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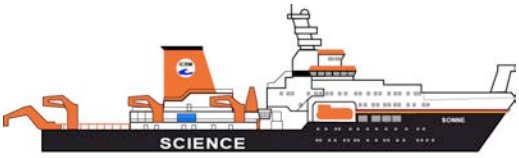
	SO-249 Leg 1 **BERING** **Weekly Report No. 1** **(5.06. – 12.06.2016)**	 **R/V SONNE** 50°30´ N / 179°45´ E

The Bering Project is a long-term international collaboration between German, Russian, and American scientists. The project encompasses two legs: (1) from Dutch Harbor, Alaska to Petropavlovsk-Kamchatsky, Russia (June 5 - July 15), and (2) from Petropavlovsk to Tomakomai, Japan (July 17 - August 14). The overall goal of the project is to study the geodynamic evolution of the southern and western margins of the Bering Sea, formed by the Aleutian Subduction Zone and Chukotka-Berginga continental margin respectively. Our research will contribute to improving our understanding of the origin of marginal seas, the initiation and geodynamic evolution of subduction zones, as well as the causes and effects of natural hazards, such as explosive volcanic eruptions. During the two cruise legs, we will carry out detailed bathymetric mapping of the seafloor, sediment profiling and sampling of volcanic and tectonic structures along the aforementioned margins of the Bering Sea.

At the Aleutian Subduction Zone, which forms the northern-most part of the Pacific "Ring of Fire", the Pacific Plate is being thrust beneath the North American Plate. As the plate subducts (sinks) into the mantle, it releases fluids (seawater taken up while the plate formed the seafloor) and melts from the down-going oceanic crust into the overlying mantle wedge. Addition of hydrous fluids and melts to the mantle causes a reduction of the melting temperature and melting of the mantle. These melts ascend to the surface and erupt, forming the Aleutian arc-like chain of volcanoes. The sliding of the two plates against each other during subduction causes the strongest earthquakes on Earth, such as the magnitude 9.0 Tohoku Earthquake on March 11, 2011, that generated the huge tsunami that devastated the coastline of Japan and caused the Fukushima disaster.

After a long, grueling journey from Germany halfway around the world to Dutch Harbor, Alaska, the German and Russian scientists met up with their American colleagues on June 4. The next day we boarded the R/V SONNE, unpacked the sampling equipment and set up the laboratories. At 9:00 a.m. on Monday June 6, the SONNE left Dutch Harbor, escorted not only by the pilot's tugboat, but also by leaping humpback whales and a young bald eagle that perched on our foredeck railing (see photos). After a day of transit, we reached our study area and began dredging on the Amlia Fault (Fracture) Zone that extends southward along the Pacific Plate south of the Central Aleutians. Here we recovered an interesting variety of rocks from a fault-bounded block in the fracture zone, which included surface sediments and bedded sedimentary rocks, clinopyroxene-, plagioclase-, and olivine-bearing basalts, as well as dioritic rocks and a sheared oceanic gabbro. On the third day of the cruise, we sampled fresh olivine-plagioclase phyric basaltic rocks from the Pacific Plate along a fault running parallel to the Aleutian deep-sea trench, caused by bending of the plate just before it is subducted. We then dredged Adams Seamount, a guyot, located directly outboard of the Aleutian Deep-sea Trench. Guyots are characterized by steep flanks and a flat top, representing former ocean island volcanoes. When the volcano becomes inactive, it is eroded to sea level and wave activity forms a plateau on its summit. When the crust below the volcano cools, it subsides deep beneath the sea surface. The full dredge from Adams Seamount contained pillow lavas with glassy rinds and hyaloclastites (a rock formed from pieces of volcanic glass), characteristic of submarine eruptions of lava, as well as subaerially-erupted oxidized soria, providing direct evidence that it once had indeed formed an ocean island volcano (see photos). Thereafter, we crossed the Aleutian trench once again and carried out several successful dredges on the lower slopes of the subduction-zone forearc and deepest parts of the walls of Adak and Amchitka Canyons. The samples included a wide variety of rocks typical for arc volcanoes. The petrologic sampling was very successful during the first week of the cruise.

