Diet and movement of Weddell seals in the deep Weddell Sea

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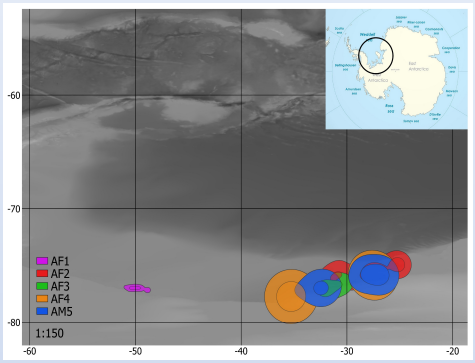
The deep Weddell Sea is an important element of the global conveyor belt of water masses. It houses the Filchner Ronne Ice Shelf, the largest Antarctic ice shelf. This shelf facilitates the mixing of different water masses and influences the high productivity levels in the Weddell Sea. The high productivity contributes to the abundances of marine mammals such as Weddell seals (*Leptonychotes weddellii)* observed in this area. Weddell seals are unique in their year-round high latitude distribution and opportunity to study the population in the deep southern Weddell Sea has been limited due to inaccessibility as a result of sea ice cover.

Objectives

- Use tracking and isotope data collected from 5 Weddell seals in the deep Weddell Sea
- Analyse seasonal movement behaviours and core isotopic niche
- Compare findings to Weddell seal populations in more accessible areas of Antarctic

Tracking summary statistics for Weddell seals in the deep Weddell Sea.

Total trip distance [km]	AF1	AF2	AF3	AF4	AM5
Summer	192.54	164.96	55.38	60.91	16.76
Autumn	1027.57	1650.02	926.12	1532.32	1042.34
Winter	183.11	39.32	225.56	281.38	74.51
Spring	390.5	239.14	685.89	677.22	53.41
Mean distance travelled per day [km ± SD]					
Summer	2.96 ±1.75	4.69 ±2.82	2.31 ±2.34	3.38 ±2.5	3.03 ±5.21
Autumn	3.05 ±2.42	7.12 ±9.23	4.67 ±7.11	7.8 ±14.17	5.66 ±9.10
Winter	4.79 ±4.7	0.78 ±0.32	8.05 ±8	5.48 ±7.2	1.63 ±0.79
Spring	2.71 ±2.97	2.56 ±3.73	4.43 ±9.96	5.11 ±23.71	2.43 ±1.46
Maximum movement from deployment site [km]					
Summer	23.75	34.45	7.59	11.65	12.27
Autumn	44.3	104.9	79.35	257.11	78.36
Winter	23.46	3.53	60.53	39.28	8.48
Spring	21.05	101.3	81.13	309.4	6.71
Total overall trip duration [days]					
	282	243	285	274	221



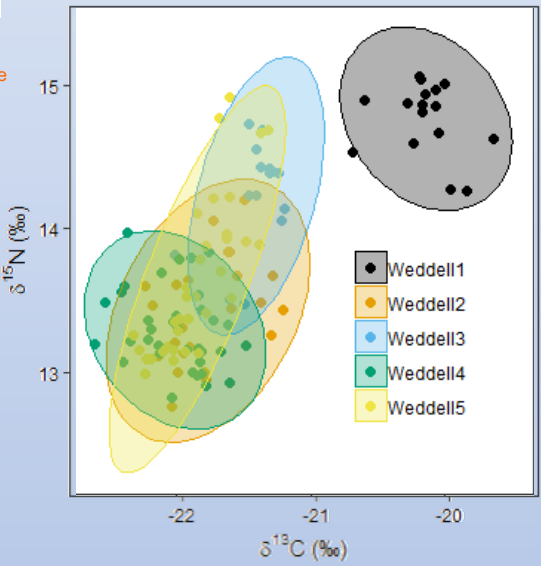
Home range analysis showed differences in core area use. The single individual AF1, deployed on the Ronne Ice shelf had a smaller home range compared to the other four seals.

Tracking

- Greatest distances were travelled in autumn and summer corresponding to seasons of intense foraging. Shorter distances were travelled in spring and summer to facilitate breeding and moulting.
- Home range distributions were influenced by sea ice extent. AF1 distributed on the Ronne Shelf had a smaller home range and less freedom of movement compared to individuals AF2-AM5 distributed on the Filchner Shelf.

Difference in isotopic enrichment signatures between individuals from the deep Weddell Sea and other seal populations

Location	$\delta^{13}C‰$	$\delta^{15}N‰$
Deep Weddell Sea	-21.43	13.85
WAP	-22.4 - -20.1	11.3 -14
Ross Sea	-24.3 - -22.5	12.2 -13.8
Amundsen Sea	-22.9	12.3
Danco Coast	-22.4	14.0



Mean $\delta^{13}C‰$ and $\delta^{15}N‰$ from the whisker samples of the 5 Weddell seals.

Isotopes

- All individuals' core foraging niches overlapped except AF1; a result of her deployment location on the Ronne Ice Shelf.
- Seals in the deep Weddell Sea had similar $\delta^{13}C‰$ isotopes compared to populations in the WAP. $\delta^{13}C‰$ were higher compared to all other locations due to the Southern Ocean $\delta^{13}C$ gradient.
- $\delta^{15}N‰$ values were intermediate amongst all other locations.
- Behaviours and foraging niches were similar to other populations. Where variation occurred it was a result of hydrographic features, ocean chemistry and individual life history.

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