Massachusetts
Division of Marine Fisheries

Massachusetts 2018 Compliance Report to the Atlantic States Marine Fisheries Commission – Horseshoe Crab

Submitted by:
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I. Introduction

Massachusetts Division of Marine Fisheries (DMF) staff and numerous volunteer groups conducted spawning beach surveys during the full and new moons from mid-April through the end of June. Prosomal widths were taken from 1,634 biomedical and bait crabs as part of our market sampling program. Dealers reported 158,386 crabs harvested for bait, while fishermen reported catching 159,002 crabs for bait in 2018. The number of crabs bled for biomedical purposes remains confidential due to the limited number of biomedical facilities in the state (one). DMF had been working with a commercial fisherman to develop a net that could retain horseshoe crabs while limiting bycatch, but that work ended when the fisherman sold his boat in 2018.

II. Request for *de minimis* status – not applicable

III. Previous calendar year's fishery

a. Bait Harvest

In 2018, 57 of 226 horseshoe crab bait permits issued by DMF were actively fished, representing a decrease of three issued bait permits from 2017, but an increase in the number of actively fished permits by nine. In addition, six letters of authorization (LOA) were issued to allow the harvest of horseshoe crabs by mobile gear fishermen with a Coastal Access Permit (down from eight in 2017) and five fishermen without proper permits reported landings. See Table 1 for the associated harvests. Based on dealer data, 48% of the quota issued by ASMFC to Massachusetts (330,377 crabs), and 96% of the more restrictive state quota voluntarily imposed by Massachusetts (165,000 crabs) was harvested. Dealers reported a slightly lower total than what was reported by harvesters, with a discrepancy of 616 crabs (Table 2). Bait crabs were harvested primarily by mobile gear (trawl or dredge; 53% of harvest) or by hand (including rakes, dipnets, and hand tongs; 44%), with only 3% harvested by other means (gill net, weirs, pots, etc.) (Table 3). Bait crabs harvested in May and June accounted for 54% of all bait crabs landed in 2018 (Table 4).

Table 1. Number of permits issued, number of permits actively fished, and number of crabs fishermen reported selling as bait. (Data source: Massachusetts Trip Level Reports and NMFS Vessel Trip Reports.)

Permit Type	# of Permits Issued	Permits Fished	# of Crabs Harvested
Bait Permit	226	57	143,162
LOA	6	6	14,615
Non-Permitted	N/A	5	1,225

Table 2. Number of bait crabs reported by dealers and harvesters. (Data sources: SAFIS Dealer Reports, Massachusetts Trip Level Reports, NMFS Vessel Trip Reports.)

	Male	Female	Unclassified	Total
Dealer reported			158,386	158,386
Harvester reported	30,954	26,099	101,949	159,002

Table 3. Number of bait crabs captured by method, as reported by harvesters. (Data source: Massachusetts Trip Level Reports and NMFS Vessel Trip Level Reports.)

Harvest Method	# of Crabs	% of Total
Hand	70,643	44
Mobile Gear	84,378	53
Other	3,981	3

Table 4. Number of bait crabs harvested by month, as reported by harvests. (Data sources: Massachusetts Trip Level Reports and NMFS Vessel Trip Reports). * indicates confidential data (fewer than three individuals reporting landings).

	# of Crabs
MAR	*
APR	4,685
MAY	47,182
JUN	38,471
JUL	27,727
AUG	12,779
SEP	8,405
OCT	12,288
NOV	6,832
DEC	*

b. Scientific and Research Harvest

As a condition of permit renewal, researchers that wish to harvest horseshoe crabs in Massachusetts are required to report the number of horseshoe crabs taken for scientific purposes. In 2018, six research organizations applied for scientific permits to collect horseshoe crabs. Under these permits, 200 crabs and three clutches of eggs were collected.

c. Biomedical Fishery

DMF issued 14 biomedical harvest permits, four of which were actively fished in 2018. This represents no change in the number of permits issued and a decrease of one actively fished permit from 2017.

Associates of Cape Cod (ACC) is the single biomedical company producing *Limulus* Amebocyte Lysate (LAL) in Massachusetts. ACC filed monthly catch reports listing the dealers from whom they purchased crabs, location of harvest, the number and sex of crabs purchased, and the ultimate disposition of the crabs (released or returned to bait market). ACC also reported the number of crabs they rejected or received dead. Per the terms of the Letter of Authorization issued to ACC, they must adhere to the following conditions: keep crabs moist during transport and storage, transport crabs in a temperature controlled truck with the thermostat set between 50 and 60° F, keep crabs in the laboratory at ≤70° F, and hold crabs in Rubbermaid barrels no more than approximately 2/3 full.

d. <u>Shorebird monitoring</u>- Not applicable

e. <u>Benthic Sampling</u>

DMF's Resource Assessment Project has conducted seasonal spring (May) and fall (September) bottom trawl surveys in state waters since 1978. Approximately 100 tows are made during each season in five bio-geographic areas (Figure 1), using a stratified random sampling design, with 22 total strata. The net's design (¾-sized two seam 39' x 51' otter trawl with 3 ½" cookies on a chain sweep, ¼" knotless codend liner) is appropriate for sampling horseshoe crabs; however, the vessel size precludes towing inside most shallow embayments less than approximately 25 feet. For this report, areas 1–3 are considered Southern New England (SNE), and areas 4–5 are the Gulf of Maine (GOM). All data reported are from the survey's two shallowest depth strata (0–30' and 30–60', combined) because 98.3% of the horseshoe crabs caught in this survey since 1978 have come from these two strata.

Horseshoe crab mean number and weight per tow from the bottom trawl survey were at or above time series median levels for both sexes, both regions, and both seasons in 2018 (Figure 2 though Figure 5). Mean number and weight of spring caught males in SNE (Figure 2 and Figure 3) and GOM (Figure 4 and Figure 5) were higher than any other point in their respective time series. The percentages of tows containing horseshoe crabs (Figure 6 and Figure 7) were also above time series medians for both sexes across both regions, and both seasons, and the percent of tows containing horseshoe crabs is increasing for each sex, region, and season combination. The percentage of 2018 tows containing horseshoe crabs varied between 7 and 23%, based on sex, season, and region.

Size distribution data are given in Figure 8 through Figure 15. Regardless of region or season of capture, most male crabs were below 20 cm in prosomal width (PW) and females below 25 cm in 2018. The largest male crab recorded in the trawl survey's history was caught in 2018 (Figure 9); this male was 30 cm PW and is only the second male crab in the survey's history to be larger than 25 cm PW. While this extreme outlier should be viewed with caution, it should be noted that the sampler measuring the crab would have received a warning notification from the data collection software that the crab was outside of the normal size range, and then asked to confirm the size.

