



STOCK STATUS UPDATE OF SHRIMP FISHING AREA 4 STRIPED SHRIMP (*PANDALUS MONTAGUI*) IN 2021

Context

The last full stock assessment of Striped Shrimp (*Pandalus montagui*) in Shrimp Fishing Area (SFA) 4 took place in February, 2021 (DFO 2021a). Fisheries and Oceans Canada (DFO) Resource Management requested the current stock status update as the basis for harvest advice for the 2022/23 fishing season.

This Science Response Report (SRR) results from the Regional Science Response Process (SRP) held virtually on January 19, 2022 for the Striped Shrimp Update for Shrimp Fishing Area 4.

Background

Stock status indicators for Striped Shrimp in SFA 4 were evaluated based on commercial catch and biomass indices from a Northern Shrimp Research Foundation (NSRF) summer shrimp survey in Northwest Atlantic Fisheries Organization (NAFO) Division 2G. The commercial fishery exploitation rate index (ERI), calculated using catch and the fishable biomass index (shrimp larger than 17 mm carapace length), was also utilized. The fishing season is based on a fiscal year starting April 1 and ending on March 31. Subsequently, commercial catch and ERI for 2021/22 is preliminary in this report. In 2021, the Canadian Atlantic Quota Report (CAQR) was replaced by the Atlantic Quota Monitoring System (AQMS).

Description of the Fishery

Commercial catch of Striped Shrimp is taken mainly as by-catch in the SFA 4 Northern Shrimp fishery and increased from 280 t in 2008/09 to a peak of 4,700 t in 2012/13, then declined to 1,600 t in 2013/14. Catch has remained relatively unchanged (2,500–3,000 t) since 2017/18. Preliminary catch in 2021/22, as of the January 5, 2022 AQMS was 2,862 t. The by-catch quota of 4,033 t has not been taken in the past nine years, with the commercial catch ranging between 1,113 t and 3,035 t (Table 1, Figure 1). Until 2012, the sole source of catch information for Striped Shrimp was logbooks; however by-catch was recorded in the CAQR beginning in 2013.

Analysis and Response

It is recognized that the population of *Pandalus montagui* spans the area of the Eastern Assessment Zone (EAZ), Western Assessment Zone (WAZ) (DFO 2021b), and SFA 4 (DFO 2021a). Currently it is unknown what the rates of exchange (export/import) are between these zones. Therefore, understanding resource dynamics as a whole requires integrating information from all assessment areas. This update is conducted at spatial scales reflecting management units to accommodate management/industry preferences and historic practices. The biological stock unit is recognized to be larger than these management scales and caution in interpreting and applying stock status information at sub-stock scales is warranted.

Indicators of the Stock Status

Biomass

Since the assessment in February 2021, a detailed review of NSRF survey data was conducted such that some data previously excluded from analyses was included in 2022. This resulted in very slight changes to biomass indices (i.e., less than 5%) from previous assessments in some years. Detailed information on this review and changes will be included in the Research Document from the February 2022 Regional Advisory Meeting for the Assessment of Northern Shrimp in SFAs 4–6 (Skane et al. in prep¹).

From 2005 to 2021, the fishable biomass index averaged 28,600 t. It was 31,000 t in 2021, a 26% increase from 2020. From 2005 to 2021, the female biomass index averaged 21,900 t. It was 22,400 t in 2021, a 24% increase from 2020 (Table 2, Figure 2).

Exploitation

The preliminary ERI, based upon the January 5, 2022 AQMS catch of 2,862 t, is 9.2% (Table 3, Figure 3). If the by-catch quota is taken, the ERI will be 13% in 2021/22.

Current Outlook

The female Spawning Stock Biomass (SSB) that is relevant to a Precautionary Approach (PA) for managing stocks consists of the animals whose spawning products will ultimately be caught in that area (as opposed to the animals that spawn in that area). The prevalence of strong currents in SFA 4 that likely affect all sizes of shrimp, especially larvae, creates challenges for estimating female SSB for this particular SFA. The true female SSB is likely different than the females observed by the survey within SFA 4.

The status of this resource is uncertain because research to establish a limit reference point (LRP) relevant to a PA Framework was not accepted during the February 2021 CSAS Peer Review Process (DFO 2021a). Subsequently, there is no PA Framework for this resource.

Conclusions

The overall status of the SFA 4 Striped Shrimp resource is unknown. There are large fluctuations in biomass from year to year, which are likely influenced by currents and tides in and around SFA 4. The status of this resource relative to a PA Framework could not be determined. Given that current biomass levels are near the long-term average and that ERIs remain low, there are no signals of concern for this resource.

