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National Report on Canadian Tuna and Tuna-like Fisheries in the North Pacific Ocean in 2018

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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 2018 fishing season are summarized in this report. The Canadian fleet consisted of 121 vessels and operated exclusively within the eastern Pacific Ocean. The Canadian troll fishery continues to be largely coastal in its operations, occurring predominantly within the Canadian and United States exclusive economic zones. Little catch and effort occurred outside the Canadian and United States EEZs in 2018. Provisional 2018 estimates of catch and effort are 2,717 metric tonnes (t) and 4,196 vessel-days, respectively, which represent a 48.5% increase in catch and 15.7% decrease in effort relative to 2017. Catch and effort were split primarily between Canadian waters (30.8% of the catch and 45.9% of the effort) and US waters (68.9% of the catch and 53.1% of the effort) while the remaining catch and effort occurred in adjacent high seas waters. About 93% of the catch occurred in a sea surface temperature band of 16-19 °C. Forty-one (41) vessels measured 9,401 fork lengths on 83 trips in 2018 for a sampling rate of 2.1% of the reported catch. Fork lengths (FL) ranged from 48 to 94 cm, having a dominated mode around 67 cm FL and a weak mode of about 80 cm FL.

1.0 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 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 2019 to 31 March 2020 are documented in the Albacore Tuna Integrated Fisheries Management Plan (IFMP) <https://waves-vagues.dfo-mpo.gc.ca/Library/4077790x.pdf>. Historically, most of the Canadian effort and catch for north Pacific Albacore has occurred between early July and the end of 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 2018.

2.0 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 19.03.31. Figures up to and including 2017 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 2018 data are preliminary at this time.

3.0 AGGREGATED CATCH AND EFFORT DATA

3.1 Catch

The preliminary estimate of the Canadian Albacore Tuna catch in 2018 is 2,717 metric tons (t), which is a 48.5% increase relative to the catch in 2017 and about the same as the catch in 2016 (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 $4,915 \pm 1,696$ t (\pm sd) since 2003, the period when logbook coverage has exceeded 90% of all vessels participating in this fishery. The 2018 catch was primarily distributed among United States coastal waters (68.9%) and Canadian coastal waters (30.8%). Catch increased by 36.4% from the US EEZ, and by 308.3% from the Canadian EEZ. The remaining small proportion of the catch was from adjacent high seas waters (0.3%). No Canadian albacore-fishing vessels entered the north Pacific WCPFC convention area in 2018. Forty-five (45) Canadian vessels entered the US EEZ and fished in 2018, as permitted according to the bilateral Treaty.

The number of Albacore released in 2018 was 5,508 fish, more than 10 times as many as in 2017 (Table 2). The estimated mean weight of released albacore was 3.32 kg in 2018, higher than the mean weight of 3.05 kg in 2017. Albacore are released because they are below the minimum marketable size. The weight of released fish is not included in Table 1, which records retained catch only.

3.2 Effort

The Canadian 2018 Albacore Tuna troll fleet consisted of 121 unique vessels just as in 2017, well below the average participation rate of 168 vessels since 2003 (Table 1). The 2018 estimate of fishing effort is 4,196 v-d and is a 15.8% decrease relative to the effort in 2017 (Table 1; Figure 1). Fishing effort in 2018 was primarily split between Canadian coastal waters (45.9%) and United States coastal waters (53.1%). Effort decreased by 22.2% in the US EEZ, and increased by 43.3% in the Canadian EEZ relative to 2017. Only a small proportion of effort was spent in adjacent high seas waters (1%). Annual fishing effort has ranged between 4,320 v-d in 1997 and 10,021 v-d in 2001, averaging $6,575 \pm 1,617$ v-d since 2003.

3.2 Catch Rate

Catch rate is expressed as catch per unit effort (CPUE), namely amount of catch in metric ton per vessel day. Catch rate in 2018 is higher than in 2017 and 2016 (Figure 1). Catch rate increased by 75% in the US EEZ, but by 185% in the Canadian EEZ. The peak of the catch rates occurred in early July of 2018 (Figure 2). In comparison with the historical average, the catch rates were about the same in the month of June, substantially higher in the month of July, comparable in the month of August, and lower in the months of September and October (Figure 2).

4.0 SPATIAL DISTRIBUTION OF CATCH AND EFFORT DATA

The Canadian troll fleet operated predominantly in the Canadian and US EEZs, where about 99% of the 2018 fishing effort and catch occurred. This coastal distribution is consistent with the pattern of operation observed in the last decade. The proportion of effort and catch occurring within United States EEZ waters is lower in 2018 (53% and 69%, respectively) than in 2017 (58% and 75%, respectively). The Canadian troll fleet operation is more narrowly distributed in

2018 than in 2017. Only 1% effort was spent in adjacent high seas waters in 2018, while 15.4% effort was spent in the high sea waters including the WCPFC convention area in 2017.

