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## PLENARY 04

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and Tuna-Like Species in the North Pacific Ocean  
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## **NATIONAL REPORT ON CANADIAN TUNA AND TUNA-LIKE FISHERIES IN THE NORTH PACIFIC OCEAN IN 2021**

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## SUMMARY

Canada has one fishery for highly migratory species in the Pacific Ocean, a troll fishery targeting juvenile north Pacific Albacore Tuna (*Thunnus alalunga*). Category I, II, and III data from the 2021 fishing season are summarized in this report. The Canadian fleet consisted of 112 vessels and operated primarily within the eastern Pacific Ocean, in 2021. One vessel from the Canadian fleet operated in the Central and western Pacific Ocean in 2021. The Canadian troll fishery continues to be largely coastal in its operations, occurring predominantly within the Canadian and United States exclusive economic zones (EEZ). Only a small proportion of catch and effort occurred outside the Canadian and US EEZs, in 2021. Provisional 2021 estimates of catch and effort in the eastern Pacific Ocean are 2,399 metric tonnes (t) and 3,660 vessel-days, respectively, which represent only a 1% increase in catch and 10.9% increase in effort relative to 2020. The proportion of the 2021 catch and effort in Canadian waters decreased only slightly to 69.8% and 72% from 71.5% and 77% in 2020, respectively. Proportion of catch and effort in US waters in 2021 increased to 28.2% and 25.6% from 19.6% and 17.4% in 2020, respectively. The remaining catch and effort occurred in adjacent high seas waters. Catch rate (CPUE) decreased by 8.9% in 2021 relative to 2020. Approximately 92% of the Albacore catch occurred in a water temperature band of 15-18 °C in 2021. Thirty-eight (38) vessels measured 10,392 fork lengths in 2021 for a sampling rate of 2.6% of the reported catch. Fork lengths ranged from 50 to 95 cm, having a dominated mode around 60 cm corresponding to 2-year old fish and a smaller mode around 80 cm corresponding to 3-year old fish. Mean length was 68.1 cm, which is similar to the mean length observed in 2020.

## 1. INTRODUCTION

The Canadian fishery for highly migratory species uses troll gear with jigs to target juvenile north Pacific Albacore (*Thunnus alalunga*) in the surface waters of the Pacific Ocean. The majority of catch and effort by the Canadian fleet occurs within the exclusive economic zones (EEZ) of Canada and the United States. Access to the United States EEZ is permitted through a bilateral Treaty, which provides for access by Canadian-flagged and licensed vessels to fish for Albacore and to land Albacore at designated ports. Some of the larger Canadian vessels may follow Albacore into offshore waters and occasionally fish in the central and western Pacific Ocean. The most recent management regulations for Canadian vessels fishing Albacore Tuna cover one year period from 01 April 2022 to 31 March 2023 are documented in the Albacore Tuna Integrated Fisheries Management Plan (IFMP; <https://waves-vagues.dfo-mpo.gc.ca/Library/41044253.pdf>). Historically, most of the Canadian effort and catch for north Pacific Albacore has occurred between early July and October.

This report summarizes Category I (annual catch and effort), Category II (monthly 1° x 1° catch and effort), and Category III (bycatch, catch size composition) data for vessels active in the Canadian north Pacific Albacore Tuna troll fishery in 2021.

## 2. DATA SOURCES

Data on Albacore Tuna catch and effort from 1995 through to the present are compiled from hail records, logbooks, and sales slips and stored in the Canadian Albacore Tuna Catch and Effort Relational Database (Stocker et al. 2007). This database contains the best available estimates of annual catch and effort by geographic zone (Canadian, US, and high seas waters) for the Canadian fishery. All Canadian fishing vessels are required to hail (call) a third party service provider when they intend to start fishing and stop fishing, and when they change fishing zones. Canadian vessels must also carry logbooks in which daily position, catch and effort (latitude, longitude, number of fish, estimated weight) are recorded for Albacore Tuna and non-target species. These data have the highest temporal and spatial resolution and are obtained when logbooks are returned in November after the fishing season is completed. The third data source, sales slips, record the weight of Albacore Tuna landed and bought by domestic buyers and provide the most accurate estimates of Albacore Tuna catch in weight since these data are the basis for payment to harvesters (Stocker et al. 2007). Logbooks and sales slips from domestic buyers (plus trans-shipment slips if applicable) are forwarded for entry into the Albacore Tuna catch database (Stocker et al. 2007).

Fork length data are collected through an on-board sampling program initiated in 2009, with a sampling goal of 1% of the reported catch. Harvesters record the lengths of the first 10 Albacore landed daily to randomize measurements. Size composition data were collected by port samplers from a portion of the Canadian catch landed in United States ports between 1981 and 2008. Size data reported by Canada since 2009 are from the domestic on-board sampling program only.

The fishery data provided in this report were taken from Canadian tuna database version 22.02.17. Figures up to and including 2020 are considered definitive and are derived from a reconciliation of logbook data (best estimates of effort, catch in pieces, and geographic location) and sales slip (best estimate of catch weight) data (Stocker et al. 2007). The 2021 data are preliminary at this time.

