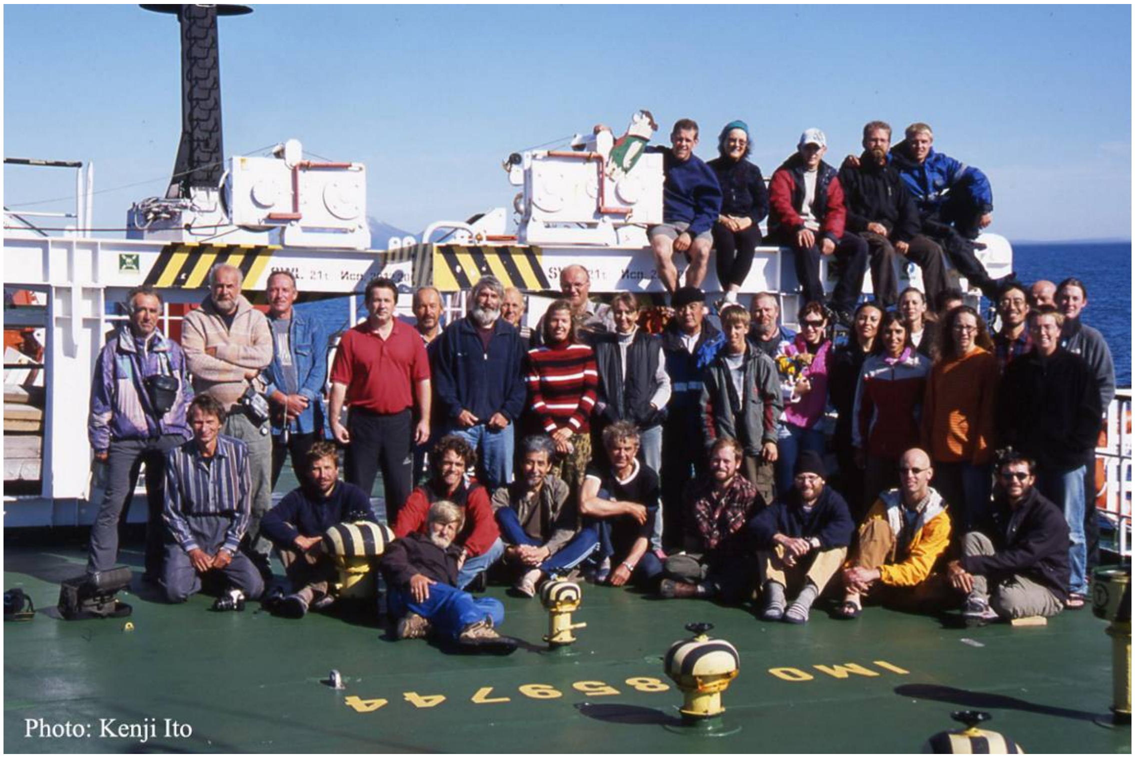
The Kuril Biocomplexity Project – First Annual Report – 2005-2006

Birds in flight near the shores of Matua Island.

NSF 0508109, PI: Fitzhugh; co-PIs: Anderson, Bitz, Bourgeois, and Holman
University of Washington
Report for Project Year 1: September 15, 2005 to September 14, 2006
Report Date: 1/19/2007

Activities and Findings:

I. General Overview



International field researchers and the ship's crew aboard the research vessel 'Gipanis'

In the first year of this project, efforts have been divided between building the simulation model structure, planning for fieldwork, and conducting the first field season.

Collaborators from the University of Washington and University of Alaska Fairbanks spent two academic quarters (Winter and Spring 2006) working together in seminars and meetings to refine the structure and approach for interdisciplinary modeling simulations and to identify mechanisms for integration of interdisciplinary data. These efforts were critical both as steps towards our modeling goals, but also to ensure that the data collected in our first field season would be properly scaled and suitable for the integrative modeling needs of the project. Progress to date on the model construction includes the development of a GIS basemap of the Kuril Islands; background research into the ecological dynamics among and between Kuril marine food webs, terrestrial food webs, earth processes (volcanic eruptions, earthquakes, and tsunamis), and climate and ocean conditions; and construction of modules of the simulation. This effort was facilitated by the work of three paid graduate student research assistants and teams of PIs/senior researchers and students in the context of an intensive seminar run during Winter Quarter through the University of Washington's Quaternary Research Center and during Spring Quarter through the University of Washington's Atmospheric Sciences Department (see Section II – below).