Monthly effort and catch concentrated in the waters of the US EEZ in June and July, and occurred both in the Canadian and US EEZs in August and September, and were exclusively in the Canadian EEZ in October (Figures 3 and 4).

Albacore were caught in waters with sea surface temperatures ranging from 11 to 21 °C in 2018, but 93% of the fish were harvested in waters within the 16-18 °C temperature band (Figure 4).

5.0 BIOLOGICAL DATA

5.1 By-Catch

Reported by-catch was seventeen fish and two sea birds in 2018. The 17 fish include five sharks of identified species and two sharks of unidentified species (Table 3). Eight yellowtail (*Seriola lalandi*), one yellowfin (*Thunnus albacares*) and one steelhead (*Oncorhynchus mykiss*) were retained. The two sea birds of unidentified species and all sharks including three shortfin Mako shark (*Isurus oxyrinchus*) and two blue shark (*Prionace glauca*) were released.

5.2 Biological Sampling

Forty-one (41) vessels measured 9,401 fork lengths on 83 trips in 2018, resulting in measurements from 2.1% of the reported catch. Fork lengths (FL) ranged from 48 to 94 cm (Figure 6). The length distribution is dominated by a single mode around 67 cm FL. A much smaller secondary mode around 80 cm FL is also visible (Figure 6). Monthly length distributions, however, appear to exhibit this secondary mode better especially in June and July (Figure 7).

The majority of measurements are of fish caught in the Canadian EEZ (52.9%), followed by the US EEZ (45.4%) and the high seas (1.7%). Albacore caught in the Canadian EEZ have a slightly smaller mean length but larger mode than in the US EEZ, and albacore caught in the high seas appear, on average, to be smaller than in the Canadian and US EEZs (Figure 8).

6.0 DISCUSSION

Canadian catch and catch rate were very low in the year of 2017, and they were close to the lowest levels observed since 1995. Both catch and catch rate increased considerably in 2018 relative to 2017. In particular, catch and catch rate in the Canadian EEZ increased drastically by 308% and 185%, respectively. In contrast, catch and catch rate in the US EEZ increased by lower percentages of 36% and 75%, respectively. In addition, the number of released albacore below marketable size is the highest since 2013.

Canadian harvesters' fishing effort was almost exclusively distributed in the Canadian and US EEZs in 2018, whilst such effort was more widely distributed in 2017. The compact fishing pattern in 2018 is possibly due to higher catch and catch rate in the coastal waters off British Columbia, Washington and Oregon states.

8.0 LITERATURE CITED

- Kleiber, P., and Perrin, C. 1991. Catch-per-effort and stock status in the U.S. north Pacific albacore fishery: reappraisal of both. *Fish. Bull.*, US. 89: 379-386.
- 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, 1995-2018. 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.

Year	Total Catch (t)	Effort (vessel-days)	Total Vessels	Logbook Coverage² (%)
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 ¹	2,717	4,196	121	100%

Table 2. Releases of Albacore below marketable size (3.18 kg) reported by the Canadian Albacore fishery.

Year	Number of Fish	Total Weight (kg)
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

Table 3. Reported catch of non-target species (by-catch) by the Canadian Albacore Tuna troll fishery in 2018.

Month	Common name	Scientific Name	Catch (Number of fish)	
			Retained	Released
July	Sea Bird			2
	Shark			1
	Shortfin Mako Shark	<i>Isurus oxyrinchus</i>		2
	Yellowfin	<i>Thunnus albacares</i>	1	
	Yellowtail	<i>Seriola lalandi</i>	1	
August	Shark			1
	Shortfin Mako Shark	<i>Isurus oxyrinchus</i>		1
	Steelhead	<i>Oncorhynchus mykiss</i>	1	
September	Blue Shark	<i>Prionace glauca</i>		2
	Yellowtail	<i>Seriola lalandi</i>	7	
TOTALS			10	9

