MONITORING UPDATE FOR NORTHERN SHRIMP (*Pandalus borealis*) AND STRIPED SHRIMP (*Pandalus montagui*) IN THE WESTERN AND EASTERN ASSESSMENT ZONES (SFA 2 AND 3)

Context

Fisheries and Oceans Canada (DFO) Resource Management (RM) requested an update of Science advice on the status of the two species of shrimp, Northern Shrimp (*Pandalus borealis*) and Striped Shrimp (*P. montagui*), in Shrimp Fishing Areas (SFA) 2 and 3. Previously, SFA 2 has been assessed three times (DFO 2008, 2010, 2011) and SFA 3 twice (DFO 2008, 2010). The Zonal Advisory Process (ZAP) for SFA 2-6 was on a biennial schedule until the 2010 ZAP indicated a large decline in the shrimp population in SFA 6 prompting a more frequent review and resulting in the 2011 ZAP the following year. The 2011 ZAP concluded that the status of resources in SFA 2-6 could be adequately monitored by having a full assessment biennially (odd numbered years) with updates of the key indices of the Precautionary Approach (PA) framework in intervening years as required. This update is the first in this scheduled series.

Assessments follow the framework developed in 2007 for Northern Shrimp off Labrador and the northeastern coast of Newfoundland (DFO 2007a). A series of fishery-independent surveys and fishery data form the basis of the assessment (see DFO 2011 for details). Northern and Striped Shrimp are assessed within the Western (WAZ) and Eastern Assessment Zones (EAZ) (Fig. 1) established at the last ZAP held in St. John's, NL 15-25 February 2011 (DFO 2011).

This Science Response Report is from the Fisheries and Oceans Canada, Canadian Science Advisory Secretariat Zonal Science Special Response Process of 20 February 2012 updating the status of Northern and Striped Shrimp resources in SFAs 2-6.

Background

Two exploitation rates are presented for each assessment zone and species because of the overlap of management areas resulting in accumulating quotas which are generally not fully taken. Exploitation rate refers to the realized exploitation rate based on reported catch while potential exploitation rate assumes the Total Allowable Catch (TAC) (total of all quotas for a particular species that can be fished in the zone) is caught and where both are divided by the survey fishable biomass in the same year unless otherwise stated.

In the EAZ, the first two years of survey data (2006-2007) are not considered comparable with the rest of the series because of poor trawl performance and incomplete sampling coverable in the Resolution Island survey area. These years are not considered when assessing trends in the indices from the EAZ.

Monitoring Update

Eastern Assessment Zone – *P. borealis*

Fishery

The 6 February 2012 Canadian Atlantic Quota Report (CAQR) showed a catch (directed and by-catch) in the EAZ of 7,999 t, 86% of the TAC and the largest catch in the time series (Fig. 2). Since the 2011/12 fishery runs until 31 March 2012, all catch records may not be complete. However, ice conditions should have curtailed fishing effort in the EAZ earlier in the year. Therefore it is likely that most of the catch for the season has been included. While the majority of catch taken in the EAZ comes from SFA 2 southeast of Resolution Island and east of the Nunavut and Nunavik land claims borders, the large increase in 2011/12 came in SFA2 east of 63°W.

Biomass

The fishable biomass and female spawning stock biomass (SSB) indices have not changed significantly over the period 2008–2011 with respective means of about 69,900 t and 39,500 t (Fig. 3).

Exploitation

The exploitation rate index varied without trend over the period 2008/09 to 2011/12 averaging 9% (Fig. 4) as did the potential exploitation rate index averaging 13% over the period. Most of the fishery was concentrated southeast of Resolution Island, however, there has been increased fishing in SFA 2EX in the past two years.

Outlook

Based on the Integrated Fisheries Management Plan (IFMP) (DFO 2007b) PA framework, the SSB for the EAZ was in the Healthy Zone with a slight probability of being in the Cautious Zone (Fig. 5).

