**RV SONNE - SO 293 "AleutBio"**

Aleutian Trench Biodiversity Studies

24. July – 06. September 2022

Dutch Harbor (Alaska, USA) – Vancouver (Canada)

**3rd Weekly Report**

1. August – 7. August 2022

At the end of July, we left the working area in the Bering Sea and at 8 pm on July 31 we reached the first abyssal station at the northern slope of our westernmost transect across the Aleutian Trench. Here we deployed all benthic gear except the lander and then moved on to spend the rest of the week at the deepest station of this transect at approximately 7240 m.

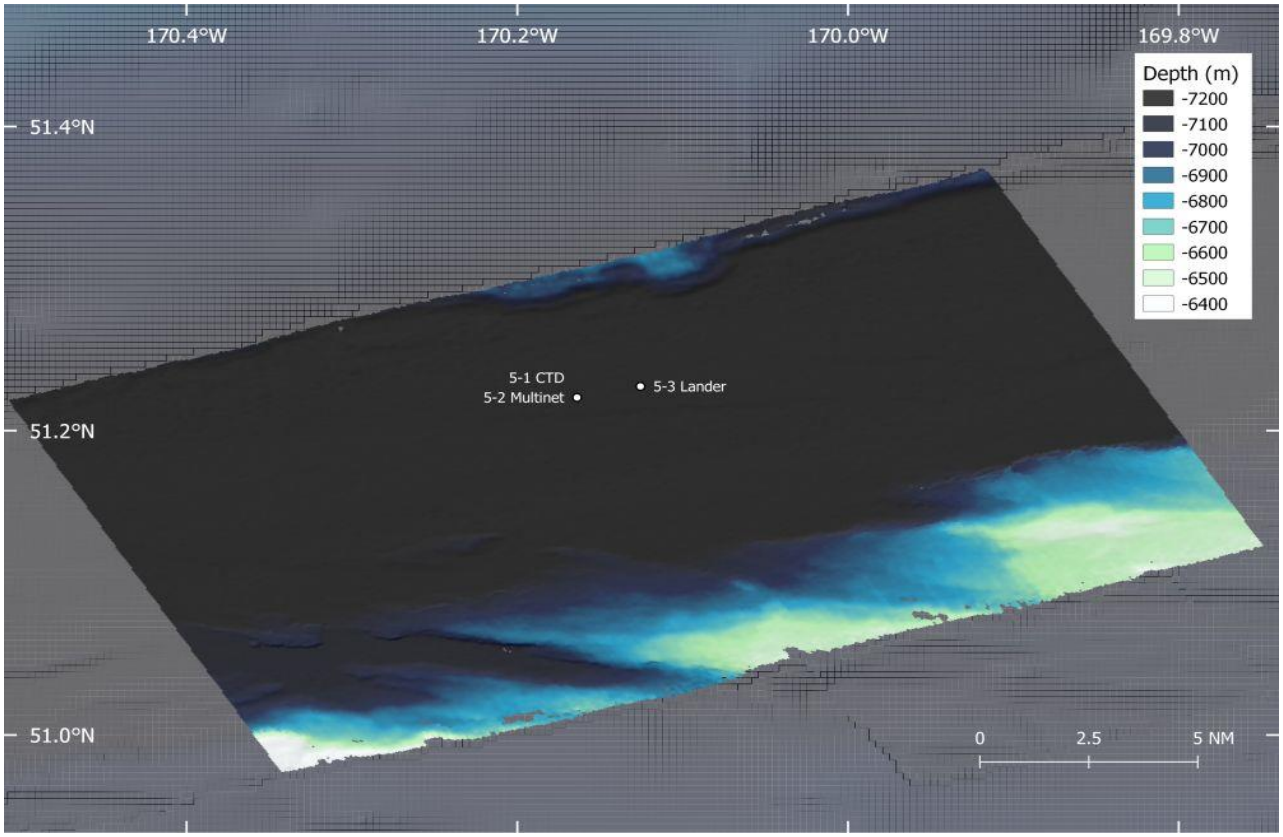


*Figure 1: Bathymetric map of the deepest station at approximately 51°14.00 "N 170° 07.45'W, 7243 m.*

The seafloor at this location, in the deepest part of the trench, showed a homogeneous smooth surface without any significant topographic structures, so we decided to deploy all instruments in the usual order.

After the loss of an experimental deep-sea lander last week, our second lander, deployed on 3 Aug 2022 at 51°13.751'N 170°07.537 W at 7239 m depth, has now also failed to leave the seafloor. We deployed the lander at 18:30 UTC on 3 Aug 2022 and then activated the acoustic release at 20:00 UTC on 4 Aug 2022. Over the next three hours, it transmitted signals that seemed to indicate that it was at decreasing depth (toward the surface), but the signals were inconsistent and indistinct, and the lander never surfaced. From our sampling, we know that the sediment in this area is very fluid, especially at the sediment surface and in another, deeper layer, but also contains much gray clay in between (Figure 2). Most likely, the lander sank quite deep into the sediment and became anchored in the sticky clay so that when the lander was released, it could not dislodge and ascend from the seafloor.