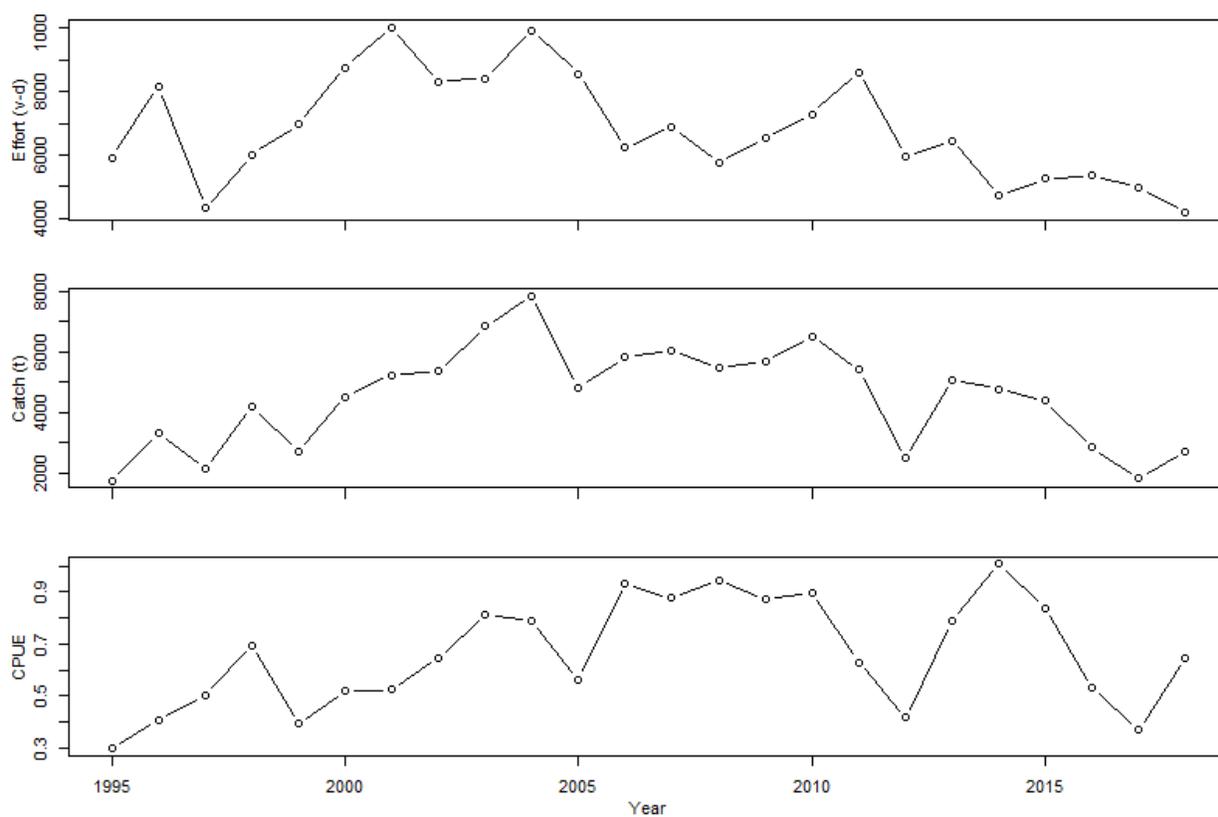


Figure 1. Historical trends in expanded catch (metric tonnes, t), effort (vessel-days, v-d) and catch per unit effort (CPUE, t/vessel-day) in the Canadian troll fishery for north Pacific Albacore Tuna from 1995 to 2018.

