna authorized purse seine lists since June 2020 (**Table 7**) and of the twenty-seven, 12 were built in recent years (2019-2021). There are also eight large-scale purse seiners that were constructed prior to 2012 which were not listed in the RFMO Records in June 2020 as they may have been inactive for some time or participating in a different fishery. There is one additional vessel that is now authorized by one of the tRFMOs but whose year of construction is unknown from public records. Using the available data, it is not possible to determine the fisheries in which those vessels not registered in tRFMO Records in 2020 participated before, if any.

As shown in [Section 3.2](#), there is considerable variability in the relationships between different vessel dimensions to estimate FHV and, hence, to determine whether 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 start being reported when they were previously not. Because of these newly reported data, a number of vessels were re-classified (**Table 7**), for example one vessel that was estimated to be large-scale in Justel-Rubio and Recio (2020) is no longer so in this study.

Several other factors explain the differences between the estimates in the previous snapshot (Justel-Rubio and Recio, 2020) and this study. Twenty-one vessels either sank or somehow are no longer in the authorized vessels records of the RFMO (most of them were previously registered to the WCPFC and IATTC). Additionally, twenty-two vessels changed name and/or flag (**Table 7**).

Without Unique Vessel Identifiers (UVIs), it is difficult to track vessel flag/name 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 2011 to 99% in 2018. The percentage is currently 98%, but it may be higher, as it is unclear at the moment of writing this report whether some of the vessels added to the IOTC in the past few years have IMO numbers or not. The four tropical tuna RFMOs (IATTC, ICCAT, IOTC and WCPFC) now require mandatory use of UVIs, such as IMO numbers. Note, however, that the [IMO Ship Identification Number Scheme Resolution](#) is part of a set of global norms aimed at the enhancement of maritime safety, pollution prevention and the prevention of maritime fraud, to which fishing vessels are also subject. Responsible fisheries should be expected to comply with all such Resolutions, despite their voluntary status, not simply as a means to obtain a unique vessel identifier.

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

| | <u>2014</u> | <u>2015</u> | <u>2016</u> | <u>2017</u> | <u>2018</u> | <u>2019</u> | <u>2020</u> | <u>2021</u> |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <u>Vessels deleted</u> | | | | | | | | |
| Sank or no longer found in tRFMO records | 39 | 23 | 40 | 72 | 19 | 18 | 16 | 21 |
| No longer classified as Large | 12 | 16 | 7 | 7 | 1 | 2 | 2 | 1 |
| No longer classified as targeting trop. tuna | 13 | 1 | 5 | - | - | - | 2 | 40 |
| Duplicate records | 3 | - | - | - | - | - | - | - |
| Different vessel type | - | 1 | 13 | - | 2 | - | - | - |
| Total | 67 | 41 | 65 | 79 | 22 | 20 | 20 | 62 |
| <u>Vessels added</u> | | | | | | | | |
| New in the RFMO records and built before 2012 | 24 | 46 | 2 | 15 | 7 | 9 | 9 | 8 |
| New in the RFMO records and built in 2012 or after | 24 | 33 | 30 | 12 | 1 | 9 | 12 | 27 |
| New in the RFMO records (year unknown) | 12 | 12 | 1 | - | - | 14 | 4 | 1 |
| Now classified as Large | 22 | 2 | 1 | 8 | 2 | - | 4 | 2 |
| Now classified as targeting trop. tuna | - | 14 | - | - | - | 1 | 1 | 5 |
| Different vessel type | - | - | - | 1 | - | - | - | 1 |
| Total | 82 | 107 | 34 | 36 | 10 | 33 | 30 | 44 |
| <u>Vessels changed flag and/or name</u> | | | | | | | | |
| Changed flag | 49 | 24 | 19 | 13 | 8 | 16 | 27 | 19 |
| (Of which changed flag and name) | (30) | (12) | (11) | (6) | (2) | (10) | (17) | (3) |
| Changed name only | 11 | 10 | 6 | 10 | 4 | 13 | 8 | 3 |
| Total | 60 | 34 | 25 | 23 | 12 | 29 | 35 | 22 |
| <u>IMO#</u> | | | | | | | | |
| Percentage of vessels with IMO# (12% in 2011) | 88% | 87% | 91% | 95% | 99% | 97% | 97% | 98% |

3.5.2. VESSELS CONSTRUCTED IN RECENT YEARS

The number of large-scale tropical tuna purse seine vessels constructed during the 2015-2021 period according to tRFMO records is summarized in **Table 8**. It is worth noting that the total number of new vessels by year have decreased since 2015.

