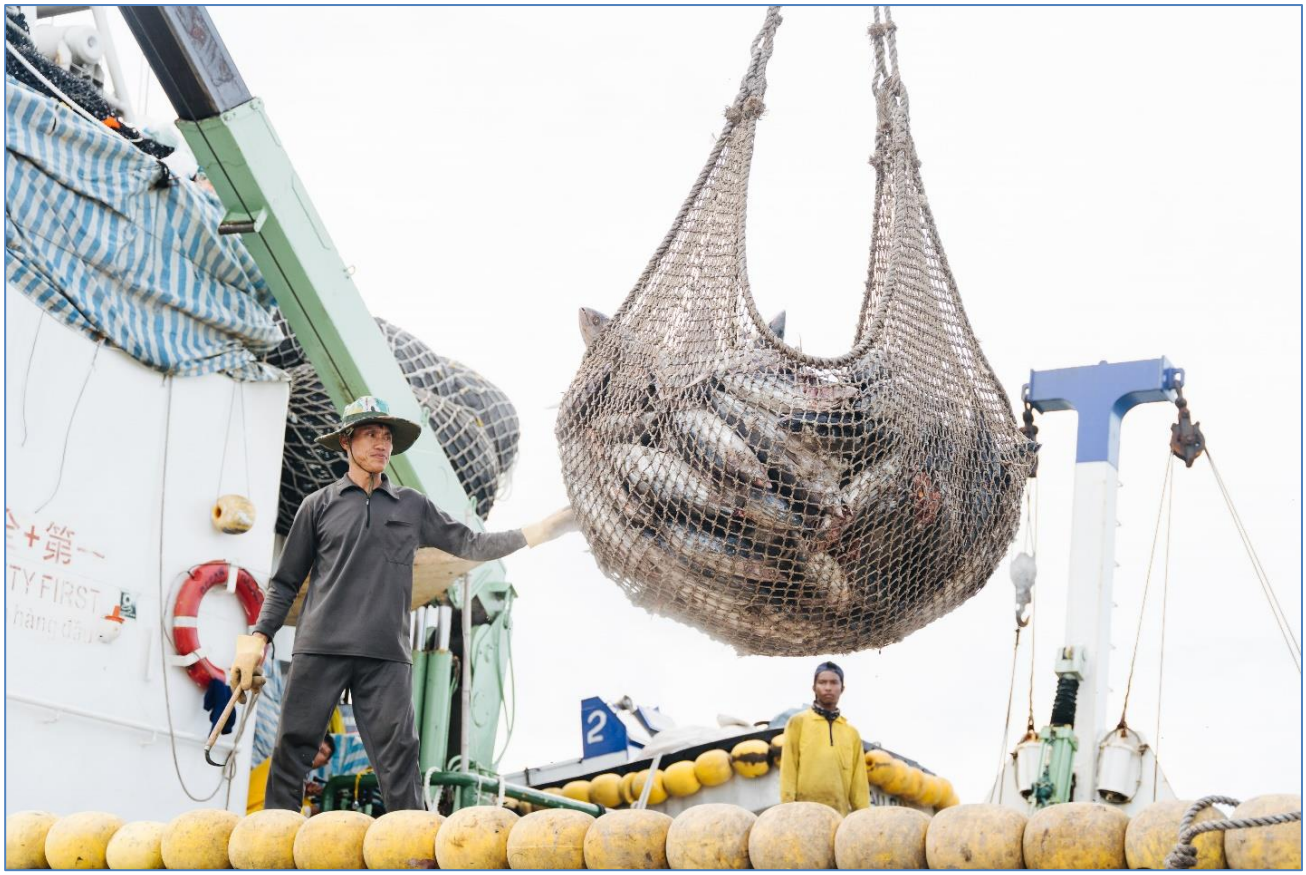

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Transshipment estimations

April 2022

POSEIDON
AQUATIC RESOURCE MANAGEMENT

Report Information

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CONTENTS

Tables

Figures

Acronyms used

AIS..... automatic identification system
ALB..... albacore tuna
AnTC ..... Antarctic
AO ..... Atlantic Ocean
BET..... bigeye tuna
BFT..... Atlantic bluefin tuna
BUM..... blue marlin
CA..... Convention Area
CCM ..... Member, Cooperating Non-Member and Participating Territory (of the WCPFC)
CCSBT ..... Commissions for the Conservation of Southern Bluefin Tuna
CDS..... catch documentation scheme
CMM..... Conservation and Management Measure
CPC..... RFMO Contracting Party (Member) and Cooperating Non-Contracting Party
CPUE..... catch per unit of effort
EAO..... East Atlantic Ocean
EEZ..... exclusive economic zone
EPO..... East Pacific Ocean
FAO ..... Food and Agriculture Organisation (of the United Nations)
FSM..... Federated States of Micronesia
GFW..... Global Fishing Watch
IATTC ..... Inter-American Tropical Tuna Commission
ICCAT..... International Commission for the Conservation of Atlantic Tunas
IO..... Indian Ocean
IOTC..... Indian Ocean Tuna Commission
IUU ..... illegal unreported and unregulated
LL..... longline
LSPLV ..... large scale pelagic longline vessel
LSTLV..... large scale tuna longline vessel
LSTV..... large scale tuna vessel
MLS ..... striped marlin
nei..... not elsewhere identified
NPFC..... North Pacific Fisheries Commission
OTH Bill ..... other billfish
OTH Tuna..... other tuna
OTH..... other
PBF..... Pacific bluefin tuna
PL ..... pole and line
PNG..... Papua New Guinea
PS..... purse seine
PSMA ..... Port State Measures Agreement
PWG..... Permanent Working Group
RAV ..... record of authorized vessels
RFMO..... regional fisheries management organisation

RMI ..... Republic of the Marshall Islands
ROP..... regional observer programme
SBF..... southern bluefin tuna
SHK ..... shark
SKJ ..... skipjack tuna
SPC ..... Pacific Community (formerly the Secretariat of the Pacific Community)
SWO ..... swordfish
TCC ..... Technical and Compliance Committee (of the NPFC)
tRFMO ..... tuna regional fisheries management organisation
VMS..... vessel monitoring system
WAO ..... West Atlantic Ocean
WCPFC..... Western Central Pacific Fisheries Commission
WCPO ..... Western Central Pacific Ocean
YFT..... yellowfin tuna

1. Background

1.1 Rationale for the study

This report provides global estimates of the volumes of tuna and tuna-like species that are transshipped, and the value of tuna transshipments at first sale and final consumption.

The Pew Charitable Trusts (Pew) has an interest in supporting reform of regional fisheries management organization (RFMO) policy and conservation and management measures related to transshipment, with a special interest in tuna RFMOs.[1] To better make the case for policy reform, an estimation of levels of transshipment in both volume and value terms is beneficial as it quantifies how important transshipments are globally.

In a previous study for Pew,[2] Poseidon used tuna RFMO landings data, and tuna prices collected from a variety of sources, to quantify the value of tuna fisheries globally, at 'first sale' i.e. ex-vessel values, and for final consumed values. This study was used by Pew as the basis for its 'Netting Billions' publication and associated data visualisation.[3] Quantification of the volume and value of transshipments is also therefore useful to determine what proportion of the volume and values of tuna globally is comprised of product that is transshipped.

In a follow up (unpublished) study for Pew, Poseidon completed an assessment of the methodological possibility and challenges of estimating: i) legal transshipments reported to/by tuna RFMOs; ii) legal transshipments reported to/by the North Pacific Fisheries Commission (NPFC); iii) illegal transshipments of tuna. Based on the findings of the study, it was agreed that Poseidon would complete a study on the first of these topics only, hence the focus of this report on providing estimates of the volumes of tuna and tuna-like species transshipped (as reported to/by tuna RFMOs), and the values of tuna species[4] at first sale and final consumption.

1.2 Background - RFMO transshipment measures

All five tuna RFMOs (tRFMO) have established **regulations that are aimed at controlling and monitoring transshipments**.

These are as follows:

- Western and Central Pacific Fisheries Commission (WCPFC): Conservation and Management Measure (CMM) on the Regulation of Transshipment, 2009-06.[5]
- Indian Ocean Tuna Commission (IOTC): Resolution 21/02 On Establishing a Programme for Transshipment by Large-Scale Fishing Vessels (updating Resolution 19/06).[6]

[1] Pew also engages with the North Pacific Fisheries Commission (NPFC) on transshipment issues related to non-tuna species.

2 G. Macfadyen et al., 2019. "Netting Billions: A Global Valuation of Tuna (An Update)". Poseidon Aquatic Resources Management Ltd., 2019.

[3] Netting Billions 2020: A Global Tuna Valuation: | The Pew Charitable Trusts (pewtrusts.org)

[4] Because the earlier Netting Billions work did not cover tuna-like species, prices for tuna-like species were not available from the Netting Billions work for use in this study to generate transshipment values for tuna-like species.

[5] https://www.wcpfc.int/doc/cmm-2009-06/conservation-and-management-measure-regulation-transshipment-0 '*The Commission agreed at WCPFC15 (2018) to include a footnote to Annex I and Annex III to reflect the adoption of the WCPFC E-reporting Standards for high seas transhipment declarations and high seas transshipment notices. A template was also agreed for paragraph 11 annual reports*'

[6] Resolution 21/02 on Establishing a Programme for Transhipment by Large-Scale Fishing Vessels | IOTC

- Inter-American Tropical Tuna Commission (IATTC): Resolution C-12-07 Amendment to Resolution C-11-09 on Establishing a Program for Transshipments by Large-Scale Fishing Vessels.[7]
- The International Commission for the Conservation of Atlantic Tunas (ICCAT): Recommendation by ICCAT on Transshipment 21-15, which amends Recommendation 16-15.[8]
- The Commission for the Conservation of Southern Bluefin Tuna (CCSBT): Resolution on Establishing a Program for Transshipment by Large-Scale Fishing Vessels.[9]

The purpose of these regulations is primarily to generate data on transshipments and ensure through reporting and verification the legality of transshipment operations. Each of these measures allows for transshipments at sea, primarily for Large Scale Pelagic Longline Vessels (LSPLV), in some cases for pole and line vessels e.g. WCPFC, IOTC[10], but also in some specific cases even for purse seine vessels e.g. WCPFC as provided for in Section 2 of CMM 2009-06[11]. IATTC also has a specific allowance for transshipment at sea by swordfish harpoon vessels that falls outside of its transshipment Resolution. In all cases, transshipments at sea, both inside and outside the convention areas, are required to be monitored by independent observers placed on the receiving carrier vessel, in addition to requirements for observers onboard certain percentages of fishing vessels. The regulations don't just relate to at-sea transshipments however, and also include various requirements related to reporting and monitoring of transshipments in ports.

1.3 Purpose and scope of this report

The **purpose and scope** of this report is to provide estimations as follows:

1. Volumes of transshipments by species for: skipjack tuna (SKJ), yellowfin tuna (YFT), bigeye tuna (BET), albacore tuna (ALB), Atlantic bluefin tuna (BFT), Pacific bluefin tuna (PBF), Southern bluefin tuna (SBF), pelagic sharks, billfish, other tuna-like species (see Appendix 1).
2. Values of transshipments at first sale and final consumed values for the tuna species listed above.
3. Volume and value estimates for the years 2012, 2014, 2016, and 2018.
4. Volume and value estimates by ocean basin for:
    - The Western Central Pacific Ocean (WCPO)
    - The East Pacific Ocean (EPO)

[7] https://www.iattc.org/PDFFiles/Resolutions/IATTC/_English/C-12-07-Active_Amends%20and%20replaces%20C-11-09%20Transshipments.pdf

[8] https://www.iccat.int/Documents/Recs/compendiopdf-e/2021-15-e.pdf and https://www.iccat.int/Documents/Recs/compendiopdf-e/2016-15-e.pdf. The new ICCAT Recommendation 21-15 will enter into force in June 2022.

[9] https://www.ccsbt.org/sites/default/files/userfiles/file/docs_english/operational_resolutions/Resolution_Transshipment.pdf

[10] For Maldivian pole and line vessels

[11] which provides exemptions and allows '*at-sea transshipments for small purse seine boats (fish hold capacity of 600 mt or less) flagged to Papua New Guinea and Philippines'* under certain conditions, and *'transshipment activities involving New Zealand flagged domestic purse-seine vessels where the fishing activity, transshipment and landing of fish all take place within New Zealand fisheries waters in accordance with New Zealand's existing legal and operational framework for monitoring and control of transhipment activity and the verification of catch'* (https://www.wcpfc.int/doc/cmm-2009-06/conservation-and-management-measure-regulation-transhipment-0)

- The Indian Ocean (IO)[12]
- The Atlantic Ocean (AO)
- The Antarctic (AnTC)

5. Volume and value estimates by fishing gear for longline (LL), purse seine (PS), and pole and line (PL).[13]
6. Volume and value estimates for transshipments taking place at-sea or in-port.