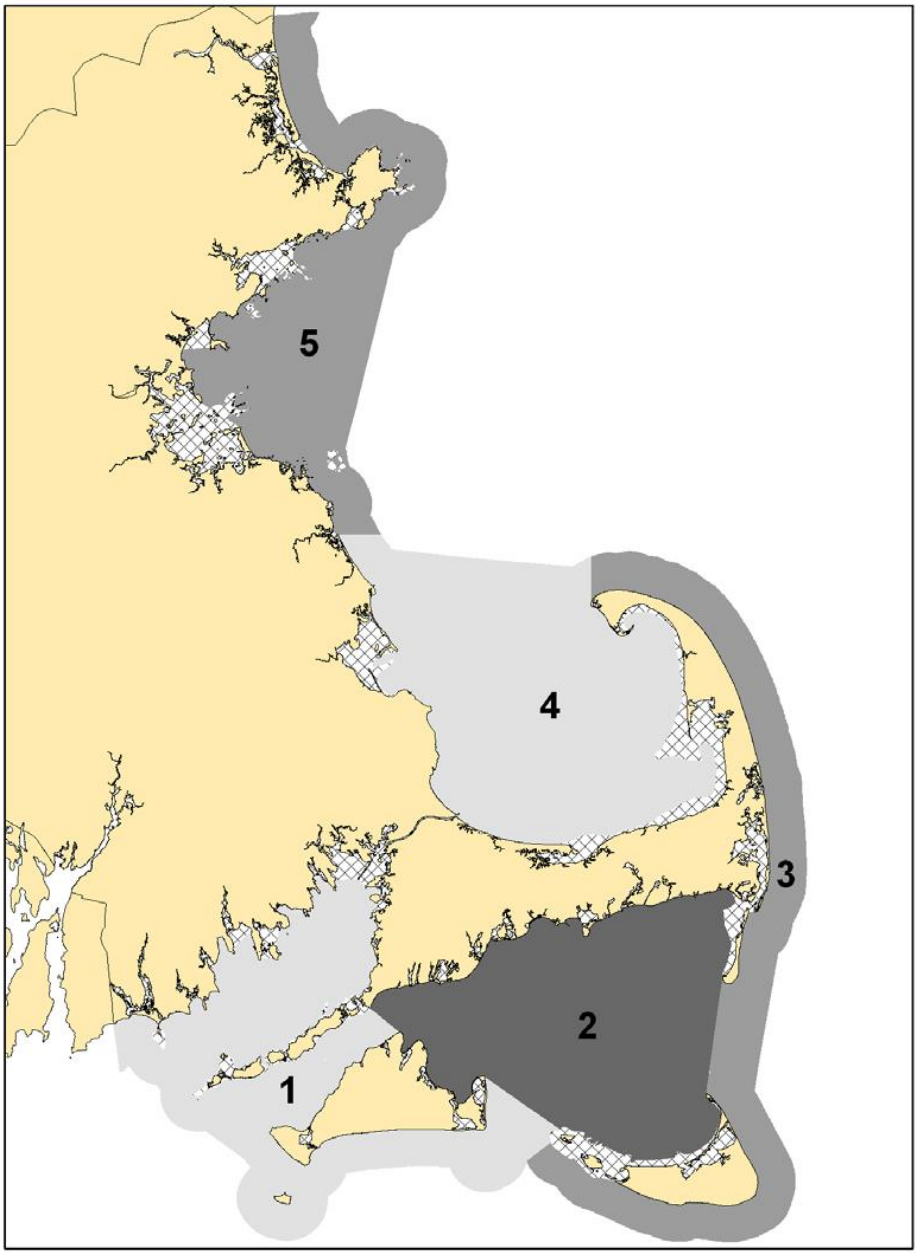

Figure 1. Map of regions for DMF's bottom trawl survey. For this report, regions 1–3 are considered Southern New England (SNE) and regions 4–5 are Gulf of Maine (GOM).

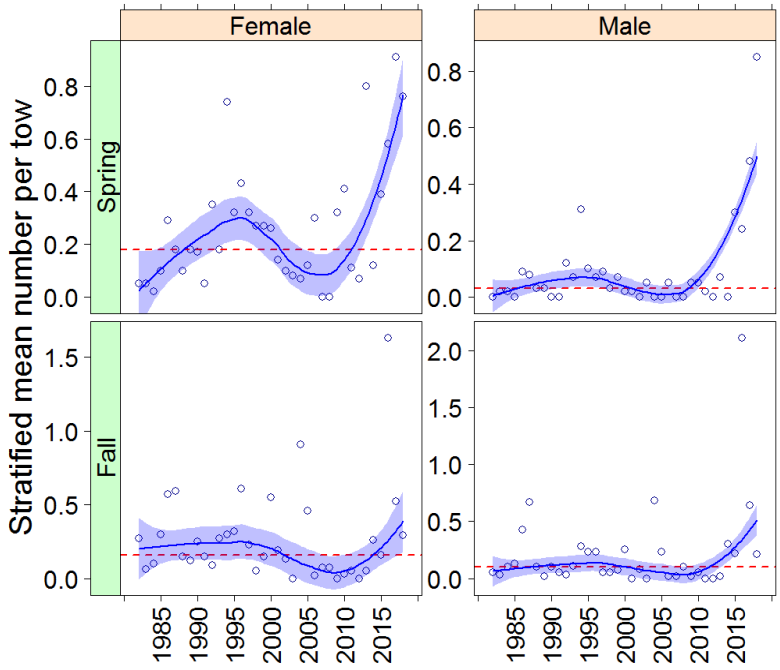

Figure 2. Bootstrapped mean number of horseshoe crabs per tow from the two shallowest depth strata (0–30' and 30–60' combined) of the DMF bottom trawl survey in SNE, by survey season and crab sex. Red, dashed line is the time series median, blue line is a loess fit using family=symmetric and span=0.66. These settings provide a resistant fit to outliers at the end of the time-series. Blue shaded area is an approximate 95% confidence interval for the fit.

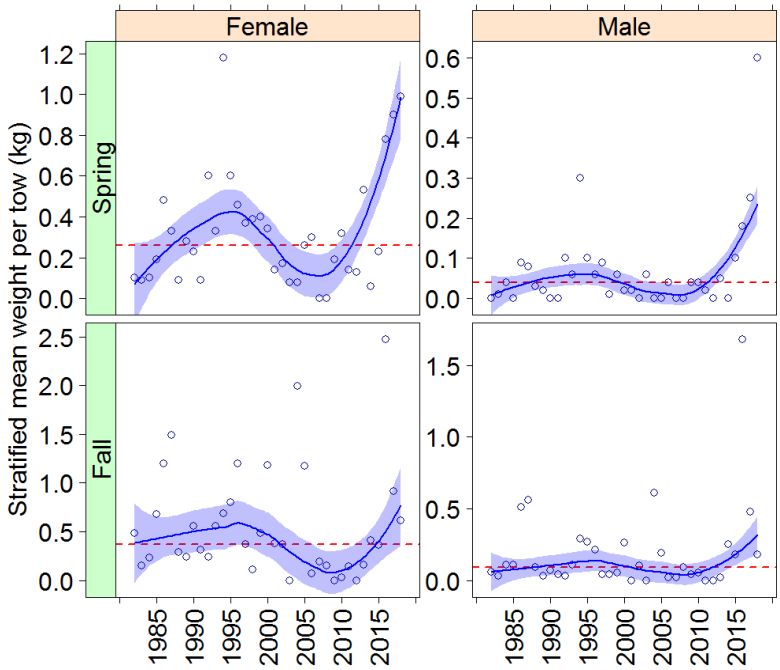

Figure 3. Bootstrapped horseshoe crab mean weight (kg) per tow from the two shallowest depth strata (0–30' and 30–60' combined) of the DMF bottom trawl survey in SNE, by survey season and crab sex. Red, dashed line is the time series median, blue line is a loess fit using family=symmetric and span=0.66. These settings provide a resistant fit to outliers at the end of the time-series. Blue shaded area is an approximate 95% confidence interval for the fit.