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¹ Skanes, K., Baker, K., Sullivan D., and Coffey, W. In Prep. An Assessment of Northern Shrimp (*Pandalus borealis*) in Shrimp Fishing Areas 4–6 in 2021. DFO Can. Sci. Advis. Sec. Res. Doc. In press.

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Sources of Information

- DFO. 2021a. [An Assessment of Northern Shrimp \(*Pandalus borealis*\) in Shrimp Fishing Areas 4–6 and of Striped Shrimp \(*Pandalus montagui*\) in Shrimp Fishing Area 4 in 2020](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2021/049.
- DFO. 2021b. [Assessment of Northern Shrimp \(*Pandalus borealis*\) and Striped Shrimp \(*Pandalus montagui*\) in the Eastern and Western Assessment Zones, February 2021](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2021/014. (Erratum: November 2021)

Appendix I: Tables

Table 1. SFA 4 Striped Shrimp commercial catches and by-catch quotas from 2002 to 2021/22. Catches for 2021/22 are preliminary as of the January 5, 2022 AQMS. Management year was changed from a calendar year to a fiscal year (April 1 to March 31) in 2003.

Year	By-Catch Quotas (t)	Catch (t)
2002	-	25
2003/04	-	0
2004/05	-	83
2005/06	-	813
2006/07	-	1,805
2007/08	-	2,182
2008/09	-	278
2009/10	-	617
2010/11	-	1,115
2011/12	-	3,236
2012/13	-	4,708
2013/14	4,033	1,611
2014/15	4,033	1,236
2015/16	4,033	2,135
2016/17	4,033	1,113
2017/18	4,033	2,611
2018/19	4,033	2,572
2019/20	4,033	3,035
2020/21	4,033	2,734
2021/22*	4,033	2,862

Table 2. SFA 4 Striped Shrimp fishable and female biomass indices from 2005 to 2021. Biomass indices and confidence intervals (CIs) were calculated using Ogmap methods on NSRF survey data.

Survey Year	Fishable Biomass Index Lower 95% CI (x1,000 t)	Fishable Biomass Index (x1,000 t)	Fishable Biomass Index Upper 95% CI (x1,000 t)	Change in Fishable Biomass Index From Last Year (%)	Female Biomass Index Lower 95% CI (x1,000 t)	Female Biomass Index (x1,000 t)	Female Biomass Index Upper 95% CI (x1,000 t)	Change in Female Biomass Index From Last Year (%)
2005	9.81	18.0	30.5	-	6.17	12.2	19.6	-
2006	7.48	13.4	22.5	-26	3.49	7.53	13.4	-38
2007	8.53	16.7	26.1	25	5.16	8.96	13.7	19
2008	21.5	35.6	54.3	113	13.8	28.5	45.3	218
2009	11.5	20.0	32.3	-44	8.59	15.7	26.3	-45
2010	8.81	14.3	23.1	-28	7.15	11.1	17.9	-29
2011	9.18	13.9	22.4	-3	5.53	8.90	14.6	-20
2012	13.7	25.3	40.2	82	8.77	21.0	31.2	136

Survey Year	Fishable Biomass Index Lower 95% CI (x1,000 t)	Fishable Biomass Index (x1,000 t)	Fishable Biomass Index Upper 95% CI (x1,000 t)	Change in Fishable Biomass Index From Last Year (%)	Female Biomass Index Lower 95% CI (x1,000 t)	Female Biomass Index (x1,000 t)	Female Biomass Index Upper 95% CI (x1,000 t)	Change in Female Biomass Index From Last Year (%)
2013	25.9	36.9	53.3	46	19.3	29.6	42.5	41
2014	22.8	31.5	47.4	-15	17.1	24.8	36.8	-16
2015	29.1	44.7	66.4	42	22.5	34.4	55.2	39
2016	16.4	23.2	35.7	-48	11.9	17.7	27.1	-49
2017	27.3	43.7	68.9	88	19.6	33.5	54	89
2018	35.3	53.7	78.5	23	30.7	45.9	68.6	37
2019	23.2	38.9	59.6	-28	17.3	32.3	50.4	-30
2020	16.2	24.6	37.6	-37	11.6	18.1	28	-44
2021	16.0	31.0	45.3	26	11.9	22.4	32.6	24

Table 3. SFA 4 Striped Shrimp ERIs from 2005 to 2021/22. The ERI for 2021/22 is preliminary and based on catches from the January 5, 2022 AQMS.