In line with the definition in the WCPFC Convention text,[14] in this study **transshipment is defined as 'the unloading of all or any of the fish on board a fishing vessel to another fishing vessel either at sea or in port'**, with fishing vessels themselves defined as including carrier vessels. Volume and value estimations provided in this report do not however include transshipments between carrier vessels. In this study:

- Data on transshipments also do not include tuna that are transferred from fishing vessels to ranches in the case of bluefin tuna. In the Atlantic, interim operations are considered 'transfers' ((see article 3i) prior to 'caging' as defined in article 3s),[15] and these operations are not subject to the requirements of ICCAT Recommendation 21-15. In the Pacific, southern bluefin tuna ranching activities are managed through CCSBT measures and covered by the CCSBT catch documentation scheme (CDS)[16] and the Resolution on authorized farms[17], with the transshipment Resolution covering the activity of tuna longline vessels with freezing capacity (with longline vessels not used to catch tuna transferred to ranches).
- Fish that are containerised[18] are not considered as transshipments and are assumed not to be included in transshipment data provided to tRFMOs given the focus of transshipment declarations on fishing vessels and carrier vessels (rather than container vessels).[19]

Subsequent **sections of this report** provide information and data on:

- The methodology and data used during the study (and the limitations) (Section 2)
- The results in terms of the volume and value estimations generated (Section 3)
- A short discussion (Section 4)

12 IOTC data are not available disaggregated into West Indian Ocean and East Indian Ocean so are aggregated at the Indian Ocean level for the purpose of this study.

13 These being the gears used to catch tuna which are transshipped.

14 https://www.wcpfc.int/convention-text

15 https://www.iccat.int/Documents/Recs/compendiopdf-e/2021-08-e.pdf

16 https://www.ccsbt.org/sites/ccsbt.org/files/userfiles/file/docs_english/operational_resolutions/Resolution_CDS.pdf

17 Microsoft Word - Resolution_AuthorisedFarms.doc (ccsbt.org)

18 Containerisation is the loading of fish from fishing vessels (or shore-based facilities) into containers (typically either 20ft or 40ft in length).

19 In the WCPFC where containerisation of tuna is practiced in a number of countries (e.g. The Republic of Marshall Islands), in-port transshipment figures are reported by coastal States/port States through their Annual Report Part 1. As per CMM 2009-06 para 4 (after the introduction) the national laws of the coastal State/port State are applicable, so it is possible that some States may include containerized fish in the in-port transshipment figures reported to the WCPFC. However, while this study has not provided for a detailed examination of reporting practices in States engaged in containerization, the supposition is that containerized tuna is not included in transshipment figures.

Excel database and model files containing all data underpinning the estimations **have been provided to Pew** as an additional output, both to allow for data to be checked, and for analysis of data based on any combination of the above variables.

2. Study methodology

2.1 Methodological steps and processes

A stepwise approach was used during this study as follows.

1. Construction of an MS Excel file structure to be used for entry of data on the volume of transshipments disaggregated by ocean basin, species, gear, and location (at-sea / in-port). This involved establishing appropriate 'lists' and formatting cells to be used for data entry with 'data validation' to avoid errors in data entry.
2. Collection of available data on transshipment volumes from publicly available sources and based on data requests to tRFMOs (as discussed in section 2.2.1 below) and entry of all data into the model file. When entering data, annotations were made where appropriate to indicate all sources of data and important assumptions and issues related to the treatment of specific data, to better facilitate Pew's data checking process prior to publication of this report (see below).
3. Generation of a pivot table in the excel file to provide transshipment volume estimates by ocean basin, species, gear, and location from the disaggregated data worksheet.
4. Expansion of the excel file to provide an additional worksheet capturing all relevant first sale and final consumed prices from earlier Netting Billions work i.e. relevant prices for years, tuna species, ocean basins, and fishing method.
5. Further expansion of the excel file to provide a worksheet for multiplication of the transshipment volume data for tuna species by the tuna price data, to generate estimates for tuna that is transshipped of the value at first sale and final consumption (Pew's data checking process).
6. Preparation of this report in draft form, using the outputs of the excel file and analysis completed.
7. Data checking of all data in the excel files, and fact checking of the contents of this report, as part of Pew's internal review processes to ensure robustness and accuracy of all outputs. This resulted in minor amendments being made prior to finalisation of this report.
8. Peer review by two peer reviewers, which also resulted in minor amendments and improvements to the content of this report.

2.2 Data available and used in this study

2.2.1 Volumes of transshipments

The extent to which the tuna RFMOs make data publicly available on the volume of transshipments is determined by:

1. The requirements in the RFMO regulations on data that must be provided by members to the RFMOs.
2. The extent to which members abide by the requirements of the regulations in providing those data.
3. Provision in the RFMO regulations, or accepted general practice, as to which data provided by members can be made publicly available and at what level of disaggregation.

IOTC

CMM 21/02 (and 19/06) Annex III provides a transshipment form to be used for authorisation for all transshipments. The form does not include a requirement to specify the fishing method/type but does require the location (port or at-sea) and product form. Data in the

individual forms completed by fishing vessels (and carrier vessels), which provide the basis for flag state submissions on transshipments to the IOTC Secretariat, are not made publicly available.

CMM 21/01 requires RFMO Contracting Party (Member) and Cooperating Non-Contracting Party (CPCs)[20] to report annually before 15 September to the IOTC Executive Secretary on:[21]

a) '*The quantities by species transshipped during the previous year (based on data in individual transshipment forms);*
b) *The list of the LSTLVs[22] registered in the IOTC Record of Fishing Vessels which have transshipped during the previous year;*
c) *A comprehensive report assessing the content and conclusions of the reports of the observers assigned to carrier vessels which have received transshipment from their LSTLVs*.'

IOTC provides two excel templates[23] for data to be reported by CPCs on i) at-sea transshipments, and ii) in-port transshipments. Based on the CPC submissions, a summary report on transshipments at sea (only) is prepared each year by the IOTC Secretariat and these are available for download from the IOTC website. These reports provide a breakdown of at-sea transshipments by flag state and species and include data on the number of transshipment events. At-sea transshipment data have therefore been sourced as follows:

- For 2012: Report on Transshipment Res 12-05 - Secretariat's Report | IOTC
- For 2014: IOTC Regional Observer Programme for at- sea transshipments – Secretariat's Report | IOTC
- For 2016: Report on Transshipment Resolution 14-06 – Secretariat's Report | IOTC
- For 2018: Report on establishing a programme for transshipment by large-scale fishing vessels - Resolution 18-06 (Secretariat) | IOTC

Despite the fact that CPCs also provide data to the IOTC on transshipments in-port, no summary report is issued on in port transshipments by the Secretariat, and the individual CPC submissions to the IOTC on in-port transshipments are not publicly available. For the purposes of this study, a special data request was made to the IOTC Secretariat for the provision of data on in-port transshipments which was shared with, and approved by, all IOTC CPCs. The Secretariat then provided in-port transshipment data to Poseidon for use in this study.[24]

WCPFC

For the WCPFC Convention Area (CA), all transshipments must be in port except for exemptions at sea (for longliners and in some specific cases for pole and line and purse seine vessels).[25] A list of data fields must be completed by both the offloading and receiving vessel for each transshipment in the CA. WCPFC transshipment reports for individual transshipments (notifications and declarations) *managed by the Secretariat* relate to *high seas* longline

[20] Note that different tRFMOs use different terminology and acronyms for their members (contracting, non-contracting, etc). For the sake of this report CPC is used throughout as a 'catch all' basis for referring to contracting and non-contracting parties.

[21] Resolution 21/02 on Establishing a Programme for Transshipment by Large-Scale Fishing Vessels | IOTC (section 5, para 23)

[22] Large scale tuna longline vessels (LSTLVs)

[23] https://www.iotc.org/compliance/reporting-templates

[24] Data were provided based on an agreement that IOTC CPCs would have an opportunity to review the report before its publication to check for any factual errors or inconsistencies with IOTC approved and recognised naming conventions.

[25] Some exemptions to these requirements have been made during the COVID-19 pandemic, but fall outside the years which are the focus of this study. https://www.wcpfc.int/covid19

transshipments in the CA. These declarations provide for the location of the transshipment to be identified (along with the location of the catch), meaning that for high seas longline transshipments, the WCPFC Secretariat has data on transshipments that can be broken down into those: i) in the CA but not in the overlap area, ii) in the overlap area,[26] and iii) outside the CA.

Purse seine transshipments occur within national waters and are not reported to WCPFC at the individual event level. For this reason, data for in-zone or in-port transshipments only appear in annual reports to the Scientific Committee (SC) by CPCs[27] as they are considered (along with high seas transshipments), in scientific analyses.

Annex 2 of CMM 09/06 requires country annual reports to provide data on both the volume and number of transshipments by gear, by species, by port/areas of national jurisdiction/areas beyond national jurisdiction (and in case of weights, by product form). The WCPFC Technical and Compliance Committee (TCC) then reports annually on WCPFC transshipment reporting. These annual reports include tables showing CPC reporting of the quantity of annual transshipments offloaded from i) longline vessels and ii) purse seine vessels, as reported in CPC Annual Reports Part 1. Data on longline transshipments reported by CPCs and included in the TCC annual reports are provided based on the location of catches (in and outside the WCPFC CA) and location of transshipment (in-port, in EEZ, in high seas within the CA, and in-port or at sea outside the CA).

For longline transshipments in the high seas, data on individual transshipments (notifications and declarations) are managed by the Secretariat as noted above. These data were provided in excel format to Poseidon, aggregated for all flag fishing vessels, but disaggregated by year, species, and location of transshipment (in the CA but excluding overlap area with the IATTC, in the overlap area with the IATTC, and outside the WCPFC CA). Data on high seas longline transshipments in the WCPFC CA *excluding the overlap area* are used in the study when making estimations of transshipments in the WCPO. Further discussion on transshipments in the overlap area is provided below. But as both WCPFC and IATTC have provided data on transshipments in the overlap area to Poseidon, rather than providing estimations of transshipment volumes for the WCPO and the EPO, this study provides estimates for three ocean areas as follows:

- in the WCPFC CA excluding the overlap area
- in the IATTC CA excluding the overlap area, and
- in the WCPO/EPO overlap area.

This removes the problem of double counting transshipments in the overlap area, which would otherwise occur.

For longline transshipments made *in port and in WCPFC EEZs*, data used in this study are sourced from the TCC annual reports and the columns in those reports showing in-port and EEZ transshipments.[28] *Purse seine in-port transshipment* data are also sourced from the TCC annual reports. The TCC annual reports used for in-port and EEZ longline transshipments, and for in-port purse seine transshipments are as follows.

- For 2012 transshipments, the WCPFC TCC 2013 report does not contain a breakdown of transshipment as provided in later years, as this was only requested by the 10th TCC, so data have been extracted from the individual CPC annual reports available at 9th Regular Session of the Scientific Committee | WCPFC Meetings

26 The convention areas for the IATTC and WCPFC overlap in the Pacific Ocean waters within an area bounded by 50° S latitude, 4° S latitude, 150° W longitude, and 130° W longitude ("overlap area").

27 Referred to as Member, Cooperating Non-Member and Participating Territory (CCM)

28 High seas transshipments data in the annual WCPFC TCC reports (based on member reporting) are not used as they are less complete than data held by the Secretariat based on individual declarations.

- For 2014: Annual Report on the High Seas transshipment reporting | WCPFC Meetings (relevant columns from Annex 2B for longline transshipments and Annex 2C for purse seine transshipments)
- For 2016: Annual Report on Transshipment Reporting | WCPFC Meetings (relevant columns from Annex 2B for longline transshipments and Annex 2C for purse seine transshipments)
- For 2018: Annual Report on WCPFC transhipment reporting | WCPFC Meetings (relevant columns from Annex 7B for longline transshipments and Annex 7C for purse seine transshipments).

In addition, data from the annual reports by port States have been used to fill in some gaps in flag state reporting on purse seine transshipments i.e. where port state reports in-port transshipments by flag States in their own annual reports. In 2012 this was possible for purse seine transshipments in the Republic of the Marshall Islands (RMI) and Kiribati by: China, Korea, Ecuador, El Salvador, Federated States of Micronesia (FSM), Korea, Papua New Guinea (PNG), Spain, Vanuatu and Tuvalu. In 2014 this was possible for purse seine transshipments in RMI by: China, Spain, Kiribati, Philippines, and Vanuatu. In 2016 this was possible for purse seine transshipments in RMI by: China, Spain, Kiribati, PNG, Philippines and Vanuatu. And in 2018 this was possible for purse seine transshipments in RMI by: China, Kiribati, Philippines, and Vanuatu.

IATTC

Each CPC has to report annually before 15 September to the Director of IATTC:

- '*the quantities by species transshipped during the previous year*
- *the names of its vessels on the IATTC LSTLFV List which have transshipped during the previous year; and*
- *comprehensive report assessing the content and conclusions of the reports of the observers assigned to carrier vessels which have received transshipment from its LSTLFVs*.'[29]

IATTC thus receives data on tuna volumes and species transshipped, as well as sharks and other non-tuna species. Often the non-tuna species are not specifically identified, but rather are grouped into general categories (sharks, billfish, etc.).