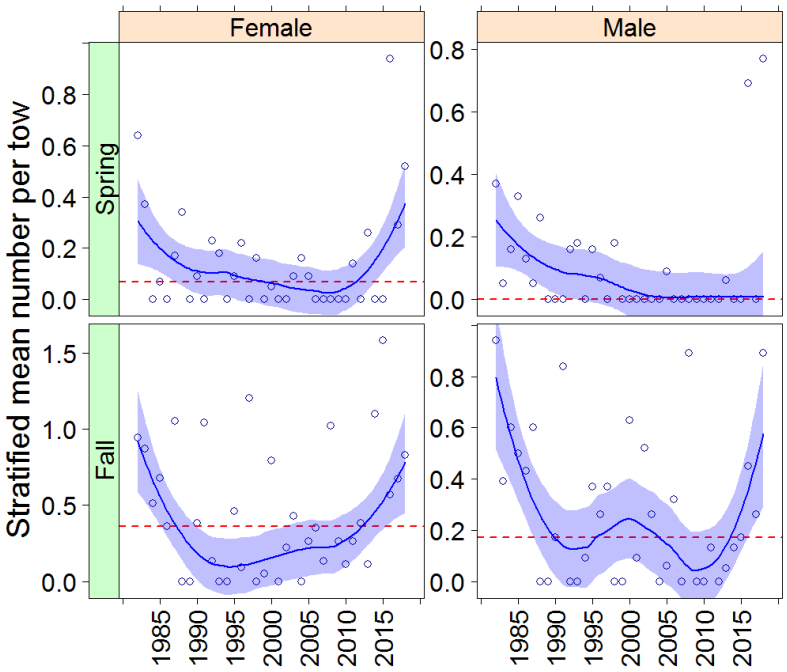

Figure 4. Bootstrapped mean number of horseshoe crabs per tow from the two shallowest depth strata (0–30' and 30–60' combined) of the DMF bottom trawl survey in GOM, by survey season and crab sex. Red, dashed line is the time series median, blue line is a loess fit using family=symmetric and span=0.66. These settings provide a resistant fit to outliers at the end of the time-series. Blue shaded area is an approximate 95% confidence interval for the fit.

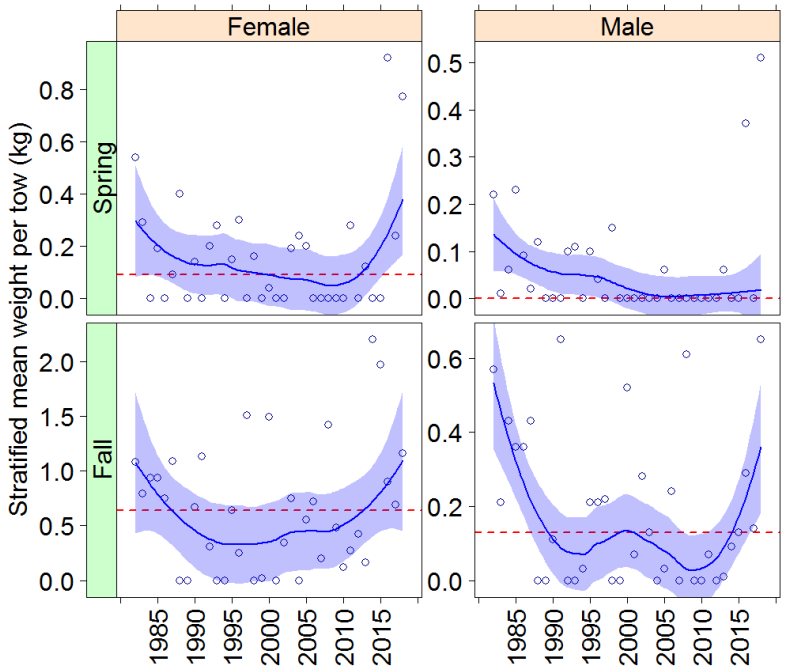

Figure 5. Bootstrapped horseshoe crab mean weight (kg) per tow from the two shallowest depth strata (0–30 and 30–60' combined) of the DMF bottom trawl survey in GOM, by survey season and crab sex. Red, dashed line is the time series median, blue line is a loess fit using family=symmetric and span=0.66. These settings provide a resistant fit to outliers at the end of the time-series. Blue shaded area is an approximate 95% confidence interval for the fit

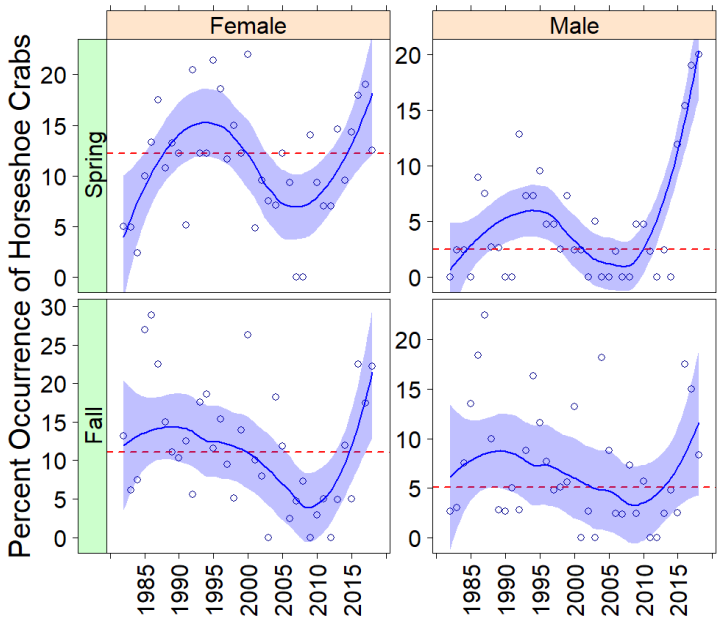

Figure 6. Percent of tows that contained horseshoe crabs from the two shallowest depth strata (0–30' and 30–60' combined) of the DMF bottom trawl survey in SNE, by survey season and crab sex. Red, dashed line is the time series median, blue line is a loess fit using family=symmetric and span=0.66. These settings provide a resistant fit to outliers at the end of the time-series. Blue shaded area is an approximate 95% confidence interval for the fit.