Table 8. Large-scale tropical tuna purse seine vessels built in recent years (2015-2021) grouped by flag and development status of the flag states.

| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | |
|------------------|-------------------------------|----------------|----------------|----------------|----------------|----------|-----------|----------|-----------|
| Developed | Chinese Taipei | 3 | | | 2 | | 2 | | 7 |
| | France | | 2 | | | | | 1 | 3 |
| | Japan | | | | | 2 | 1 | | 3 |
| | Korea, Rep. | 2 | | 1 | | 2 | | | 5 |
| | Spain | | | 1 | | | | 1 | 2 |
| Other | Cape Verde | | 1 ⁴ | | | | | | 1 |
| | China, P.R. | 2 | 1 | | | | 3 | | 6 |
| | Curaçao | 1 | | | | | | | 1 |
| | El Salvador | 1 ⁵ | | | | | | | 1 |
| | Indonesia | 2 | | | 1 | | | | 3 |
| | Kenya | | | 6 ⁶ | | | | | 6 |
| | Marshall Islands | | | | 3 | | | | 3 |
| | Mexico | 2 | | 1 | | | | | 3 |
| | Fed. States Micronesia | | 2 | 1 | 1 ⁷ | 1 | | 1 | 6 |
| | Panama | | | 1 | | 1 | 3 | | 5 |
| | Philippines | 2 | 3 | | | 1 | 1 | | 7 |
| | Seychelles | 3 | | | | | | | 3 |
| | Solomon Islands | 2 | | | | | | | 2 |
| Vanuatu | | | | 1 | | | | 1 | |
| | Grand Total | 20 | 9 | 11 | 8 | 7 | 10 | 3 | 68 |

⁴ This vessel was originally a Supply & Tender vessel and flagged to Spain

⁵ This vessel was initially flagged to USA

⁶ These vessels were initially flagged to People's Republic of China

⁷ This vessel was initially flagged to Papua New Guinea

4. Conclusions

Using updated information available from both the tRFMOs and the supporting databases, we estimate that—in July 2021—there were 1,855 purse seine vessels authorized to fish for tunas worldwide, with a combined FHV of over 1,125,000 cubic meters. This represents an 8% increase in the number of vessels since the previous snapshot report by Justel-Rubio and Recio (2020), due mainly to the re-listing of several vessels from the tRFMO authorized vessels lists, predominantly those of medium-small size and/or targeting bluefin tuna in the Atlantic ocean and Mediterranean sea and medium-size vessels operating in the Indian ocean. Restricting the list to large-scale vessels, defined here as ≥ 335 m³ FHV, reduces the number of purse seiners to 826, with a combined FHV of over 940,000 m³.

Focusing on large-scale purse seine vessels that target tropical tunas brings the number down to 678 vessels with about 865,000 m³ of combined FHV. Close to three times as many of these vessels are flagged to developing countries than are flagged to developed countries. A large proportion of these vessels (74% in number, 81% in FHV) are registered in ISSF's Proactive Vessel Register. About 16% 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 last year estimates (Justel-Rubio and Recio, 2020), using updated data, shows that, once more, there were numerous changes in the tRFMO authorized vessel records (**Table 7**). Several vessels that appeared on the records in 2020 can no longer be found. Other (older) vessels that were not on the records are now listed, and some vessels changed in reported dimensions which affect their inclusion or exclusion from our large-scale PS list. 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 tRFMO members exercise greater quality control of the data they submit to the tRFMOs for the vessel records and that tRFMOs adopt vessel registry requirements that include quality control mechanisms.