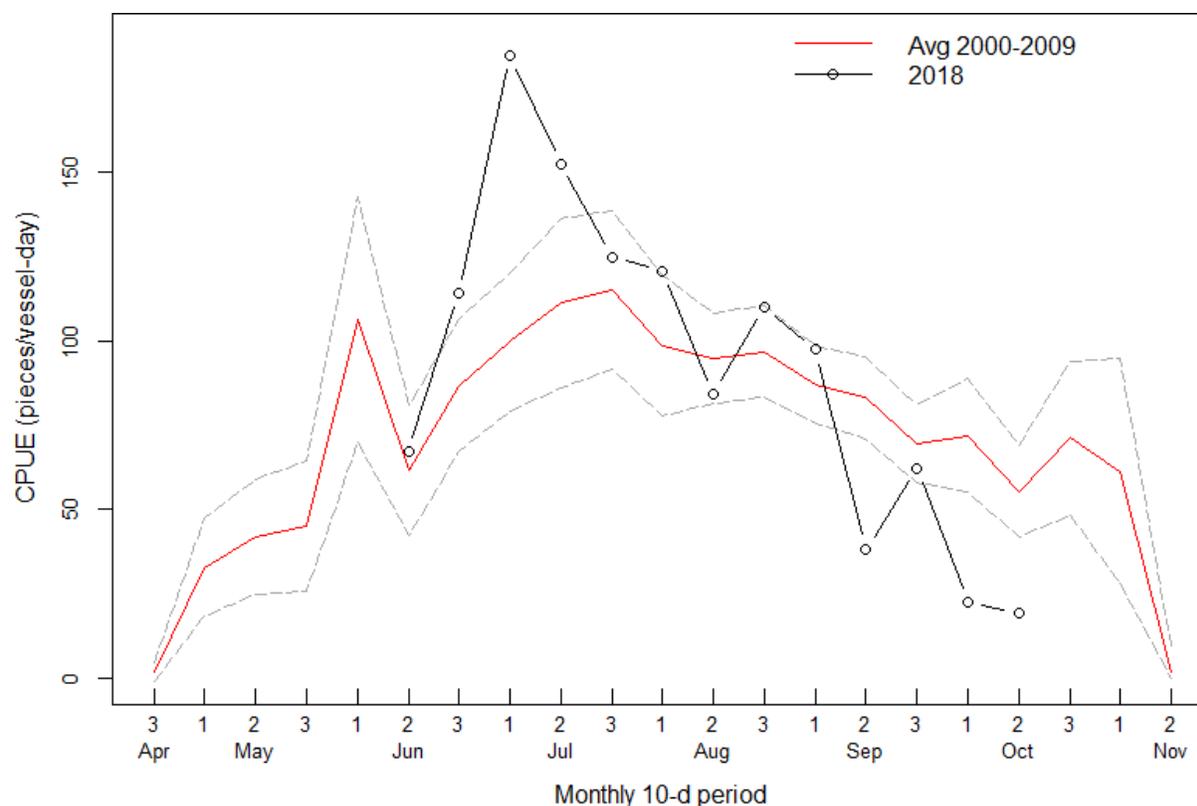


Figure 2. Nominal catch per unit effort (CPUE) for 10-day periods of the Canadian fleet averaged for 2000-2009 compared to the 2018 fishing season. Each data point is the average of all $1^{\circ} \times 1^{\circ}$ spatial strata in which effort occurred during one of three 10-day periods in a month. The grey dashed lines are the lower and upper 95% confidence interval around the average CPUE "climatology". See Kleiber and Perrin (1991) for CPUE calculation details.

