Marine mammals in the North Water and Northeast Water polynyas in Greenland
Study area

Circumpolar maps of known polynyas

3 known polynyas in Greenland

North water

Northeast water

Scoresby Sound

Source: CAFF (Conservation of Arctic Flora and Fauna)
Polynyas at 75-85°N
Major wintering areas for ice-associated marine mammals

NOW - North Water
Continental waters <200m
Deep waters >200m
The most productive ecosystem North of the Arctic circle
Aerial survey April 2014
Satellite tracking of bowhead and walrus

NEW - Northeast Water
Continental waters <200m
Highly variable in size
Aerial survey April 2017
Satellite tracking of bowhead and walrus
Areal survey

Long history of aerial surveys at the Greenland Institute of Natural Resources
Cover large area
Not dependent on sea and ice conditions
Areal survey

90 nm/h
700 feet
Abundance

Distance sampling
- Double-observer configuration
- Distance sampling
- Perception bias
- Availability bias

Mark-recapture abundance estimate
- Double-observer configuration
- Distance sampling
- Perception bias
- Availability bias

Chapman estimate
- Double-observer configuration
- Strip census (equal detection)
- Perception bias

Assessment model
- Abundance estimate
- Hunt statistics
- Life history traits

→ annual level of removals
- Water depths <100m
  - Walrus habitat
  - Ice floes for haul out
- Water depths 100-1000m
  - Occupied by cetaceans

North Water Polonya

- Eastern part of NOW
- 16,000 km²
- ~1400 km on effort

Northeast Water Polonya

- Covered whole polynya
- 39,000 km²
- ~4500 km on effort
**Walrus**

**Abundance estimate**

- **95 observations**
- **Mark-recapture abundance estimates for walrus in water**
- **Availability bias – spend 37% time at depths 0-2m**
- **Strip census estimate for walrus on ice**

- **ESW 100-550m**
  - 604 walrus
- **ESW 0-800m**
  - 1904 walrus

**~2500 individuals in survey region**
Walrus

Satellite tracks

3 tagging locations in May

Walrus occupy the shallow water area close to the Greenlandic coast in winter (October-mid May)

Summer is spent in Canada
Walrus

14 observations
• 75% in water

Chapman estimate from 2017 = 279 animals (cv=0.34)
Estimate from 2009 ~500 animals (Born et al. 2005)
Walrus

Terrestrial summer haul outs


Born et al. 2005
Bowhead whale

Only one observation was made during survey
Satellite tracks show little use of NOW in winter
Predictive movement of bowhead whales, Chambault et al. 2018
Bowhead whale

NOW satellite tagging

SST gradient (°C/km) 2008-04-20
Bowhead whale

Year-round acoustic presence
25 observations
Mating activity

Chapman estimate
Corrections
· Perception bias
· Availability bias*
· Time-in-view

N= 103 whales
N*= 264 (cv=0.51);
Cl= 102-681

*Dive data from satellite-tagged whales from Disko Bay

Abundance estimate ~100 animals* (2009)
*Boertmann et al. 2015
NEW satellite tagging

Bowhead

June 2017

16 animals tagged with satellite transmitter
Narwhal and beluga

Occupy waters at depths 100-1000m
Abundant numbers in a small area

- Narwhals
  - Deeper waters
  - Possibly feed on halibut and polar cod

- Beluga
Narwhals

2 observations of narwhal

• Where do narwhals winter?
Beluga

No belugas
• Separate stock around Svalbard
## Comparison

<table>
<thead>
<tr>
<th></th>
<th>NOW</th>
<th>NEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polynya</td>
<td>Stable</td>
<td>Variable</td>
</tr>
<tr>
<td>Productivity</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Stratum area</td>
<td>16,000 km²</td>
<td>39,000 km²</td>
</tr>
<tr>
<td>Transects on effort</td>
<td>1400 km</td>
<td>4500 km</td>
</tr>
<tr>
<td>Walrus</td>
<td>2500</td>
<td>500 -&gt; 300</td>
</tr>
<tr>
<td>Bowhead whale</td>
<td>Few</td>
<td>260</td>
</tr>
<tr>
<td>Narwhal</td>
<td>3000</td>
<td>Few</td>
</tr>
<tr>
<td>Beluga</td>
<td>2300</td>
<td>No</td>
</tr>
</tbody>
</table>

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