### 3. AGGREGATED CATCH AND EFFORT DATA

#### 3.1. Catch

The preliminary estimate of the Canadian albacore tuna catch in the eastern Pacific Ocean, in 2021 was 2,399 metric tons (t), which is only a 1% increase relative to the catch in 2020 (Table 1; Figure 1). The total catch by the Canadian troll fishery has ranged from 1,761 t in 1995 to 7,857 t in 2004 and averaged  $4,516 \pm 1,814$  t ( $\pm$  sd) since 2003, the period when annual logbook coverage has exceeded 90% of all vessels participating in this fishery. The 2021 catch was achieved primarily in Canadian coastal waters (69.8%) and US coastal waters (28.2%). Catch in the Canadian EEZ slightly decreased by 1.4% and increased by 45.3% in the US EEZ, compared to 2020. The remaining small proportion (2%) of the eastern Pacific Ocean catch was from adjacent high seas waters. One vessel from the Canadian albacore troll fleet was active in the south Pacific Ocean and the catch from this fishing trip is not reported here due to privacy restrictions.

The number of Albacore released in 2021 was 6,624 fish, nearly 10 times more than was reported in 2020 (Table 2). The estimated mean weight of released Albacore was 3.28 kg in 2021, similar to the mean weight of 3.12 kg in 2020. Albacore are released because they are below the minimum marketable size. The weight of released fish is not accounted for in Table 1, which records retained catch only.

#### 3.2. Effort

The Canadian albacore tuna troll fleet in 2021 consisted of 112 unique vessels, substantially below the average participation of 160 vessels since 2003 (Table 1). Canadian vessels which fished the US EEZ increased from thirty-four (34) in 2020 to forty-one (41) in 2021. The 2021 estimate of fishing effort is 3,660 vessel-days (v-d) and is a 10.9% increase relative to the fishing effort in 2020 (Table 1; Figure 1). Fishing effort in 2021 occurred largely in Canadian coastal waters (72%) and US coastal waters (25.6%). Effort increased by 3.8% in the Canadian EEZ and by 63.5% in the US EEZ relative to 2020. A small proportion (2.3%) of the Canadian fleet effort was reported in adjacent high seas waters in 2021. One Canadian vessel from the albacore tuna fleet operated in the south Pacific between January and March in 2021.

#### 3.3. Catch Rate

Catch rate or catch per unit effort (CPUE) is calculated by dividing the catch in metric ton by the number of vessel days. Total CPUE for the Canadian fleet has been relatively stable over the last 4 years, decreasing slightly from 0.72 t/v-d in 2020 to 0.66 t/v-d in 2021 (Figure 1). CPUE in the Canadian EEZ has been relatively stable over the last three years. Although there was a slight decrease in catch rate in the Canadian EEZ between 2020 and 2021, it remains well above 2017 when the CPUE dropped to the lowest level in the existing record, in the Canadian EEZ. CPUE has also been higher in the US EEZ for the past four years relative to 2017. The CPUE in the Canadian EEZ was lower by 12% relative to the CPUE in the US EEZ, in 2021. The peak of the catch rates in all areas occurred in August of 2021 (Figure 2).

### 4. SPATIAL DISTRIBUTION OF CATCH AND EFFORT DATA

In 2021, the Canadian troll fleet primarily operated within the Inter-American Tropical Tuna Commission (IATTC) convention area east of 150°W and north of the equator, with approximately 98% of the fishing effort and catch occurred within the Canadian and US EEZs. Catch and effort in adjacent the North Pacific high seas decreased in 2021 relative to 2020. One vessel from the Canadian fleet operated in the Western and Central Pacific Fisheries Commission (WCPFC) convention area west of 150°W in 2021.

A small amount of catch and effort occurred in June 2021 in the North Pacific primarily in the US EEZ. Effort and catch were largely distributed in the Canadian and US EEZs in July and August. In September the effort and catch were predominantly concentrated in the Canadian EEZ and fishing only occurred in the Canadian EEZ in October. Small amounts of effort and catch took place in the adjacent North Pacific high seas between June and September in 2021 (Figures 3 and 4).

Albacore were caught in waters with sea surface temperatures ranging from 11 to 21 °C in 2021 (Figure 5). The proportion of fish caught in waters within the favourable 16-19 °C temperature band decreased from 91% in 2020 to 68% in 2021.

## 5. BIOLOGICAL DATA

### 5.1. By-Catch

In 2021, the reported by-catch consisted of 52 fish and five sea birds of unidentified species (Table 3). All sea birds were released and 85% of the fish by-catch were retained. Yellowtail Amberjacks (*Seriola lalandi*), had the highest amount of retained by-catch with thirty individuals, followed by eight Pacific Bluefin Tuna (*Thunnus orientalis*), two yellowfin tuna, two skipjack tuna and two coho salmon retained. Other by-catch species that were released included sharks (Blue Shark (*Prionace glauca*) and Salmon Shark (*Lamna ditropis*)), Steelhead Trout (*O. mykiss*) and Bonito (*Sarda*).

### 5.2. Biological Sampling

Thirty-eight (38) vessels measured 10,392 fork lengths in 2021 for a sampling rate of 2.6% of the reported catch. Fork lengths ranged from 50 to 95 cm, having a dominated mode around 60 cm corresponding to 2-year old fish and a smaller mode around 80 cm corresponding to 3-year old fish (Figure 6). Mean length was 6.1 cm, which is similar to the mean length observed in 2020.