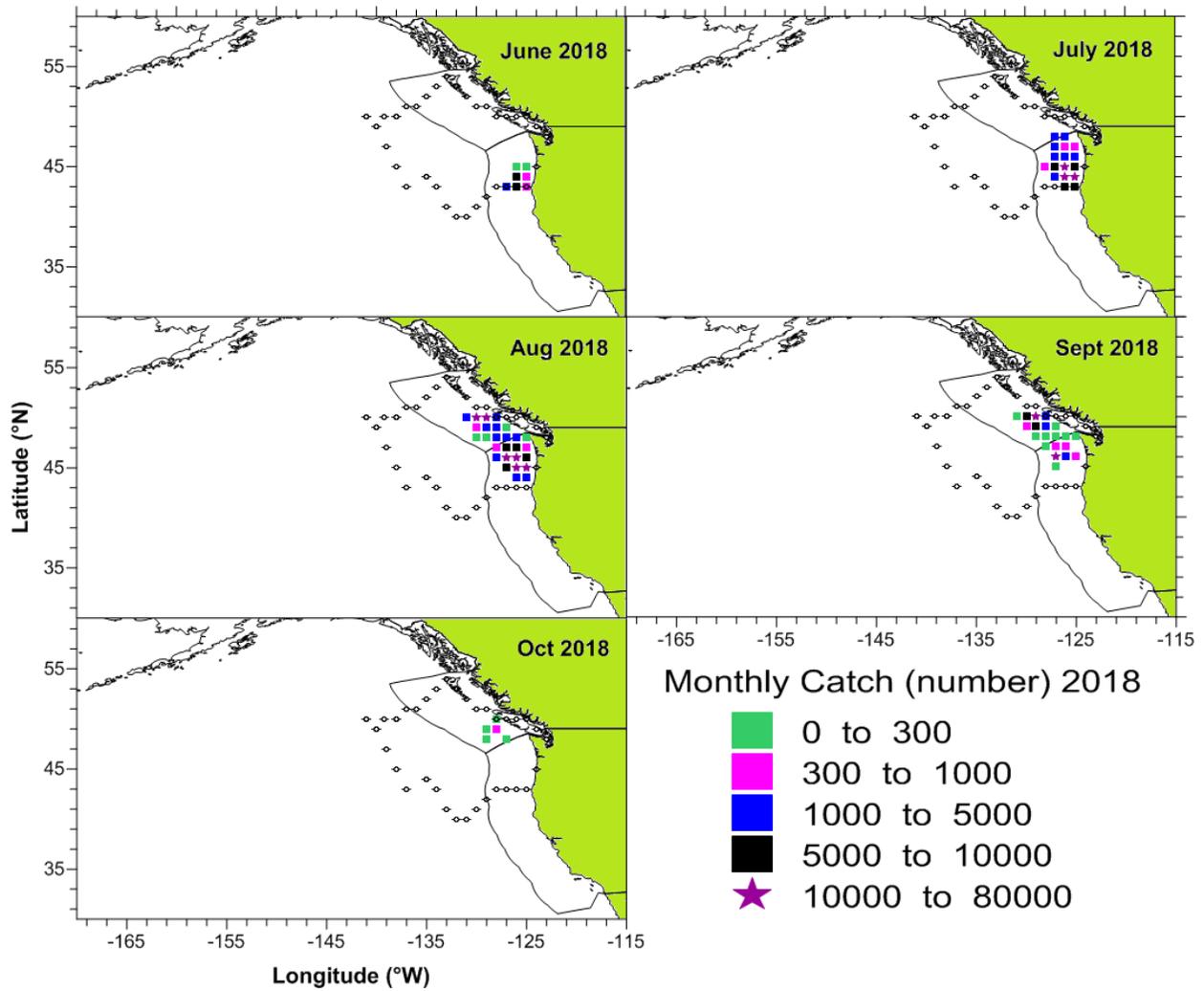


Figure 3. Monthly spatial distribution of reported catch in Canadian Albacore Tuna troll fishery in 2018. Data are plotted on a $1^\circ \times 1^\circ$ strata with symbols located on the bottom-right corner. Strata in which fewer than three vessels reported are not shown. Empty dots approximate the border line of the operational area of the Canadian fishery in 2018.

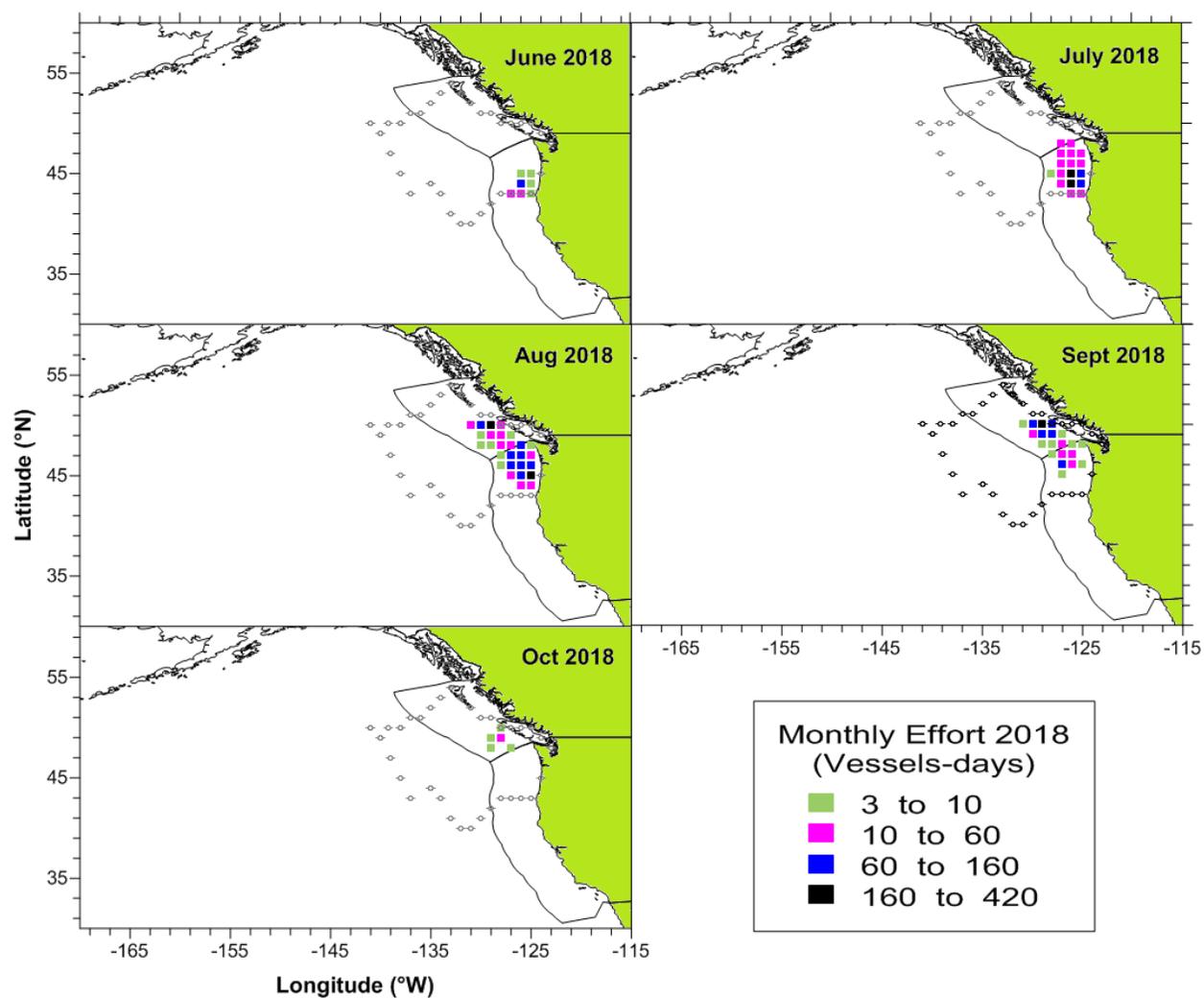


Figure 4. Monthly spatial distribution of effort by the Canadian Albacore Tuna troll fishery in 2018. Data are plotted on $1^\circ \times 1^\circ$ strata with symbols located on the bottom-right corner. Empty dots approximate the border line of the operational area of the Canadian fishery in 2018.