The biology program of SO249 aims at collecting marine fauna from both hard rocks and sediments to determine the benthic biodiversity south of the Aleutian Islands and of the incoming Pacific Plate. Due to the nature of the sampling equipment (chain sack dredge, see photo), only a selected part of the benthic macrofauna can be obtained. However, numerous organisms such as sea cucumbers, brachiopods, bivalves, or bristle worms use rocks as their preferred substrate for dwelling. Hence, every single rock brought up during dredging is screened before geological processing. In addition, the chain sack dredge includes four metal tubes that sample the sediment while the dredge is moving across the seafloor. This sediment includes so-called meiofauna, i.e. organisms living in the seawater between the sand grains. Biological sampling during the first week was very successful, in particular on Adams seamount and at the base of Adak Canyon (see photos).

Everyone on board is doing well and sends their greetings.

Kaj Hoernle (chief scientist SO249) and the cruise participants

During departure, a curious, young bald eagle visited the R/V SONNE. (Alexander Ziegler).

One of the many humpback whales that escorted the R/V SONNE out of Dutch Harbor. (Gene Yogodzinski).

A piece of subaerial scoria from Adams seamount (ca. 3,600 m depth). (Kaj Hoernle).

Seamen of the R/V SONNE maneuver a full dredge from the base of Adak Canyon onto the ship's deck. (Kaj Hoernle).

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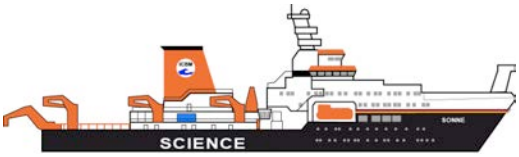
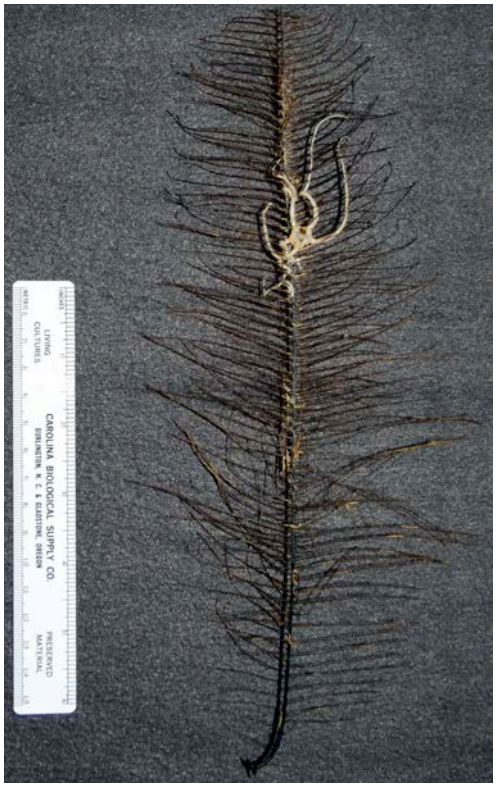
SO-249 Leg 1
BERING

Weekly Report No. 1
(5.06. – 12.06.2016)



R/V SONNE
50°30´ N / 179°45´ E



A deep-water coral associated with a brittle star found on a volcanic rock sampled on Adams seamount (ca. 3,700 m depth). (Alexander Ziegler).

A yet unidentified crustacean sample from within the sediment layer found at the base of Adak Canyon (ca. 4,000 m depth). (Alexander Ziegler).

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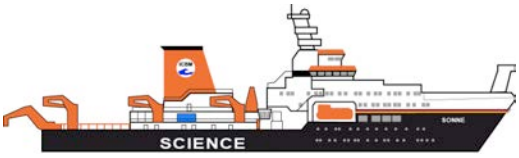
	SO-249 Leg 1 **BERING** **Weekly Report No. 2** **(13.06. – 19.06.2016)**	 **R/V SONNE** 52°08´ N / 174°30´ E

On board the R/V Sonne, we had a short week, since we skipped Monday after crossing the 180° meridian. Therefore the day shift went to bed on Sunday and woke up on Tuesday. On board we use UTC (Coordinated Universal or Greenwich Time), so the missing day does not show up in any of the cruise-related reports.