Since Justel-Rubio and Recio (2020), 27 large-scale purse seine vessels constructed between 2012 and July 2021 have been added to the tRFMO records, 12 of which were recently constructed (2019-2021).

Recommendations

This study resulted in four recommendations:

Recommendation 1:

- Vessel owners, irrespective of vessel types and sizes (i.e. not only large-scale purse seine vessels) also apply for IMO numbers, given the utility of using IMO numbers as Unique Vessel Identifiers and, hence, as a powerful tool to combat Illegal unreported and unregulated (IUU) fishing.

Recommendation 2:

- Owners of vessels with an IMO number communicate to IHS-Maritime any changes to their vessel details, to ensure all vessel information is up-to-date in the vessel's profile on IHS-Maritime's online database⁸.

Recommendation 3:

- Tuna RFMO members exercise greater quality control of the data they submit to the tRFMOs for the vessel records and tRFMOs adopt vessel registry requirements that include quality control mechanisms.

Recommendation 4:

- All tRFMOs maintain not only lists of vessels authorized to operate in the Convention Areas, but also maintain lists of vessels that are actively fishing in the Convention Areas, to make it possible to estimate active capacity by region in any given year (e.g. by including a requirement to provide a copy of the relevant permit/license to substantiate an actively fishing notification).

Authorized Vessel Lists Recommendations

**For more recommendations specific to tRFMO
Lists of Authorized Vessels, please consult**

[Technical Report 2021-04 Tuna RFMO Authorized
Vessel Lists: A Comparative Analysis to Identify Best
Practices \(Version 6\).](#)

⁸ See <https://imonumbers.lrfairplay.com/Home/Help>:
If your vessel is NOT In Service yet send an E-mail to: ship.imo@ihs.com
If the ship is In Service then send an E mail to maritime.ships@ihs.com

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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.
- ISSF. (2021). Status of the world fisheries for tuna. Mar 2021. ISSF Technical Report 2021-10. 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.
- 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.
- Justel-Rubio, A., Recio, L. and Restrepo, V. (2018). A Snapshot of the Large-Scale Tropical Tuna Purse Seine Fishing Fleets as of June 2018. ISSF Technical Report 2018-17. International Seafood Sustainability Foundation, Washington, D.C., USA.
- Justel-Rubio, A. and Recio, L. (2019). A Snapshot of the Large-Scale Tropical Tuna Purse Seine Fishing Fleets as of June 2019 (Version 7). ISSF Technical Report 2019-09. International Seafood Sustainability Foundation, Washington, D.C., USA.
- Justel-Rubio, A. and Recio, L. (2020). A Snapshot of the Large-Scale Tropical Tuna Purse Seine Fishing Fleets as of June 2020 (Version 8). ISSF Technical Report 2020-14. International Seafood Sustainability Foundation, Washington, D.C., 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.
- 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.
- 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>.
- van der Geest, C. (2021). Tuna RFMO Authorised Vessel Lists: A Comparative Analysis to Identify Best Practices (Version 6). ISSF Technical Report 2021-04. International Seafood Sustainability Foundation, Washington, D.C., USA.
- 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 ft³ = 2.83 m³).

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):