Annex 1 paragraph 6 of C-12-07 says that '*Each flag CPC with LSTFVs shall report each year to the IATTC the details of the transshipments by its vessels*'. LSTFVs include both purse seine vessels transshipping in-port, and longline vessels doing at-sea transshipments based on the footnote to LSTFVs.[30] However, IATTC have confirmed that CPCs focus almost exclusively in their reporting on at-sea transshipments and that they have only received a few reports since the resolution on transshipments in-port came into force[31] - this despite the requirement of C-12-07 to cover all vessels/transshipments and the fact that the IATTC transshipment declarations provide for specification of whether transshipments occur in-port or at-sea.[32]

[29]https://www.iattc.org/PDFFiles/Resolutions/IATTC/Compendium-of-active-resolutions-and-recommendations.pdf

[30] '*defined as all vessels fishing beyond areas of national jurisdiction or beyond each CPC-controlled areas and targeting tuna or tuna-like species*.' https://www.iattc.org/PDFFiles/Resolutions/IATTC/_English/C-12-07-Active_Amends%20and%20replaces%20C-11-09%20Transhipments.pdf

[31] Pers. Comm., IATTC

[32]https://www.iattc.org/PDFFiles/Resolutions/IATTC/_English/C-12-07-Active_Amends%20and%20replaces%20C-11-09%20Transhipments.pdf

Annual reports of the longline transshipment programme (e.g. CAF-07-03 EN Transshipment program (iattc.org)) provide data on the area of *catches* that were transshipped (EPO, overlap area, WCPO, or unknown). However, Appendix 1 of the annual transshipment reports does not provide a similar breakdown for the location of the *transshipment*, only providing transshipments taking place in the EPO as a whole. And species data provided are not very disaggregated (data only provided for bigeye tuna, yellowfin tuna, albacore tuna, swordfish, shark, and other). For longline vessels, from transshipment declarations and CPC reports, the IATTC does however have data on where transshipments occur (in the IATTC CA non-overlap area, in the overlap area, and outside the CA), and a complete species breakdown, although these data are not publicly reported. Consequently, the IATTC Secretariat provided data on transshipment volumes by species, for 2012, 2014, 2016 and 2018 separately for those transshipments in the EPO non-overlap area (along with similar data for transshipments in the overlap area), and at a greater level of species disaggregation. Data provided were at an aggregated flag state level, but this aggregation by flag is not considered problematic for the overall study methodology, as the intention of this study is not to report transshipments by flag state.

WCPO/EPO overlap area

This study has used data provided by the WCPFC and IATTC secretariats on request, to generate estimations of transshipped volumes of longline caught tuna and tuna-like species in the WCPO/EPO overlap area. Interestingly (and discussed later), while figures recorded in the overlap area by WCPFC and IATTC should be similar, they are not. For the purposes of the database constructed, the higher of the two figures recorded by WCPFC/IATTC was used as reports to RFMOS are far more likely to be under-reported than over-reported. In most cases (years and species) this meant using IATTC records of transshipments in the overlap area.

ICCAT

The flag CPCs of LSPLVs which have transshipped during the previous year and the flag CPCs of carrier vessels accepting transshipments are required to report annually to the Executive Secretary of ICCAT and to provide the following:

a) '*The quantities by species transshipped during the previous year.*
b) *The names of its vessels on the IATTC LSTLFV List which have transshipped during the previous year; and*
c) *A comprehensive report assessing the content and conclusions of the reports of the observers assigned to carrier vessels which have received transshipment from its LSTLFVs*.' [33]

However, while the CPC reports are made available to the Commission and relevant subsidiary bodies for review and consideration, they are supposed (according to Recommendation 21-15) to be posted on a password protected website accessible to CPCs rather than being made available to the public. Data on transshipments of different species by the individual Contracting Parties are currently available however in Annexes 1 (at-sea) and 2 (in port) of Permanent Working Group (PWG) documents available through ICCAT's meeting site at the following links under the permanent working group sub-page and have been accessed for use in this study:

- For 2018: 26th Regular Meeting of the Commission (iccat.int)
- For 2016: 25th Regular Meeting ICCAT

However, given the availability of these data appears to be an error, ICCAT have confirmed that data for other years will not be published and can't be provided.[34]

[33] C-12-07-Active_Amends and replaces C-11-09 Transhipments.pdf (iattc.org)

[34] Pers. Comm., ICCAT

Detailed transshipment data from the Regional Observers Programme for transshipment is not publicly available but an annual summary is also published in the Secretariat reports. ICCAT have reported to the Poseidon[35] however that it came to light during 2019 that there had been problems with the database held by the consortium managing the at-sea transshipment observer programme,[36] and so the summaries published contained errors. They therefore advised against using any observer programme data, as data in the currently available reports are inaccurate. More reliable are the summarised data from the individual Contracting Parties referred to above.

Data available for in-port transshipments are not separated by fishing method e.g. purse seine and longline as this is not required by the Recommendation 21-15.[37] However, it has been possible to allocate transshipments by fishing method by using the ICCAT vessel lists.[38]

CCSBT

The CCBST Resolution on Transshipment Annex 1[39] requires declarations to include information on whether transshipments occur in-port or at-sea, and the volumes of different products, [40] and the species, along with vessel details. The Resolution defines a 'LSTLV' as being tuna longline fishing vessel with freezing capacity i.e. purse seine fishing[41] is not included.

The Resolution requires CPCs to include in their annual reports to the Annual Meeting of the Commission:

- '*The quantities and percentage of SBT transshipped at sea and in port during the previous fishing season,*
- *The list of the LSTLVs registered in the CCSBT Authorised Vessel List which have transshipped at sea and in port during the previous fishing season, and*
- *A comprehensive report assessing the content and conclusions of the reports of the observers assigned to Carrier Vessels which have received at-sea transshipments from their LSTLVs during the previous fishing season*.' [42]

The annual reports are provided to the Extended Commission and relevant subsidiary bodies for their review and consideration, and the Executive Secretary then presents a report on the implementation of the Resolution to the Compliance Committee meeting. Data on transshipped volumes of southern bluefin tuna are also provided in Table 7 of each individual country report available at the CCSBT website on the meetings page[43], with data provided for the previous three fishing seasons in kilogrammes transshipped at-sea and in-port (and the proportion that transshipments represent of catches).

[35] Pers. Comm., ICCAT

[36] The consortium is comprised of the companies MRAG and Capfish

[37] Pers. Comm., ICCAT

[38] ICCAT·CICAA·CICTA

[39] ccsbt.org

[40] product has to be indicated as Round (RD), Gilled and gutted – tail on (GGO), Gilled and gutted - tail off, (GGT), Dressed – tail on (DRO), Dressed – tail off (DRT), Fillet (FL), or Other (OT).

[41] Mainly by Australian vessels with fish kept alive and towed to waters near the Australian mainland and stocked into floating cages.

[42] (ccsbt.org)

[43] https://www.ccsbt.org/en/past-meetings

Data on volumes transshipped are therefore available and have been used as follows:

- For 2018 (being the 2018/19 fishing season): CCSBT 26 (2019) - CC 14 | CCSBT Commission for the Conservation of Southern Bluefin Tuna
- For 2016 (being the 2016/17 fishing season): CCSBT 24 (2017) - CC 12 | CCSBT Commission for the Conservation of Southern Bluefin Tuna
- For 2014 (being the 2014/15 fishing season: CCSBT 22 (2015) - CC 10 | CCSBT Commission for the Conservation of Southern Bluefin Tuna
- For 2012 (being the 2012/13 fishing season): CCSBT 20 (2013) - CC8 | CCSBT Commission for the Conservation of Southern Bluefin Tuna

Summary

The following table (Table 1) summarises the availability of data on transshipment volumes used in this study. As can be seen from the table, gaps remain for in-port transshipments in the EPO for all years, and for at-sea transshipments in the Atlantic in 2012 and 2014.

Table 1: Summary of data available from tRFMOs on reported volumes of at-sea and in-port transshipments and used in this study

Ocean area	At-sea data	In-port data
Indian Ocean	2012*, 2014*, 2016*, 2018*	2012, 2014, 2016, 2018
WCPO (excluding overlap)	2012, 2014, 2016, 2018	2012*, 2014*, 2016*, 2018*
EPO (excluding overlap)	2012, 2014, 2016, 2018	None
WCPO/EPO overlap	2012, 2014, 2016, 2018	Not relevant
Atlantic Ocean	2016*, 2018*	2016*, 2018*
Antarctic Ocean	2012*, 2014*, 2016*, 2018*	2012*, 2014*, 2016*, 2018*

Source: Poseidon. Note: includes publicly available data (shown with an *), and data provided based on request

2.2.2 Values and prices of transshipments

None of the tRFMOs make or publish estimates of the value of tuna transshipments.

First sale/ex-vessel landings price data applicable for different tuna species and ocean basins, were collected for 2012, 2014, 2016 and 2018 as part of Poseidon's inputs to previous the Netting Billions reports. Sources of all data were articulated and documented in these earlier submissions to Pew and are not repeated here. First sale/ex-vessel price data, and prices for final consumed values used in earlier Netting Billions work are used again in this study to generate estimates of first sale and final consumed values of tuna transshipments.

Value/price estimates of non-tuna species are not provided in this study as were not within the scope of earlier Netting Billions work, and therefore not included in the terms of reference for this study.

2.3 Methodological limitations and challenges

2.3.1 Data completeness and approach to missing data on transshipment volumes

Table 1 above highlights that transshipment data are not available for all years, or for all ocean basins, even based on direct requests to tRFMOs rather than relying solely on publicly available information. There are no in-port transshipment data available for the EPO, and no at-sea or in-port transshipment data available for the Atlantic for 2012 and 2014.

Also of concern is that in the datasets that are publicly available, or which have been provided and used in the study, are known to be incomplete and/or to contain errors, with some CPCs having failed to report transshipments to tRFMOs despite the requirements of the related CMMs. For example:

- Tables in the WCPFC TCC reports of transshipments for purse seine and longline (e.g. Annex 2B, 2C of the 2015 and 2017 reports pertaining to 2014 and 2016 transshipment data) make clear/note that some CPCs are not listed as they provided partial reports of transshipments in their Annual Report Part 1, or could not be included due to data gaps, confidential data, or a format of data that doesn't fit to the table template (e.g. gear types combined or not specified). China for example didn't start reporting data on transshipments until 2016 and then only for longline vessels.
- Tables/Annexes in the WCPFC TCC reports contain apparent errors. Totals for the figures in the columns showing transshipments by transshipment location are not always equal to the totals of the figures in the columns showing transshipments by catch location. And in some cases, figures provided in the publicly available reports are obviously in kg rather than MT (e.g. Tuvalu longline transshipments reported for 2016, and Kiribati longline transshipments reported for 2018). The WCPFC report[44] that these inconsistencies are often because data in the tables are sourced from both i) the separate notification and declaration reports from each of two vessels involved in the transshipment which are required for the WCPFC's official record of the intended and subsequent actual transshipment event. This information is to be provided by each CPC within timeframes set out in the transshipment CMM 2009-06, and ii) other data provided each year by CPCs in their Annual Report Part 1.[45]
- Data for in-port transshipment in the Indian Ocean provided by IOTC have no records of transshipments by Spain in 2016, as none were made to the Secretariat. Spain reported transshipments in 2014 of 137 500 MT and in 2018 of 290 000 MT. Likewise, no in-port transshipments were reported by Mauritius for 2012 and 2014, which appears unlikely given that in 2016 transshipment volumes were c.a. 5 000 MT, and in 2018 c.a. 6 500 MT.
- No in-port transshipment data are reported by IATTC (as noted above and for reasons further explained below).
- Data reported to WCPFC and IATTC in the overlap area in the WCPO/EPO should theoretically be identical, but as noted above are not. Data for most species reported to IATTC are slightly greater than the figures provided to the WCFPC.[46]
- For ICCAT data, the PWG report in 2019 pertaining to 2018 transshipment data[47] shows that for in-port transshipments there are many countries for which 'no information' is available, with this being 'No report received, and the Secretariat does not know whether or not the requirement is applicable'. This is similarly the case for the corresponding report in 2017 covering 2016 transshipment data,[48] however in this report there are also countries for which the entry reads 'not received', with this being

[44] Pers. Comm., WCPFC

[45] WCPFC transshipment reporting began in the last half of 2010. The process and quality of data through routine day-to-day reporting of notifications and declarations has progressively improved as CPCs have been able to implement and report against WCPFC requirements, and as the Secretariat's processes and systems, including data quality reviews, have evolved. In 2019, the Secretariat introduced a new electronic system to capture and allow CPCs to analyse any issues with transshipment reports which has yielded further incremental improvement in the quality of data provided from notifications and declarations. CPCs are still, in some cases, reviewing the new tools and how they can best be applied within national processes.

[46] The reason for these data discrepancies are not clear

[47] Document PWG-02 found here: 26th Regular Meeting of the Commission (iccat.int) (page 6)

[48] Document PWG-02 found here: 25th Regular Meeting ICCAT (page 6)

'CPC reported previously that the requirement was applicable, but the report was not received'. These notes to the reports suggest that CPC reporting is not complete for the Atlantic, but especially so for 2016.