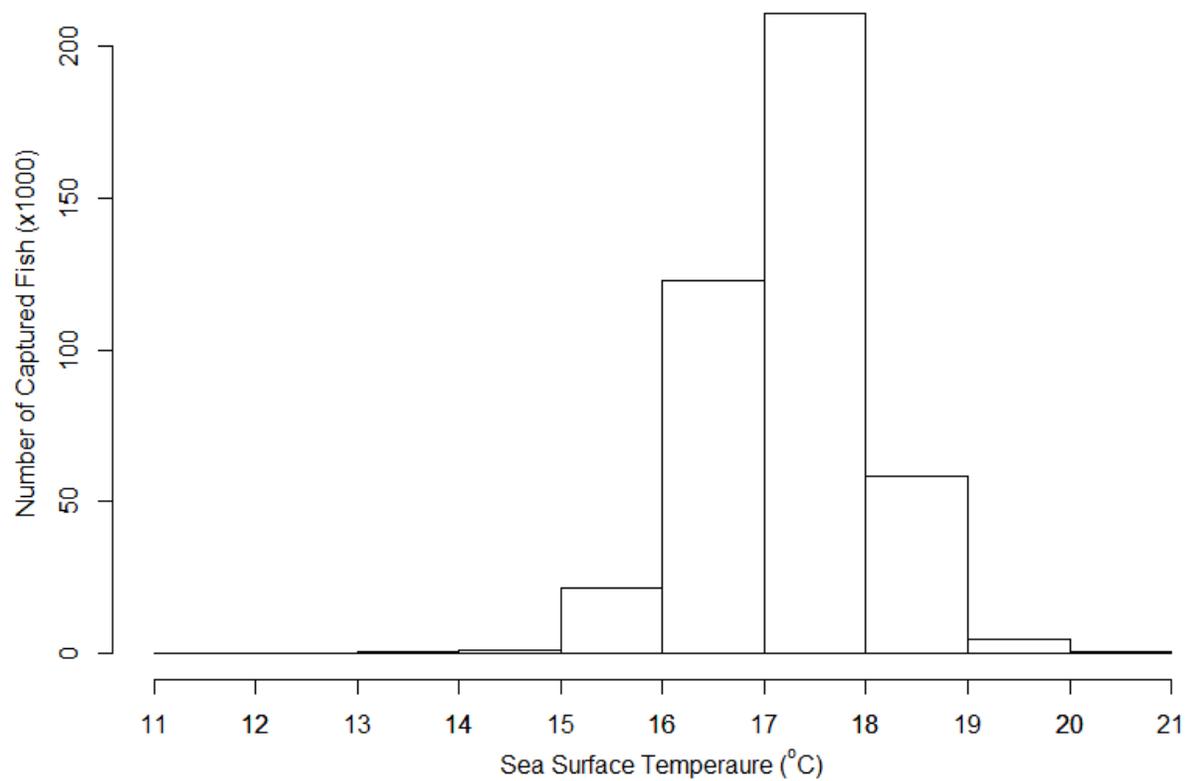


Figure 5. Sea surface temperatures at which Albacore Tuna were caught by the Canadian troll fishery in 2018.