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

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

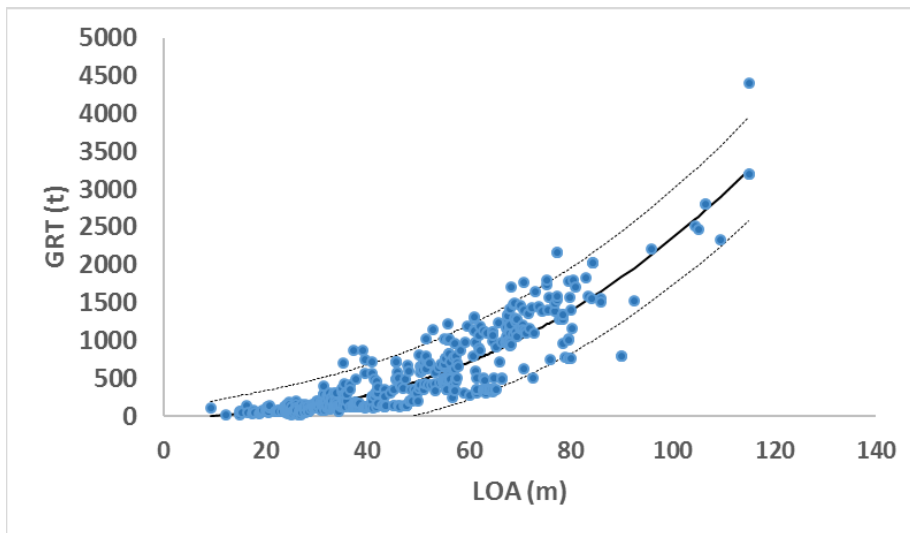


Figure 1a. Relationship between GRT (tonnes) and LOA (m) and 95% confidence intervals.

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):

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

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

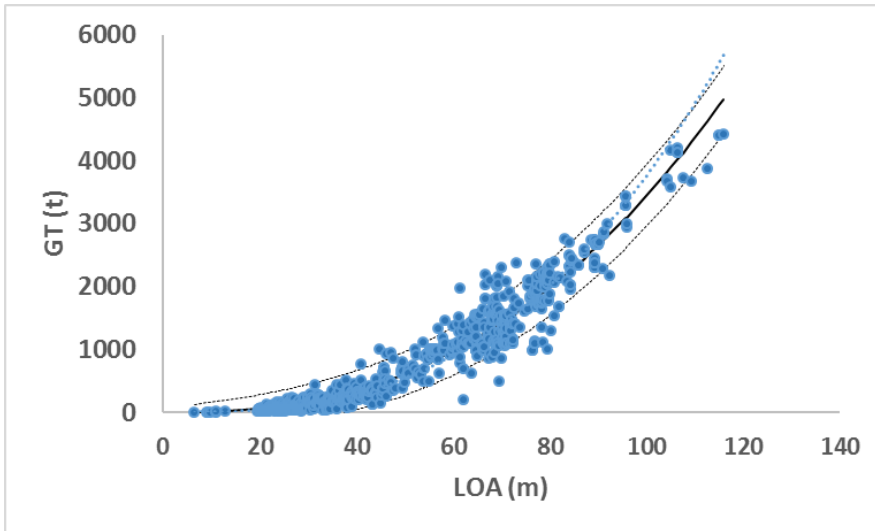


Figure 1b. Relationship between GT (tonnes) and LOA (m) and 95% confidence intervals.

2. FHV VS FCC

The relationship between FHV (m³) and FCC (tonnes) estimated using a MLE approach on the subset of IATTC vessels for which FHV values were verified was linear (**Figure 2**):

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

Fish Carrying Capacity and Fish Hold Volume are highly correlated.