Eastern Assessment Zone – *P. montagui*

Fishery

The majority of *P. montagui* catch is taken as by-catch in the directed fishery for *P. borealis* in SFA 2CM south of 63°N. There are quotas for directed *P. montagui* fisheries within the Nunavut Settlement Area (NSA) but generally have not been taken. The catch is taken between 63°W and 64°30'W with small amounts just over the eastern boundary of SFA 3 with no catch west of Resolution Island. The catch declined steadily from about 4,000 t in 1999 to about 600 t by 2009/10 where it has remained to date (Fig. 6). The catch in 2011/12 was about 680 t.

Biomass

The 2011 fishable biomass index was about 7,700 t, approximately the same as the 2010 level, but SSB index continued to decline to 3,100 t in 2011 (Fig. 7).

Exploitation

The exploitation rate index varied without trend since 2007/08 averaging 6% but was about 9% for 2011/12 (Fig. 8). The potential exploitation rate index has a mean of 62%, but with the first two years below and the last two above the mean. The potential exploitation rate for 2011/12 was 84%.

Outlook

The SSB in the EAZ entered the Cautious Zone in 2010 and in the lower half of the zone in 2011 with a small probability of being in the Critical Zone (Fig. 9).

Western Assessment Zone – *P. borealis*

Fishery

Until 2010/11, the WAZ had not been fished since the 1980s. The 2007 and 2009 research surveys renewed interest in fishing the area. A single trawler fished the zone in the 2010/11 and 2011/12 directing for *P. montagui*. All *P. borealis* caught in the WAZ are deducted from the 400 t *P. borealis* by-catch quota which can be fished in SFA 3 east of 66°W and SFA 2 inside the NSA. Observer records show that there was 56.9 t of *P. borealis* caught in 2010/11. No *P. borealis* catch was reported for 2011/12.

Biomass

The fishable biomass and SSB indices have not changed significantly in the three surveys conducted (Fig. 10). The mean fishable biomass index over the three surveys was about 16,600 t, while the mean SSB index was about 4,500 t. In 2011, the fishable biomass index was 19,700 t and the SSB index was 6,400 t.

Exploitation

P. borealis catch has only been reported from the 2010/11 fishery. Since there was no survey in 2010, the exploitation rate was based on the average of the fishable biomass from the 2009 and 2011 surveys. The exploitation rate for 2010/11 was less than 1%. If the entire by-catch quota was taken in the WAZ it would result in an exploitation rate between 2% and 3% (Fig. 11).

Western Assessment Zone – *P. montagui*

Fishery

Until 2010/11, the WAZ had not been fished since the 1980s. Renewed interest in the area after the 2007 and 2009 research surveys has resulted in catches of 310 t in 2010/11 and 836 t in 2011/12. The 2011 catch represents about 84% of the total *P. montagui* quota (1,000 t) which can be fished in the area.

Biomass

The fishable biomass and SSB indices have not changed significantly in the three surveys conducted (Fig. 12). The mean fishable biomass index for the three surveys was about 57,400 t, while the mean SSB index was about 23,300 t. In 2011, the fishable biomass index was 71,500 t and the SSB index was 32,500 t.

Exploitation

With 84% of the quota caught in 2011/12, the resulting exploitation rate was only 1% (Fig. 13). Potential exploitation was also low given the current quota of 1,000 t.

Conclusions

Eastern Assessment Zone

P. borealis

- The *P. borealis* resource is currently in the Healthy Zone well above the Upper Stock Reference.
- The mean exploitation and potential exploitation rates were 9% and 14% respectively.

P. montagui

- The *P. montagui* female spawning stock biomass continues to decline and now in the lower half of the Cautious Zone with a small probability of being in the Critical Zone.
- While the mean reported exploitation rate (6%) is relatively low, the mean potential (62%) exploitation rate remains very high.

Western Assessment Zone

P. borealis

- In 2011, the *P. borealis* fishable biomass index was 19,700 t and female spawning stock biomass index was 6,400 t similar to previous surveys.
- The potential exploitation rate was between 2-3%.