Summer 2006 was spent in the first of three project field expeditions to the Kuril Islands. In addition to the ship crew on the Russian ship "Gipanis", this expedition included 21 scientists, 8 graduate students, 4 undergraduate students, a middle school teacher and a photographer – 35 project participants in all (see Table 1). This group spent 43 days (July 18 to August 30) visiting the Kuril Islands and conducting archaeological, geological, and paleoecological field investigations on a number of islands from the southernmost end of Kunashir to the northernmost island of Shumshu (a linear distance of 1140 km). In an effort to maximize the amount of research performed in a limited time frame, teams of archaeologists, geologists, and paleoecologists were deployed in remote field camps for periods of up to two weeks in promising locations while the ship took the remaining participants to other sectors of the archipelago for more rapid scientific surveys. Teams went to shore at approximately 35 locations throughout the archipelago.

TABLE 1: **Kuril Biocomplexity Project: Participant list 2006**

Russians:	
1	Shubin, Valery Orionovich (SRM-Sakhalin Regional Museum, Y-S)-Archaeologist
2	Shubina, Marina Ivanovich (SRA-Sakhalin Regional Archives, Y-S)-Ethnohistorian
3	Golubtsov, Vladimir (SRM) - archaeologist
4	Vasilenko, Nikolai Fedorovich (IMGG-Institute of Marine Geology and Geophysics, Y-S)- geophysicist
5	Toropova, Natalya Vitalevna (SRM) - archaeologist
6	Rybin, Alexander Viktorovich (IMGG)
7	Razzhigaeva, Nadezhda Glebovna (PIG-Pacific Institute of Geography, Vladivostok)
8	Belousov, Alexander Borisovich (IOG-Institute of Ocean Geology, Moscow)
9	Koroteyev, Igor Gennadyovich (IMGG)
10	Kharlamov, Andree, Alexandrovich (IMGG)
11	Minyuk, Pavel Sergeyevich (NEISRI- North-East Interdisciplinary Research Institute, Magadan)

12	Pakhamov, Alexander Yurievich (NEISRI)
13	Lozhkin, Anatoly Vladimirovich (NEISRI) - paleoecologist
14	Klitin, Andree Konstantinovich (SIF- Sakhalin Institute of Fisheries, Y-S) – entomologist/ecologist
15	Pinegina, Tatiana Konstantinovna (IVGG- Institute Volcanic Geology and Geochemistry, P-K) – sedimentologist/tsunamist
16	Frolov, Dmitri Igorevich (PTI- Physical Technic Institute, St
17	Kravchunovskaya, Ekatarina (IVGG- Institute Volcanic Geology and Geochemistry, P-K) – sedimentologist/tsunamist
18	Nyushko, Tatiana - botanist/ecologist
19	Shubin, Dima Valerionovitch - undergraduate student
Americans:	
20	Anderson, Patricia (UW) - paeloecologist
21	Berkey, Dena Hillard (UW) - undergraduate student
22	Bourgeois, Joanne (UW) – sedimentologist/tsunamist
23	Einhorn, Jesse (UW)- undergraduate student
24	Etnier, Michael A
25	Fitzhugh, John Benjamin (UW) - archaeologist
26	Hezel, Paul Joseph (UW) - graduate student
27	MacInnes, Breannyn Teal (UW) - graduate student
28	Martin, Maria Elizabeth (UW) - graduate student
29	Nikula-Ohlsen, Misty (UW, honorary) – teacher
30	Phillips, Stephan Colby (UW) - graduate student
31	Taylor, James William (UW) - graduate student
32	Walsh, Matthew Joseph (UW) - undergraduate student

Japanese:	
33	Amano, Tetsuya (HUM- Hokkaido University Museum, Sapporo) - archaeologist
34	Tezuka, Kaoru (HMH- Historical Museum of Hokkaido, Sapporo) – ethnohistorian/archaeologist
35	Ito, Kenji (Sapporo) - photographer


Photo: Kenji Ito

Golubtsov at high elevation on Paramushir Island.