Proportion of large fish appeared to be lower in 2021 than in 2020. Monthly mean length of fish in 2021 increased from June to August and decreased in September and October (Figure 7). Albacore caught from the Canadian EEZ had a larger mean length than the US EEZ, and Albacore caught in the high seas were, on average, larger than those harvested in the Canadian or US EEZ (Figure 8).

## 6. DISCUSSION

The total annual catches and catch rates for the Canadian Albacore fishery have been relatively stable over the past 3 years, at levels above the low levels seen in 2017, but still below the past ten year average. The total effort of the Canadian fleet, however, has been on a decreasing trend overall since 2017, with only a modest increase in 2021. The proportion of the Canadian catch and effort have been increasing more in the Canadian EEZ in recent years than in the US EEZ. In 2021 the Canadian catch had a slight increase in the Age 3-4 fish compared to 2020 but the majority of the catch was still Age-2. Most of the Canadian catches since 2014 appear to be largely composed of Age 2 fish compared to the earlier years of 2009-2013, during which catches were mainly composed of Age 3-4 Albacore.

## 7. LITERATURE CITED

Stocker, M., H. Stiff, W. Shaw, and A.W. Argue. 2007. The Canadian albacore tuna catch and effort relational database. Canadian Technical Report of Fisheries and Aquatic Sciences 2701: vi+76 p.

**Table 1.** Fishery statistics from the Canadian troll fishery for north Pacific Albacore Tuna, 1995-2021. Catch and effort data are expanded or raised to account for vessels that do not report logbook data. The level of expansion can be determined by the logbook coverage figures.

<b>Year</b>	<b>Total Catch (t)</b>	<b>Effort (vessel-days)</b>	<b>Total Vessels</b>	<b>Logbook Coverage (%)</b>
1995	1,761	5,923	287	18%
1996	3,321	8,164	295	24%
1997	2,166	4,320	200	30%
1998	4,177	6,018	214	50%
1999	2,734	6,970	238	71%
2000	4,531	8,769	243	68%
2001	5,249	10,021	248	81%
2002	5,379	8,323	232	74%
2003	6,847	8,428	193	96%
2004	7,857	9,942	221	92%
2005	4,829	8,564	213	94%
2006	5,833	6,243	174	95%
2007	6,040	6,902	207	92%
2008	5,464	5,774	137	93%
2009	5,693	6,540	138	97%
2010	6,527	7,294	161	96%
2011	5,385	8,556	176	99%
2012	2,484	5,974	174	100%
2013	5,088	6,465	183	99%
2014	4,780	4,745	160	100%
2015	4,391	5,244	164	99%
2016	2,842	5,359	152	100%
2017	1,830	4,978	121	100%
2018	2,717	4,196	121	100%
2019	2,402	3,882	122	100%
2020	2,375	3,301	104	100%
2021 <sup>1</sup>	2,399	3,660	112	100%

<sup>1</sup> 2021 data are preliminary based on Ver. 22.02.17 of the *Canadian Albacore Tuna Catch and Effort Relational Database*. See Stocker et al. (2007) for a description of the database.

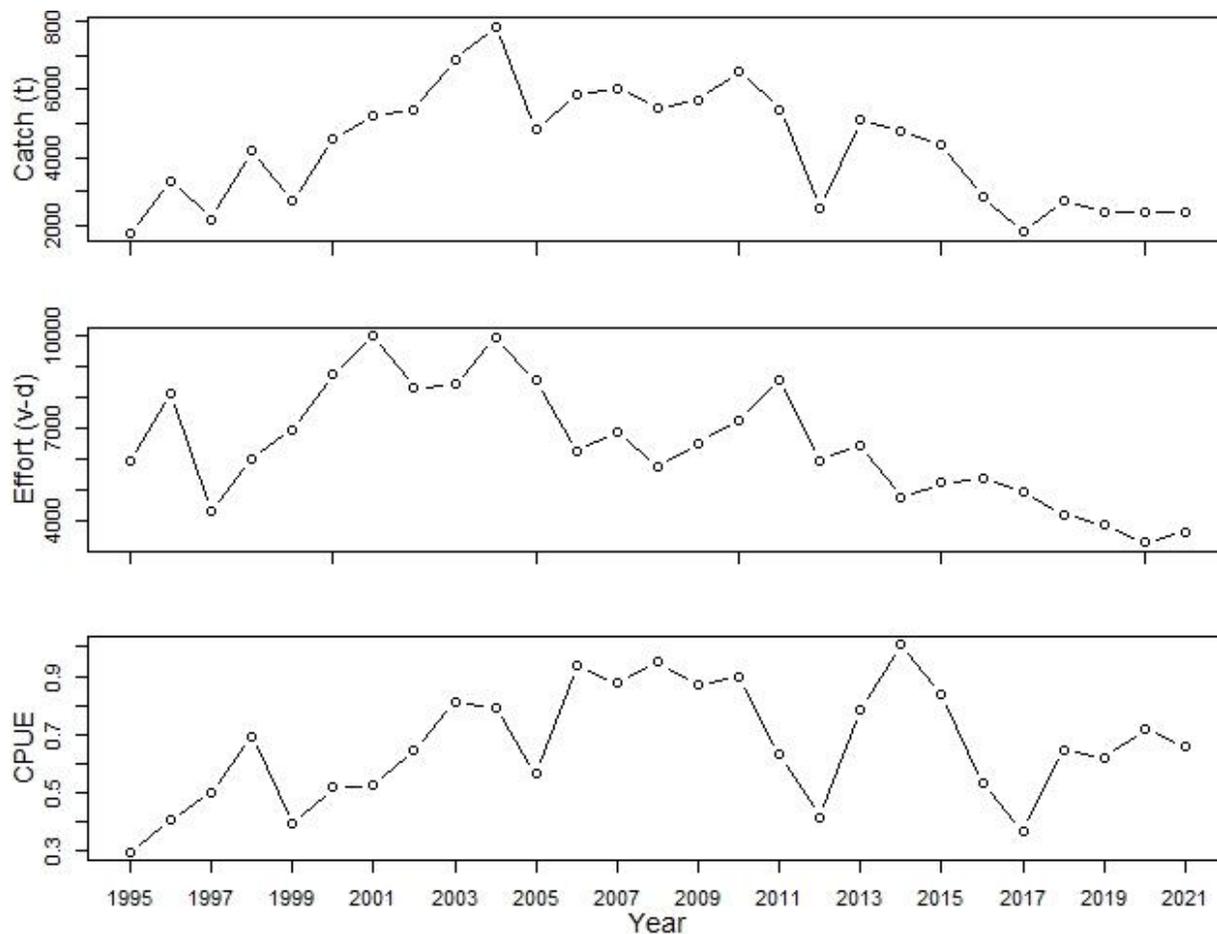
**Table 2.** Releases of Albacore below marketable size (3.18 kg) reported by the Canadian Albacore fishery in 2013-2021.