P. montagui

- In 2011, the *P. montagui* fishable biomass index was 71,500 t and female spawning stock biomass index was 32,500 t similar to previous surveys.
- The potential exploitation rate was 2%.

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(Approved 4 March 2012)

Sources of information

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Figures

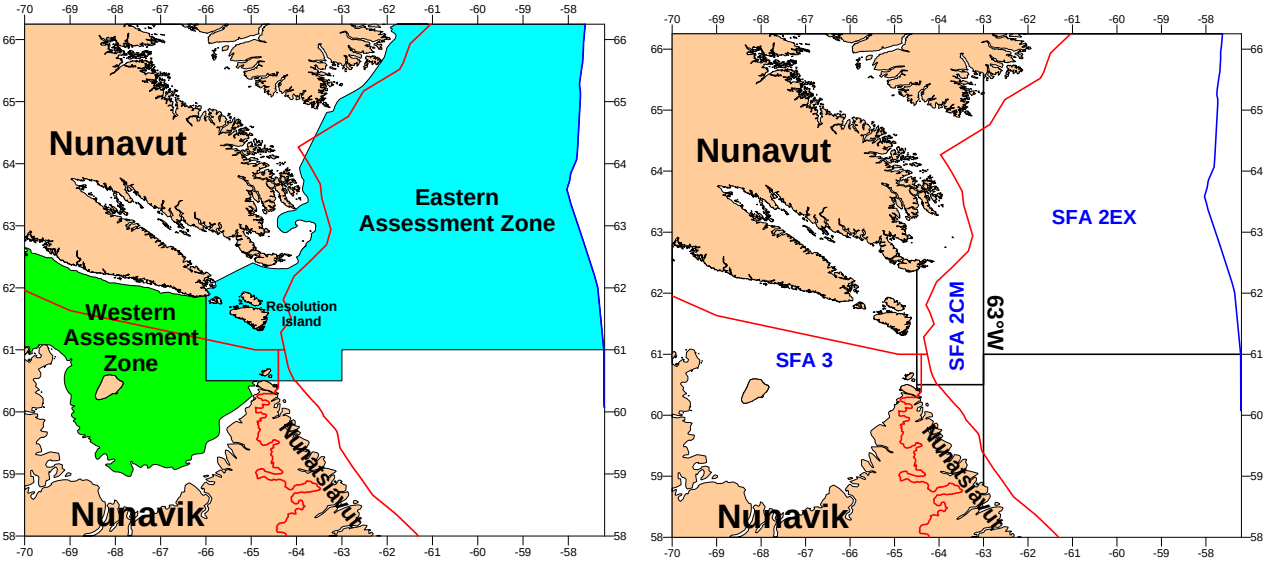

Figure 1. Location of the Western and Eastern assessment zones (left panel) and overlapping management units (right panel). Boundaries of the Nunavut, Nunavik and Nunatsiavut Land Claims Areas are identified with red lines. Shrimp Fishing Area (SFA), Commercial (CM), Exploratory (EX).