The following sections detail the specific activities and preliminary results of each research team:

II. Simulation Modeling:

Team:

Dr. Darryl J. Holman, co-PI and team leader
Megan Carney, graduate student
Adam Freeburg, graduate student

General Objectives:

One major component of the project is the development of an agent-based simulation model that will be used to investigate human population dynamics and ecology over time. The final simulation model will include (1) a geographical grid with initial simulation conditions, (2) an ecological simulator that determines changes in distributions of each biological species from one time period to the next, (3) a climate generator, (4) a geological events generator, and (5) a human agent component.

Primary Output in Year one:

Over the past year, Holman and two graduate students have developed the core of the simulation model. The current version of the program is coded in about 22,000 lines of Pascal. The core program is capable of reading in and manipulating a geographic description of the islands. The grid and initial conditions are exported from ArcGIS as text files and read by the simulation program. Adam Freeburg compiled the basemap coverages for the GIS in Winter 2006. The ecological simulation component has been developed and is currently undergoing testing and validation with fictitious species. Coding for the climate and geological events generators has not started, although some design work has been undertaken. Work on the human agent component has not yet begun.

In support of the modeling initiative, we ran "modeling seminars" in Winter and Spring 2006 to link the modeling component of this project with the interdisciplinary science and to ensure field data would be appropriately calibrated to the developing model. The first was run as a Quaternary Research Center Winter Seminar (QUAT 504A) with 10 graduate students and 2 undergraduates. The second was run as an Atmospheric Sciences seminar in Spring 2006 with 8 graduate students and 2 undergraduate. These interdisciplinary sessions provided a context for project scientists and students to work on the integration and data resolution issues critical to successful synthesis and modeling. The success of the modeling depends on shared knowledge across the teams about the nature of input parameters and variables and the kinds of output that are both desirable and necessary for effective model performance. These were very useful venues for project development and will continue throughout the duration of the project.

III. Archaeology

Surface artifacts at the Berezovka archaeological site, Iturup Island.

TEAM:

DR. BEN FITZHUGH, PI/PROJECT DIRECTOR AND AMERICAN TEAM LEADER
DR. VALERY SHUBIN, LOGISTICS DIRECTOR AND RUSSIAN TEAM LEADER
DR. TETSUYA AMANO, JAPANESE TEAM LEADER
DR. MICHAEL ETNIER, ZOOARCHAEOLOGIST
DR. KAORU TEZUKA, ARCHAEOLOGIST AND ETHNOHISTORIAN
VOLODYA GOLUBTSOV, ARCHAEOLOGIST
MARINA I. SHUBINA, ETHNOHISTORIAN
NATASHA V. TOROPOVA, MUSEUM TECHNICIAN

COLBY PHILLIPS, GRADUATE STUDENT
JAMES TAYLOR, GRADUATE STUDENT
DENA BERKEY, UNDERGRADUATE STUDENT
MATT WALSH, UNDERGRADUATE STUDENT
DIMA V. SHUBIN, UNDERGRADUATE STUDENT

In addition, we had the help of Misty Nikula-Ohlsen, resident middle-school teacher, Paul Hezel (graduate student) in atmospheric sciences, and Kenji Ito, professional photographer. We interacted with all other teams. We consulted and worked closely together with members of the Coastal Processes team, who described the sedimentological attributes of many stratigraphic sections through archaeological deposits as well as sections and profiles near archaeological sites. We also consulted with other teams to assure agreement in sampling and other protocols.

PRIMARY OBJECTIVES IN YEAR 1 FIELD SEASON:

1) to develop a chronological framework for archaeological sites throughout the Kuril Islands;
2) to locate, map, and sample archaeological sites throughout the Kurils;
3) to collect zooarchaeological materials from preserved midden deposits at these sites;
4) to develop an understanding of environmental events and processes that affected human occupation and site preservation through collaboration with geology and paleoecology teams.

