Cruise report

M/T Paamiut SFW RejeFisk Survey Togt 1

27th May – 13th June 2017: Nuuk-Ilulissat

Personell

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Objectives

1. Collection of sea bed photos in areas of shrimp fishery in West Greenland. In order to investigate the long term impact of trawling in this area, priority was given to remaining stations of which there were images taken between 1977 and 1985 (by Per Kanneworff and colleagues) to continue our study of historical change of the benthic community.
2. Testing and collection of video footage of the sea bed using a new developed benthic sled with a mounted GoPro and new torches.
3. Collection of benthic bycatch data from cosmos shrimp trawls (GINR project supported by Stephen Long)
4. Collection of abundance and biomass data of the benthic community using a beam trawl (INAMON project supported by Stephen Long)
5. Conduct first survey (beam and video sled) in the MabHab area in Disko bay.
6. Inform and educate by conducting outreach activities around the cruise.

Summary of work

The survey was a joint venture between the Greenland Institute of Natural Resources (GINR) and Zoological Society of London. We had effective ship time of 14 nights for our camera activities. Night-time sampling was shared between the camera survey conducted by ZSL and beam trawls conducted by the INAMon project. The benthic habitat mapping during the cruise leg 1 onboard Paamiut was successful and resulted in over 200 pictures of the sea bed from 15 stations and more than 9 hours of video footage from 36 stations between the latitudes 64º15 and 69 º49 (between Nuuk and Disko Bay), at depths ranging from 29 to 872 m. Bottom substrates ranged from muddy to mixed rocky ground. Our primary object was to re-sample areas with historical imagery available, and we managed to resample 9 of these. Due to ice conditions the northernmost target stations with historical imagery (13) were not accessible.

Equipment

Drop camera

ZSL's benthic drop camera was used for imaging the seabed (Fig. 1). The camera was additionally equipped with a GoPro and one standard torch in a GB-PT underwater housing (we tested two torches as well which resulted in a slight overexposure). 15 to 20 pictures were taken per station with an interval of 1 min. To obtain video coverage of a larger area, we tested drifting the camera ca. 1 m above the seabed with help of a trawleye (mounted on the frame), which provides live feedback on the distance to the seabed. A computer was set up in the winch room to give real time information on the depth of the camera using the trawl eye data. The team viewer software was used to provide a view of the bridge computer via a new network cable set up during the cruise. The video obtained helped in getting an impression of the habitat and aided identification of animals, but did not provide additional quality footage for quantitative analysis, mostly because precise estimation of the distance to the sea bottom could not be achieved. Furthermore, an experiment was performed deploying the camera in area with extreme high sloping seabed, where trawling gear could not be deployed. This provided footage of the seabed which could not be gathered with our other survey methods, including video footage of a vertical rockface.

Benthic sled with GoPro camera

High quality video footage was obtained using a new custom made benthic sled (dimensions 3m x 2m x 1m, weight approximately 1 ton), constructed to take video of the sea bed from a fixed distance (Fig. 2). A GoPro camera and two Nautilux torches in GB-PT 1750 group binc underwater housings were mounted on the sled pointing forwards and allowing for a larger area to be surveyed than with the drop camera. Each video sled trawl was deployed for 15 mins of bottom-contact time, and recorded using the same datasheets used for beam trawl and cosmos trawl deployment. These were entered into the database as “video sled” deployments.

Early deployments involved experimentation with the angle of the camera and lighting, along with settings for the camera. We settled on a strategy of an angle of approximately 31° from horizontal for the camera, providing a balance between distance visible in the video and the area covered by the lighting. These settings have been permanently marked onto the sled. An experiment with time-lapse photography, rather than video, was attempted at one station, but the still images were often blurred and it was felt that the video produced more reliable and usable images. The system is sensitive to the speed of the sled over the ground. It was felt a speed of around 0.8 knots was optimal. Too much faster and it is difficult to get a clear image, especially in the area of the image closer to the camera, which appears blurry at faster speeds. It is difficult for the ship to go reliably slower than this, with the additional difficulty of slower speeds increasing the potential for the winch wire to droop and touch the ground ahead of the sled, causing sediment clouds to obscure the image. This was more of an issue on soft ground, deeper water and uneven seabed. In order to reduce seabed contact, 4 floats were mounted on the chain at the point it links with the main winch wire. We recommend these are attached before each deployment. Another factor in this issue is the amount of winch wire let out during deployment. We have used a ratio of wire length = 1.5x depth (i.e. 1500m of wire for deployment at 1000m), it is worth considering reducing this ratio at deeper deployments.