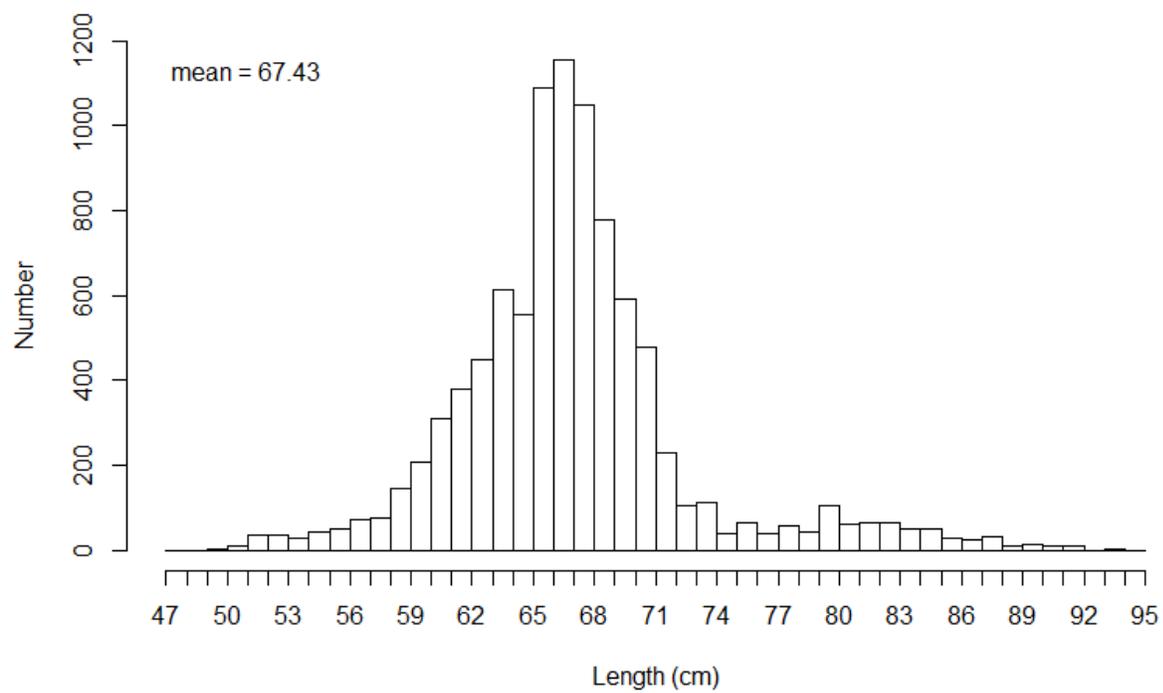


Figure 6. Distributions of fork lengths (cm) of North Pacific Albacore Tuna harvested by the Canadian troll fishery in 2018.

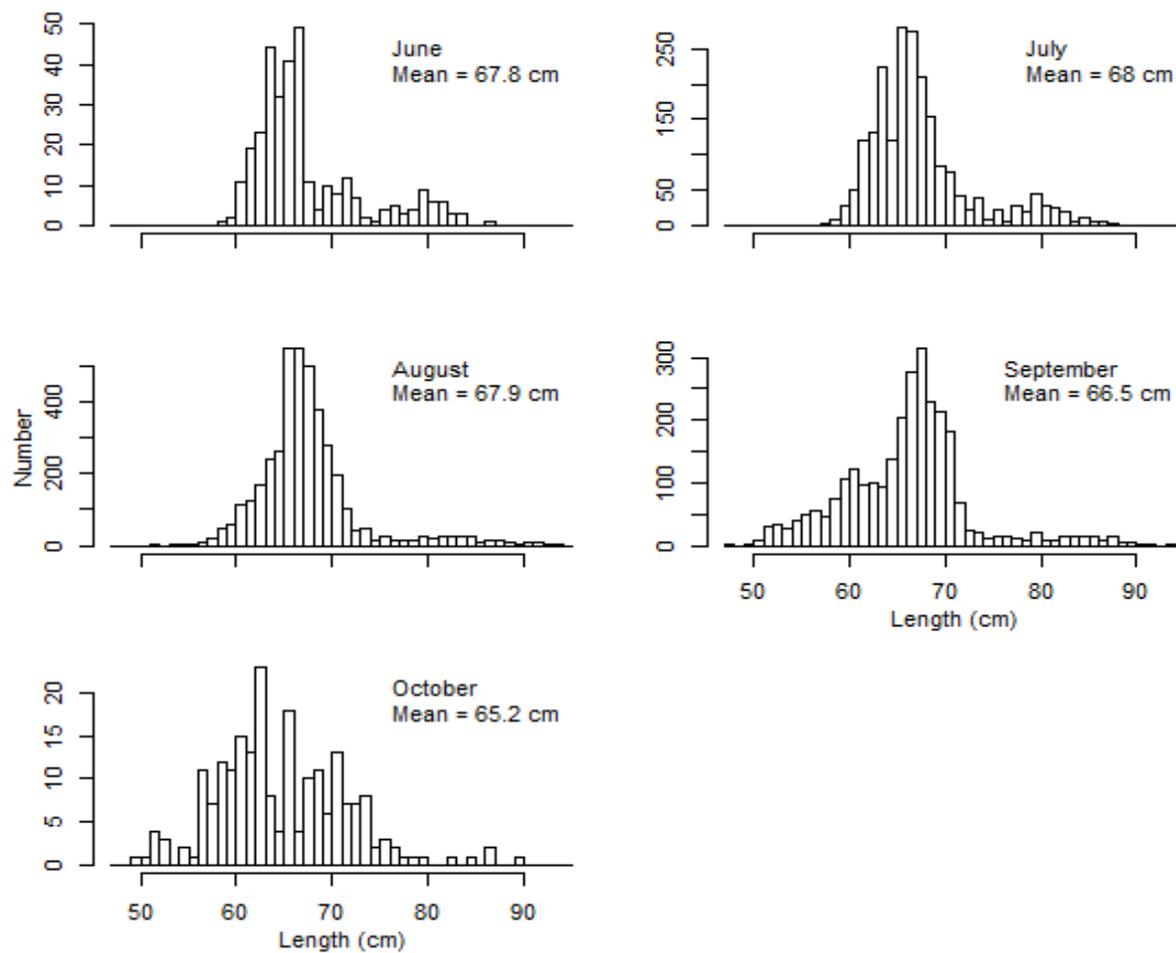


Figure 7. Monthly fork length (cm) distributions of North Pacific Albacore Tuna harvested by the Canadian troll fishery in 2018.

