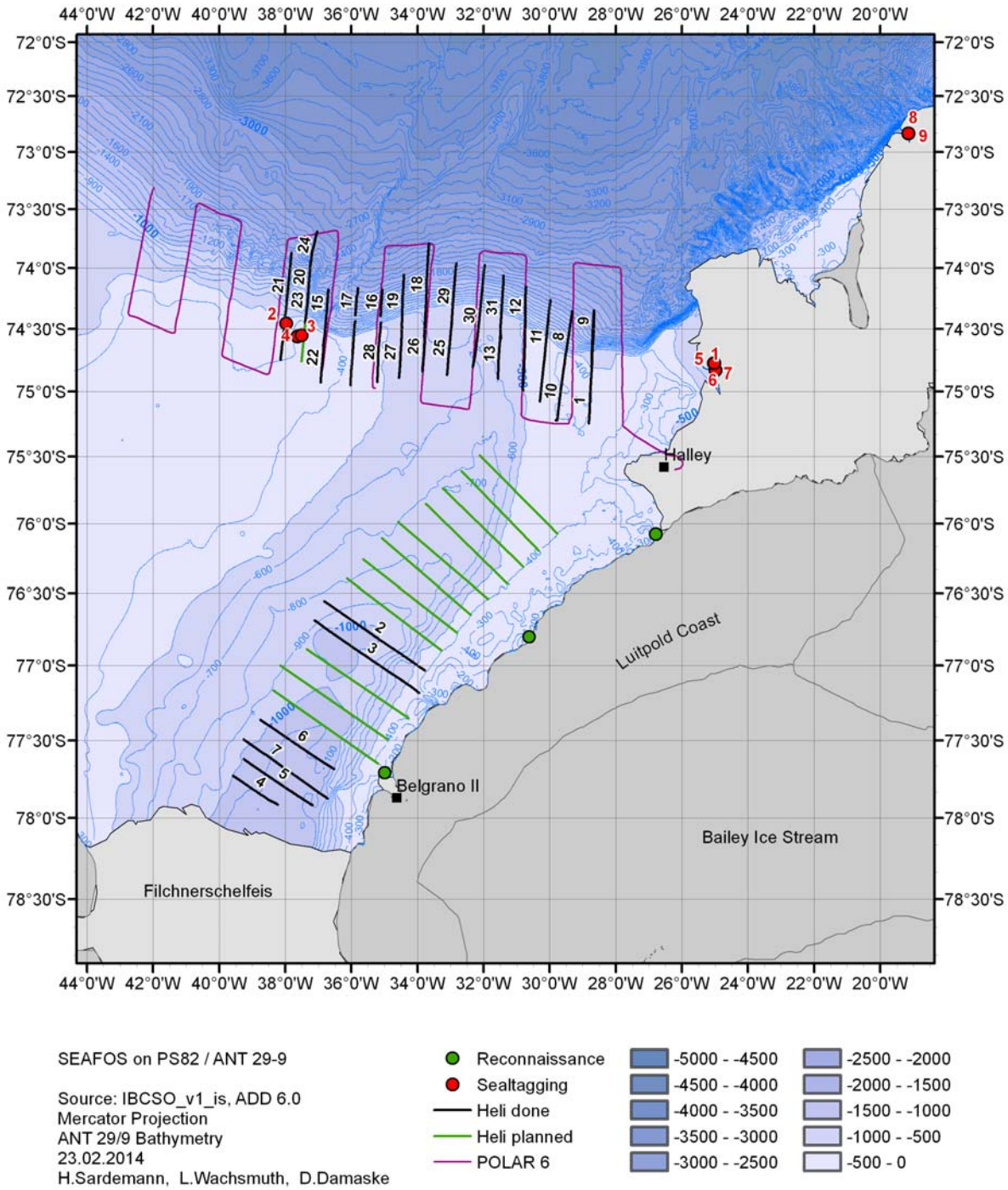
Aircraft	Bölkow Blohm 105 twin engined helicopter
Altitude	60 m (200 feet)
Speed	~110 km h^{-1} (60 knots)
Transect spacing	18.52 km (10 nm) between transects



Transects flown in the FOS by the AWI research aircraft Polar 6 (purple trackline), and the RV Polarstern onboard helicopter (black transects). Numbers in black denote the corresponding transect installations. Green transects were projected according to the corresponding ship's positions, but could not be flown due to unfavourable weather conditions. Green dots identify potential locations for deployments of satellite transmitters on Weddell seals following reconnaissance flights. Red dots mark locations where transmitters were deployed on Weddell seals

Comments on the SEAFOS helicopter survey from aboard RV Polarstern during FIL2014