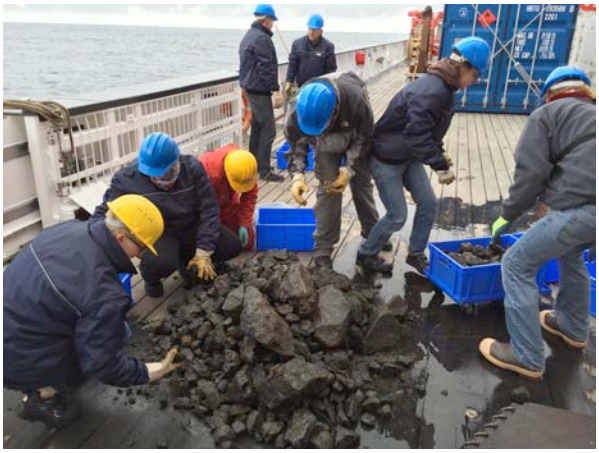
On June 13 we left Amchitka Canyon at the southern side of the Aleutian Arc and crossed the Aleutian Deep-sea Trench onto the Pacific Plate. We attempted to sample three seamounts south of the trench. From one seamount, we recovered volcaniclastic, plutonic and metamorphic rocks. Although some of the samples are subangular, others are well rounded, suggesting that they were transported by glaciers and dropped onto the seamount when the glaciers melted. Such rocks are referred to as dropstones. On June 4, we reached the Rat Fracture Zone, oriented north-south and thus perpendicular to the trench. The fracture zone consists of two parallel troughs elongated north-south with an elevated region in between. The elevated region was divided into narrow east-west oriented ridges. We interpret this as an uplifted block between splays of the Rat Fracture Zone that was divided into east-west oriented ridges through faulting caused by the bending of the subducting plate south of the trench. Four dredges along the Rat Fracture Zone brought up a variety of volcanic (basalts and volcaniclastic rocks) and plutonic (diorites) rocks including manganese crusts.

On June 16, we crossed the trench again and began dredging in Murray Canyon, located southwest of Kiska Island. All eight dredge hauls were successful, bringing large amounts of rocks on deck (see photos). Six of the dredge hauls were carried out along the base of the western, northern and southern canyon walls. Along the NE wall of the canyon, two shallower dredge halls formed a profile with one of the deeper dredges extending from the base of the canyon to intermediate canyon depths. A wide variety of plagioclase-clinopyroxene-amphibole-olivine-mica phyric volcanic rocks, dioritic to gabbroic intrusive rocks, and a variety of sedimentary rocks were recovered with many very fresh samples. Unfortunately our deepest dredge track thus far at the base of the forearc slope, just above the sediment fill in the trench, brought up a third a dredge of consolidated mud. Thus far the dredging has proceeded exceptionally well with 83% of the dredge hauls being successful.

The second week of the cruise resulted in more biological samples being brought up from the North Pacific seafloor, including some organisms caught while the dredge was being brought back to the surface. Apart from the very successful sediment sampling aimed at obtaining meiofaunal organisms, the dredging stations in and around the Rat Fracture Zone, south of the Aleutian Trench, did not yield any macrofauna. However, the sampling stations in Amchitka and Murray Canyons north of the Aleutian Trench were rich in macrofaunal organisms. The specimens collected represent a wide taxonomic range of zoological samples (see photos), including bristle worms (Polychaeta), sea cucumbers (Holothuroidea), sponges (Porifera), brittle stars (Ophiuroidea), crustaceans (Crustacea), sea lilies (Crinoidea), moss animals (Bryozoa), and jellyfish (Cnidaria). The latter usually get entangled in the dredge's metal cable during uplift - the last sample taken was probably a specimen of the highly toxic Portuguese man o' war (Physalia physalis, Siphonophorae). In the meantime, Dr. Hiroshi Senou, an ichthyologist at the Kanagawa Prefectural Museum of Natural History in Japan was able to identify the "mysterious" specimen dredged up at Adak Canyon and pictured in the last weekly report: instead of being part of a crustacean's carapace or leg, this sample represents part of the skull of a deep sea predatory bony fish (see photo), either from a snake mackerel (Gempylidae) or a frostfish (Trichiuridae).

The weather on the cruise thus far has primarily been cool, foggy and rainy. Despite rarely seeing the sun and the hard work, everyone on board is doing well and in high spirits.