FIELD ORGANIZATION:

Typically we worked in teams of between 2 and 6 researchers scouting for archaeological traces, documenting sites and collecting samples. Often one or more participants remained on the ship to process collections (catalog, clean, and organize).

Fitzhugh, Shubina, Taylor, and Etnier record and sample an archaeological site on Iturup Island. The research vessel ‘Gipanis’ is anchored in the distance.

ARCHAEOLOGICAL NARRATIVE:

In the course of the field expedition, 42 archaeological sites were documented, with 20 of these being new discoveries. Documentation included recording site location and size, mapping surface features (e.g., house depressions, artifact scatters, eroding exposures, and abandoned historic period features), and excavating test pits or cleaning off erosion exposures. Excavations of test pits and eroding sections involved recording stratigraphy, and collecting artifacts, faunal material, charcoal, and various sediment samples such as volcanic tephra and dune sand for stratigraphic and luminescence dating, respectively. Photography was used to document interesting aspects of site layout, stratigraphy, and the context of material remains. Video was used occasionally for this purpose as well.

Collections were documented and returned to the ship for cleaning, cataloging and preliminary analysis. Artifacts collected included pottery fragments, stone tools, chips of stone, and occasionally, bone, wood, or iron tools or tool parts. Table 2 summarizes the archaeological collections made by University of Washington and Sakhalin Regional Museum participants. Additional samples from the volcanological team (Institute of Marine Geology and Geophysics) and paleoecological teams (UW and Northeast Interdsiciplinary Sceintific Research Institute, Magadan) are not included in this report.

TABLE 2

Material Type	***Number of Bags***	***Repository***
Charcoal/Carbon for dating	217	University of Washington
Chipped stone	171	University of Washington
Metal	6	Sakhalin Regional Museum
Miscellaneous Materials	31	Sakhalin Regional Museum
Pottery	149	Sakhalin Regional Museum
Stone Tools	117	Sakhalin Regional Museum
Worked bone/ bone tools	12	Sakhalin Regional Museum
Worked Leather	1	Sakhalin Regional Museum
Worked wood/ wood tools	9	Sakhalin Regional Museum
Faunal samples	183	University of Washington
OSL samples	13	University of Washington
Water Samples	33	University of Washington

Archaeological sites were found in every region of the archipelago, and indeed on every island visited with the exception of Ketoy. Sites were even found on remote and small islands in the central chain, such as Yankicha and Ryponkicha (Table 3).

TABLE 3

Island name	***Site name***	***Date visited***	***Time periods represented***[1]	***Fauna sampled***
Iturup	Berezovka 1	7/23 – 7/24	2.1, 2, 2.3, 3	X
Iturup	Berezovka 2	7/24		
Iturup	Glush	7/30	1.4	

Iturup	Kubushevskaya 1	7/22	1.4	X
Iturup	Olya 1	7/29	1.4, 2.1, 3.3	
Iturup	Tikhaya 1	7/23	3	X
Kharimkotan	Kharimkotan 1			X
Kunashir	Alёkhina 1	7/28		
Kunashir	Danilova 2	7/28	2, 2.1, 3?	
Kunashir	Golovnina Beach Terrace 1	7/27		
Kunashir	Peschanaya 1	7/28	1.4	
Kunashir	Peschanaya 2	7/28		X
Kunashir	Rikorda 1	7/27		X
Kunashir	Sernovodsk 1	7/26		X
Kunashir	Spokoyny Creek	7/25		
Matua	Ainu Bay 1	8/09 – 8/11	4	X
Matua	Ainu Bay 2	8/09 – 8/11	2.1	X
Paramushir	Kokina Cape			
Paramushir	Okeanskoye			
Paramushir	Savushkina 1			X
Paramushir	Savushkina 2			
Paramushir	Trudnaya 1			
Paramushir	Tukharka 1			X
Paramushir	Vasileva			
Ryponkicha - Ushishir	Ryponkicha 1	8/10	3, 3.2	X
Shiashkotan	Beli Ruchey			
Shiashkotan	Drobnyye 1	8/13 – 8/14	2.1, 3.2	X
Shiashkotan	Grotovyye 1			
Shumshu	Baikova 1	8/18	3	X
Shumshu	Bol'Shoy 1	8/20	3.2	X
Simushir	Vodopadnaya 1			
Simushir	Vodopadnaya 3			
Simushir	Vodopodnaya 2			X
Urup	Ainu Creek	7/25, 7/31 – 8/01	2, 2.1, 3, 3.2	X
Urup	Fastritsa			
Urup	Kapsul	7/22	3.2	X
Urup	Kompaneski			
Urup	Osma			
Urup	Tokotan 1	8/02		
Urup	Tokotan 4	8/02	3.2	X
Urup	Vasino 1	7/31		X
Yankicha - Ushishir	Yankicha 1	8/10	5	
TOTAL	42			