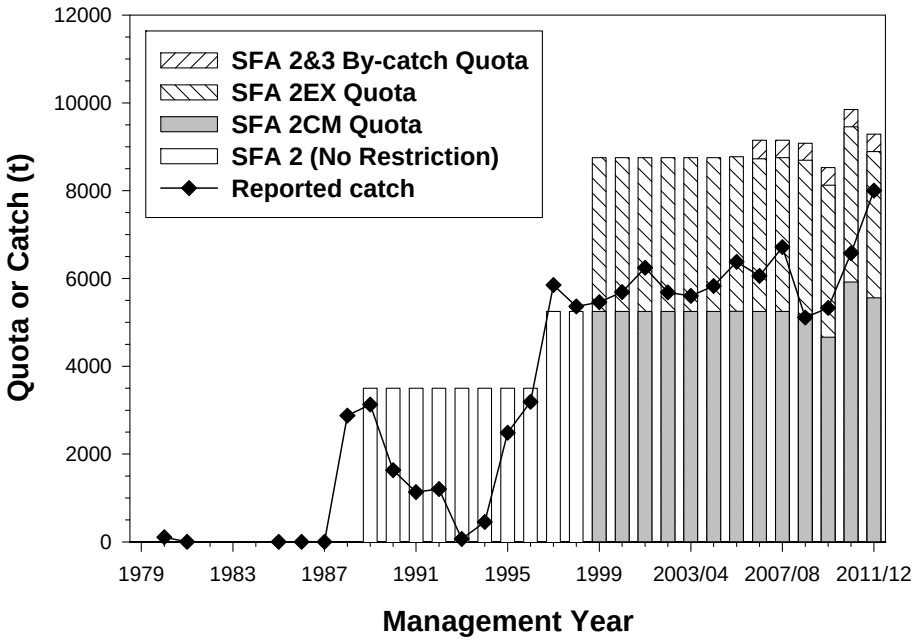

Figure 2. The Eastern Assessment Zone Pandalus borealis *TAC and catch recorded in the Canadian Atlantic Quota Report.*

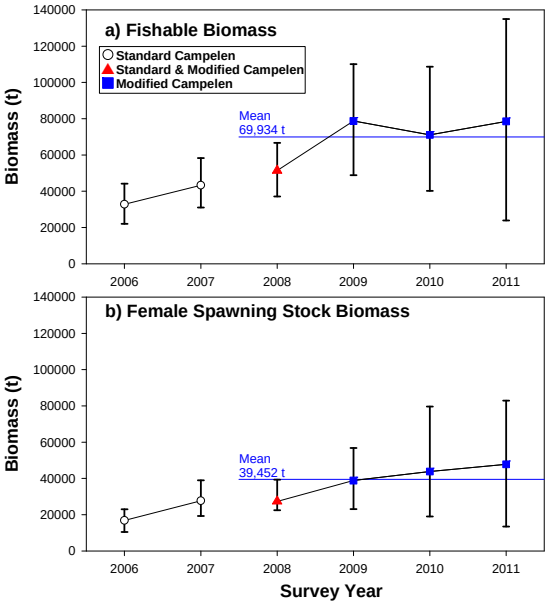

Figure 3. The Eastern Assessment Zone a) fishable and b) female spawning stock biomass indices of Pandalus borealis *for the survey years 2006-2011.*

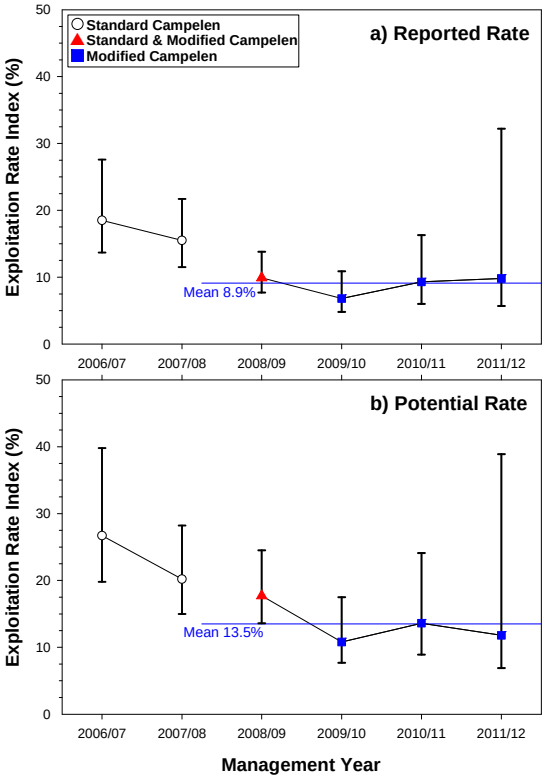

Figure 4. The Eastern Assessment Zone Pandalus borealis *a) exploitation rate and b) potential exploitation rate indices for 2006/07-2011/12.*