<b>Year</b>	<b>Number of Fish</b>	<b>Total Weight (kg)</b>
2013	289	918
2014	2,214	7,153
2015	4,295	14,271
2016	562	2,134
2017	545	1,660
2018	5,508	18,291
2019	4,093	12,929
2020	668	2,082
2021	6,624	21,709

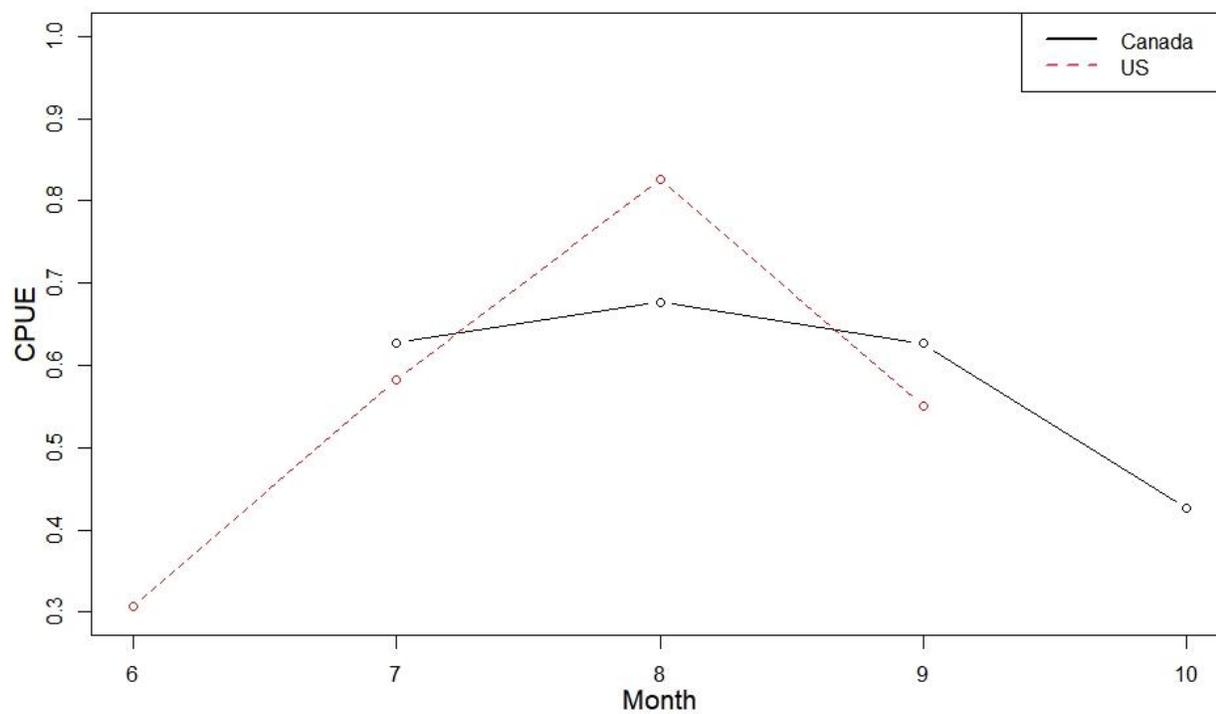
**Table 3.** Reported catch of non-target species (by-catch) by the Canadian Albacore Tuna troll

Month	Common name	Scientific Name	Catch (in Numbers)	
			Retained	Released
July	Blue Shark	<i>Prionace glauca</i>		1
	Sea Bird	N/A		2
	Yellowtail Amberjack	<i>Seriola lalandi</i>	2	
	Skipjack Tuna	<i>Katsuwonus pelamis</i>	2	
	Yellowfin Tuna	<i>Thunnus albacares</i>	2	
August	Yellowtail Amberjack	<i>Seriola lalandi</i>	8	1
	Sea Bird	N/A		1
	Salmon Shark	<i>Lamna ditropis</i>		1
	Pacific Bluefin Tuna	<i>Thunnus thynnus</i>	8	
	Coho Salmon	<i>Oncorhynchus kisutch</i>	2	1
September	Sea Bird	N/A		1
	Yellowtail Amberjack	<i>Seriola lalandi</i>	10	
	Blue Shark	<i>Prionace glauca</i>		1
	Skipjack Tuna	<i>Katsuwonus pelamis</i>		1
	Bonito	<i>Sarda</i>		1
October	Steelhead Trout	<i>Oncorhynchus Mykiss</i>		1
	Sea Bird	N/A		1
	Yellowtail Amberjack	<i>Seriola lalandi</i>	10	
TOTALS			44	13