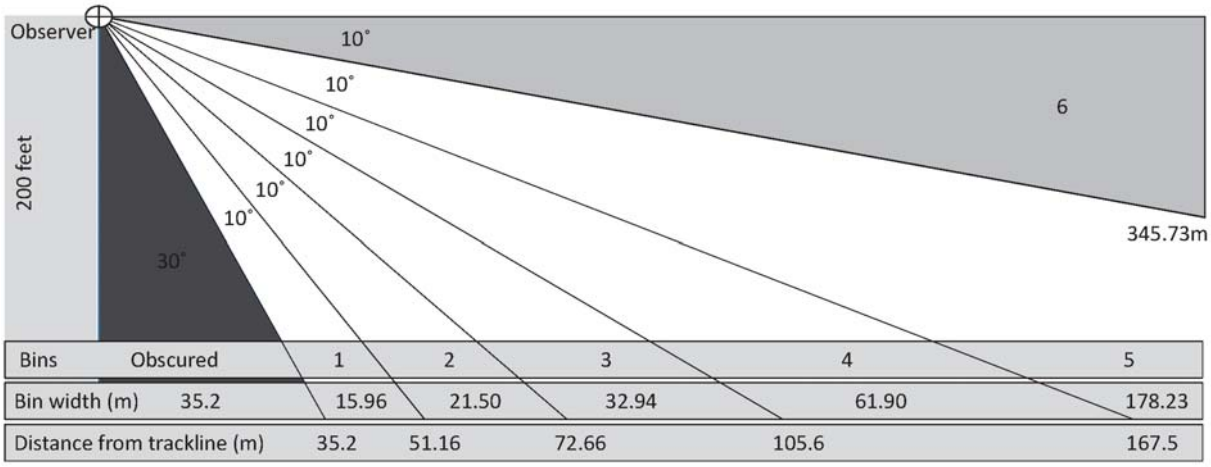
Visual surveys of pack ice seals using helicopters were conducted from 4 January to 9 February 2014 from aboard RV *Polarstern* (PS82). For all seal related operations (including deployments of satellite transmitters and reconnaissance flights) a total of 30:13 hours during 20 flights were flown (MIN 0:11; MAX 3:13). The survey region was sampled by flying systematically spaced line transects (parallel lines approximately 10 nm apart) whenever ship position and weather conditions allowed, without clustering transects in areas of easier access. When a full transect length could not be flown on a day, we attempted to complete (extend) the particular transect on a following day.

We considered two sampling regions, allowing comparisons to be drawn between these areas. First, we surveyed pack ice along the east coast of the Weddell Sea (Coats Land), from the Brunt Ice Shelf (76° section) along the Luitpold Coast (77° section) southwards to the Filchner Ice Shelf (78° section) as outlined in the station chart. We subsequently refer to this area as the Filchner Trough region. Second, we surveyed pack ice to the west of the Brunt Ice Shelf along the outflow of the Filchner Trough between the section 'eastern' and the section 'western' shelf. We only surveyed pack ice as potential seal habitat. Counting seals on fast ice was disregarded as it would have been biased towards Weddell seals and not representative of the species composition of pack ice seals.

Transects in the Filchner Trough region were placed perpendicular to the coast across the bathymetric gradient, starting at the 400 m contour. Six transects, totalling 425.54 km, were flown in this region. Transects in the Filchner outflow region were superimposed on the transect grid surveyed with *Polar 6*[1], though with less latitudinal extent and a doubling of the longitudinal density of transects to increase sampling intensity (transects were 18.52 km, i.e. 10 nm apart). Again, transects were placed perpendicular to the 1,000 m bathymetric contour, and extended if possible up to the 400 and 2,000 m bathymetric contours. Twenty-five transects, totalling 1,367.61 km, were flown in this region.

Aerial surveys were flown with a Bölkow Blohm twin engined helicopter at a height of approximately 60 m (200 ft) and at a velocity of ~110 km h^{-1} (60 knots). Three observers (two on portside, one on starboard) independently searched for seals hauled out on ice, and identified seals sighted to species level. Each observer counted seals through sighting bars (aligned markers on the windows of the helicopter) allowing observations to be grouped into non-overlapping distance intervals (or "bins") based on the perpendicular distance from the trackline. Sighting bar distance intervals were calibrated to each observer by flying over flagged marker poles laid out on the shelf ice in proximity to the *Neumayer III* Station prior to the start of the survey. These perpendicular distances were used to estimate the detection function - the probability that a seal is detected, as a function of distance from the trackline. All individuals present 'on the trackline' are assumed to be detected for conventional distance sampling analyses; this assumption could be tested for the two portside observers using mark-recapture distance sampling methodology. Because the area directly below the helicopter was obscured for observers sitting in the rear of the helicopter, the visible trackline (g0) was offset by 35.2 m to each side of the helicopter.