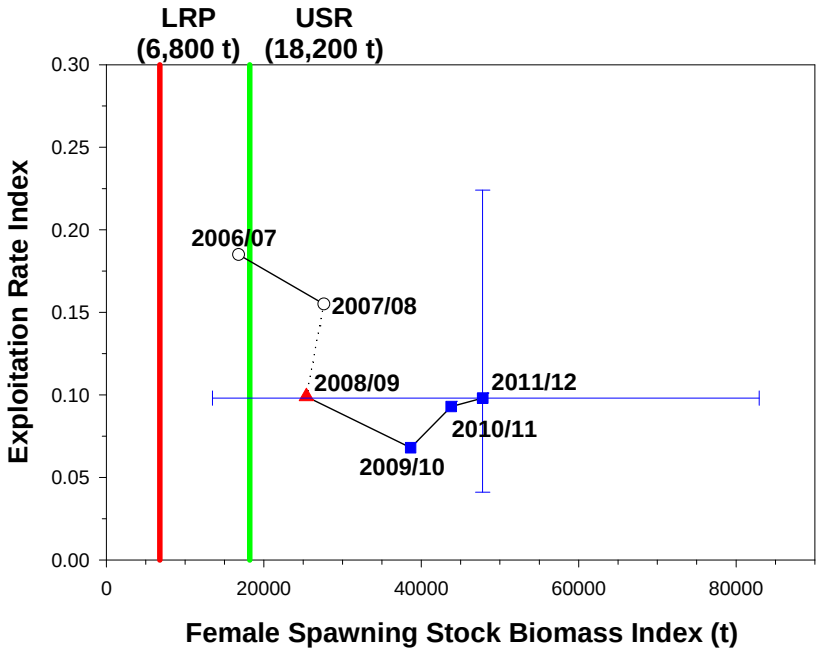

Figure 5. The Eastern Assessment Zone trajectory of Pandalus borealis *female spawning stock biomass and exploitation rate indices in relation to reference points from the IFMP for SFA 2. USR=Upper stock reference and LRP=limit reference. (O = standard Campelen trawl, ▲ = mix of standard and modified Campelen, ■ = modified Campelen)*

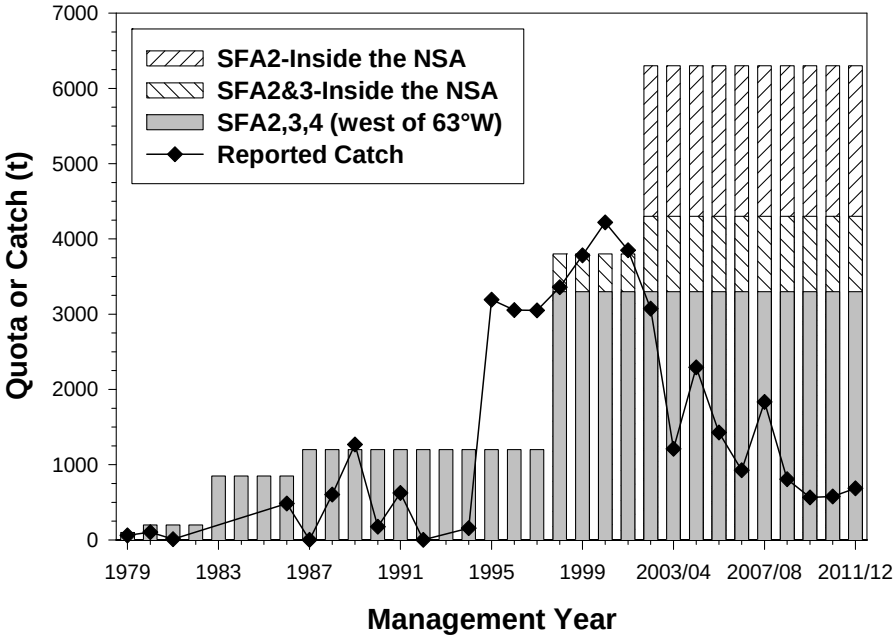

Figure 6. The Eastern Assessment Zone Pandalus montagui *TAC and catch recorded in the Canadian Atlantic Quota Report.*