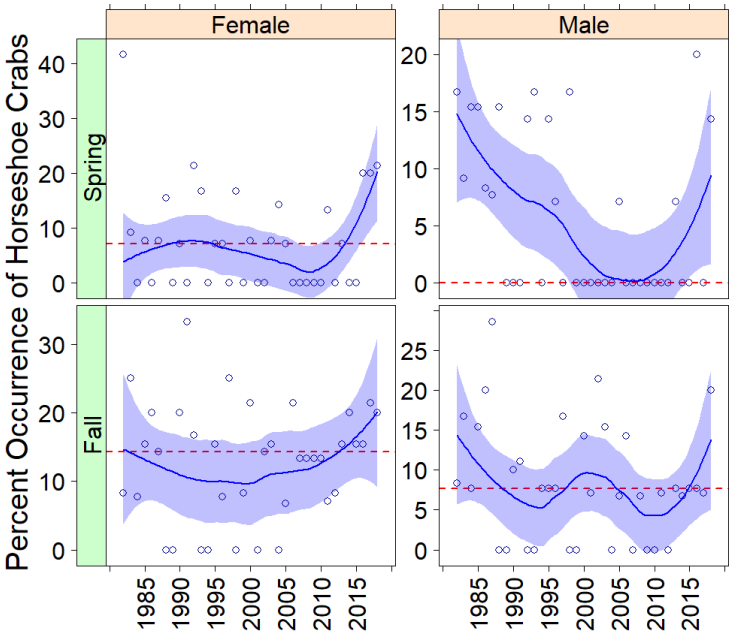

Figure 7. Percent of tows that contained horseshoe crabs from the two shallowest depth strata (0–30' and 30–60' combined) of the DMF bottom trawl survey in GOM, by survey season and crab sex. Red, dashed line is the time series median, blue line is a loess fit using family=symmetric and span=0.66. These settings provide a resistant fit to outliers at the end of the time-series. Blue shaded area is an approximate 95% confidence interval for the fit.

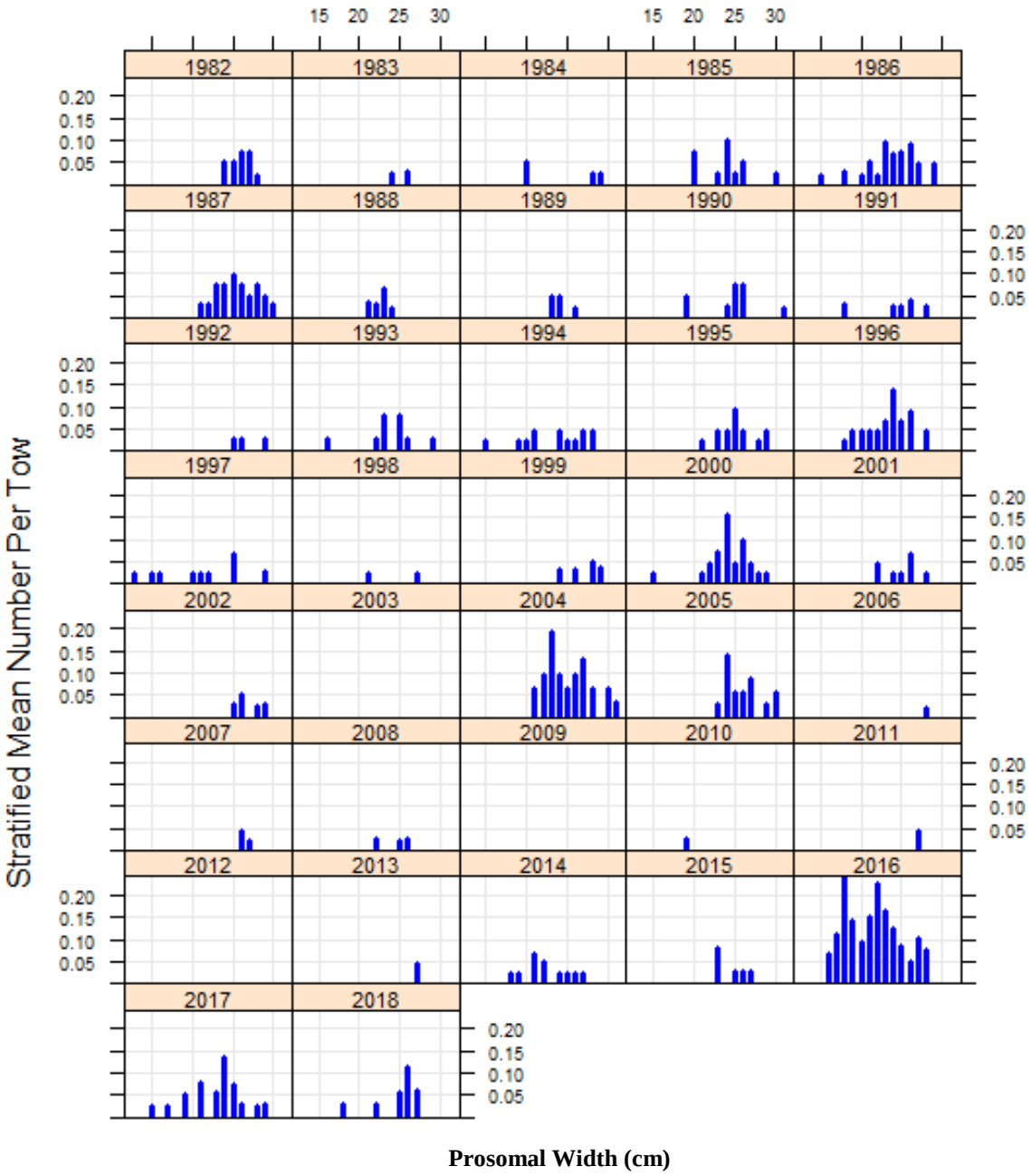

Figure 8. SNE female horseshoe crab size distribution from the two shallowest strata (0–30' and 30–60' combined) of the DMF fall bottom trawl survey.