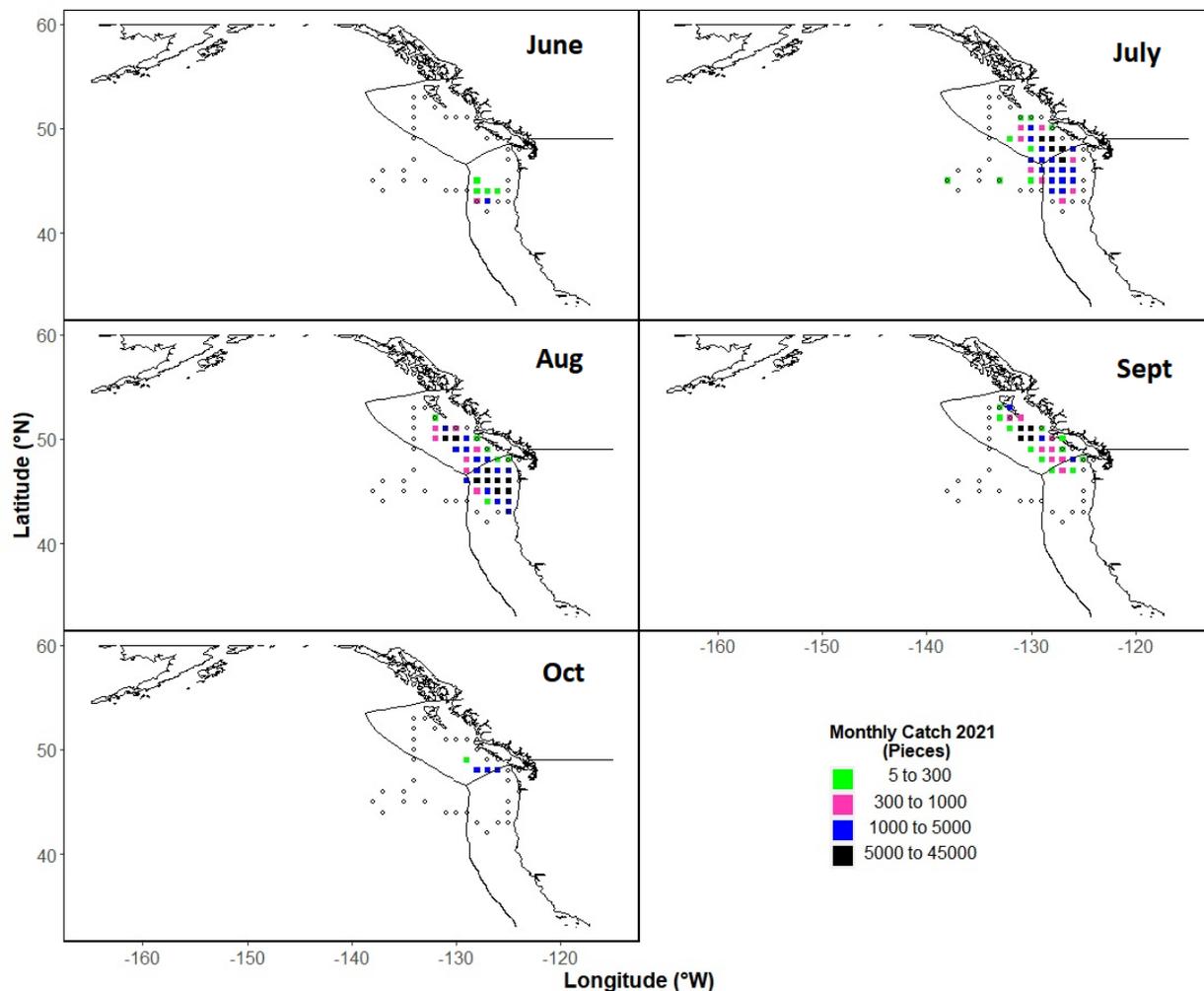
fishery in 2021.