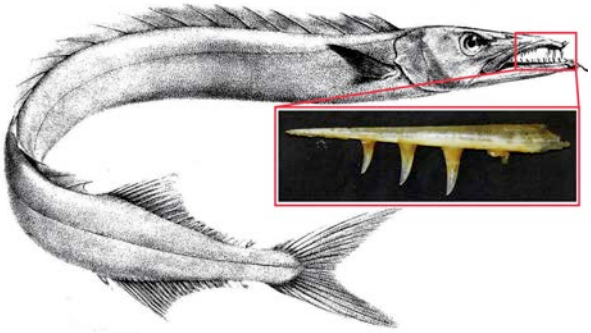
Kaj Hoernle (chief scientist SO249) and the cruise participants



It was a busy week on board. (Kaj Hoernle)

Sawing rocks is a dirty job. (Kaj Hoernle)

Despite the hard work, the scientists are still in very good spirits. (Kaj Hoernle)



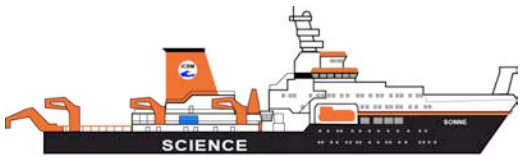
The "mysterious" specimen dredged from Adak Canyon last week was identified as part of the jaw of either a snake mackerel or a frostfish. (Alexander Ziegler)

In Amchitka and Murray Canyons, multiple bristle worm tubes where found. The animal itself with its large tentacle crown can be extracted from its protective tube using forceps. (Alexander Ziegler)

The benthic fauna in Amchitka and Murray Canyons also included two brittle star species. (Alexander Ziegler)

SO-249 Leg 1
BERING

Weekly Report No. 3
(20.06. – 26.06.2016)



R/V SONNE
51° N / 172° E

An important goal of the two SO249 cruise legs is to determine if the Aleutian Volcanic Front can be traced continuously from the Ingenstrem Trough, west of Buldir Island (US), to Piip Volcano, north of Bering Island (Russia) in the westernmost Aleutians. From June 19 to June 20, we added to previous mapping looking for young submarine volcanic centers west of the Ingenstrem Trough, but found no new centers until we approached the Western Cones Region, which was discovered on the R/V SONNE 201/1b KALMAR Expedition. There we found several new cones aligned in a perfect linear array along a young fault cutting the uppermost sedimentary sequence and recovered largely rhyodacites, presumably melts of the subducting Pacific Plate. We then proceeded southwards to the Kresta Ridge, which is a steep fault scarp bounding the northern side of a deep graben with a relief of up to 1.7 km. The fault appears to be an extension of the Bering Fault system that forms the northern margin of the plateau on which the Komandorksy Islands (Bering and Medny) are located and is believed to have a large right-lateral strike-slip component of movement, due to the highly oblique subduction of the Pacific Plate beneath the westernmost Aleutians. Here we carried out three successful dredges recovering volcaniclastic rocks, a variety of lavas, and gabbroic rocks cut by small basaltic dikes. Age dating and geochemical analyses of these rocks will clarify if they preserve information about the early history of the Aleutian arc.

On June 21, we returned to the Aleutian forearc and carried out several deep dredges to depths of up to 6.7 km at the nose of the forearc, largely recovering volcaniclastic material and sedimentary rocks. We then crossed the trench to the northwestern tip of the Stalemate Fracture Zone and mapped the large fault block that had been previously sampled at its southern end during the SO201/1b cruise. The mapping revealed evidence for a complex history of faulting of this block and showed that this block forms a barrier in the Aleutian Deep-Sea Trench, separating sedimentary material derived from North America from that derived from Siberia. On the previous SONNE cruise, dunitic rocks (primarily consisting of >90% olivine) were recovered and were interpreted to have been previously exposed to subaerial conditions, based on their alteration style. The proposed large-scale vertical tectonic movements of “several thousand meters” were met with much skepticism. Subaerial exposure, however, has now been confirmed, as will become evident below. Our first dredge June 23 was half full and contained a wide array of rocks ranging from ultramafic samples (olivine orthopyroxenites to harzburgites) to plutonic rocks (gabbros, diorites and possibly plagiogranites) to basaltic volcanic rocks. These rocks, present in a single dredge, represent a cross-section through the entire ocean crust into the uppermost mantle, providing invaluable information about the composition of the entire crustal and upper mantle input into the subduction zone, one of the major goals of the Bering project. A quarter-full dredge from the top of the tectonic block was even more exciting than the first dredge. Although we expected to sample pillow basalts, representing the uppermost portion of the ocean crust, we again recovered the complete section through the ocean crust and upper mantle (see photo), with many of the rocks being rounded river/beach cobbles (see photo) and coarse-grained sandstones of the major rock types in the dredge. The cobbles and sandstones provided direct confirmation that this block had indeed undergone major tectonic uplift, such that even lower crustal and upper mantle rocks were emergent and formed, at some point in their history, part of an island. If we use an average oceanic crustal thickness of 6-7 km and add this to the water depth of similar aged seafloor of ~5 km, then the vertical tectonic uplift has to have been ≥11 km followed by down-dropping of ~5 km (present-day depth) of this ~70 km long by ~25 km wide tectonic block.