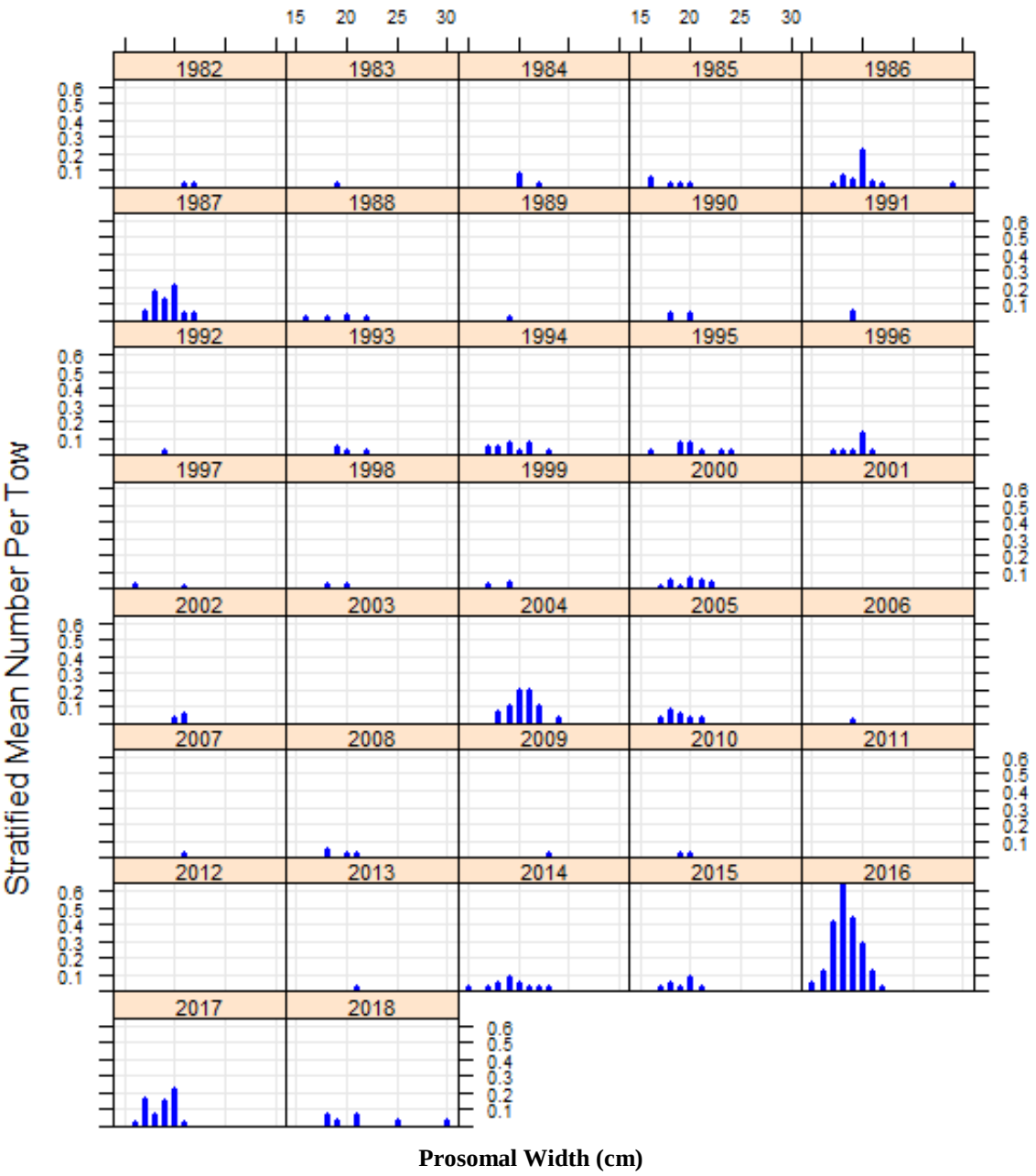

Figure 9. SNE male horseshoe crab size distribution from the two shallowest strata (0–30' and 30–60' combined) of the DMF fall bottom trawl survey.

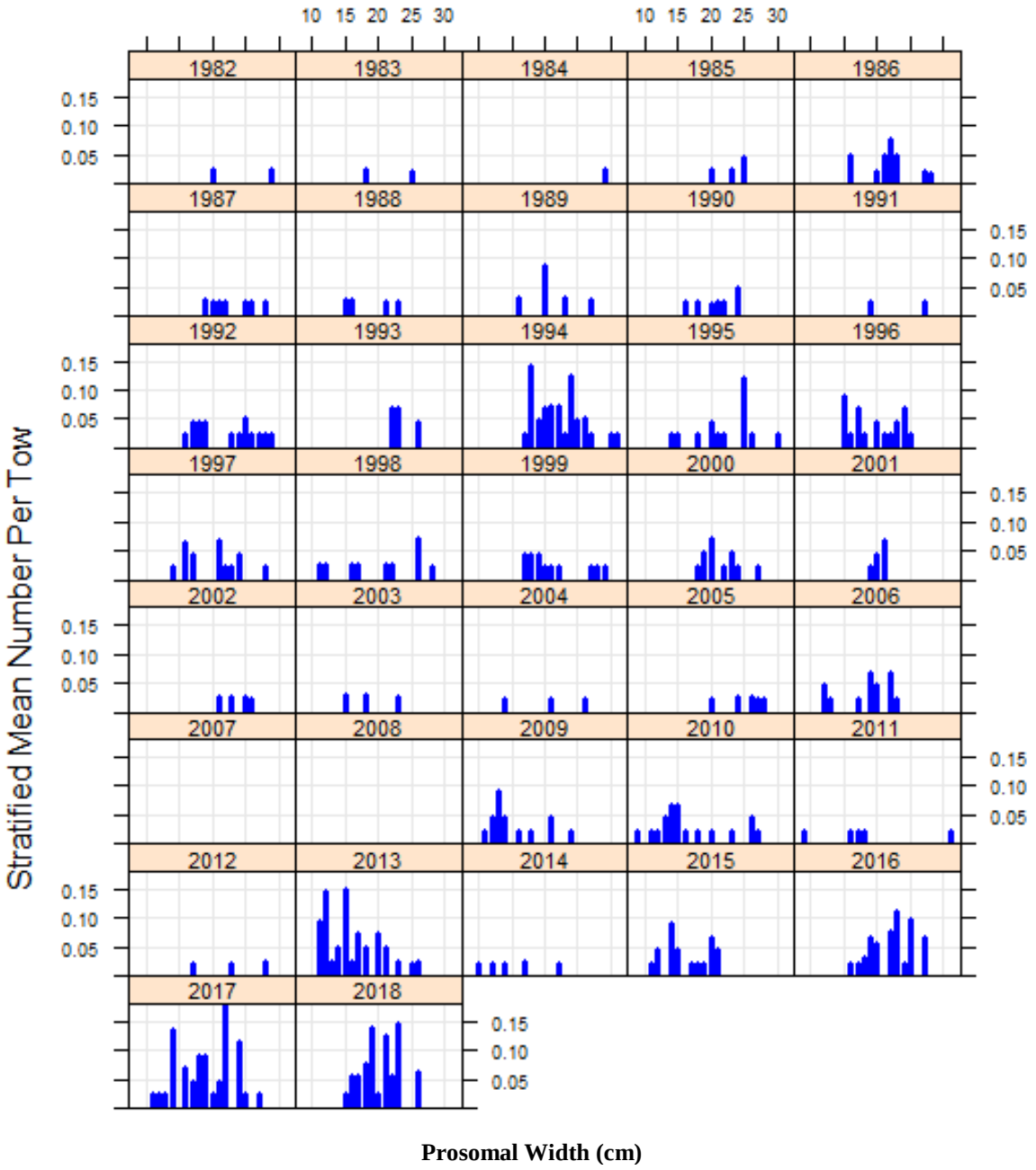

Figure 10. SNE female horseshoe crab size distribution from the two shallowest strata (0–30' and 30–60' combined) of the DMF spring bottom trawl survey.