Where data on transshipment volumes are not available, consideration was given to the feasibility of inferring volumes. A decision was made to infer data for at-sea and in-port transshipments in the Atlantic for 2012 and 2014. The volume estimates for both years are inferred using the average of data available for 2016 and 2018 for the Atlantic, on the assumption that transshipment volumes in 2016 and 2018 were representative of, and not significantly different to, those in 2012 and 2014.

With respect to the lack of any data on in-port tuna transshipments in the EPO, consideration was given to inferring transshipment volumes, but rejected on the basis that:

- IATTC and flag States are not emphasising reporting on in-port transshipments even though it is technically a requirement of Resolution C-12-07. This suggests transshipment volumes are very low if they take place at all.
- Around 82-83% of purse catches in the EPO a year are by Ecuadorian and Mexican flagged vessels,[49] and these countries have considerable canning capacity which is supplied by domestic fleets (with Ecuador alone processing around 500 000 tonnes of tuna a year).[50]
- Some transshipments from the WCPO go to Manta/Ecuador suggesting plenty of processing capacity and demand (into which catches in the EPO can also be landed directly by vessels fishing in the EPO).

With respect to missing country-specific data, volumes have also generally not been inferred, as it is difficult to know if countries without volumes recorded by the tRFMOs did not make any transshipments, or whether they did but the transshipments are not reported. There are three exceptions to this general methodological approach, given that transshipments can reasonably be expected to have taken place given transshipment volumes in other years:

- In-port transshipments (of purse seine and longline catches) by Spain in the Indian Ocean are inferred for 2016, using the average of transshipments reported by Spain in 2014 and 2018.[51]
- In-port transshipments (of purse seine catches) by Mauritius in the Indian Ocean are inferred for 2012 and 2014, using (in both years) the average of transshipments reported by Mauritius in 2016 and 2018.
- At-sea longline transshipment by China in the WCPO are inferred for 2012 and 2014. Transshipment volumes for 2016 are not provided by species, however totals for 2016 and 2018 are very similar (c.a. 24 000 in 2016 and c.a. 25 500 in 2018). For this reason, the proportions of the 2018 total comprised of different species are first applied to the 2016 total to generate species-specific totals for 2016. An average of 2016 and 2018 species-specific transshipments are then used for 2012 and 2014.

Transshipment volumes that are inferred in line with the statements above have been added to the main database file.

[49] SAC-12-03 The tuna fishery in the eastern pacific ocean in 2020 (iattc.org) page 37

[50] Pers. Comm, EPO tuna expert

[51] There were no recorded at-sea transshipments by Spain in 2014 or 2018 so none are inferred for 2016.

2.3.2 Disaggregation of transshipment data by species

Data from the tRFMOs used in this study are available at different levels of aggregation/disaggregation for different ocean basins. Aggregation at the flag level for data on transshipments in some ocean basins is not problematic for this study, as the intention is not to publish results by flag state. With respect to species, some datasets from the different tRFMOs provide greater levels of species disaggregation than others. So that results can be presented like for like between ocean basins, data are presented based on the minimum level of disaggregation available across all ocean basins.[52] Results are thus presented for the following species/categories, with volume estimates for all species/groups listed below, and value estimates for all tuna species. Species included with the categories of 'other tuna', 'other billfish', 'shark' and 'other' are provided in Appendix 1.

- Skipjack tuna / *Katsuwonus pelamis* (SKJ)
- Yellowfin tuna / *Thunnus albacares* (YFT)
- Bigeye tuna / *Thunnus obesus* (BET)
- Albacore tuna / *Thunnus alalunga* (ALB)
- Atlantic bluefin tuna / *Thunnus thynnus* (BFT)
- Pacific bluefin tuna / *Thunnus orientalis* (PBF)
- Southern bluefin tuna / *Thunnus maccoyii* (SBF)
- Other tuna (OTH Tuna)
- Blue marlin / *Makaira nigricans* (BUM)
- Striped marlin / *Kajikia audax* (MLS)
- Swordfish / *Xiphias gladius* (SWO)
- Other billfish (Other Bill)
- Sharks (SHK)
- Oilfish (OIL)
- Other (OTH)[53]

2.4 Methodological approach, limitations and challenges in estimating transshipment values

Aspects of the methodology used to generate transshipment values to note include the following:

- First sale and final consumed values are generated by multiplying the transshipment volume data collected and assembled during this study, with the species-, product-, gear-, and ocean-specific tuna prices obtained in earlier Netting Billions work for Pew.
- First sale and final consumed tuna prices from the Netting Billions work did not differentiate between tuna landed and transshipped and can be considered 'basket prices' for a mix of landed and transshipped catch. For this study the assumption is

[52] The excel database of transshipment volumes provided to Pew provides additional disaggregation in many cases.

[53] This category includes transshipments of species shown in Appendix 1 as 'other', but may also include some transshipments of catches where the species is unknown in the reporting (and for which species cannot be inferred).

made that that there are no differences in prices paid for tuna that are transshipped as opposed to landed.[54]

- In the case of longline catches and transshipments, first sale prices and consumed prices in the Netting Billions account for conversion factors, such that the value estimates generated are for whole round 'green' weight.
- All prices/values are nominal, rather than adjusted to real prices.
- First sale prices used in the Netting Billions work for individual tuna species caught by different fishing gears differentiated (for each ocean basin) by market flow/destination and product types e.g. canning, fresh sashimi, frozen sashimi, and domestic (sales of fish caught by coastal fleets and sold locally).
    - In cases where a particular species is destined for more than one type of market, the weighted average of the prices from the Netting Billions work is used in this study. As an example, the Netting Billions work assumed that 95% of PS caught YFT in the WCPO in 2018 was for canning (with a first sale price of USD 1 579), and 5% for the frozen sashimi market (with a first sale price of USD 4 781). So, for YFT in 2018, this study assumes a first sale price of PS transshipments of USD 1 739.
- In the case of the Atlantic, the Netting Billions work generated first sale tuna prices for individual species for both the East Atlantic Ocean (EAO) and the West Atlantic Ocean (WAO), which while generally similar, were in some cases different. In this study the AO is not disaggregated. Likewise for the Indian Ocean this study does not disaggregate into the West Indian Ocean and the East Indian Ocean. In this study, where prices between sub-ocean areas differ, the price used was the one corresponding to the sub-ocean area with greater catch volume identified in the Netting Billions work.
- Where transshipment volumes of tuna are not species-specific but categorised as 'other tuna', the lowest of the other species-specific prices for that ocean basin and fishing gear are used given that this category may often include small and low value tuna species.[55]
- Final consumed values of purse seine caught tuna that is transshipped and destined for the canned tuna market, are primarily presented to reflect the value of tuna in the can i.e. the drained weight of tuna, rather than whole value of the can, so as not to over-estimate values. However, the results section also includes some data of the value of transshipments using the full value of tuna cans i.e. the price of the tuna, can, and liquid/sauce in the can.
- For the overlap area between the WCPO and the EPO, an average of the prices for the EPO and the WCPO are used for each species.

[54] Prices of species caught using certain gears generally tied to transshipment (longlines, purse seines) were robustly measured (although not explicitly for transshipment) in the original price datasets, and implicitly assume similar prices for fish landed and transshipped.

[55] As shown later, volumes of 'other tuna' only account for 0.3% of the volumes of tuna transshipments reported.

3. Results – estimation of transshipment volumes

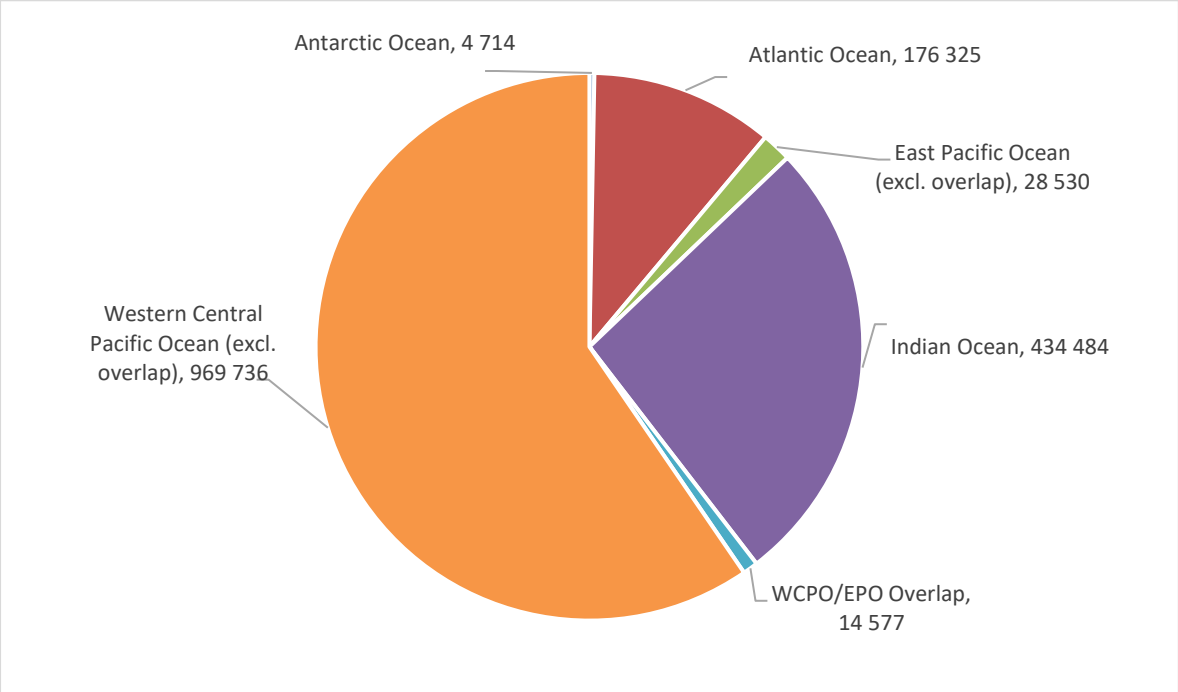
This section of the report presents the results obtained from the database on transshipment volumes constructed using the methods and sources as described earlier, and including the inferred data. **All figures below are likely to under-report actual volumes of transshipments** given that it is known that some flag States with vessels transshipping did not report transshipment data, and transshipment volumes cannot in all cases be inferred. However, while not quantifiably knowable, the under-estimations may not be that significant given the transshipment volumes that have been inferred, and especially in 2014 – 2018 as reporting by flag States to tRFMOs appears to have improved compared to 2012.

All transshipment volumes presented below are those reported to tRFMOs and **in some cases may represent less than the whole round 'green' weight of fish**. In the case of purse seine-caught fish, reported volumes are whole/round weight volumes. In the case of longline-caught fish (contributing relatively low proportions to total fish transshipped as shown below), transshipment volumes reported may be for whole or gilled/gutted weights, and in some cases (e.g. shark) of 'dressed weights'. The extent to which reported transshipment volumes accurately reflect the weight of fish transshipped, and/or differ to reported catch weights has not been explored in this study. Weights of fish reported as being transshipped are used in the estimates.

3.1 Transshipments by ocean area and year

For the most recent year for which data on transshipment volumes have been collected (2018), the following figure shows that **in 2018 the WCPO (excluding the overlap area with the EPO) accounted for 59.6% of all transshipments and the Indian Ocean a further 26.7%, with global transshipments of 1.63 million tonnes**.

Figure 1: Transshipments by ocean area in 2018 (MT)



Source: Poseidon analysis

Table 3 below shows that transshipment volumes in **2014, 2016 and 2018 are fairly consistent across years**. Lower figures estimated for 2012 are more likely to reflect lower

reporting levels during that year.[56] Consequently, the table shows an average volume of transshipments estimated for the years 2014, 2016 and 2018.

As can be seen from the table, **total global transshipments are estimated at around 1.7 million tonnes a year on average**.

Volumes of fish transshipped varies considerably however by ocean area. **The WCPO (excl. overlap) accounts for by far the largest share, at c.a. 66% of average yearly volumes**, followed by the Indian ocean (20%), and the Atlantic Ocean (10%). Yearly average transshipment volumes in the EPO (excl. overlap), the WCPO/EPO overlap area, and the Antarctic are very low.

Table 2: Transshipments for 2012, 2014, 2016, and 2018 (in MT)

Ocean	2012	2014	2016	2018	Average 2014, 2016 and 2018	Proportion of average by ocean area
Western Central Pacific Ocean (excl. overlap)	721 233	1 355 277	1 018 504	969 736	**1 114 505**	65.6%
Indian Ocean	173 204	237 476	334 157	434 484	**335 372**	19.7%
Atlantic Ocean	202 809	202 809	229 293	176 325	**202 809**	11.9%
East Pacific Ocean (excl. overlap)	21 144	25 762	29 671	28 530	**27 987**	1.6%
WCPO/EPO overlap	6 967	12 654	19 544	14 577	**15 592**	0.9%
Antarctic	1 912	2 845	3 533	4 714	**3 697**	0.2%
Grand Total	**1 127 269**	**1 836 822**	**1 634 701**	**1 628 366**	**1 699 963**	100.0%

Source: Poseidon analysis

3.2 Transshipments by location (in-port/at-sea) and gear

Table 3 below shows that transshipments volumes estimated are far greater 'in-port' that 'at-sea', with average **in-port transshipments estimated at around 1.5 million tonnes a year (88% of all transshipments)**. **At-sea transshipments are estimated around 205 000 tonnes per year on average**. This is expected given that at-sea transshipments take place by longline vessels catching far lower volumes of fish than purse seine (PS) vessels, and as a result of regulations on at-sea transhipments by PS.