After carrying out more dredging in the forearc of the Aleutian subduction zone on June 24-25, we again crossed over to the Pacific Plate and mapped the remaining portion of the Stalemate Fracture Zone and began dredging again late in day on June 26. The long mapping exercise provided the first day off for the scientists since the beginning of the cruise and allowed a shift

rotation, such that the scientists working at night are now working during the day and vice versa. It also provided an excellent opportunity for the midway party, enjoyed by both crew and scientists.

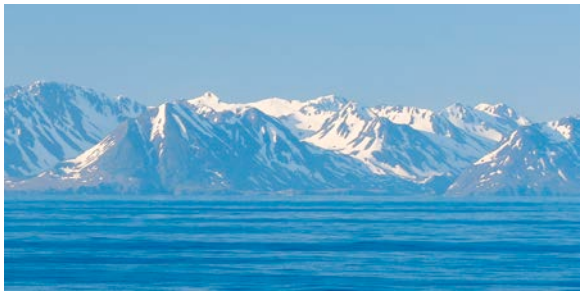
Biological sampling in the third week of the cruise resulted in about a dozen new sediment samples with associated meiofauna from various stations surrounding the island of Attu. As in the previous two weeks, the bathymetric range of the sampling (2,000-7,000 m) was impressive and is certainly bound to lead to one or the other new discovery. In addition, a large variety of macrofaunal organisms was found, including echinoderms (Echinodermata), crustaceans (Crustacea), sponges (Porifera), bristle worms (Polychaeta), moss animals (Bryozoa), corals (Cnidaria), lamp shells (Brachiopoda), and sea squirts (Tunicata). One of the notable specimens was a sea cucumber found at about 3,500 m depth on one of the submerged cones NW of the island of Attu (see photo). Another interesting specimen was found at about 6,500 m depth and is likely to be a representative of a group of sea squirts (Tunicata) called Stolidobranchiata - it might actually be one of the few members of this group that evolved a predatory lifestyle (see photo). Further analyses at the Museum für Naturkunde in Berlin, where all biological samples will be sent, will reveal more details about all the biological specimens.

On Saturday June 25, while dredging south of snow-covered Attu Island (see photo) and west of the barren Agattu Island, we passed out of the fog for several hours and were able to bask in the sun with gorgeous views of the islands before returning to the fog and cold. The seas have remained amazingly calm and the exciting work, beautiful island views, midway party with gorgeous sunset (see photo), and day off (at least for most scientists) have assured that everyone on board continues to do well and remain cheerful.

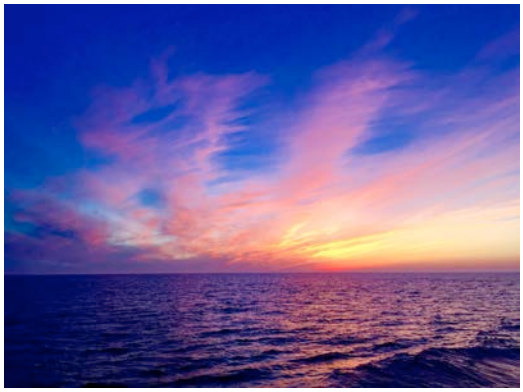
Kaj Hoernle (chief scientist SO249) and the cruise participants

Russian colleagues are excited about recovering an entire cross section from the upper mantle (foreground) through the lower crust (middle) to the top of the ocean crust (background) from the Stalemate Fracture Zone. (Kaj Hoernle)

Olivine (altered to orange) orthopyroxenite (bottom) and gabbro (top) from the lower ocean crust. Samples on left are river/beach cobbles, providing evidence that the top of the Stalemate Fault block once formed an island. (Kaj Hoernle)



A rare view of the snow-covered Attu Island on the nicest evening of the cruise thus far (Gene Yogodzinski)



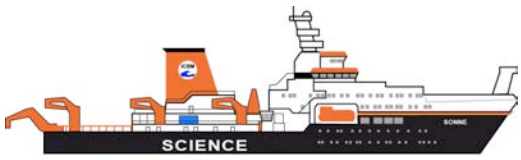
Gorgeous sunset to accompany the midway party. (Kaj Hoernle)

This ca. 25 cm long sea cucumber was brought up from a depth of about 3,500 m. As a defensive reaction, the animal has expelled part of its intestines. (Alexander Ziegler)