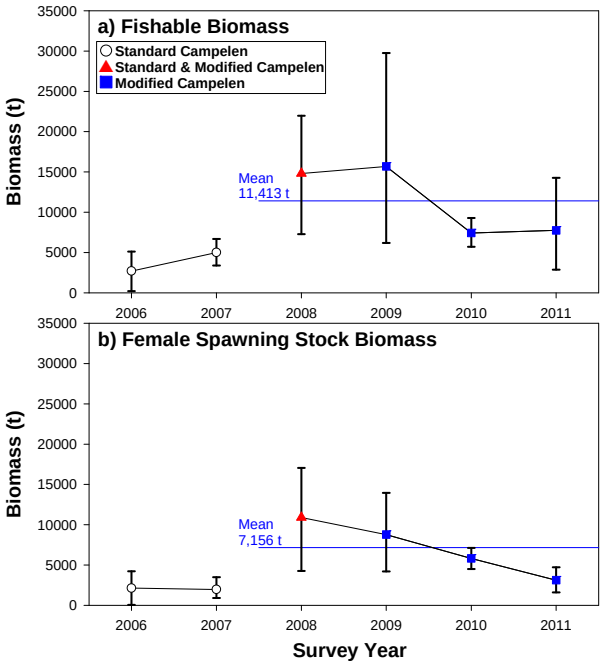

Figure 7. The Eastern Assessment Zone a) fishable and b) female spawning stock biomass indices of Pandalus montagui *for the survey years 2006-2011.*

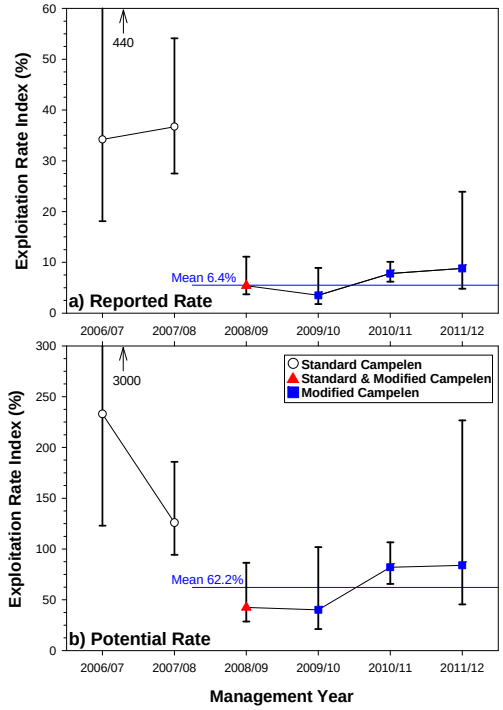

Figure 8. The Eastern Assessment Zone Pandalus montagui *a) exploitation rate and b) potential exploitation rate indices for 2006/07-2011/12.*