[1] http://doi.pangaea.de/10.1594/PANGAEA.843395
http://doi.pangaea.de/10.1594/PANGAEA.843394
http://doi.pangaea.de/10.1594/PANGAEA.843392



Grouping of non-overlapping distance intervals ("bins") based on the observers' angle of view and resulting in the respective perpendicular distance from the trackline

"Binned" observations based on perpendicular trackline distance

Bin	Bin width [m]	Distance from helicopter [m]*	Mean detection distance [m]	Comment
0	35.2	0	-	Observations truncated
1	15.96	35.2	43.18	g(0)
2	21.5	51.16	61.91	
3	32.94	72.66	89.13	
4	61.9	105.6	136.55	
5	178.23	167.5	256.615	
6	-	345.73	-	Observations truncated

*Distance to the start of the bin. Bin 6 stretched to the horizon

Counts were made in conjunction with the date, time and GPS location (continuous logging of GPS positions) of each observation. Observers used digital voice recorders to log count data and maximize search effort. Seals within two-body lengths of each other were assumed to occur as a group. One observer visually assessed sea ice concentration, size of ice floes and their surface nature during flights; in addition, photographs of sea ice were taken at 3 min intervals as reference material. To correct on-ice abundance estimates for seals unavailable for detection (seals in water), all flights were flown between 11:00 (starting) and 16:00 (ending) approximate local apparent time (LAT), corresponding to the midday haulout maxima of seals on the ice. Since the Filchner Trough is located ca. -3h relative to UTC, flights were scheduled between 13:00 and 17:00 UTC, under consideration of the Filchner Trough area circumscribed (coverage) by Median Latitude: -74.50 * Median Longitude: -34.00 * South-bound Latitude: - 75.50 * West-bound Longitude: -43.00 * North-bound Latitude: -73. 00 * East-bound Longitude: -26.00.

For further information see Bornemann H, Oosthuizen WC, Bester MN (2014) Seal research at the Filchner Outflow System (SEAFOS). Pp 115-135 in Knust R & Schröder M (eds) The Expedition PS82 of the Research Vessel POLARSTERN to the southern Weddell Sea in 2013/2014 http://hdl.handle.net/10013/epic.44292.d001

Primary data on file contain:

Heading	Unit	Description
Date		yyyy/mm/dd
Stratum		Filchner Outflow or Filchner Trough (southern-most transects)
Transect		List c(1,2,3….31)
Transect Label		SEAFOS_yyyy/mm/dd_transect
Transect start Lat		Latitude point position where transect starts
Transect start Lon		Longitude point position where transect starts
Transect end Lat		Latitude point position where transect ends
Transect end Lon		Longitude point position where transect ends
Transect Length	[km]	Transect effort
Target Altitude	[m]	Flying altitude
Transect start time	[GMT]	Time @ start of transect
Transect end time	[GMT]	Time @ end of transect
Transect effort time	[hh:mm:ss]	Time on effort [hh:mm:ss]
Segment		List c(1,2,3….17). Observers divided each transect into 3 minute segments, while conducting the survey. Each observation can be linked to a segment. Three environmental (ice) variables were also collected for each segment while in the air
Segment Label		SEAFOS_yyyy/mm/dd_transect_segment
Segment start Lat		Latitude point position where segment starts
Segment start Lon		Longitude point position where segment starts
Segment end Lat		Latitude point position where segment ends
Segment end Lon		Longitude point position where segment ends
Segment length	[km]	Segment effort
Segment start time	[GMT]	Time @ start of segment
Segment end time	[GMT]	Time @ end of segment
Segment on effort time	[hh:mm:ss]	Time on effort (hh:mm:ss) per segment
Observer		Horst Bornemann (HB), Marthan Bester (MNB) or Chris Oosthuizen (WCO)
Helicopter side		Left or right side of the helicopter
Distance sampling options		HB made all observations from the right of the aircraft. Only conventional distance sampling (CDS) is an option. MNB and WCO were independent observers on the left of the aircraft. Their data may be analysed using mark-recapture distance sampling
Species		Crabeater seal or Weddell seal or unidentified seal if no certain species identification could have been made

Size		Group size: list c(1,2,3,4,5,6)
Bin		Distance interval where the observation was made. Bin intervals: Left truncation at 35.2m. Bin 1 (35.2m - 51.16m) Bin 2 (51.16m - 72.66m) Bin 3 (72.66m - 105.6m) Bin 4 (105.6m - 167.5m) Bin 5 (167.5m - 345.73m) Bin 6 (345.73m - horizon)
Mean detection distance	[m]	Distance to the centre of each bin
MRDS inconsistencies		Cases where MNB and WCO reported different seal species observed (Crabeater / Weddell / Unidentified), or where the observations were not made in the same bin (but in adjacent bins); or where the size of the group counted differed
Object		Unique integer for each seal sighted
Unique records		Only one of the duplicate sightings (of MNB and WCO) have a "1"
Observation time	[GMT]	Time when observation was made
Observation lat		Latitude when observation was made
Observation lon		Longitude when observation was made
Segment ice type		Subjective scoring of ice concentration while flying. Open water; Brash Ice (Wreckage of ice); Cake Ice <10m; Small floes 10-100m Medium floes 100-500m; Large floes >500m
Segment ice concentration		Open water; Open pack ice; Medium pack ice; Close pack ice; Solid pack ice
Segment ice surface		Rough or smooth; occasionally NA is segment in only associated with open water
Transect air temperature		Mean air temperature (in degrees C) recorded by Polarstern during the hour closest to the transect on effort tim
Transect wind velocity		Mean true wind velocity (in m/s) recorded by Polarstern during the hour closest to the transect on effort time
Transect visibility		Mean visibility (in m) recorded by Polarstern during the hour closest to the transect on effort time
Comments		Comments