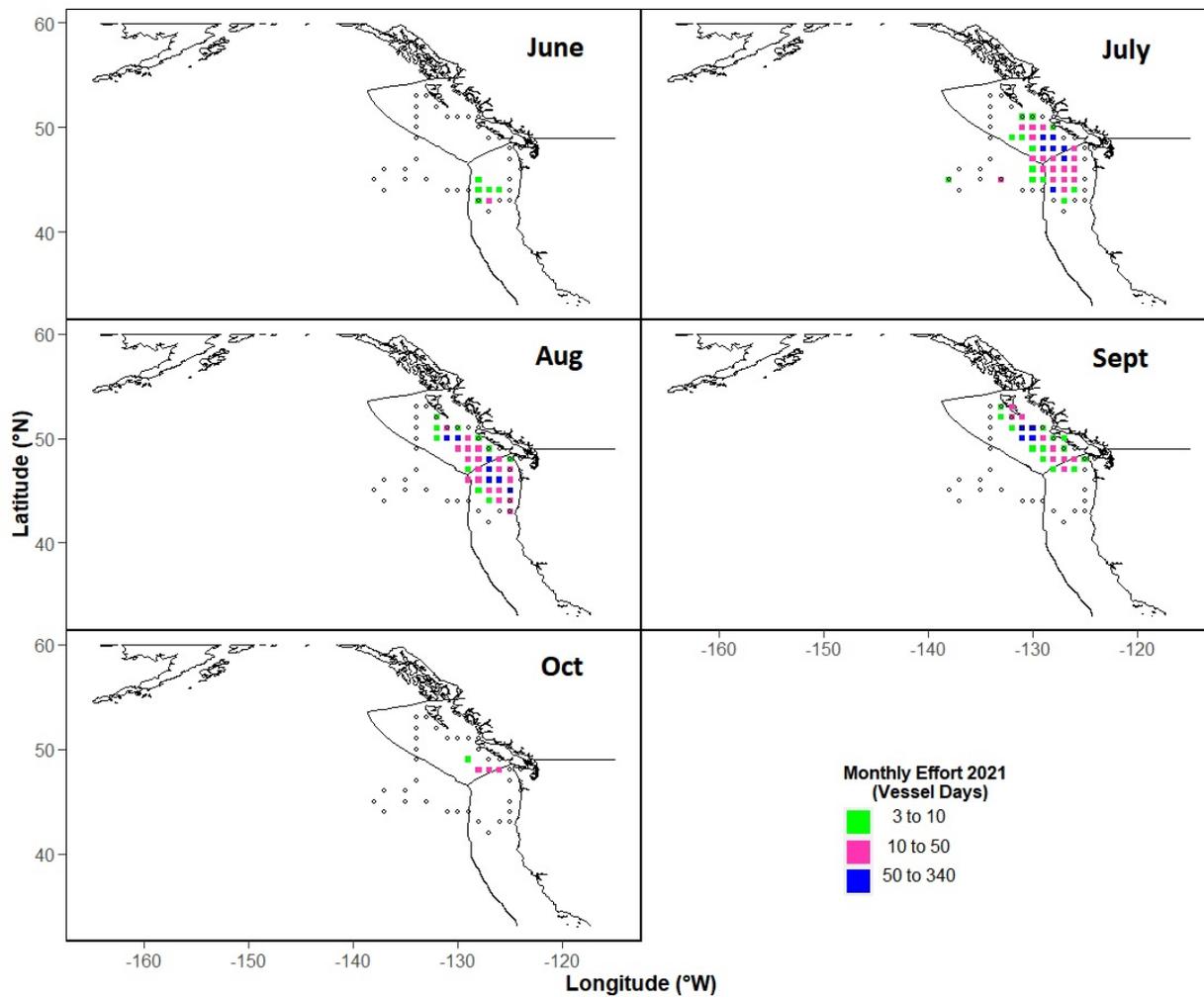
**Figure 1.** Historical trends in expanded catch (metric tonnes, t), effort (vessel-days, v-d) and catch per unit effort (CPUE, t/vessel-day) in the Canadian troll fishery for north Pacific Albacore Tuna from 1995 to 2021.



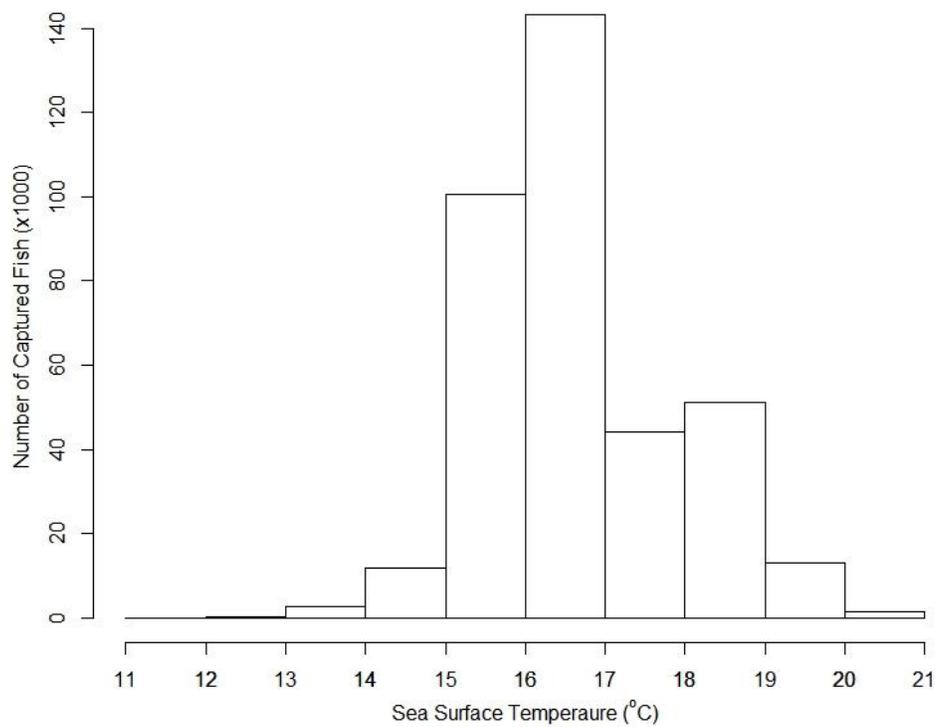
**Figure 2.** Monthly catch per unit effort (CPUE, t/vessel-day) in the Canadian and U.S. EEZs for Canadian Albacore Tuna troll fishery in 2021.