The sled occasionally became stuck on rocks, but generally coped well in rocky terrain.

There were issues with the deployment of the Nautilux torches. The cables inside the housing were regularly twisted by the screwing/unscrewing of the housing and bent by the movement of the battery. The cables frequently either became loose or snapped. Several methods were attempted to reduce the twisting (changing the section of housing to unscrew, placing the torch light-down while screwing), but the lights would partially fail every 4 or 5 deployments (typically one wire would detach causing one led to fail at initial deployment). Although there is a time-delay for switching on the torches, this function was not used because it was important to check the lights were functioning before deployment. Although it is recommended not to turn on lights out of water, the risk of overheating seems minimal in such cold conditions. We are working on an internal housing for the wiring to try to reduce this problem in future.

A starmon temperature sensor was mounted on the sled.

Beam trawls

If ship time allowed, after each camera survey was complete, a beam trawl survey was carried out at the same station. The beam trawl samples mostly epibenthic organisms larger than 5mm. These trawls were conducted as part of the INAMon benthic survey of the Greenland shelf currently being conducted by Martin Blicher (GINR). Specimens were identified and documented by a team of benthic taxonomists.

A GoPro camera and 2 GPH 1750m torches were fitted to the beam trawl in a similar setup to the video sled, only the camera and torches are not adjustable on the beam trawl and are inclined at a steeper angle. This setup produced good video at the start of deployment, but on soft sediments in particular, the video would become obscured by sediment stirred up by the trawl. Additionally the speed required for beam trawl can lead to blurred video.

Results

Imaging

In a continuation of previous year's activities, 15 drop camera stations (Table 1, Fig. 3) were resampled and produced liable images of high quality which can be compared to historical images available. A highlight was the second observation of the carnivorous sponge *Chondrocladia gigantea* (Fig. 4). The camera was also deployed in slopy rocky bottom and the mounted GoPro managed to capture a vertical wall with sponge and anemone assemblages.

36 stations were covered by the benthic video sled (Table 1, Fig. 3), the deepest deployment was 872 m. At station V030 at 390 m depth, we discovered a diverse species assemblage including Nephtheid corals (Fig. 5). The picture and video material will be sighted and analysed for species abundance data.

Bycatch processing and beam trawls

GINR documented and collected all benthic fauna taken as bycatch from cosmos trawls as a reference collection of benthic fauna for the area. On the first leg of this year's surveys, this was conducted by the scientists and students conducting the shrimp stock assessment. Additionally samples of benthic invertebrates were collected and dried for use during public engagement and outreach activities.

There was limited benthic bycatch from Cosmos shrimp trawls in terms of biodiversity and biomass. Mostly these were non-target shrimp species.

Combined sampling of stations by camera/video and beam trawls, together with the taxonomic expertise on board, proved extremely useful in identification of fauna seen in images and video.

MapHab area

Three nights of sampling were conducted in an area in Disko Bay known as the "MapHab" area. This region is the focus of an ongoing project to map benthic habitats in the area using a combined approach of multibeam, mud sampling, biological sampling and imaging. Sampling in this area involved 7 video sled stations, 5 beam trawls (all at areas with video footage) and 2 drop camera stations at high-sloping areas where it was impossible to put down trawling gear (Fig 6). These data will form part of the larger MapHab project.

Outreach

As part of previous outreach to the Devonshire Hill Nursery & Primary School in North London school, we send pictures and short summaries to the pupils, telling them about our work and life on board. Other digital communication comprised twitter feeds (example https://twitter.com/MonaFuhrmann/status/873737435666149376) and a blog at the ZSL wild science portal (https://www.zsl.org/blogs/wild-science/exploring-the-deep-seafloor). We produced a highlight video from collected footage which was distributed to the crew and will be developed further for showcasing at outreach events. In addition, specimens for culture night in January (Nuuk) were collected by GINR.