However, not all in-port transshipments are made by PS vessels, with longliners (LL) also transshipping in-port, for example of Atlantic bluefin where at-sea transshipment is prohibited. Almost **a quarter (23%) of average annual LL transshipments take place in-port**.

Purse seine vessels account for 84.4% of annual average global transshipments by volume, and longliners for 15.6%.[57]

Despite the large number of other gears in use around the world to target tuna, billfish, shark and other large pelagic species, **transshipments are essentially limited to catches made by PS and LL vessels**.

[56] Pers. Comm., tRFMOs and based on published data sources and known gaps in data that could not be inferred.

[57] A very small volume (300 MT) of in-port transshipments were reported in the WCPO in 2014 by pole and line vessels (PL) by Kiribati.

Table 3: Transshipments by location and gear, 2012, 2014, 2016, and 2018 (in MT)

Location / gear	2012	2014	2016	2018	Average 2014, 2016 and 2018	Proportion of average
Port	**970 586**	**1 652 762**	**1 425 158**	**1 406 525**	**1 494 815**	**87.93%**
LL	88 432	93 950	50 586	35 238	59 925	3.53%
PL	0	300	0	0	100	0.01%
PS	882 154	1 558 512	1 374 571	1 371 286	1 434 790	84.40%
Sea	**156 684**	**184 060**	**209 543**	**221 842**	**205 148**	**12.07%**
LL	156 684	184 060	209 543	221 842	205 148	12.07%
Total	**1 127 269**	**1 836 822**	**1 634 701**	**1 628 366**	**1 699 963**	

Source: Poseidon analysis.

As Table 4 below shows, for individual ocean areas **the WCPO (excl. overlap) has the highest proportion of transshipments taking place in port (93.4%).** The Antarctic proportions being transshipped in port (31.6%) are logically low given that the species concerned is southern bluefin tuna caught by longline vessels. As noted in earlier discussion, transshipments in-port in the EPO are thought to be virtually zero, but in the absence of data are not inferred. For non-Antarctic ocean areas, when considering that the transshipments at-sea in the overlap area between the WCPO and the EPO are excluded from the transshipments shown for the EPO and the WCPO, the real at-sea proportions in these two ocean areas is higher than the figures shown in table.

Table 4: Transshipments by ocean area/location, 2012, 2014, 2016, and 2018 (in MT)

Ocean area and location	2012	2014	2016	2018	Average 2014, 2016 and 2018	Proportion of ocean average by location
Antarctic Ocean	**1 912**	**2 845**	**3 533**	**4 714**	**3 697**	
Port	1 120	1 145	1 443	912	1 166	31.55%
Sea	792	1 700	2 090	3 802	2 531	68.45%
Atlantic Ocean	**202 809**	**202 809**	**229 293**	**176 325**	**202 809**	
Port	173 282	173 282	200 289	146 276	173 282	85.40%
Sea	29 526	29 526	29 004	30 049	29 526	14.60%
East Pacific Ocean (excl. overlap)	**21 144**	**25 762**	**29 671**	**28 530**	**27 987**	
Sea	21 144	25 762	29 671	28 530	27 987	100.00%
Indian Ocean	**173 204**	**237 476**	**334 157**	**434 484**	**335 372**	
Port	129 865	196 284	271 400	370 647	279 444	83.30%
Sea	43 339	41 191	62 756	63 837	55 928	16.70%
WCPO/EPO overlap	**6 967**	**12 654**	**19 544**	**14 577**	**15 592**	
Sea	6 967	12 654	19 544	14 577	15 592	100.00%
Western Central Pacific Ocean (excl. overlap)	**721 233**	**1 355 277**	**1 018 504**	**969 736**	**1 114 505**	
Port	666 318	1 282 051	952 026	888 690	1 040 922	93.40%
Sea	54 915	73 226	66 478	81 046	73 583	6.60%
Total	**1 127 269**	**1 836 822**	**1 634 701**	**1 628 366**	**1 699 963**	

Source: Poseidon analysis.

3.3 Transshipments by species

Table 5 below shows that **skipjack (SKJ) and yellowfin tuna (YFT) combined account for almost 80% of global transshipments by volume**. This proportion is perhaps not surprising given skipjack is one of the main target species for purse seine vessels and the large quantities caught. Location-specific transshipments (in-port, and at-sea) for different species are presented in Table 23 and Table 24 in Appendix 2, and show that for at-sea transshipments bigeye tuna, albacore tuna, and yellowfin tuna are the three most important species by volume , followed by swordfish.

Table 5: Transshipments by species, 2012, 2014, 2016, and 2018 (in MT)

Species	2012	2014	2016	2018	Average 2014, 2016 and 2018	Proportion of average
SKJ	659 045	1 240 639	995 006	957 337	1 064 327	62.61%
YFT	209 645	278 303	281 513	262 451	274 089	16.12%
BET	114 903	133 320	124 499	132 241	130 020	7.65%
OTH	63 399	67 484	125 690	165 020	119 398	7.02%
ALB	44 390	62 107	57 511	63 423	61 014	3.59%
SWO	11 902	16 973	15 436	16 682	16 364	0.96%
OIL	1 647	5 657	9 746	8 242	7 882	0.46%
SBF	5 219	6 151	7 978	6 881	7 003	0.41%
OTH Tuna	1 154	12 050	3 023	2 996	6 023	0.35%
OTH Bill	4 007	4 190	5 774	4 149	4 705	0.28%
BUM	3 177	2 900	3 801	3 355	3 352	0.20%
SHK	5 923	3 813	1 930	3 047	2 930	0.17%
BFT	1 722	1 722	1 819	1 624	1 722	0.10%
MLS	1 128	1 503	972	919	1 132	0.07%
SHKF	8	11	0	0	4	0.00%
Grand Total	**1 127 269**	**1 836 822**	**1 634 701**	**1 628 366**	**1 699 963**	**100.00%**

Source: Poseidon analysis. Notes: 1/ shark includes transshipments recorded as sharkfin. 2/ No PBF was reported as transshipped to tRFMOs in the years concerned.

When **considering the groups of species and the individual species transshipped and the gears used to catch them** (see Table 6, and based on additional analysis of data assembled during the study):

- Tuna on average accounts for around 91% of all annual transshipments reported to tRFMOs and included in this study, 'other'[58] for 7.0%, billfish for 1.5%, oilfish for 0.5%, and shark for just 0.2% (see Table 6 below).
- All billfish, oilfish and shark transshipped are caught by longline vessels.
- 99.99% of albacore tuna transshipped are caught by LL, and 100% of southern bluefin tuna and Atlantic bluefin tuna transshipped are caught by LL.
- For yellowfin tuna 83.4% of transshipments are caught by PS vessels and the balance (16.6%) by longline vessels.
- Oilfish transshipments take place almost exclusively in the Indian Ocean (an average of 7 875 MT a year for 2014, 2016 and 2018), apart from an average of 6 MT a year in the Atlantic.

[58] May include transshipments of tuna, billfish and shark as well as other large fish not falling into those categories. 'OTH' transshipments mainly relate to reported transshipment volumes in the Indian Ocean, most notably by PS vessels from Spain (and to a lesser extent France).

- For skipjack tuna, 99.99% of transshipments are caught by purse seine vessels.

Table 6: Transshipments by species and year, 2012, 2014, 2016, and 2018 (in MT)

Species group / gear	2012	2014	2016	2018	Average 14, 16 and 18	Proportion of species average	Proportion of total average
tuna by LL	184 223	217 382	193 346	198 266	202 998	13.1%	
tuna by PS	851 855	1 516 908	1 278 005	1 228 686	1 341 200	86.9%	
Total tuna	**1 036 078**	**1 734 290**	**1 471 350**	**1 426 952**	**1 544 198**		90.8%
billfish by LL	20 214	25 566	25 982	25 102	25 550	100.0%	
billfish by PS	0	1	2	3	2	0.0%	
Total billfish	**20 214**	**25 567**	**25 984**	**25 105**	**25 552**		1.5%
other by LL	33 100	25 581	29 125	22 423	25 710	21.5%	
other by PL	0	300	0	0	100	0.1%	
other by PS	30 298	41 603	96 565	142 597	93 588	78.4%	
Total other	**63 399**	**67 484**	**125 690**	**165 020**	**119 398**		7.0%
oilfish by LL	1 647	5 657	9 746	8 242	7 882	100.0%	
Total oilfish	**1 647**	**5 657**	**9 746**	**8 242**	**7 882**		0.5%
shark by LL	5 931	3 824	1 930	3 047	2 934	100.0%	
Total shark	**5 931**	**3 824**	**1 930**	**3 047**	**2 934**		0.2%
Total	**1 127 269**	**1 836 822**	**1 634 701**	**1 628 366**	**1 699 963**		**100.0%**

Source: Poseidon analysis

4. Results - estimation of tuna transshipment values

This section of the report presents the results obtained from the analysis completed to estimate the global values of tuna (only) transshipped, at both: i) ex-vessel or first sale, and ii) final consumption. As with the transshipment volumes, and as the value estimates are generated by multiplying transshipped volumes by species-, product-, ocean-, and gear-specific prices for tuna with volumes potentially under-estimated due to reporting by flag States, **all figures below are also likely to under-report actual values of transshipments**.

4.1 Ex vessel/first sale values of reported tuna transshipments

Key findings from the estimates of first sale values of transshipments can be drawn from Table 7, Table 8, and Table 9Table 10 below.

Annual first sale values of transshipments in 2014, 2016 and 2018 are very similar and are estimated at approximately **USD 3 billion in each year**. The similarity between years is explained by the fact that both volumes (as shown earlier) and prices (see Table 15 and Table 16 in Appendix 2) vary little between the years.

Average annual first sale transshipment (when considering transshipments both at-sea and in-port) **values are comprised 60% of tuna caught by purse seiners, and 40% by longliners**, despite the fact that 84.4% of the volumes of transshipments are from purse seiners. This of course is explained by the generally higher first sale prices of tuna caught by longline vessels, with purse seine prices being 32% of those for longline prices when considering a simple non-weighted 'basket' average of the species-specific prices provided in Table 15 and Table 16 in Appendix 2.

Longline transshipments at-sea account for 82% of average annual total first sale values of longline transshipments, reflecting the findings presented earlier that an important proportion of longline transshipments takes place in-port. **Longline transshipments at-sea account for 33% of the combined average annual first sale value of purse seine and long-line transshipments.** Correspondingly **67% of the total first sale values of transshipments (USD 2.02 billion) take place in-port rather than at sea.**

By species, **skipjack tuna accounts for 45% of the average annual first sale value of global transshipments**, with bigeye (26%) and yellowfin (21%) being the next two most important species. All other species account individually for less than 6% of the total value, and **bluefin tuna (Southern and Atlantic combined) account for less than 4%**.

One hundred percent of the total value of Southern and Atlantic bluefin tuna transshipments, and close to 100% of albacore and bigeye tunas, are from longline vessels. Longliners also account for 39% of the value of yellowfin tuna transshipments. **Purse seine vessels account for 100% of the first sale values of tuna transshipments, and 61% of yellowfin tuna and 58% of 'other tuna'**.

Reflecting the WCPO's dominance in terms of transshipment volumes, and given relatively small differences in first sale prices between ocean basins, **the WCPO also accounts for the largest share of average annual first sale transshipment values, at close to 60%** (excluding the overlap area, thus its actual share is even slightly higher).