Management Year	Exploitation Rate Index Lower 95% CI (%)	Exploitation Rate Index (%)	Exploitation Rate Index Upper 95% CI (%)
2005/06	2.7	4.5	8.3
2006/07	8.0	13.5	24.1
2007/08	8.4	13.1	25.6
2008/09	0.5	0.8	1.3
2009/10	1.9	3.1	5.4
2010/11	4.8	7.8	12.7
2011/12	14.4	23.3	35.3
2012/13	11.7	18.6	34.4
2013/14	3.0	4.4	6.2
2014/15	2.6	3.9	5.4
2015/16	3.2	4.8	7.3
2016/17	3.1	4.8	6.8
2017/18	3.8	6.0	9.6
2018/19	3.3	4.8	7.3
2019/20	5.1	7.8	13.1
2020/21	7.3	11.1	16.9
2021/22*	6.3	9.2	17.9

Appendix II: Figures

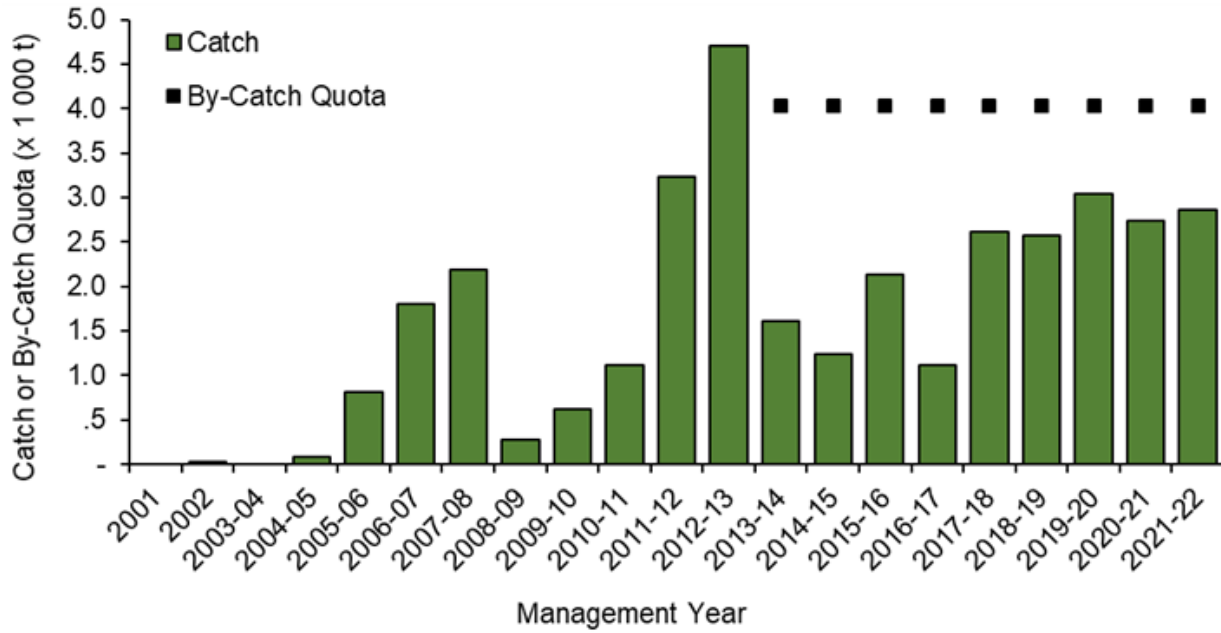


Figure 1. SFA 4 Striped Shrimp commercial catches and by-catch quotas from 2002 to 2021/22. Catches for 2021/22 are preliminary as of the January 5, 2022 AQMS.