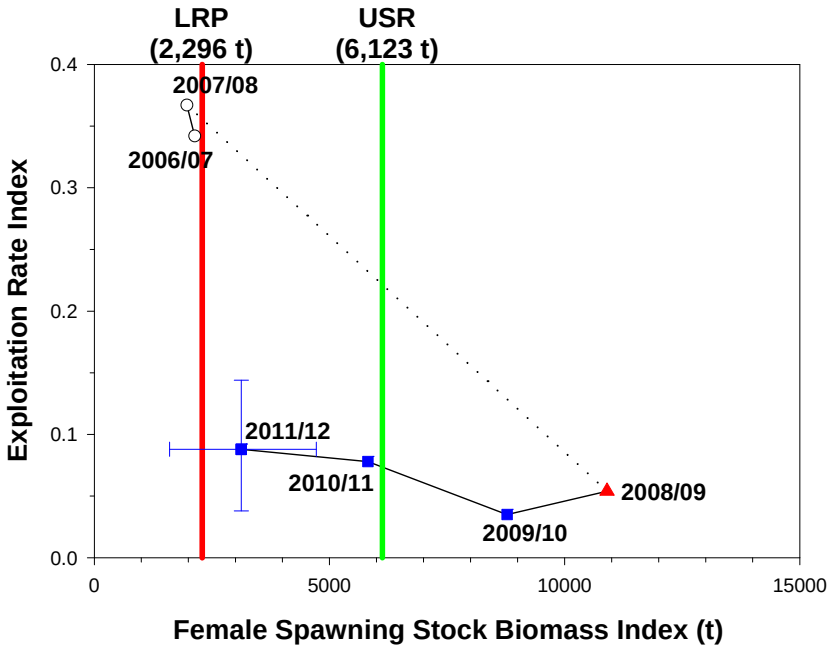

Figure 9. The Eastern Assessment Zone trajectory of Pandalus montagui *female spawning stock biomass and exploitation rate indices in relation to reference points from the IFMP for SFA 2. USR=Upper stock reference and LRP=limit reference. (O = standard Campelen trawl, ▲ = mix of standard and modified Campelen, ■ = modified Campelen)*

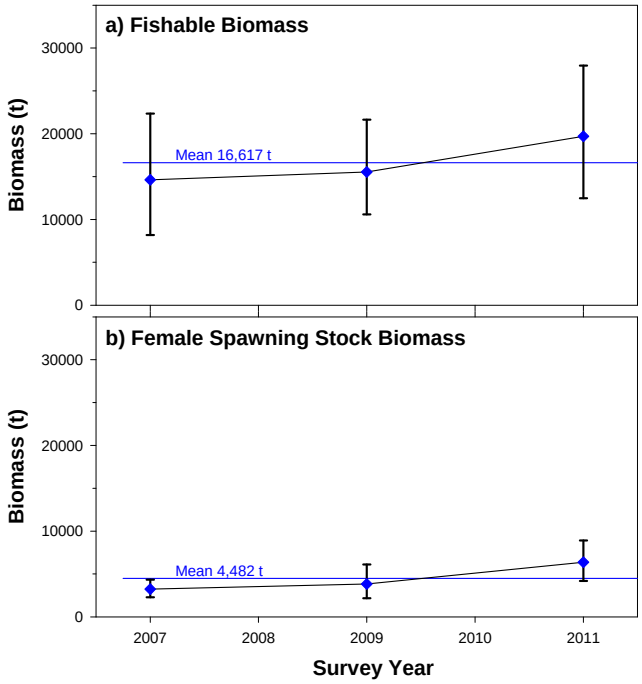

Figure 10. The Western Assessment Zone a) fishable and b) female spawning stock biomass indices of Pandalus borealis *for the survey years 2007, 2009 and 2011. All years fished with the Cosmos trawl.*

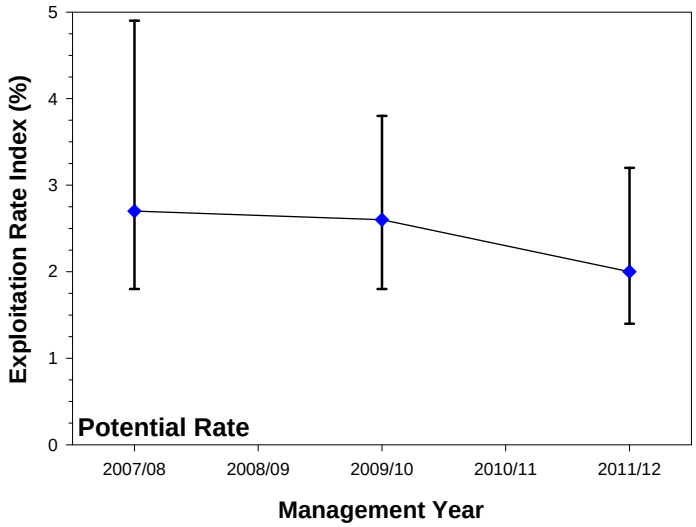

Figure 11. The Western Assessment Zone Pandalus borealis *potential exploitation rate index.*