This stalked colonial tunicate was dredged at about 6,500 m depth in the Stalemate Fracture Zone. (Alexander Ziegler)

SO-249 Leg 1
BERING

Weekly Report No. 4
(27.06. – 03.07.2016)



R/V SONNE
51° N / 172° E

The fourth week of the cruise focused on the northwest Pacific Plate. We continued our multi-beam mapping of the seafloor and carried out 24 dredge hauls. We spent June 27-28 sampling the southeast portion of the Stalemate Fracture Zone that we had mapped during the shift change the week before. The dredges brought up primarily basaltic rocks. These included both pillows, some with glassy rinds, and subvolcanic rocks, probably parts of the sheeted dike complex. Dioritic to gabbroic rocks and a variety of sedimentary rocks were also recovered. Thereafter we proceeded to a seamount province between the Stalemate FZ and the Emperor seamounts. Almost all of these seamounts are named after Japanese emperors. Nothing is known about this fairly dense province of large seamounts. In contrast to the nearby Emperor Seamounts, they don't appear to form part of a hotspot track, because they are randomly distributed rather than forming a line as is typical for hotspot tracks. The seamounts range from conical-shaped to ridge-like structures and some appear to be guyots. We successfully sampled four seamounts, recovering basaltic rocks with phenocrysts of olivine, plagioclase and/or clinopyroxene and a hyloclastite sample, which may contain fresh glass. Since June 30, we have been mapping and sampling Detroit, Hanzei and Suizei Seamounts, which belong to the Emperor Seamount Chain. Although sampling was extremely difficult due to the thick (up to 20 cm) Mn pavement on these Cretaceous seamounts, we recovered the first ever samples from Hanzei Seamount (basaltic clasts in a Mn covered breccia), as well as olivine-plagioclase basalts from the eastern and western flanks of Suizei Seamount.

The biological specimens recovered during the fourth week of the cruise again represent a wide range of the marine invertebrate fauna of the deep sea. The fact that we were able to recover a large number of macroscopic zoological specimens despite the use of a chain sack dredge built primarily for geological sampling is indicative of the relatively rich deep sea fauna in this area of the North Pacific. In addition, sampling of the meiofauna continued with the usual success, with now over 70 sediment samples taken along our trajectory from Dutch Harbor to Petropavlovsk-Kamchatka. Among the notable larger zoological specimens found during the last week (see photos) was a goose barnacle (Crustacea) attached to the stem of a sponge (Porifera), a fairly intact deep-sea coronate medusa (Cnidaria), and a gorgonian deep-sea coral (Alcyonacea) with half a dozen associated brittle stars (Ophiuroidea). However, the crew's weekly favorite was a large specimen belonging to a group of odd-shaped sea cucumbers (Holothuroidea), the Elasipodida.

Since the gorgeous evening that accompanied our halfway party, the weather has been gray, foggy and rainy again, although we did get about three minutes of sun today. On the bright side, the seas have remained remarkably calm and we have not lost any time to bad weather thus far. All on board are doing well and send greeting to those at home.

Kaj Hoernle (chief scientist SO249/1) and the cruise participants

The chief engineer explaining why scales don't work on board during a tour through the bowels of the ship, where the engine rooms, diesel engines, electric generators, screw schafts, pump jet, thrusters, stabilizers, water cleaning system and much more are located. This is a "Safe to Port" ship, in which all systems are duplicated, so that if one fails there is a backup system so that the ship can return safely to port. (Kaj Hoernle)

Half a dredge of glacial dropstones. It contained an incredible variety of primarily continental-derived rocks, including granites, an array of metamorphic rocks and a variety of sedimentary rocks. No two rocks in the dredge were alike or as a Russian colleague put it: "None of the rocks had a brother or sister." Getting multiple rocks with similar mineralogy and texture is an important criteria for determining if the rocks could have been in situ. (Kaj Hoernle)

An American colleague appealing to the scientific crew to accept his view of Aleutian subduction zone geodynamics. (Kaj Hoernle)

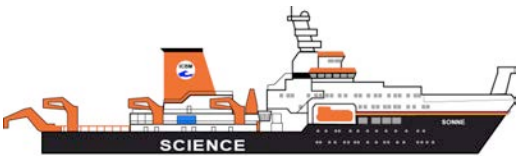
Eating on board can be fun, for example such a nicely packaged vegetarian meal. (Kaj Hoernle)