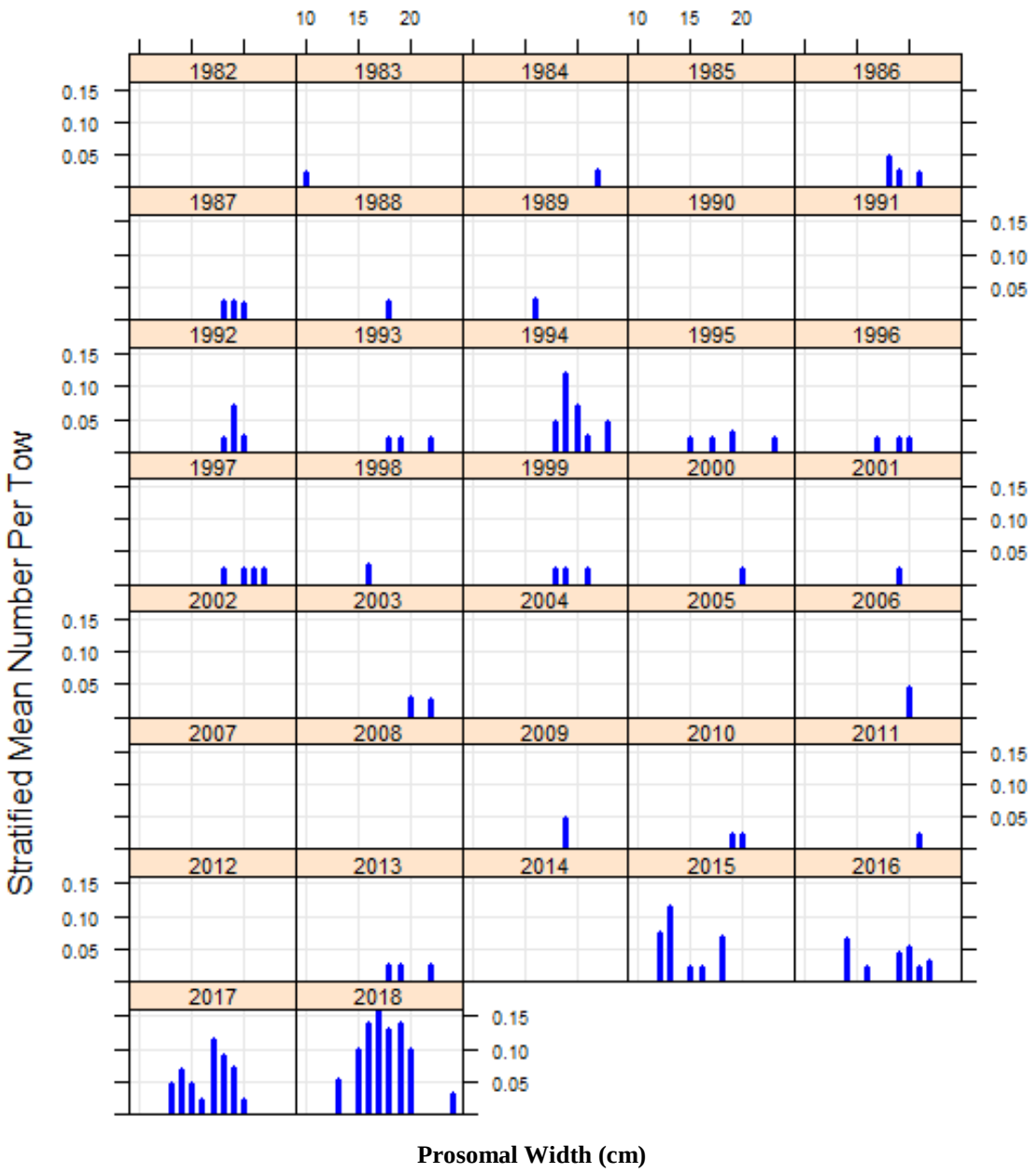

Figure 11. SNE male horseshoe crab size distribution from the two shallowest strata (0–30' and 30–60' combined) of the DMF spring bottom trawl survey.