1. Codes from Table 3.

While it is impossible to make conclusive statements about results this soon after the fieldwork in our first field season, and pending the analysis of materials and information collected, some preliminary conclusions are already possible. Based on an initial analysis of the pottery collected during the 2006 expedition as well as house forms and other information, we can make an initial assessment of the extent and intensity of past human occupation along the chain. The culture history of the Kurils is broken into several periods and sub-periods (phases) based on similarity of pottery styles and other traits with the prehistory of Hokkaido. In general, no significant northern cultural influence is observed south of northern Paramushir and Shumshu until the Russian exploration of the 18th century. Known occupation extends back to the Late Jomon phase roughly 5000 bp and possibly as early as 7000 bp (Fitzhugh et al 2004). Subsequent occupation is known in the Epi-Jomon, Okhotsk, Ainu, and Historic periods (Table 4).

TABLE 4: **Culture history periods of the Kuril Islands**

PERIOD	PHASE*	CODE (FOR TABLE 2)	AGE RANGES (APPX)**
20th Century		**5**	**0-95 BP**
Ainu/ (Russian/Japanese)		**4**	**55-700/ (100-200) BP**
Okhotsk		**3**	**800-1,300**
	Late	3.3	
	Middle	3.2	
Epi-Jomon		**2**	**1,300-2,000**
	Late	2.2	
	Early	2.1	
Jomon		**1**	**2,000-7,000(+/-)**
	Late	1.4	

* *Only listing phases currently documented for the Kurils.*

** *Period dates are rough estimates. Phase dates not given as these are still being worked out in the current project.*

As expected the Kuril Biocomplexity Project documented occupations of all of these periods. Unexpected was the overwhelming number and scale of Epi-Jomon settlements stretching from Kunashir to Shiashkotan and perhaps onto Paramushir. Our working model led us to expect an increasing human presence on the islands with time, but it currently appears that the Epi-Jomon were one of the most successful settlers of the chain. Pottery types suggest that the Epi-Jomon occupation was concentrated during the Early Epi-Jomon phase, leading us to hypothesize that some factor in climate and environment may have rendered the archipelago less attractive in the subsequent phases. It is also possible that Kuril populations were significantly isolated from Hokkaido cultural developments in later phases and that pottery styles failed to develop in parallel in the later Epi-Jomon time periods. Radiocarbon dating in process should help to resolve these two possibilities.

Epi-Jomon pottery found on Kunashir Island.

The Okhotsk period occupation was also substantial and may be concentrated primarily in the Middle Okhotsk phase. Interestingly, we found very little Okhotsk archaeology in the southernmost island of Kunashir, though early 20th century Japanese reports note several sites in the region, especially on Iturup (Chard 1960). Following conventional understanding of Okhotsk subsistence adaptations to ice-adapted marine mammals, we speculate that Okhotsk populations entered the Kurils from the northern side of the Shiretoko Peninsula and concentrated in areas adjacent to the distribution of seasonal pack ice from Iturup north, especially in areas of the southern Kurils, on the Okhotsk Sea side, where seasonal pack ice reaches its greatest extent. A few Okhotsk sites are known from Kunashir, and we identified one possible Okhotsk pottery fragment in southern Kunashir. The more northerly range of this occupation, including sites on Shiashkotan and Shumshu, does not currently experienced seasonal pack ice (as does the southern archipelago), and additional reasoning will be necessary to explain Okhotsk presence there. As with all patterns discussed here, we must also consider the possibility that our preliminary identifications are subject to large sampling biases that will be reduced substantially with the addition of radiocarbon dates and additional research in the coming field seasons.