This large goose barnacle - presumably a member of the Lepadidae - was caught on the Stalemate Ridge at about 3,000 m depth. (Alexander Ziegler)

Jellyfish can also be found in the deep sea. This so-called coronate medusa (*Atolla* sp.) was dredged at about 3,200 m depth S of Detroit seamount. (Alexander Ziegler)

This gorgonian deep-sea coral dredged at about 2,200 m depth on Detroit seamount provided shelter for six brittle stars. (Alexander Ziegler)

This odd-shaped specimen is in fact a member of a group of sea cucumbers predominantly found in the deep sea. It was captured on Detroit seamount at about 4,100 m depth. (Alexander Ziegler)

	SO-249 Leg 1 **BERING** **Weekly Report No. 5** **(4.07. – 10.07.2016)**	 **R/V SONNE** 49°30' N / 163° E

The fifth and final full week of the cruise focused on mapping and sampling the northwest Pacific Plate subducting beneath the Kamchatka Volcanic Arc. From July 4-6, we continued mapping and carried out six dredge hauls on the large Tenji Seamount Complex. Although the weather didn't allow us to barbecue on deck, the cooks prepared a spectacular feast of grilled meat, fish and vegetables, so that the Americans on board wouldn't miss out on a traditional fourth of July celebration. Late in the evening on July 6, we reached the Krusenstern Fracture Zone and recovered pillow basalts and possibly some fresh glass from the upper Pacific ocean crust at several locations. On July 9-10, we mapped and sampled the seafloor south of the Krusenstern FZ. This work will continue through Tuesday July 12, which will mark the end of our work program on SO249 Leg 1. As of Sunday afternoon, we completed 90 dredge hauls of which 74 (=82%) yielded volcanic, plutonic, ultramafic and/or sedimentary rocks.

The fifth week was again successful with regard to biological sampling. As the previous weeks had shown, dredging on seamounts leads to very interesting findings. Of particular interest were samples obtained on Tenji seamount at depths from about 3,000-4,500 m. One dredge brought up a large array of deep-sea corals (Alcyonacea), many of which had unusually large brittle stars (Ophiuroidea) among their branches. However, the absolute star this week was an almost fully intact specimen belonging to a group of cephalopods (Cephalopoda) called cirrates (Cirrata). In fact, this adult specimen belongs to the genus *Grimpoteuthis*, a group of cirrates colloquially known as dumbo octopusses (see photos). The further dredging operations along the Krusenstern Fracture Zone then brought up a large amount of different kinds of deep-sea sponges, with some of these samples being tube-shaped (see photo) and others resembling large, stalked mushrooms with a crown of almost 40 cm width. In conclusion, it must be stated that biological sampling during this first leg of the cruise was unusually successful (see photo) and will result in many months of further analysis, and hopefully a large number of interesting scientific publications.

All of the major goals of the SO249 cruise leg 1 were achieved. These included mapping and hard-rock, sediment and biological sampling of 1) the oldest, accessible parts of the Aleutian subduction zone, 2) the present-day volcanic front in the western Aleutians, and 3) the input (subducting Pacific Plate) into the Aleutian and Kamchatka subduction systems, including sediments, volcanic and plutonic ocean crust, exposed upper mantle ultramafic rocks underlying the crust and the full range of intraplate volcanic seamounts.

On July 13, we will cross into the Russian Exclusive Economic Zone (EEZ), arriving in Petropavlovsk-Kamchatsky early in the morning of July 14. Nine of the present scientific crew will disembark in Petropavlovsk on July 15 and will be replaced on July 16 by 14 new scientists, primarily from Russia, to carry out SO249 Leg 2 to the westernmost Aleutians and the Chukotka margin of the Bering Sea.

Special thanks go to Captain Mallon and his crew for assuring the success of this cruise leg!

On behalf of the scientific crew
Kaj Hoernle

Catch of the day: biologist retrieving fragile deep-sea corals out of the chain bag dredge. (Kaj Hoernle)

Excited geologists fascinated by the biological catch of the day: A fully intact dumbo octopus from the deep sea caught in a chain bag dredge. (Kaj Hoernle)

Work on board never stops. At 2:00 a.m., the night shift attentively waits while one of the scientists washes the mud from the dredge overboard, so that they can get to the rocks. (Kaj Hoernle)

Upon reaching the deck, it was suddenly clear why there had been an extra five tons of tension on the dredge while it was on the seafloor. Luckily, the dredge proved stronger than the old fishing net, won the struggle and safely returned on board. (Kaj Hoernle)

The SO-249 Leg 1 scientific party.