Table 7: First sale values of tuna transshipment by ocean and gear (USD)

	2012	2014	2016	2018	Average 2014, 2016, 2018
Western Central Pacific Ocean (excl. overlap)	1 542 976 407	1 942 342 045	1 687 758 075	1 674 114 299	**1 768 071 473**
Atlantic Ocean	561 697 262	469 858 889	574 152 351	484 574 882	**509 528 707**
Indian Ocean	476 909 456	436 165 635	500 707 975	588 777 595	**508 550 401**
East Pacific Ocean (excl. overlap)	110 335 060	89 782 210	136 360 410	125 564 365	**117 235 662**
WCPO/EPO overlap	41 116 257	56 085 580	82 810 341	66 334 005	**68 409 975**
Antarctic Ocean	23 970 799	35 863 372	43 342 833	60 560 597	**46 588 934**
Total	**2 757 005 242**	**3 030 097 731**	**3 025 131 985**	**2 999 925 742**	**3 018 385 153**
Purse seine	1 479 539 903	1 826 705 633	1 822 227 758	1 736 999 095	**1 795 310 829**
Longline	1 277 465 339	1 203 392 097	1 202 904 227	1 262 926 647	**1 223 074 324**
Total	**2 757 005 242**	**3 030 097 731**	**3 025 131 985**	**2 999 925 742**	**3 018 385 153**

Source: Poseidon analysis

Table 8: Average annual first sale values of tuna transshipments by species and gear (USD)

	Purse seine	Longline	Proportion PS	Proportion LL
Albacore	64 488	161 798 935	0.04%	99.96%
Bigeye	66 469 918	704 070 294	8.63%	91.37%
Other tuna	5 409 753	3 883 274	58.21%	41.79%
Skipjack	1 341 161 255	61 435	100.00%	0.00%
Yellowfin	382 205 415	242 720 152	61.16%	38.84%
Atlantic bluefin tuna	0	22 599 261	0.00%	100.00%
Southern bluefin tuna	0	87 940 973	0.00%	100.00%
Total	1 795 310 829	1 223 074 324	59.48%	40.52%

Source: Poseidon analysis. Averages of 2014, 2016, and 2018

Table 9: Proportion of average annual first sale values of tuna transshipment by ocean, gear, and species

	Proportion of total
	By ocean
Atlantic Ocean	1.5%
Indian Ocean	16.9%
East Pacific Ocean (excl. overlap)	3.9%
WCPO/EPO overlap	16.8%
Antarctic Ocean	2.3%
Western Central Pacific Ocean (excl. overlap)	58.6%
	By gear
Purse seine	59.5%
Longline	40.5%
	By species
Albacore	5.4%
Bigeye	25.5%
Other tuna	0.3%
Skipjack	44.4%
Yellowfin	20.7%
Atlantic bluefin tuna	0.7%
Southern bluefin tuna	2.9%

Source: Poseidon analysis

4.2 Consumed values of reported tuna transshipments

Key findings from the estimates of consumed values of products that can be traced to transshipments can be drawn from Table 10, Table 11, Table 12Table 10 below.

Annual consumed values of transshipments in 2014, 2016 and 2018 are very similar and are estimated at an average of around **USD 8.9 billion a year**.[59]

The ratio of consumed transshipment values to first sale transshipment values is 2.94:1, reflecting the higher consumed prices compared to ex-vessel prices (see Table 19 and Table 20 for final consumed prices for longline and purse seine caught tuna).

Average annual consumed values of transshipments are comprised 68% of tuna caught by purse seiners, and 32% by longliners (when considering transshipments both at-sea and in-port). The higher figure for purse seiners (68%) compared to the corresponding figure for purse seiners of first sale values (60%) is explained by the fact that the ratio of consumed to first sale prices for purse seine caught tuna is higher (3.36:1) than the ratio of consumed to first sale prices for longline caught tuna (2.32:1), coupled with the larger volumes of total transshipments comprised of purse seine caught tuna.

By species, **skipjack tuna accounts for just under half of the average annual final consumed value of global transshipments**, with yellowfin and bigeye being the next two most important species. All other species account individually for less than 5% of the total value, and **bluefin tuna (southern and Atlantic combined) account for less than 3%**.

The WCPO also accounts for the largest share of average annual first sale transshipment values, at around 63% (excluding the overlap area, thus its actual share is even slightly higher). The AO and the IO account for a similar share (c.a. 15.6-15.8%) of the total consumed value of transshipments.

Table 10: Final consumed values of tuna transshipment by ocean and gear (USD)

	2012	2014	2016	2018	Average 2014, 2016, 2018
Western Central Pacific Ocean (excl. overlap)	4 174 233 486	6 911 127 186	4 871 128 062	4 947 849 715	**5 576 701 654**
Indian Ocean	1 117 770 096	1 308 779 782	1 305 062 121	1 587 722 575	**1 400 521 493**
Atlantic Ocean	1 563 413 016	1 431 404 916	1 476 542 162	1 248 659 451	**1 385 535 510**
East Pacific Ocean (excl. overlap)	274 686 615	216 028 909	243 249 762	245 069 650	**234 782 774**
WCPO/EPO overlap	102 634 619	135 982 970	172 660 537	140 785 873	**149 809 793**
Antarctic Ocean	89 965 268	91 492 360	120 667 880	166 028 532	**126 062 924**
Total	**7 322 703 100**	**10 094 816 124**	**8 189 310 525**	**8 336 115 796**	**8 873 414 148**
Purse seine	4 128 120 115	7 110 710 605	5 523 497 727	5 455 303 742	**6 029 837 358**
Longline	3 194 582 985	2 984 105 519	2 665 812 797	2 880 812 055	**2 843 576 790**
Total	**7 322 703 100**	**10 094 816 124**	**8 189 310 525**	**8 336 115 796**	**8 873 414 148**

Source: Poseidon analysis

[59] This estimate is based on the value of the drained weight of tuna used in canned tuna products as noted earlier in the methodological discussion. When the full sales value of cans is used, the final consumed value of purse seine caught transshipments (averaged over 2014, 2016 and 2018) rises from USD 6.3 billion to USD 8.4 billion (assuming all purse seine caught tuna that is transshipped is destined for canning) and total consumed values of tuna from USD 8.9 billion to USD 11.2 billion.

Table 11: Average annual values of tuna transshipments by species and gear (USD)

	Purse seine	Longline	Proportion PS	Proportion LL
Albacore	148 291	437 758 551	0.03%	99.97%
Bigeye	192 744 192	1 430 301 667	11.88%	88.12%
Other tuna	19 327 989	10 551 851	64.69%	35.31%
Skipjack	4 353 280 881	195 623	100.00%	0.00%
Yellowfin	1 464 336 005	654 805 734	69.10%	30.90%
Atlantic bluefin tuna	0	72 405 254	0.00%	100.00%
Southern bluefin tuna	0	237 558 111	0.00%	100.00%
Total	6 029 837 358	2 843 576 790	67.95%	32.05%

Source: Poseidon analysis. Note: average of 2014, 2016 and 2018

Table 12: Proportion of average annual consumed values of tuna transshipments by ocean, gear, and species

	Proportion of total
	By ocean
Antarctic Ocean	1.4%
Atlantic Ocean	15.6%
East Pacific Ocean (excl. overlap)	2.6%
Indian Ocean	15.8%
WCPO/EPO overlap	1.7%
Western Central Pacific Ocean (excl. overlap)	62.8%
	By gear
Purse seine	68.0%
Longline	32.0%
	By species
Albacore	4.9%
Bigeye	18.3%
Other tuna	0.3%
Skipjack	49.1%
Yellowfin	23.9%
Atlantic bluefin tuna	0.8%
Southern bluefin tuna	2.7%

Source: Poseidon analysis

5. Discussion

The final section of the report provides a short discussion, drawing on the findings presented in earlier sections. While the terms of reference for this study are focussed on providing quantitative information, several implications arise from the findings which are worth considering.

The importance of transshipments, and resulting policy implications

To the best of our knowledge, this study is the first to provide a global picture of reported transshipments. As shown in Table 13 overleaf, an important part - 31% on average in volume terms - of all global tuna catches are transshipped. This is a conservative estimate based on reported transshipments and may not be fully comprehensive of all actual transshipments taking place.

When considering longline and purse seine tuna catches rather than tuna catches by all gears, at a global level 39% of combined longline and purse seine tuna catches are reported as transshipped, 40% of purse seine tuna catches are reported as transshipped, and 36% of longline tuna catches are reported as transshipped. For some ocean and gear combinations the proportion of tuna catches being transshipped is even higher: in the Western Central Pacific Ocean and the Atlantic Ocean for example, reported purse seine transshipments account for around 50% of all purse seine catches,[60] and reported longline transshipments in the Atlantic Ocean are also around 50% of longline catches.

This study has not examined the financial and human resources devoted by RFMOs and States (in their capacities as flag, coastal and port States) to oversight of transshipments. However, the large proportion of total catches being transshipped may suggest a need to spend more resources managing transshipments, with implications for further strengthening of at-sea observer programmes, in-port inspections/monitoring, and the provision and management of transshipment data. There is also a need for more research and management of the activities and practices of carrier vessels.

Findings presented earlier highlighted that in-port transshipments account for 88% of total transshipments by volume (all species), and 67% by value (for tuna transshipments). However, also important is the location where different species are transshipped. In-port transshipments are dominated by skipjack, which being of low value relative to other species and being more fecund is less susceptible to overfishing than other larger tuna species. In terms of ensuring sustainable fisheries, this may indicate the need for more focus on at-sea transshipments by longline vessels targeting other species, if resources are not available to monitor all transshipments. Conversely, with almost a quarter of longline transshipments taking place in-port and given the volumes of purse seine catches transshipped in-port, it would be a mistake to neglect data collection and control of in-port transshipments. This is especially the case for those ocean basins where in-port transshipments represent a significant share of all transshipments. In each of the Atlantic Ocean, the Indian Ocean, and the Western Central Pacific Ocean, in-port transshipments account for more than 80% of the total volume of transshipments in the ocean basin.

The proportion of longline transshipments by species group is also instructive in terms of the need to focus sufficient monitoring and management efforts on transshipments accordingly

[60] Note the figure for purse seine transshipments in the WCPO differs from the 79% suggested in the 2019 MRAG Asia Pacific report ('WCPO Transshipment Business Ecosystem Study') on page 30, as the denominator in Figure 13 (catches) of that report is for FFA countries only (not all WCPO countries as implied by the Figure title), and does not include purse seine catches by non-FFA flag state vessels from Indonesia, Philippines, South Korea, Japan, Chinese Taipei, and others with significant purse seine catching capacity, and which may land catches directly into canneries. WCPO purse seine catches are around 2 million tonnes a year, not 1.2 million tonnes as shown in Figure 13.

(and potentially the need for advocacy organisations such as Pew to focus efforts sufficiently on non-tuna species as well as on tuna). Data provided earlier show that while around three quarters of all longline transshipments are comprised of tuna species, one quarter is not, with important volumes of billfish, shark, oilfish (notably in the Indian Ocean) and other species also being transshipped each year. To date, less transshipment policy attention has been paid to these species groups.

Table 13: Tuna transshipment volumes (MT), first sale and consumed values (USD), with volumes as a proportion of total tuna catches and values, 2014 - 2018

Total catches and transshipments	2014	2016	2018	Average 2014, 2016, 2018
Total tuna catches all gears (MT)	4 986 006	5 014 999	5 183 839	5 061 615
Total tuna transshipments (MT)	1 734 290	1 471 350	1 426 952	1 544 198
First sale value of tuna catches all gears (USD billions)	9.76	11.32	11.71	10.93
First sale value tuna transshipments (USD billions)	3.03	3.03	3.00	3.02
Consumed sales value of tuna catches all gears (USD billions)	32.96	30.94	33.69	32.53
Consumed sale value of tuna transshipments (USD billions)	10.09	8.19	8.34	8.87
LL transshipments (MT) as % of LL catches (MT)	2014	2016	2018	Average 2014, 2016, 2018
Antarctic Ocean	37%	38%	40%	38%
Atlantic Ocean	59%	42%	45%	49%
East Pacific Ocean	33%	46%	45%	41%
Indian Ocean	36%	28%	28%	31%
Western Central Pacific Ocean	37%	33%	32%	34%
Total	**38%**	**35%**	**34%**	**36%**
PS transshipments (MT) as % of PS catches (MT)	2014	2016	2018	Average 2014, 2016, 2018
Antarctic Ocean	0%	0%	0%	0%
Atlantic Ocean	57%	55%	36%	49%
East Pacific Ocean	0%	0%	0%	0%
Indian Ocean	31%	39%	41%	37%
Western Central Pacific Ocean	58%	49%	45%	51%
Total	**45%**	**39%**	**35%**	**40%**
LL&PS transshipments (MT) as % of all gear catches (MT)	2014	2016	2018	Average 2014, 2016, 2018
Antarctic Ocean	24%	24%	27%	25%
Atlantic Ocean	44%	41%	29%	38%
East Pacific Ocean	4%	4%	4%	4%
Indian Ocean	17%	21%	23%	20%
Western Central Pacific Ocean	47%	37%	35%	39%
Total	**35%**	**29%**	**28%**	**31%**
LL&PS transshipments as % of LL&PS catches	**2014**	**2016**	**2018**	**Average 2014, 2016, 2018**
Total	**44%**	**38%**	**35%**	**39%**

Source: Poseidon analysis (based on Netting Billions data and transshipment data collected during this study). Notes: i) 2012 excluded as transshipment volumes thought to be under-reported. ii) Transshipments in WCPO/EPO overlap area allocated equally to EPO and WCPO. iii) First sale values of total tuna catches and transshipments are just over USD 1 950/MT, explained by the large proportion of catches and transshipments comprised of skipjack tuna as earlier presented (with a low unit price per tonne at first sale of around USD 1 300/MT – see Table 16 in Appendix 2). Prices per tonne of other

species are much higher and are also provided in Appendix 2. iv) consumed values in table reflect drained weight values for canned tuna. When the full sales value of canned tuna is considered, the value of consumed tuna (average for 2014, 2016 and 2018) is USD 40.20 billion, and the value of consumed tuna from transshipments USD 11.23 billion (or 28%).