Fig. 1 Setting up the drop camera

Fig. 2 Deployment of the benthic sled

Table 1 Station list

Station ID	Type	Latitude	Longitude	Depth	Date
1	Camera	64°32.45	52°51.956	435	28.05.17
2	Camera	64°16.098	53°14.428	366	29.05.17
3	Camera	64°15.971	52°57.922	392	29.05.17
4	Camera	64°54.109	53°07.023	351	30.05.17
5	Camera	64°35.076	55°07.328	399	31.05.17
6	Camera	64°56.345	53°34.455	75	31.05.17
7	Camera	64°57.907	53°18.180	35	01.06.17
8	Camera	66°29.475	56°02.505	168	02.06.17
9	Camera	66°21.987	56°24.099	293	02.06.17
10	Camera	66°17.673	56°30.340	487	02.06.17
11	Camera	66°40.450	56°41.342	564	05.06.17
12	Camera	66°48.413	55°08.257	230	06.06.17
13	Camera	68°26.986	54°17.702	443	07.06.17
14	Camera	68°55.321	53°07.368	262	10.06.17
15	Camera	68°51.595	53°10.412	279	10.06.17
V015	Sled	64°36.853	53°56.376	150	29.05.17
V017	Sled	64°51.130	53°17.394	131	30.05.17
V024	Sled	64°21.430	53°45.900	138	30.05.17
V026	Sled	64°25.238	54°07.551	160	30.05.17
V027	Sled	64°29.143	54°27.697	266	31.05.17

V030	Sled	64°34.837	55°07.0716	390	31.05.17
V038	Sled	64°54.279	54°05.572	137	31.05.17
V040	Sled	64°56.527	53°36.01	79	31.05.17
V042	Sled	64°57.608	53°17.6575	29	01.06.17
V050	Sled	66°12.840	54°42.15	97	01.06.17
V059	Sled	66°37.237	55°03.611	119	02.06.17
V061	Sled	66°49.770	54°41.7234	47	03.06.17
V062	Sled	66°52.8454	54°10.3999	71	03.06.17
V072	Sled	67°00.4209	56°27.7191	258	04.06.17
V080	Sled	67°45.3143	55°41.9859	87	04.06.17
V082	Sled	67°51.7400	54°38.0224	29	05.06.17
V084	Sled	67°57.7074	54°16.2692	96	05.06.17
V085	Sled	68°00.0855	54°10.1455	168	05.06.17
V091	Sled	68°25.6868	55°09.9966	468	05.06.17
V093	Sled	68°48.4231	55°08.1638	232	06.06.17
V094	Sled	68°45.828	54°42.280	209	06.06.17
V102	Sled	68°29.532	55°07.5822	470	06.06.17
V106	Sled	68°36.1292	53°50.1651	872	06.06.17
V113	Sled	68°58.5166	52°59.1480	137	06.06.17
V114	Sled+Beam	68°56.5472	53°22.1250	674	08.06.17
V124	Sled+Beam	68°55.1017	53°00.3260	86	08.06.17
V125	Sled	68°54.5934	53°11.7499	759	09.06.17
V126	Sled+Beam	68°51.8604	53°20.1899	868	09.06.17
V128	Sled+Beam	68°50.5060	53°09.1520	315	09.06.17
V137	Sled+Beam	68°53.7444	52°57.8394	443	09.06.17
V145	Sled	69°41.7532	51°46.9780	124	10.06.17
V147	Sled	69°42.208	51°28.779	430	11.06.17
V149	Sled	69°49.327	51°36.404	614	11.06.17
V150	Sled	69°34.468	51°37.551	249	11.06.17
V157	Sled	69°20.3871	51°42.9881	330	11.06.17
V159	Sled	69°30.5685	52°01.2982	331	12.06.17
V160	Sled	69°15.1025	51°50.2847	429	12.06.17