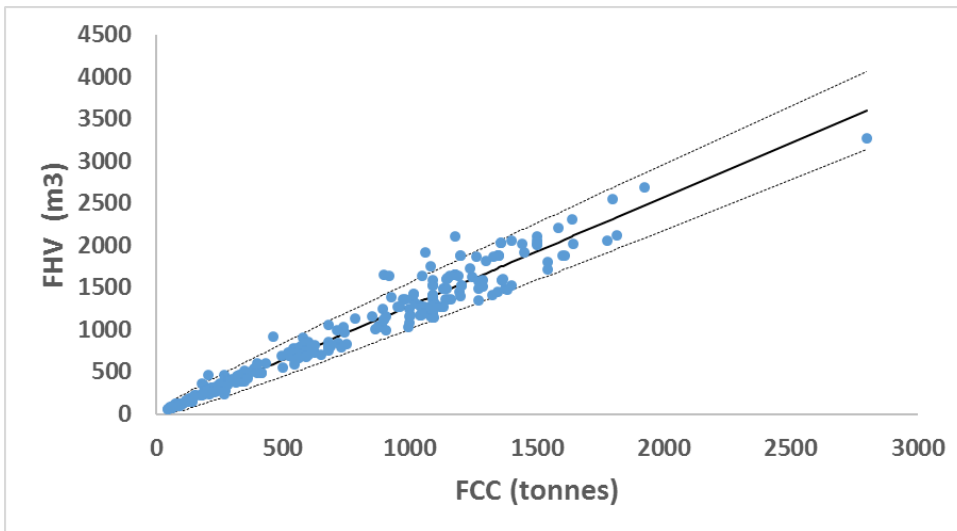


Figure 2. Relationship between FHV (m³) and FCC (tonnes) and 95% confidence intervals.

3. FHV VS LOA

The relationship between FHV (m³) and LOA (m) estimated using a MLE approach on the subset of IATTC vessels for which FHV values were verified followed a power function of the form (**Figure 3**):

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

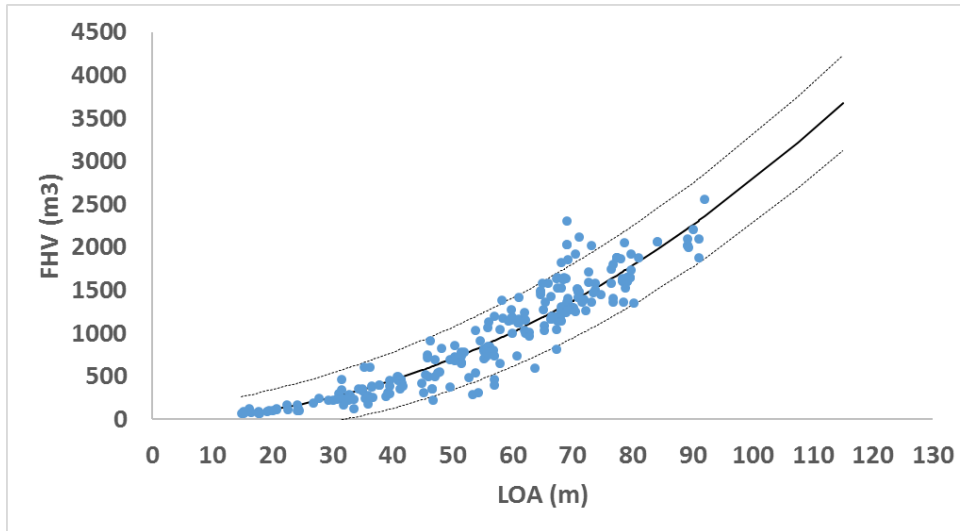


Figure 3. Relationship between FHV (m³) and LOA (m) and 95% confidence intervals.

Appendix 3. Version log

| VERSION | DATE | TECHNICAL ⁹ REPORT | AUTHORS |
|---------|---------|----------------------------------|--|
| 1.0 | 01/2012 | 2012-01 | Víctor Restrepo and Francesca Forrestal |
| 2.0 | 04/2014 | 2014-07 | Ana Justel-Rubio and Víctor Restrepo |
| 3.0 | 05/2014 | 2015-05 | Ana Justel-Rubio and Víctor Restrepo |
| 4.0 | 07/2016 | 2016-12 | Ana Justel-Rubio and Víctor Restrepo |
| 5.0 | 08/2017 | 2017-05 | Ana Justel-Rubio, Lorena Recio and Víctor Restrepo |
| 6.0 | 06/2018 | 2018-17 | Ana Justel-Rubio, Lorena Recio and Víctor Restrepo |
| 7.0 | 07/2019 | 2019-09 | Ana Justel-Rubio and Lorena Recio |
| 8.0 | 06/2020 | 2020-14 | Ana Justel-Rubio and Lorena Recio |
| 9.0 | 07/2021 | 2021-12 | Ana Justel-Rubio and Lorena Recio |

⁹ Earlier versions of the report can be requested by e-mail (info@iss-foundation.org)



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