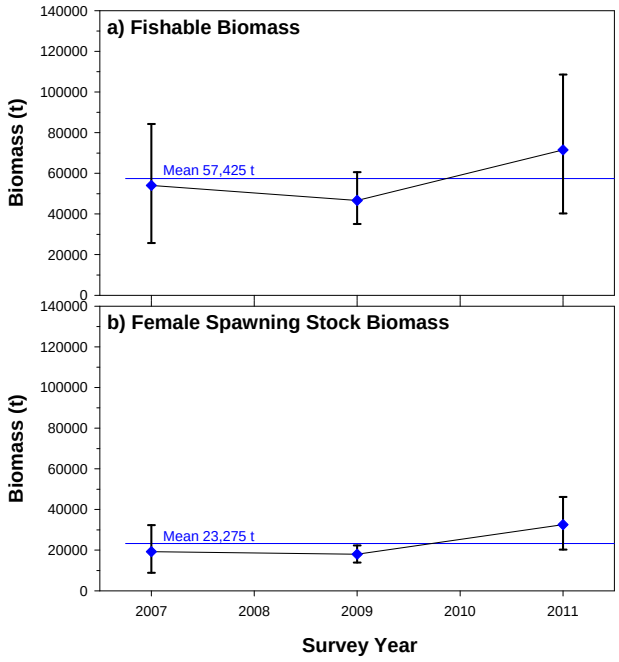

Figure 12. The Western Assessment Zone a) fishable and b) female spawning stock biomass indices of Pandalus montagui *for the survey years 2007, 2009 and 2011. All years fished with the Cosmos trawl.*

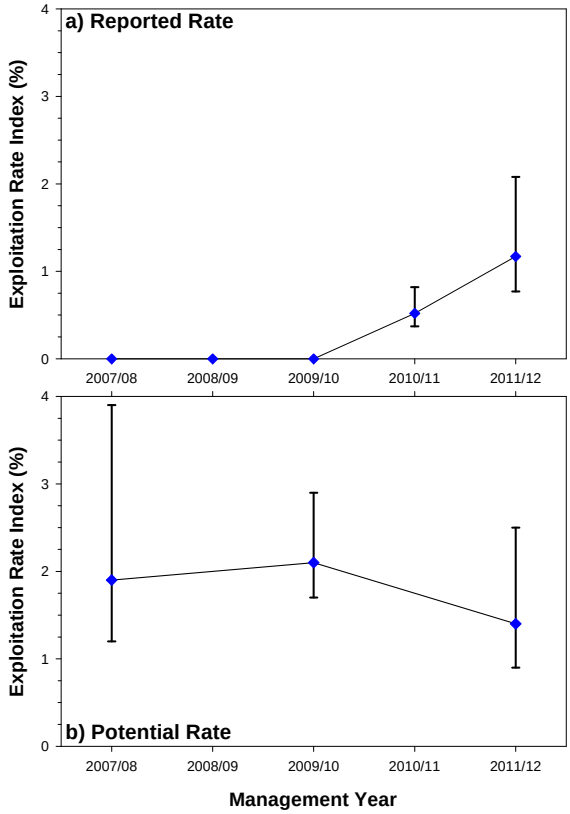

Figure 13. The Western Assessment Zone Pandalus montagui *a) exploitation rate and b) potential rate indices. Note that there was no survey in 2010 so the exploitation rate for 2010/11 was based on the average fishable biomass from the 2009 and 2011 surveys.*

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