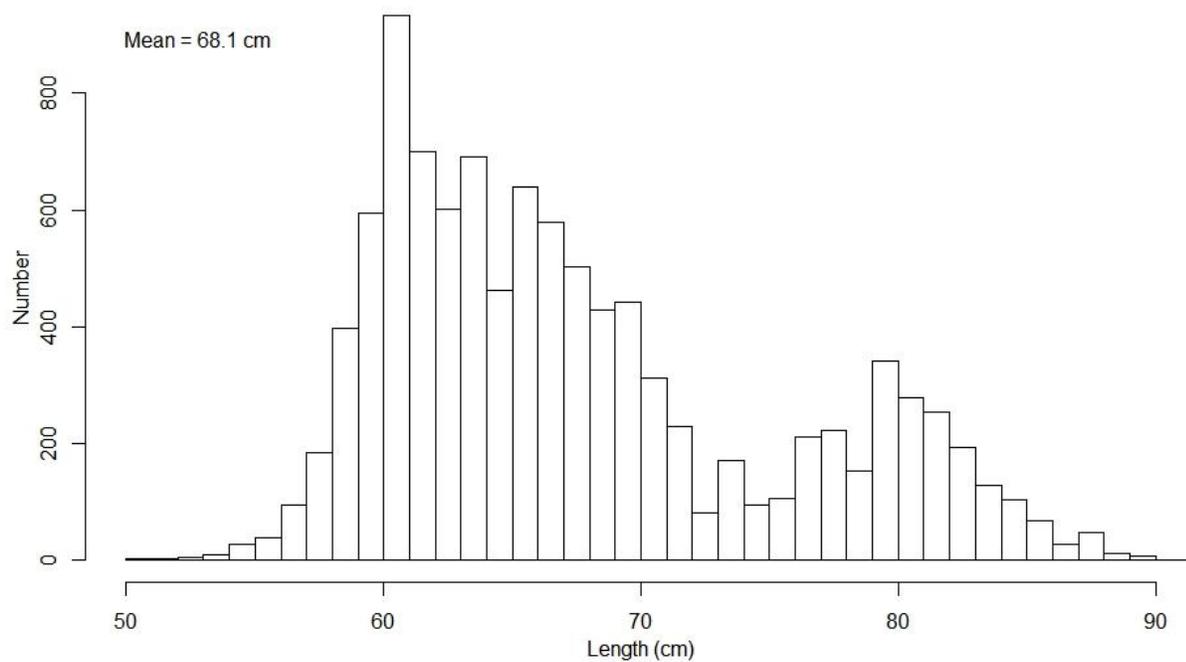
**Figure 3.** Monthly spatial distribution of reported catch in Canadian Albacore Tuna troll fishery in 2021. Data are plotted on a 1° x 1° strata with symbols located on the bottom-right corner. Strata in which fewer than three vessels reported are not shown. Empty dots approximate the border line of the operational area of the Canadian fishery in 2021.



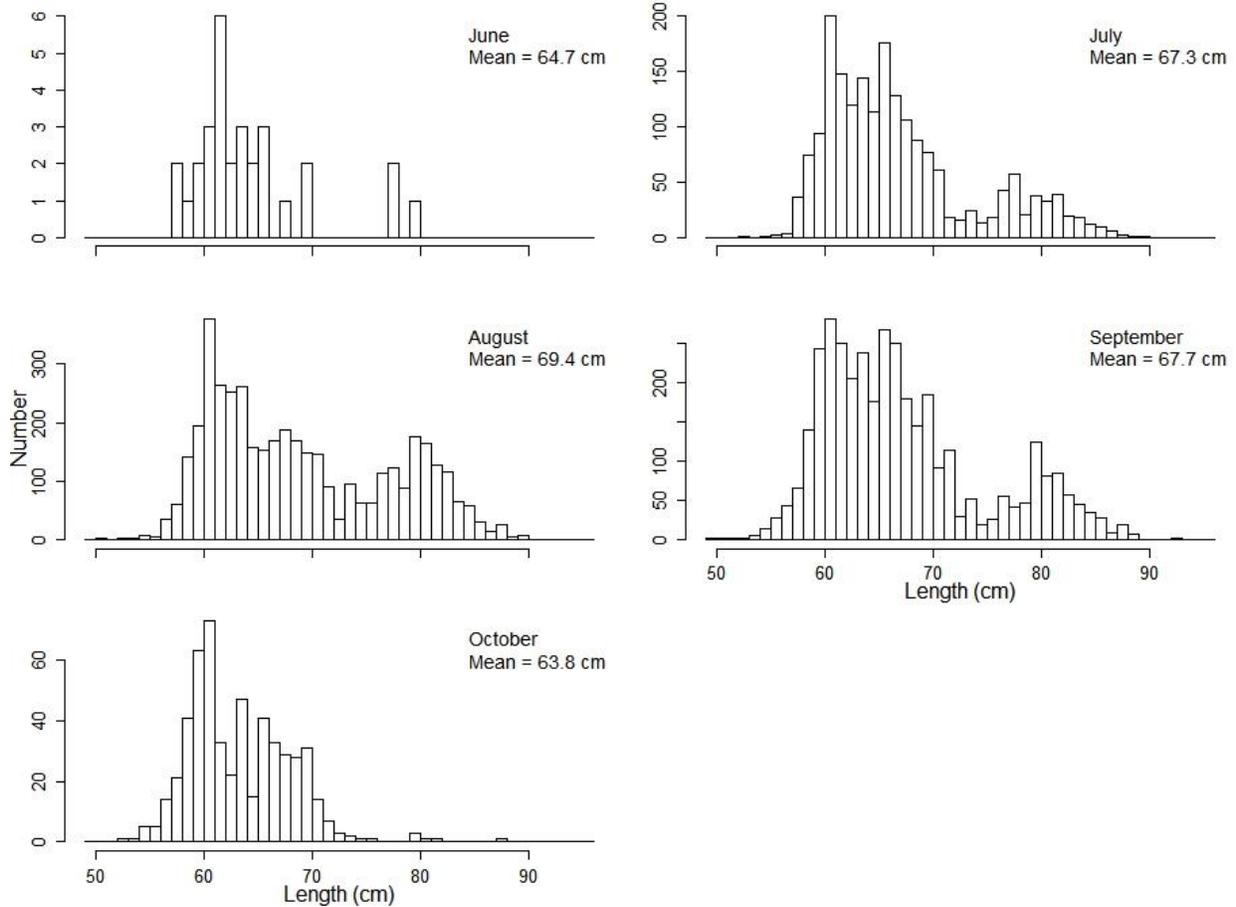
**Figure 4.** Monthly spatial distribution of effort by the Canadian Albacore Tuna troll fishery in 2021. Data are plotted on  $1^\circ \times 1^\circ$  strata with symbols located on the bottom-right corner. Empty dots approximate the border line of the operational area of the Canadian fishery in 2021.