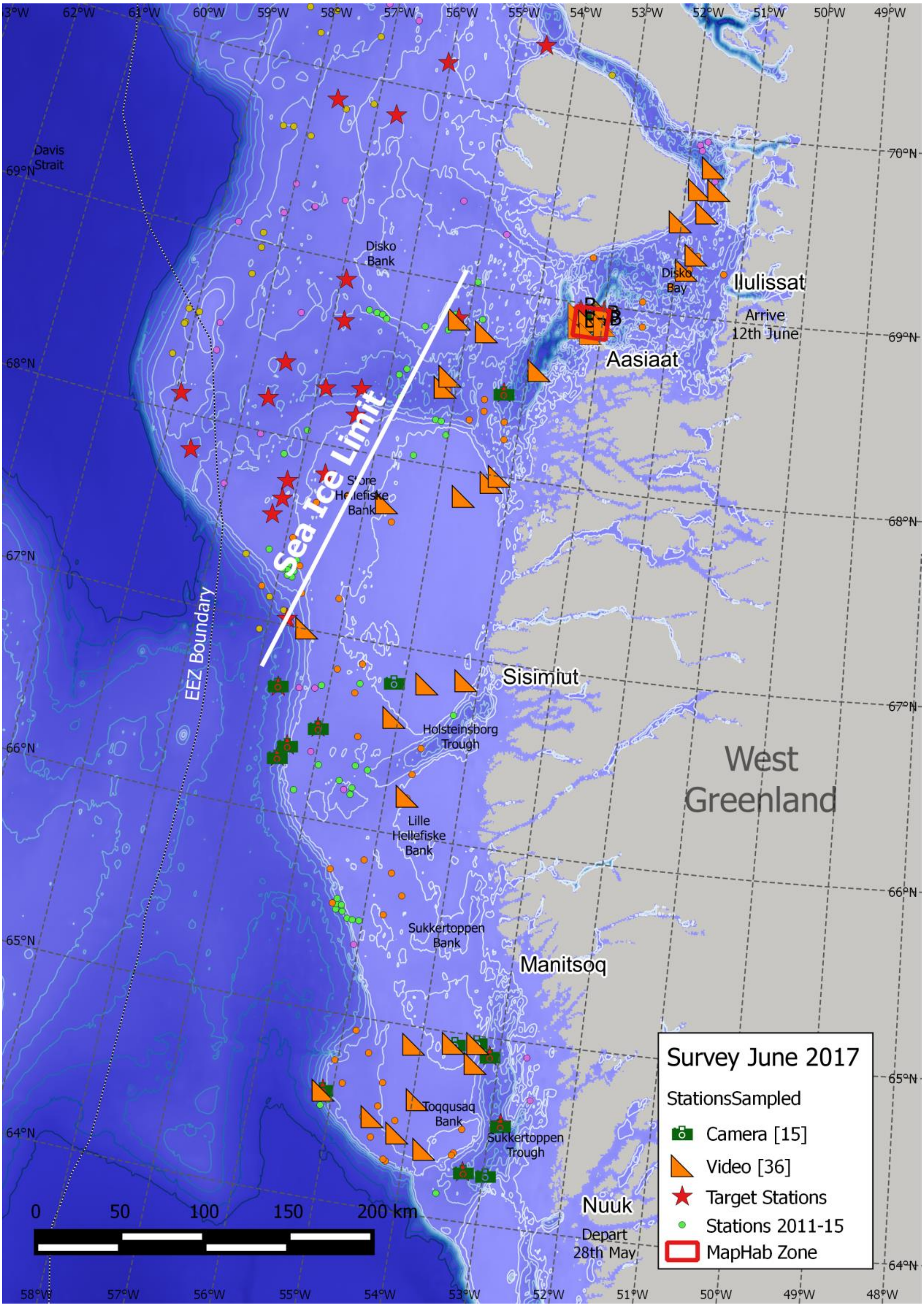


Fig. 3 Map over the study area and stations sampled during the Paamiut cruise June 2017