Findings presented earlier suggest that the WCPO accounts for around 60% of the volume of all global transshipments, the Indian Ocean around 27%, and other ocean basins far lower proportions. This may have implications for advocacy organisations such as Pew with an interest in enhanced monitoring and control of transshipments, in terms of where they should focus their advocacy efforts (bearing in mind the existing quality and extent of monitoring and control of transshipments in different ocean basins).

Transshipment data

This study has revealed two issues of concern with regards to transshipment data.

The first is the level of data publicly available and routinely published by tRFMOs. While data that are not publicly available can be requested, and in the case of some tRFMOs provided (as was the case for this study), it is concerning that more data are not made more routinely available in support of data transparency. As the table below shows, transshipment data disaggregated by location (at-sea/in-port) is not routinely available for several ocean basins.

Table 14: Data publicly available from tuna RFMO websites on reported volumes of at-sea and in-port transshipments

Ocean area	At-sea data	In-port data
Indian Ocean	Yes	No
Western Central Pacific Ocean	Yes	Yes
East Pacific Ocean	Yes	No
Atlantic Ocean	No	No
Antarctic Ocean	Yes	No

Source: Poseidon analysis (based on tRFMO websites). Note Atlantic Ocean transshipment data recorded in this table as not available, as in-port and at-sea datasets available for 2016-2018 will not be available for future years.

Specific concerns over data availability are as follows:

- For the Indian Ocean, even though CPCs provide data to the IOTC on transshipments in-port, no summary report is issued on in-port transshipments by the Secretariat (as it is for at-sea transshipments).
- For the Indian Ocean, the species definition of ‘other’ (OTH) for at-sea transshipments was expanded in 2016 by IOTC to include a variety of shark species that had hitherto been reported separately.[61] Data tables available for 2016 onwards omit the column shown for earlier years for 'Sharks/Sharks prod'. This was due to a decision of the Compliance Section when preparing the report rather than any agreed policy,[62] but seems a retrograde step given the lower transparency/disaggregation and lack of shark-specific data available from 2016 onwards.

[61] blacktip shark, blue shark, longfin mako, mako, oceanic white-tip, pelagic sharks not elsewhere included, silky shark, various sharks.

[62] Pers. Comm., IOTC

- In the Atlantic Ocean, ICCAT have confirmed that the datasets of transhipment data (available for 2016-2018) will not be published for future years, due to the requirements of Recommendation 21-15[63] that reports by CPCs be posted to a password protected website. There seems no special reason why the Recommendation itself should not preclude the Secretariat from providing summary data provided by CPCs, or why CPCs would not be willing for data to be available if appropriately summarised to protect any commercial confidentialities, given that flag States that are CPCs of ICCAT are often members of other tRFMOs which provide such data.
- With respect to ICCAT transshipment data, the transshipment declaration template provided in Appendix 1 of Recommendation 21-15 does not require the fishing method to be specified. This means that without cross checking vessel names and numbers with the ICCAT record of vessels, there is no way for ICCAT (or the public if in-port data were to be made available) to know if in-port transshipments are by longline or purse seine vessels.
- For the East Pacific Ocean, data made publicly available by IATTC (as well as confidential data provided by CPCs to IATTC) only cover transshipments by vessels at-sea. The result is that there is currently a lack of publicly available data on in-port transshipments in the IATTC convention area even though Recommendation 16-05 requires provision of such data by vessels to IATTC. While in-port transshipments in the EPO may be very low or non-existent given processing capacity in canneries in EPO countries (see earlier discussion), in-port data should be reported by CPCs and made available, or formally stated as not occurring, so this could be routinely confirmed in case the situation were to change in the future.

The second issue of concern with respect to transshipment data is the reliability and completeness of data. Leaving aside that this study has not focussed on assessing any illegal or unreported transshipments (i.e. transshipment declarations not being submitted or being completed incorrectly by vessels), this study also found several problems in terms of the completeness of reports by CPCs to tRFMO secretariats and the accuracy of data provided. Reviewing and cleaning data during this study revealed that data errors and completeness have been improving steadily over time, and CPCs and tRFMOs should be commended for their efforts. Nevertheless, some specific issues worth noting include:

- A number of flag States fail to report transshipments to the IOTC in some recent years, for both at-sea and in-port data.
- For flag States reporting transhipments to the WCPFC as part of their Annual Report Part 1, errors in their submissions, failure to disaggregate by species, or failure to report in-port transshipments at all when they are known to have taken place. Similar errors in flag state reports to other RFMOs cannot be ruled out
- Data held by the WCPFC and the IATTC on transshipments in the WCPO/EPO overlap area, as provided in the transshipment declarations, are not consistent with IATTC data. IATTC figures are for almost all species slightly higher, and typically show total transshipments in the overlap area of around 2 000 MT more per year than shown in WCPFC data.[64]

[63] 2016-15-e.pdf (iccat.int) Article 22

[64] Such data are not publicly available but were made available on request by WCPFC and IATTC as part of this study

Appendix 1: Species groupings used in the study

Other tuna includes:

Small tuna	*Tunida*
Tuna not elsewhere identified	*nei*
Blackfin tuna	*Thunnus atlanticus*
Little tunny	*Euthynnus alletteratus*
Atlantic bonito	*Sarda sarda*
Frigate tuna	*Auxis thazard*
Plain bonito	*Orcynopsis unicolor*
Slender tuna	*Allothunnus fallai*
Bullet tuna	*Auxis rochei*
Striped bonito	*Sarda orientalis*
Eastern Pacific bonito	*Sarda chiliensis*
Australian bonito	*Sarda australis*
Dogtooth tuna	*Gymnosarda unicolor*
Leaping bonito	*Cybiosarda elegans*
Black skipjack	*Euthynnus lineatus*
Kawakawa	*Euthynnus affinis*
Longtail tuna	*Thunnus tonggol*

Other billfish includes

Black marlin	*Istiompax indica*
Marlin, sailfish, spearfish, swordfish nei	*Istiophoridae, Xiphiidae*
Sailfish	*Istiophorus platypterus*
Atlantic sailfish	*Istiophorus albicans*
Marlin, nei	*Makaira, Tetrapturus*
White marlin	*Tetrapturus albidus*
Shortbill spearfish	*Tetrapturus angustirostris*
Longbill spearfish	*Tetrapturus pfluegeri*
Indo-Pacific sailfish	*Istiophorus platypterus*
Mediterranean spearfish	*Tetrapturus belone*
Roundscale spearfish	*Tetrapturus georgii*

Other

Wahoo	*Acanthocybium solandri*

Dorado, mahi mahi, dolphinfish, nei	*Coryphaenidae*
Opah	*Lampris guttatus*
Escolar	*Lepidocybium flavobrunneum*
Ocean sunfish, Mola	*Mola mola*
Narrow-barred Spanish mackerel	*Scomberomorus commerson*
Atlantic Spanish mackerel	*Scomberomorus maculatus*
King mackerel	*Scomberomorus cavalla*
West African Spanish mackerel	*Scomberomorus tritor*
Cero	*Scomberomorus regalis*
Serra Spanish mackerel	*Scomberomorus brasiliensis*
Common dolphinfish	*Coryphaena hippurus*
Seerfish nei	*Scomberomorus spp*
Atlantic mackerel	*Scomber scombrus*
Chub mackerel	*Scomber japonicus*
Escolar	*Lepidocybium flavobrunneum*
black scabbardfish	*Aphanopus carbo*
Snake mackerel	*Gempylus serpens*
Black gemfish	*Nesiarchus nasutus*
Silver scabbardfish	*Lepidopus caudatus*
Chinese seerfish	*Scomberomorus sinensis*
Indo-Pacific king mackerel	*Scomberomorus guttatus*
Streaked seerfish	*Scomberomorus lineolatus*
Pacific sierra	*Scomberomorus sierra*
Queensland school mackerel	*Scomberomorus queenslandicus*
Japanese Spanish mackerel	*Scomberomorus niphonius*
Broad-barred king mackerel	*Scomberomorus semifasciatus*
Korean seerfish	*Scomberomorus koreanus*
Monterey Spanish mackerel	*Scomberomorus concolor*
Papuan seerfish	*Scomberomorus multiradiatus*
Kanadi kingfish	*Scomberomorus plurilineatus*
Australian spotted mackerel	*Scomberomorus munroi*
Butterfly kingfish	*Gasterochisma melampus*
Shark mackerel	*Grammatorcynus bicarinatus*
Double-lined mackerel	*Grammatorcynus bilineatus*
Hairtails, scabbardfishes nei	*Trichiuridae*
Pelagic stingray	*Pteroplatytrygon violacea*
Giant manta	*Manta birostris*
Lesser devil ray	*Mobula hypostoma*

Spinetail mobula	*Mobula japanica*
Devil fish	*Mobula mobular*
Smoothtail mobula	*Mobula thurstoni*
Chilean devil ray	*Mobula tarapacana*
Lesser Guinean devil ray	*Mobula rochebrunei*

Oilfish

Oilfish	*Ruvettus pretiosus*

Shark

Thresher shark	*Alopias vulpinus*
Oceanic whitetip shark	*Carcharhinus longimanus*
Sharks, nei	*Euselachii*
Shortfin mako shark	*Isurus oxyrinchus*
Longfin mako shark	*Isurus paucus*
Blue shark	*Prionace glauca*
Porbeagle	*Lamna nasus*
Basking shark	*Cetorhinus maximus*
Bigeye thresher	*Alopias superciliosus*
Great white shark	*Carcharodon carcharias*
Whale shark	*Rhincodon typus*
Silky shark	*Carcharhinus falciformis*
Smooth hammerhead	*Sphyrna zygaena*
Scalloped hammerhead	*Sphyrna lewini*
Great hammerhead	*Sphyrna mokarran*
Galapagos shark	*Carcharhinus galapagensis*
Crocodile shark	*Pseudocarcharias kamoharai*
Cookie cutter shark	*Isistius brasiliensis*
Megamouth shark	*Megachasma pelagios*
Spined pygmy shark	*Squaliolus laticaudus*

Appendix 2: Supporting data tables

Table 15: First sale prices of longline caught tuna transshipments used in analysis (USD/MT)

	2012	2014	2016	2018
Antarctic				
SBF	12 534	12 607	12 268	12 847
Atlantic				
ALB	3 452	2 584	2 667	2 653
BET	6 265	5 742	9 114	9 094
BFT	20 812	17 012	10 940	11 456
SBF	12 534	12 607	12 268	12 847
YFT	5 869	7 000	3 675	4 781
East Pacific				
ALB	3 452	2 584	2 876	2 653
BET	7 694	5 993	8 930	8 958
OTH Tuna	3 452	2 584	2 876	2 653
YFT	4 863	4 297	4 623	5 249
Indian				
ALB	3 452	2 694	2 725	2 700
BET	10 853	7 125	6 751	8 940
OTH Tuna	3 452	2 694	2 725	2 700
YFT	5 253	6 104	7 203	7 839
Overlap				
ALB	3 490	2 639	2 695	2 609
BET	8 126	6 576	8 683	8 672
OTH Tuna	3 490	2 639	2 695	2 609
YFT	5 129	4 725	4 539	5 405
Western Central Pacific				
ALB	3 527	2 694	2 515	2 564
BET	8 559	7 160	8 436	8 386
SKJ	1 564	1 142	1 331	1 343
YFT	5 395	5 152	4 455	5 560

Source: Poseidon, based on Netting Billions

Table 16: First sale prices of purse seine caught tuna transshipments used in analysis (USD/MT)

Purse seine transshipments	2012	2014	2016	2018
Atlantic				
ALB	3 531	2 584	2 667	2 653
BET	1 927	2 079	1 558	1 487
OTH Tuna	1 754	1 158	1 331	1 447
SKJ	1 754	1 158	1 331	1 447
YFT	2 262	2 023	1 653	1 579
Indian				
ALB	3 531	2 584	2 798	2 823
BET	2 005	1 358	1 228	1 172
OTH Tuna	1 517	1 142	1 189	1 343

SKJ	1 517	1 142	1 189	1 343
YFT	1 852	1 280	2 285	1 579
Western Central Pacific				
ALB	3 531	2 584	2 798	2 689
BET	3 643	2 511	2 050	2 031
SKJ	1 574	1 142	1 331	1 343
YFT	2 262	1 280	1 754	1 739

Source: Poseidon, based on Netting Billions

Table 17: First sale values of longline caught tuna transshipments by ocean and species (USD)