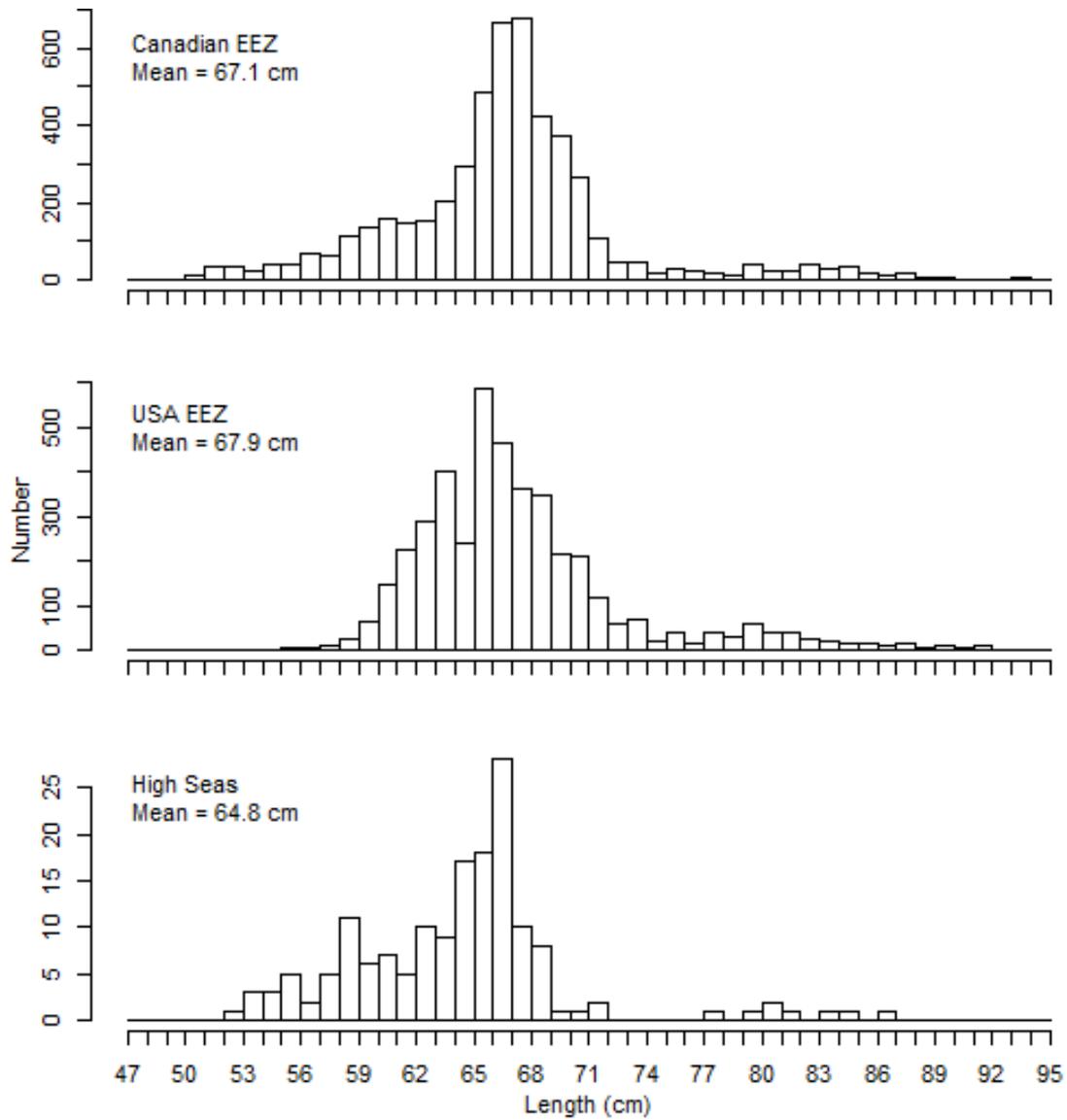


Figure 8. Distributions of fork lengths (cm) of North Pacific Albacore Tuna harvested by the Canadian troll fishery in 2018 in Canadian EEZ, USA EEZ and High Seas.