*Figure 2: Sediment from the deepest station in the Multi-corer.*

However, we also have very good news. After the lander deployment, we deployed the instruments for the water column which require the ship to be clean and without sediment on deck, such as CTD and multinet (the multinet recovered a large volume of calanoid copepods), and later these were followed by the instruments deployed on the seafloor, such as the box-corer, multicorer (MUC), epibenthic sled, and Agassiz trawl.

The sediment in the Aleutian Trench is completely different from that in KKT and, in addition, we find much lower abundances of macro- and megafauna here at the first hadal station than in KKT. The larger organisms are rather rare, but the smaller the fraction becomes, the more interesting it is. We found massive abundance of tiny foraminifera in the Aleutian trench and made an exciting discovery when the < 250 microns fraction of the sediment collected by the MUC at the deepest hadal site was examined. Large number of tiny foraminifera (single-cell protozoans) were immediately observed among the diatom frustules making much of this sediment fraction. Within a few minutes we were able to pick up hundreds of specimens. Their spherical shape and organic wall suggested that they belong to the genus *Bathyallogromia*. We described the first species of this genus during the ANDEEP expedition with RV Polarstern to the Weddell

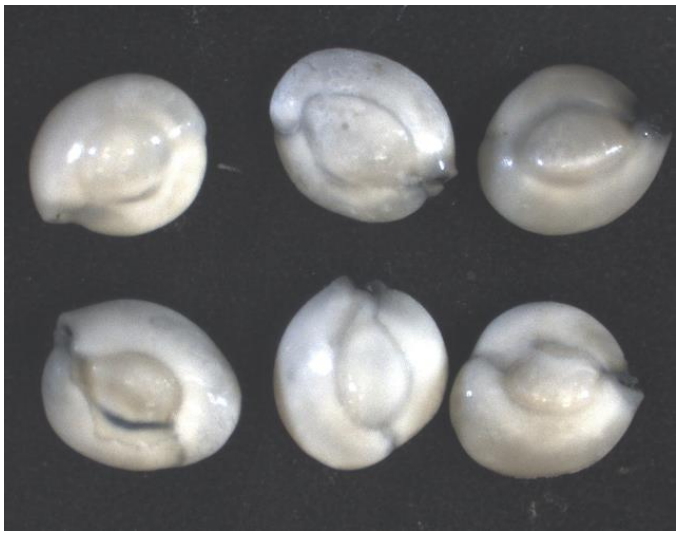

*Figure 3: Foraminifera of the genus Bathyallogromia.*

Sea. The genus was subsequently reported from other areas but never in such massive abundance. Very few other foraminifera were found in the MUC samples from this station.

The Agassiz trawl, which is designed to collect much larger organisms, also contained a number of calcareous foraminifera living well below the depth at which calcite shells normally dissolve.

Among larger animals, one dominant group is the isopods. And we have now recovered the largest specimen of the genus *Paropsurus* (Munnopsidae). There are two females of different sizes, the largest animal is 65 mm long. Torben Wolff had described the largest species so far, *Paropsurus giganteus* Wolf, 1962, with a specimen of 60 mm length from the material of the *Galathea* expeditions 1962 from the Tasman Sea as well as the East Pacific of Costa Rica between 3570 and 4400 m depth. Our species is very similar to *P. giganteus*, but also shows differences (Figure 4).