An exceptionally well-preserved adult specimen of a dumbo octopus was caught at about 4,200 m depth on Tenji seamount. (Alexander Ziegler)

The underside of the octopus. One of its eight arms appears to have been injured before it was caught in the dredge, which might explain why it couldn't escape. (Kaj Hoernle)

A piece of a larger, tube-shaped sponge found near the Krusenstern Fracture Zone at over 5,000 m depth. (Alexander Ziegler)

After five weeks of dredging operations, several drums are now brim-full with sediment samples and biological specimens that are awaiting further analysis back home. (Alexander Ziegler)

SO-249 Leg 1+2
BERING

Weekly Report No. 6
(11.07. – 17.07.2016)

R/V SONNE
52°47´N / 159°28´E

The 6th week of R/V SONNE's cruise SO-249 was characterized by our port call in Petropavlovsk-Kamchatsky, the capital of the Russian region of Kamchatka. On Tuesday, July 12th scientific operations of the first leg of SO-249 ended with two dredges in more than 5,500 m depth at an unnamed fracture zone located west of the northern Emperor Seamounts and southeast of the southern Kamchatka Peninsula ('N/N Fracture Zone'). We then headed towards Petropavlovsk, which is nestled at the northern edge of Avacha Bay. During the morning of the July 14th, R/V SONNE entered Avacha Bay under cloudy skies and arrived at the pier in the afternoon (see photos). This was the first stay of the new R/V SONNE in Russia, and - according to our knowledge - the first port call ever of a German research vessel in Petropavlovsk. During the following two days in the harbor, nine scientists left the vessel for their return trip home, and 15 new, primarily Russian colleagues came on board. In addition, two groups of scientists of the Russian Institute for Volcanology and Seismology in Petropavlovsk (IVS FEB RAS) visited R/V SONNE and attended crew- and scientist-led tours that were met with great interest. Finally, apart from the usual harbor operations, crew and scientists of the ship took part in an excursion organized by our Russian friends to Termalny, a village known for its hot springs located about an hour's drive southwest of Petropavlovsk. We thoroughly enjoyed bathing in the warm, mineral-rich waters and ended the evening with a nice barbeque.

On Sunday afternoon, R/V SONNE left Avacha Bay and continued its scientific cruise heading north, where we shall conduct further investigations of the Russian parts of the Bering Sea. Here, we will be dredging canyons that deeply cut into the southern flank of the so-called Komadorsky block, a formation on which the western-most islands (Medny and Bering) of the Aleutian chain are located. We hope to retrieve old rocks that can provide us with new data on the inception and early geological history of the Aleutian Arc. In the following days we will pass through the island arc to sample young submarine volcanoes immediately north of the islands. These dredging operations are intended to tackle the questions of whether and how the composition of the lavas of the Aleutian volcanoes changes along their western expanse. These data are, among other aspects, needed to reconstruct the physical and chemical parameters during magma generation in this area. This is of particular interest, because the subducting Pacific plate is here moving almost parallel to the Aleutian Arc. Furthermore, sampling of submarine structures is the only way to get insight into recent magmatic processes in this area since the western-most Aleutian islands are uplifted tectonic blocs and young volcanoes do not exist on the islands.

After five weeks at sea, the visit to Petropavlovsk and its surroundings was a welcome and relaxing respite for all on board. Unfortunately, the weather in Petropavlovsk was - with temperatures around 60°F, low clouds, and frequent rain - quite unfavorable. However, near the end of the second leg of cruise SO-249 we will again enter Avacha Bay and then will have a second chance to see the massive volcanoes – some of the largest and most active subduction volcanoes on Earth - that encircle Petropavlovsk. All scientists are well and send their greetings to those at home.

Reinhard Werner (chief scientist) and the cruise participants

R/V SONNE on its way to the pier in the port of Petropavlovsk. The cranes were produced in the ex-GDR. The pier is dotted with bags that contain mining products. (Gesine Wellschmidt)

A Russian tugboat is pushing R/V SONNE gently towards the pier. (Alexander Ziegler)

A view of R/V SONNE with Avacha Bay in the background taken from Leninskaya Street. (Alexander Ziegler)

The town Petropavlovsk was named after the two ships of Vitus Bering, namely the 'St. Peter' and the 'St. Paul'. The monument pictures the two saints. (Alexander Ziegler)