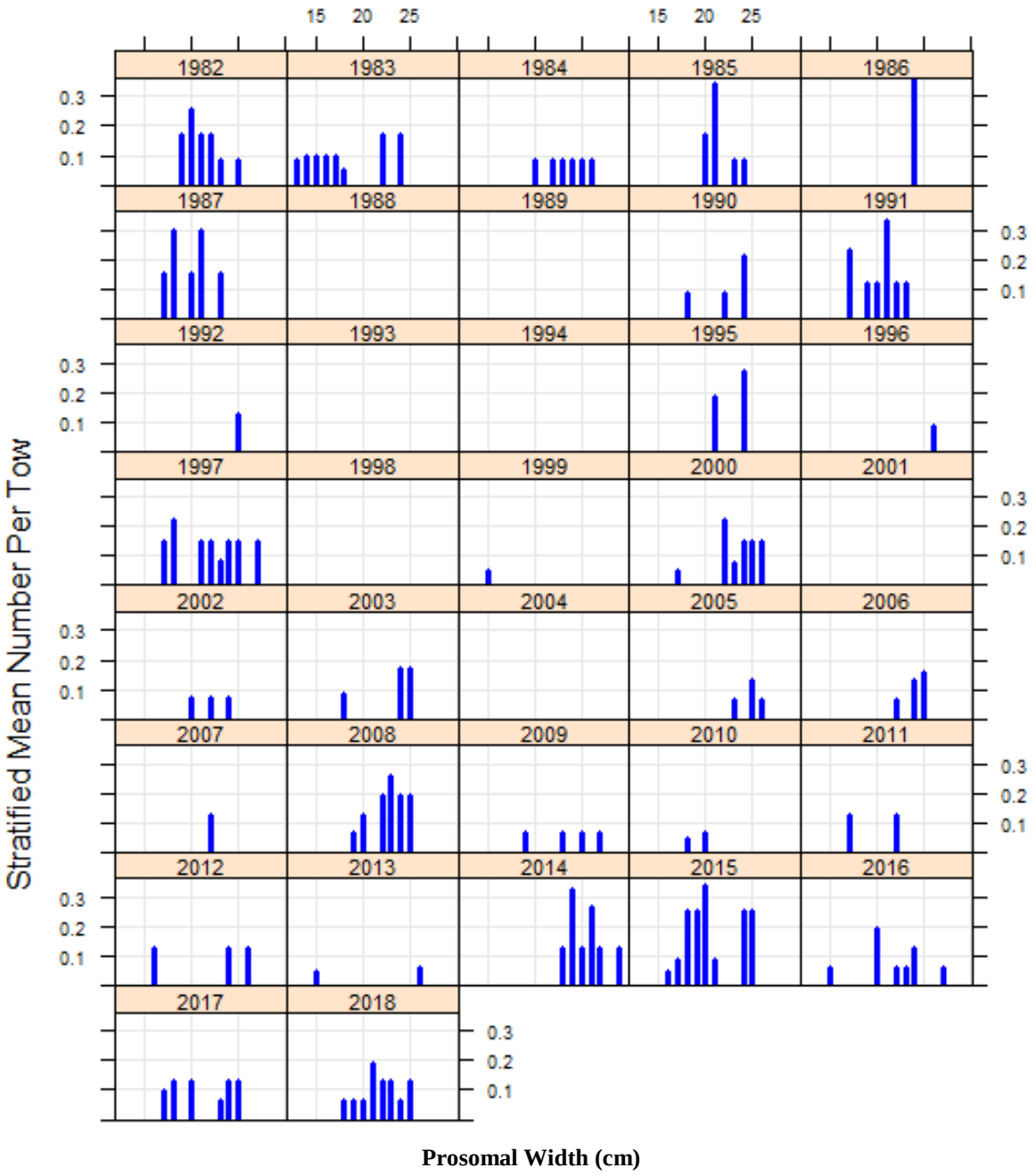

Figure 12. GOM female horseshoe crab size distribution from the two shallowest strata (0–30’ and 30–60’ combined) of the DMF fall bottom trawl survey.

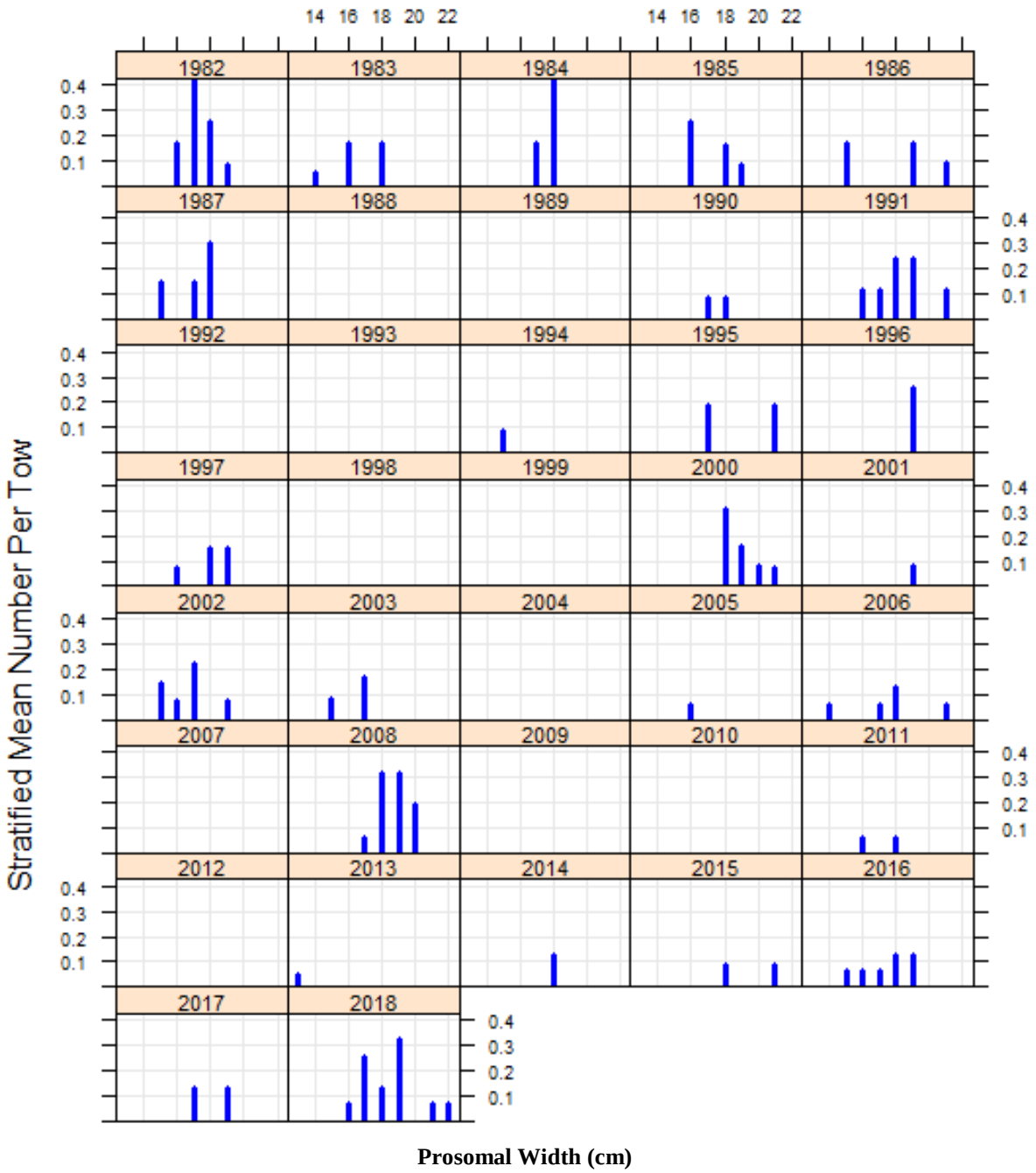

Figure 13. GOM male horseshoe crab size distribution from the two shallowest strata (0–30' and 30–60' combined) of the DMF fall bottom trawl survey.