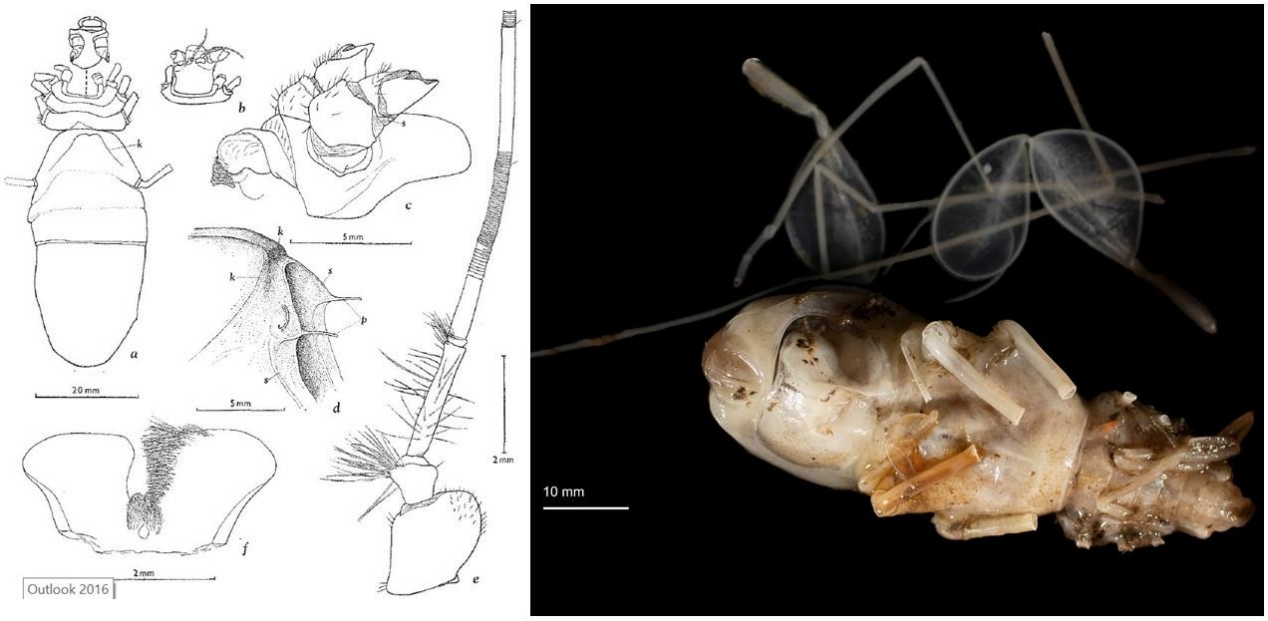


*Figure 4: Paropsurus giganteus Wolff, 1962; drawing from Galathea Expedition Costa Rica Trench at 3570-4400 m, 56-60 mm long (left); cf. new species of 65 mm from Aleutian Trench (right).*

In these two stations south of the Aleutian Islands, a large number of amphipods were brought on deck of the RV *Sonne* in four epibenthic sled samples, of which 59 specimens could be sorted out. A rough morphological identification allowed the distinction of representatives of the genus *Rhachotropis*, most likely *Rachotropis saskia* Lörz & Jażdżewska, 2018. This recently described Northwest Pacific species has a very wide bathymetric distribution of over 3,000 m (~5000-8000m), which was also confirmed by molecular biology. This species also occurs on both sides of the Kuril-Kamchatka Trench (KKT) and in the trench itself (Lörz et al. 2018; DOI 10.7717/peerj.4887) and has now apparently been detected in the eastern Aleutian Trench. Species of the genus *Rhachotropis* are known predators and have good swimming abilities. The present result sheds new light on the distribution of deep-sea species when also confirmed by molecular studies. This result shows that our hypothesis is correct that at least some species also have a wide geographic distribution. Selected individuals of the species were fixed so that they can be used for further trophic level or proteomic analyses in the home laboratory.

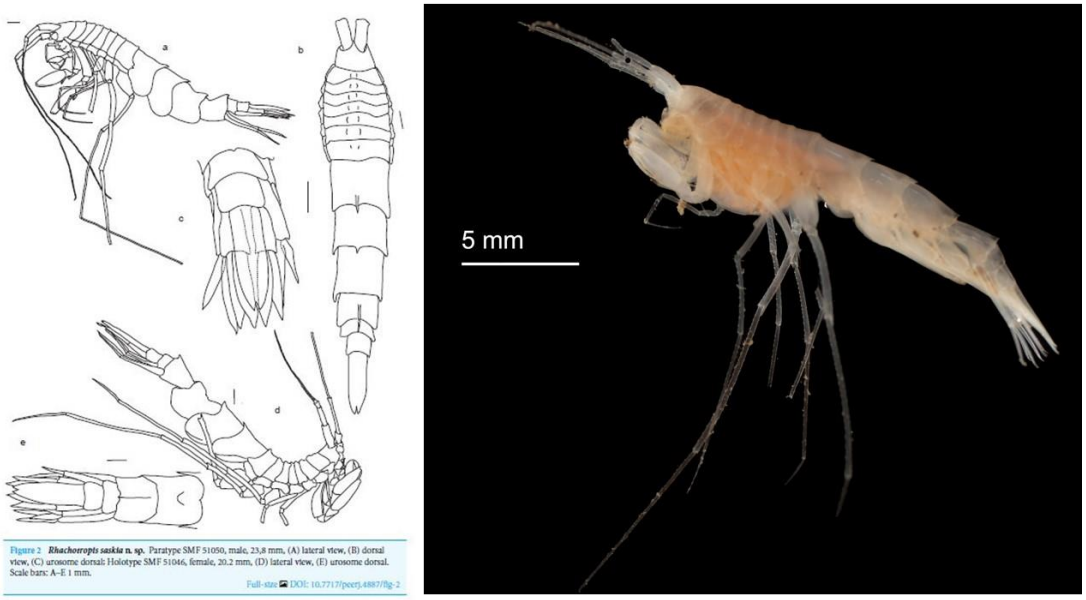


*Figure 5: Rhachotropis saskia Lörz and Jazdzewska 2018, female with eggs in marsupium. Drawing from KKT (left) and photo from the Aleutian Trench (right).*

The OFOS videos help us understand our samples, and sometimes we can even make a direct comparison with the species we collected with the other instruments. We can see the tracks they leave in the mud (Figure 6 left). Even delicate species can sometimes be recovered in good condition (Figure 6 right).

*Figure 6. The deep-sea snail Tropidofusus aequilonius (Sysoev, 2000): left, in-situ image from the OFOS, right, specimen photographs taken on board RV* Sonne*.*

All are well and send greetings home.

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