	2012	2014	2016	2018	Average 2014, 2016, 2018
Antarctic Ocean	**23 970 799**	**35 863 372**	**43 342 833**	**60 560 597**	**46 588 934**
SBF	23 970 799	35 863 372	43 342 833	60 560 597	46 588 934
Atlantic Ocean	**247 896 351**	**232 258 898**	**303 163 032**	**277 588 364**	**271 003 432**
ALB	4 667 328	3 493 736	662 456	6 515 073	3 557 088
BET	145 330 536	133 194 062	217 171 597	205 194 144	185 186 601
BFT	35 831 547	29 290 289	19 902 614	18 604 880	22 599 261
SBF	41 440 487	41 680 963	54 533 683	27 841 470	41 352 039
YFT	20 626 453	24 599 848	10 892 681	19 432 798	18 308 442
East Pacific Ocean	**110 335 060**	**89 782 210**	**136 360 410**	**125 564 365**	**117 235 662**
ALB	20 239 742	29 734 354	34 905 769	35 996 212	33 545 445
BET	80 036 715	51 393 796	91 500 709	78 441 839	73 778 781
OTH Tuna	38 303	125 394	68 336	160 185	117 972
YFT	10 020 299	8 528 666	9 885 596	10 966 129	9 793 463
Indian Ocean	**364 828 228**	**301 173 981**	**254 223 008**	**294 000 222**	**283 132 404**
ALB	35 420 344	53 656 819	33 372 549	46 357 793	44 462 387
BET	280 502 308	165 026 778	111 852 330	121 994 552	132 957 886
OTH Tuna	2 011 722	2 593 515	4 347 751	3 939 862	3 627 043
YFT	46 893 854	79 896 870	104 650 377	121 708 016	102 085 088
WCPO/EPO overlap	**41 116 257**	**56 085 580**	**82 810 341**	**66 334 005**	**68 409 975**
ALB	3 254 262	7 558 071	23 917 766	12 764 095	14 746 644
BET	33 630 897	41 076 753	48 993 932	46 195 391	45 422 025
OTH Tuna	5 709	191 713	213 194	9 871	138 260
YFT	4 225 390	7 259 042	9 685 449	7 364 648	8 103 047
Western Central Pacific Ocean	**489 318 643**	**488 228 056**	**383 004 604**	**438 879 093**	**436 703 918**
ALB	91 101 947	71 217 001	60 294 017	64 951 095	65 487 371
BET	295 904 654	292 788 045	247 061 135	260 325 821	266 725 000
SKJ	9 983	54 051	103 011	27 241	61 435
YFT	102 302 059	124 168 960	75 546 440	113 574 936	104 430 112
Total	**1 277 465 339**	**1 203 392 097**	**1 202 904 227**	**1 262 926 647**	**1 223 074 324**

Source: Poseidon analysis

Table 18: First sale values of purse seine caught tuna transshipments by ocean and species (USD)

	2012	2014	2016	2018	Average 2014, 2016, 2018
Atlantic Ocean	**313 800 911**	**237 599 991**	**270 989 319**	**206 986 517**	**238 525 276**
ALB	17 694	12 948	0	26 587	13 179
BET	17 170 045	18 527 849	9 052 067	17 864 654	15 148 190
OTH Tuna	980 578	647 148	1 001 790	528 308	725 749
SKJ	196 267 470	129 529 850	186 707 417	120 747 430	145 661 566
YFT	99 365 125	88 882 195	74 228 044	67 819 538	76 976 593
Indian Ocean	**112 081 229**	**134 991 654**	**246 484 967**	**294 777 372**	**225 417 998**
ALB	520 964	57 703	93 537	0	50 413
BET	5 690 156	13 317 128	21 092 039	32 165 874	22 191 680
OTH Tuna	0	11 884 634	680 432	1 486 945	4 684 004
SKJ	33 943 993	47 380 172	114 241 571	196 103 588	119 241 777
YFT	71 926 116	62 352 017	110 377 387	65 020 965	79 250 123
Western Central Pacific Ocean	**1 053 657 764**	**1 454 113 989**	**1 304 753 472**	**1 235 235 205**	**1 331 367 555**
ALB	0	0	0	2 689	896
BET	18 207 085	31 462 897	32 680 473	23 246 774	29 130 048
SKJ	826 005 313	1 241 613 072	1 009 696 158	977 464 507	1 076 257 912
YFT	209 445 366	181 038 020	262 376 841	234 521 236	225 978 699
Total	**1 479 539 903**	**1 826 705 633**	**1 822 227 758**	**1 736 999 095**	**1 795 310 829**

Source: Poseidon analysis

Table 19: Consumed prices of longline caught tuna transshipments used in analysis (USD/MT)

	2012	2014	2016	2018
Antarctic				
SBF	47 042	32 162	34 155	35 221
Atlantic				
ALB	6 227	6 180	6 156	6 360
BET	17 290	15 114	16 042	17 226
BFT	60 634	53 802	35 656	36 769
SBF	47 042	32 162	34 155	35 221
YFT	18 321	14 254	15 565	16 969
East Pacific				
ALB	6 227	6 180	6 156	6 360
BET	19 690	13 881	13 596	14 568
OTH Tuna	6 227	6 180	6 156	6 360
YFT	16 152	12 884	13 594	14 754
Indian				
ALB	6 227	7 967	6 787	7 727
BET	19 690	15 114	16 042	17 226
OTH Tuna	6 227	7 967	6 787	7 727
YFT	18 636	14 559	15 565	16 969
Overlap				
ALB	7 333	7 074	6 471	7 044
BET	19 690	15 078	14 819	15 897
OTH Tuna	7 333	7 074	6 471	7 044

YFT	17 358	13 687	14 580	15 862
Western Central Pacific				
ALB	8 439	7 967	6 787	7 727
BET	19 690	16 276	16 042	17 226
SKJ	4 305	4 273	3 911	4 041
YFT	18 563	14 489	15 565	16 969

Source: Poseidon, based on Netting Billions

Table 20: Consumed prices of purse seine caught tuna transshipments used in analysis (USD/MT)

Purse seine transshipments	2012	2014	2016	2018
Atlantic				
ALB	6 227	6 180	6 156	6 360
BET	5 502	5 461	3 810	3 936
OTH Tuna	4 305	4 273	3 911	4 041
SKJ	4 305	4 273	3 911	4 041
YFT	6 750	6 699	5 706	5 895
Indian				
ALB	6 227	6 180	6 156	6 360
BET	5 502	5 461	3 810	3 936
OTH Tuna	4 305	4 273	3 911	4 041
SKJ	4 305	4 273	3 911	4 041
YFT	6 750	6 699	5 706	5 895
Western Central Pacific				
ALB	6 227	6 180	6 156	6 360
BET	7 860	7 391	5 033	5 265
SKJ	4 305	4 273	3 911	4 041
YFT	6 750	6 699	6 199	6 449

Source: Poseidon, based on Netting Billions

Table 21: Consumed values of longline caught tuna transshipments by ocean and species (USD)

	2012	2014	2016	2018	Average 2014, 2016, 2018
Antarctic Ocean	**89 965 268**	**91 492 360**	**120 667 880**	**166 028 532**	**126 062 924**
SBF	89 965 268	91 492 360	120 667 880	166 028 532	126 062 924
Atlantic Ocean	**733 794 976**	**608 009 012**	**646 605 741**	**609 327 834**	**621 314 196**
ALB	8 419 084	8 355 941	1 529 117	15 618 642	8 501 233
BET	401 068 524	350 595 426	382 247 862	388 693 752	373 845 680
BFT	104 392 589	92 630 770	64 870 201	59 714 790	72 405 254
SBF	155 531 095	106 333 831	151 823 578	76 328 151	111 495 187
YFT	64 383 685	50 093 045	46 134 982	68 972 499	55 066 842
East Pacific Ocean	**274 686 615**	**216 028 909**	**243 249 762**	**245 069 650**	**234 782 774**
ALB	36 509 127	71 115 420	74 729 235	86 294 035	77 379 563
BET	204 828 178	119 042 406	139 304 891	127 569 003	128 638 767
OTH Tuna	69 093	299 903	146 300	384 014	276 739
YFT	33 280 216	25 571 180	29 069 336	30 822 597	28 487 704
Indian Ocean	**742 782 072**	**707 007 190**	**585 875 320**	**642 455 054**	**645 112 521**

ALB	63 892 407	158 690 605	83 115 265	132 658 562	124 821 477
BET	508 882 552	350 069 377	265 785 857	235 060 389	283 638 541
OTH Tuna	3 628 812	7 670 348	10 828 195	11 274 402	9 924 315
YFT	166 378 302	190 576 859	226 146 003	263 461 701	226 728 188
WCPO/EPO overlap	**102 634 619**	**135 982 970**	**172 660 537**	**140 785 873**	**149 809 793**
ALB	6 838 632	20 259 310	57 423 237	34 464 313	37 382 287
BET	81 484 512	94 181 256	83 612 799	84 680 978	87 491 678
OTH Tuna	11 997	513 885	511 849	26 654	350 796
YFT	14 299 478	21 028 518	31 112 652	21 613 928	24 585 033
Western Central Pacific Ocean	**1 250 719 435**	**1 225 585 077**	**896 753 556**	**1 077 145 111**	**1 066 494 581**
ALB	217 979 637	210 625 027	162 676 598	195 720 344	189 673 990
BET	680 703 091	665 556 947	469 791 882	534 712 174	556 687 001
SKJ	27 470	202 227	302 684	81 958	195 623
YFT	352 009 238	349 200 876	263 982 392	346 630 635	319 937 968
Total	**3 194 582 985**	**2 984 105 519**	**2 665 812 797**	**2 880 812 055**	**2 843 576 790**

Source: Poseidon analysis

Table 22: Consumed values of purse seine caught tuna transshipments by ocean and species (USD)

	2012	2014	2016	2018	Average 2014, 2016, 2018
Atlantic Ocean	**829 618 039**	**823 395 904**	**829 936 420**	**639 331 617**	**764 221 314**
ALB	31 203	30 969	0	63 738	31 569
BET	49 037 677	48 669 894	22 136 978	47 295 674	39 367 515
OTH Tuna	2 406 254	2 388 208	2 943 616	1 475 726	2 269 183
SKJ	481 623 767	478 011 589	548 612 663	337 284 439	454 636 230
YFT	296 519 138	294 295 245	256 243 164	253 212 040	267 916 816
Indian Ocean	**374 988 025**	**601 772 592**	**719 186 801**	**945 267 521**	**755 408 971**
ALB	918 707	138 009	205 799	0	114 602
BET	15 616 778	53 551 148	65 440 241	108 038 347	75 676 579
OTH Tuna	0	44 465 372	2 237 459	4 473 587	17 058 806
SKJ	96 310 948	177 268 980	375 659 484	589 992 340	380 973 601
YFT	262 141 592	326 349 084	275 643 818	242 763 248	281 585 383
Western Central Pacific Ocean	**560 580 132**	**627 308 251**	**400 403 086**	**456 347 881**	**494 686 406**
ALB	160 830 121	163 386 477	147 561 771	161 087 536	157 345 261
BET	271 720 997	302 254 303	147 401 701	163 442 322	204 366 109
SKJ	27 470	202 227	302 684	81 958	195 623
YFT	128 001 544	161 465 244	105 136 930	131 736 065	132 779 413
Total	**1 765 186 196**	**2 052 476 747**	**1 949 526 308**	**2 040 947 018**	**2 014 316 691**

Source: Poseidon analysis

Table 23: Transshipments in-port by species, 2012, 2014, 2016, and 2018 (in MT)

Species	2012	2014	2016	2018	Average 14, 16 and 18
SKJ	659 045	1 240 616	994 977	957 335	1 064 309
YFT	190 357	254 229	251 447	228 424	244 700
OTH	56 311	58 330	114 678	149 441	107 483
BET	31 352	48 420	45 439	59 930	51 263
ALB	19 400	24 233	5 834	3 268	11 112

OTH Tuna	559	10 966	1 851	1 472	4 763
SWO	3 109	6 909	2 776	2 516	4 067
SBF	2 750	2 774	4 595	1 018	2 796
BFT	1 722	1 722	1 819	1 624	1 722
OTH Bill	1 046	2 083	533	675	1 097
BUM	1 708	1 223	831	647	900
SHK	3 034	739	288	169	399
MLS	178	511	90	4	202
SHKF	8	7			7
OIL	7	0	0	0	0
Grand Total	**970 586**	**1 652 762**	**1 425 158**	**1 406 525**	**1 494 815**

Source: Poseidon analysis

Table 24: Transshipments at-sea by species, 2012, 2014, 2016, and 2018 (in MT)

Species	2012	2014	2016	2018	Average 14, 16 and 18
BET	83 551	84 899	79 060	72 311	78 757
ALB	24 990	37 873	51 677	60 155	49 902
YFT	19 288	24 074	30 067	34 027	29 389
SWO	8 793	10 064	12 660	14 165	12 296
OTH	7 088	9 154	11 011	15 579	11 915
OIL	1 640	5 657	9 746	8 242	7 882
SBF	2 469	3 377	3 383	5 863	4 208
OTH Bill	2 961	2 108	5 241	3 475	3 608
SHK	2 888	3 074	1 642	2 877	2 531
BUM	1 469	1 677	2 970	2 708	2 452
OTH Tuna	596	1 084	1 172	1 523	1 260
MLS	950	992	883	915	930
SKJ	0	23	29	1	18
SHKF	0	5	0	0	2
Grand Total	**156 684**	**184 060**	**209 543**	**221 842**	**205 148**

Source: Poseidon analysis

Windrush, Warborne Lane
Portmore, Lymington
Hampshire SO41 5RJ
United Kingdom

Telephone: +33 450206805
graeme@consult-poseidon.com
http://www.consult-poseidon.com