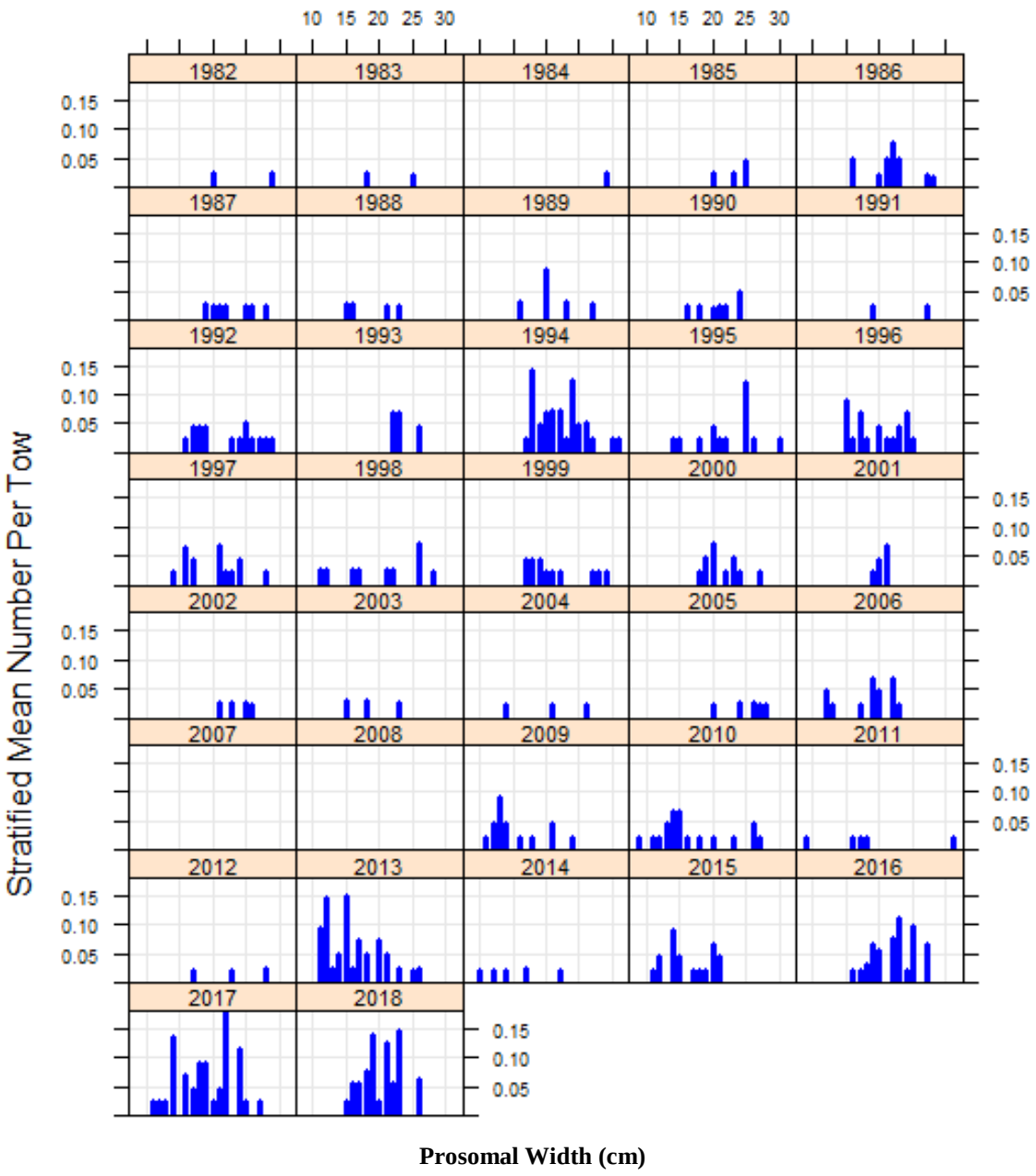

Figure 14. GOM female horseshoe crab size distribution from the two shallowest strata (0–30' and 30–60' combined) of the DMF spring bottom trawl survey.

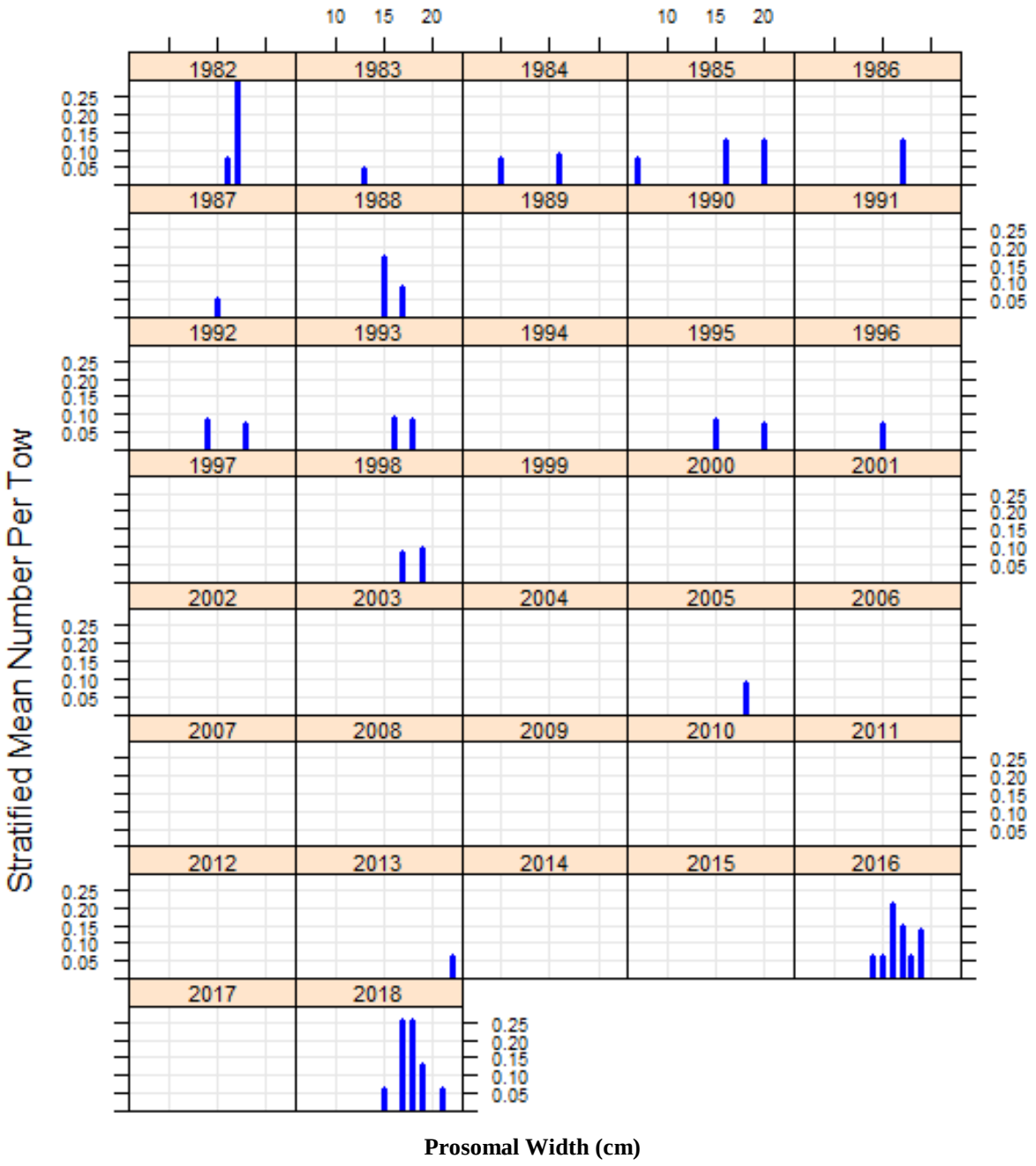

Figure 15. GOM male horseshoe crab size distribution from the two shallowest strata (0–30' and 30–60' combined) of the DMF spring bottom trawl survey.

IV. Planned management programs for the current calendar year

a. Summary of changes from previous years

None.

b. Summary of monitoring programs that will occur

- DMF will continue collecting catch reports from all crab harvesters, dealers, and scientific permit holders.
- DMF will continue to collect monthly reports from ACC (biomedical company).
- DMF will also continue to characterize the commercial fishery through market sampling.
- DMF's spring and fall bottom trawl surveys will continue to monitor and record weight, number, and prosomal width by sex of individuals collected.
- DMF will continue to coordinate and support spawning beach surveys conducted in cooperation with various volunteer organizations.

V. Law Enforcement reporting requirements

The Massachusetts Environmental Police did not report any horseshoe crab related violations in 2018. DMF is contacting the five fishermen that reported landing horseshoe crabs without proper permits to prevent the situation from reoccurring.