Fig. 4 Observation of *Chondrocladia gigantea* and sea anemones at 445 m depth

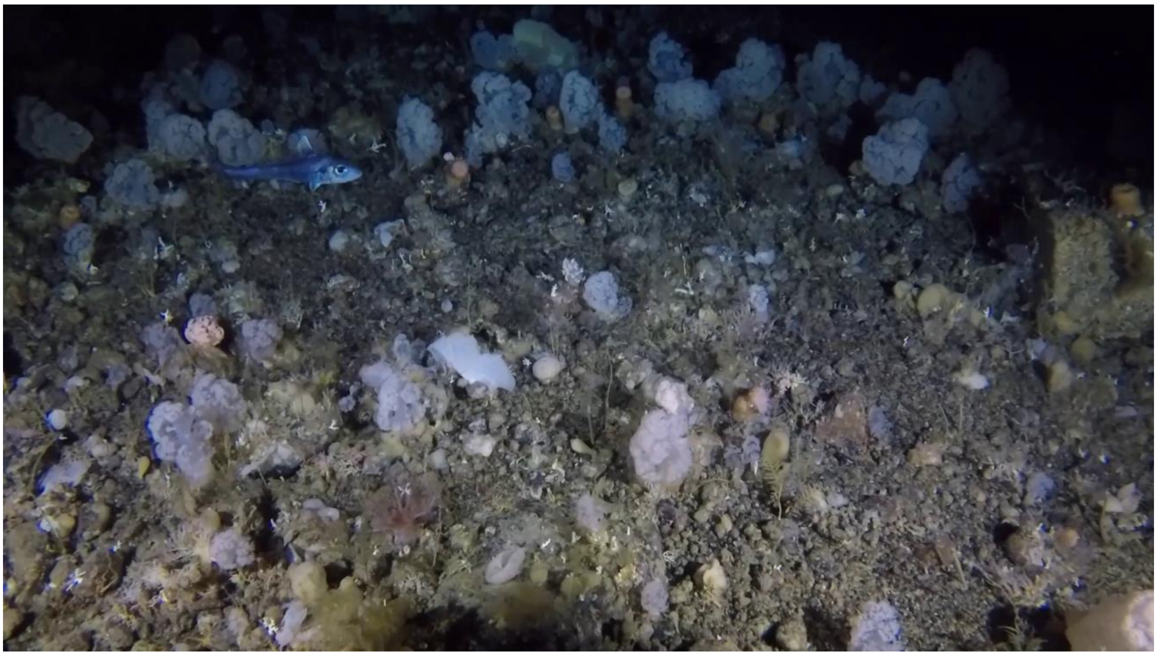
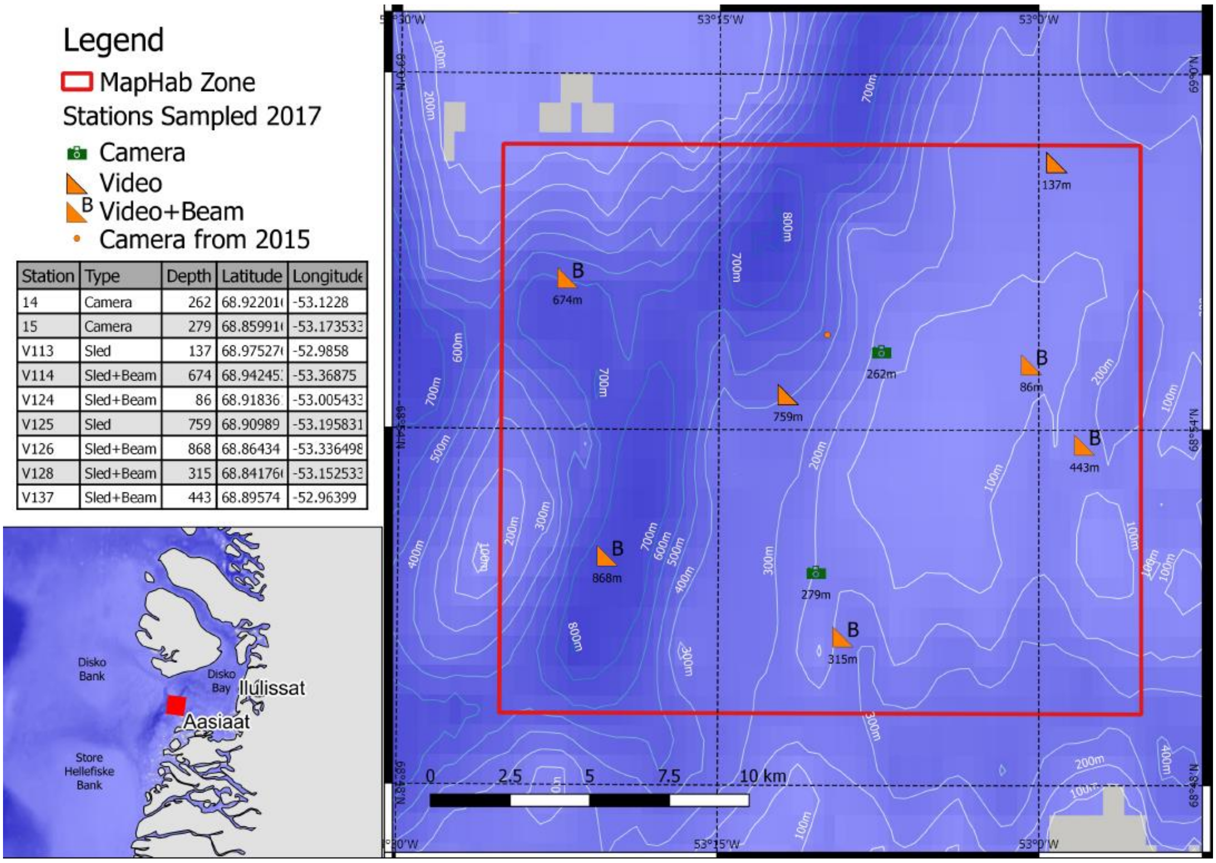


Fig. 5 Coral garden at 390 m depth



Station	Type	Depth	Latitude	Longitude
14	Camera	262	68.92201	-53.1228
15	Camera	279	68.85991	-53.17353
V113	Sled	137	68.97527	-52.9858
V114	Sled+Beam	674	68.94245	-53.36875
V124	Sled+Beam	86	68.91836	-53.00543
V125	Sled	759	68.90989	-53.195831
V126	Sled+Beam	868	68.86434	-53.336498
V128	Sled+Beam	315	68.84176	-53.15253
V137	Sled+Beam	443	68.89574	-52.96399

Fig. 6. Sampling in the MabHab area