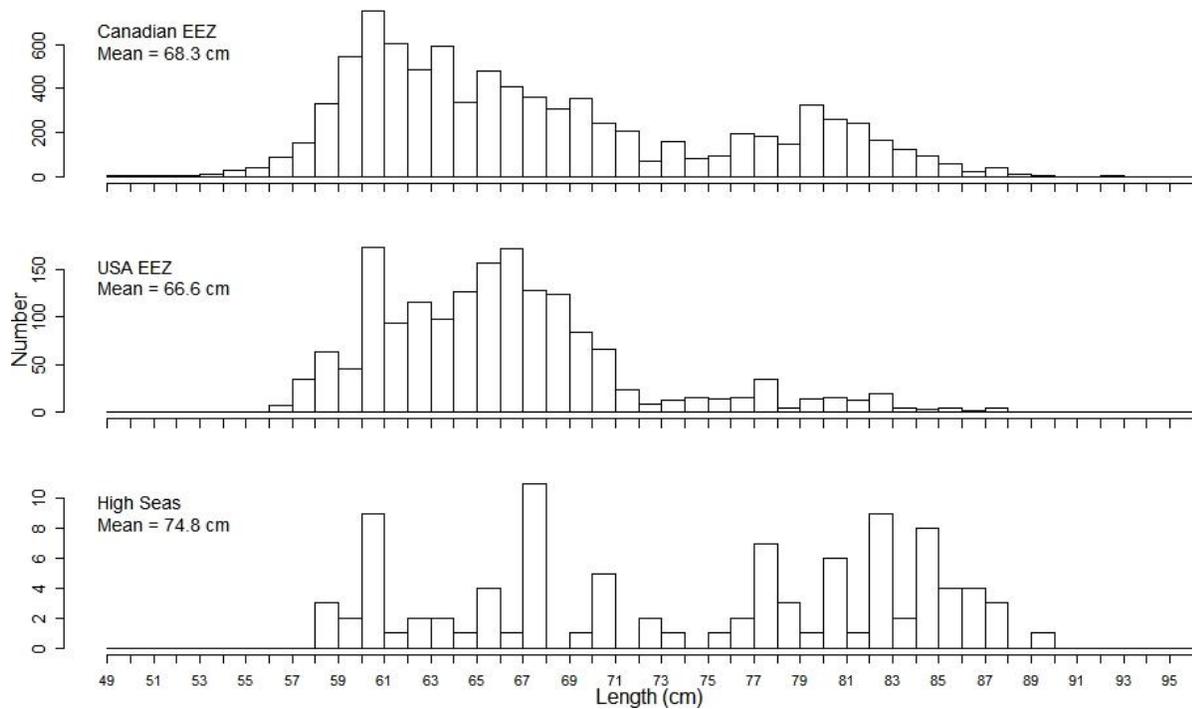
**Figure 5.** Number of north Pacific Albacore Tuna caught by the Canadian troll fishery in 2021 at various sea surface temperatures.



**Figure 6.** Distributions of fork lengths (cm) of north Pacific Albacore Tuna harvested by the Canadian troll fishery in 2021.



**Figure 7.** Monthly fork length (cm) distributions of north Pacific Albacore Tuna harvested by the Canadian troll fishery in 2021.



**Figure 8.** Distributions of fork lengths (cm) of north Pacific Albacore Tuna harvested by the Canadian troll fishery in 2021 in Canadian EEZ, USA EEZ and High Seas.