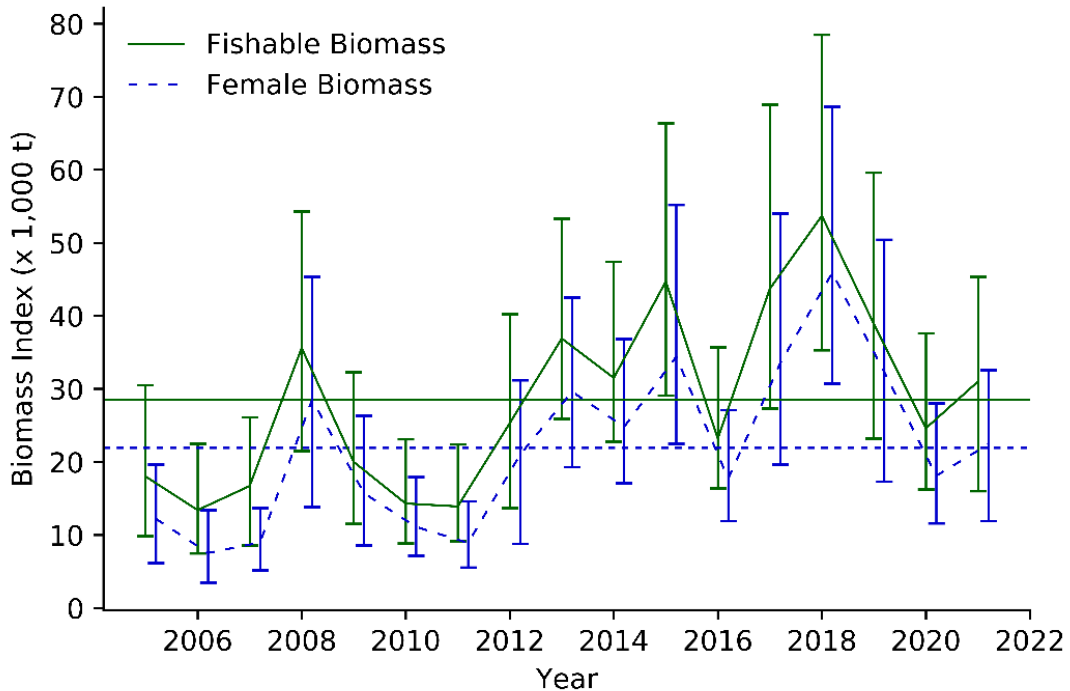


Figure 2. SFA 4 Striped Shrimp fishable and female biomass indices from 2005 to 2021. Biomass indices were calculated using Ogmap on NSRF survey data and error bars reflect 95% CIs. Horizontal lines represent the mean of fishable (green solid line) and female (blue dashed line) biomass indices over the 2005 to 2021 NSRF survey time series.

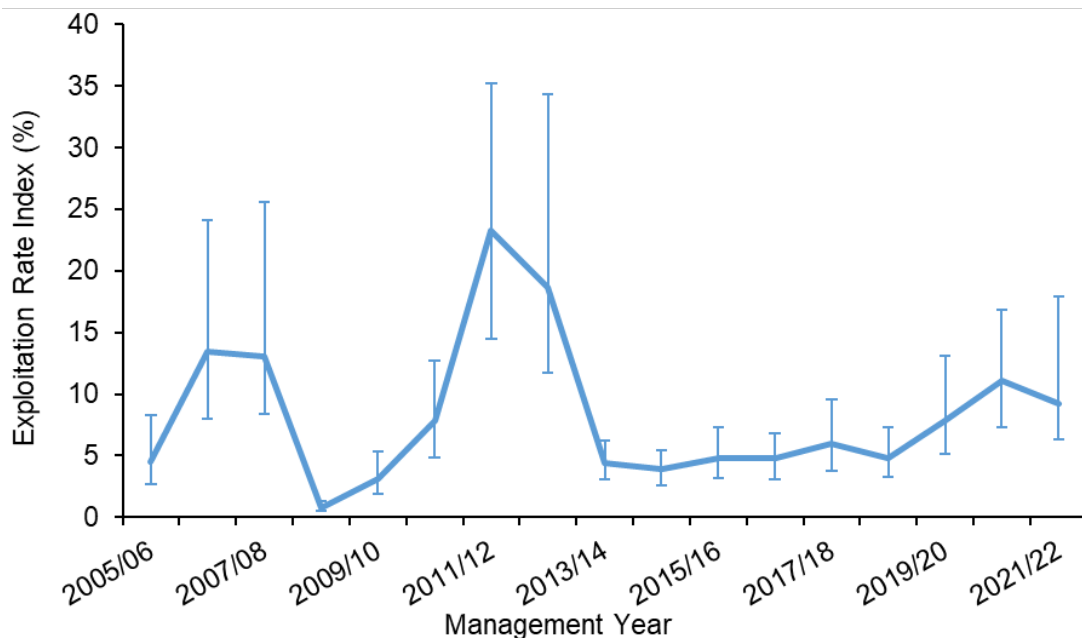


Figure 3. SFA 4 Striped Shrimp ERIs from 2005 to 2021/22. The ERI for 2021/22 is preliminary and based on catches from the January 5, 2022 AQMS. Error bars reflect 95% CIs.

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