Of particular surprise to the archaeology team was the scarcity of evidence of Ainu occupations throughout the Kurils. Ethnohistoric documentation (Krashenenikov 1972) and earlier archaeological study (Baba 1934, 1935, 1937, 1939; Baba and Oka 1938), have documented a significant, if not abundant record of Ainu occupation in the islands from Kunashir all the way to Paramushir and Shumshu (with the possibility of admixture with Kamchatka Itel'men in the Northern settlements on Shumshu: Krashenenikov 1972). Our survey in 2006 identified only one site with Ainu pottery (interior lugged handles mimicking iron pot styles from Japan). That site was on Matua (Ainu Bay 1 site). In addition we documented one site with typical moated pit houses on Simushir (Vodopadnaya 3 site). Prior research in 2000 by the International Kuril Island Project (IKIP) also documented Ainu housepits on Chirpoi and southern Paramushir. Radiocarbon dates support Ainu occupation on Chirpoi, Matua, and Paramushir, as well (Fitzhugh et al. 2004).

There are several possibilities to explain the relatively low visibility of Ainu sites through the Kurils. It is possible that there really were very few Ainu in the Kurils, and that their occupation was concentrated in a few locations. This hypothesis is consistent with ethnohistoric notes referring to relatively low population densities in the Kurils but not of the reported differentiation of the Kuril Ainu into two distinct dialect groups in the northern and southern islands, respectively (Krashenenikov 1972). Minimally we know from ethnohistoric accounts in the 18th and 19th centuries that Ainu had settlements minimally on Kunashir, Iturup, Urup, Chirpoi (seasonally), Simushir, Rasshua (probably), Shiashkotan, Kharimkotan, Onekotan, Paramushir and Shumshu. At least one of these settlements was reportedly destroyed by a volcanic eruption on northern Shiashkotan that buried the village under pyroclastic debris flow (Snow 1910). Other possibilities to explain the observed dearth of Ainu archaeological remains include differences in the nature of the Ainu material record relative to the preceding culture groups. For example, it is also possible that the Ainu living in this region were relatively mobile during much of the year. When not in a few fixed settlements they may have left little archaeological record of their seasonal camps. It is also likely that the diagnostic attributes of Ainu occupation are relatively less frequent than those of the Jomon, EpiJomon and Okhotsk. Ainu pottery is generally reported to be rather undecorated, with the primary unique attribute being the internal lugs. As these occupy a relatively small portion of any pot, the resulting pot sherds can be expected to be dominated by undecorated and non-diagnostic body sherds. Earlier culture groups tended to decorate many of their pots across the exterior surfaces, leaving a much more visible record. Ainu in Hokkaido, are also well known for having lived in above ground wooden structures, which leave less visible traces on site surfaces. While trees would have been scarce and structural building materials limited to drift wood in much of the Kurils (at least north of Urup), it is possible that some Ainu houses were nevertheless above ground features, reducing their archaeological visibility. Ethnohistoric reports, however, only identify semi-subterranean dwellings among the Kuril Ainu (Krashenenikov 1972; Snow 1897)

Historic sites observed during the 2006 expedition were primarily inferred as Japanese and Soviet military installations and features from World War II and the Cold War era. We did not focus our attention on documenting these installations, but it is worth pointing out that Japanese trenches, bunkers, and gun emplacements were a very common feature on the coastal landscape. It was rare to find an archaeological site from an earlier era that was not impacted to one degree or another by these WWII defensive features. Post war Soviet border-guard stations were positioned strategically throughout the chain, and were quite destructive of archaeological deposits in their footprints, but the nature of the Soviet (and subsequent Russian) occupation left a less widespread or extensive overlay on the older archaeological patterns than did the trenching and bunkering during WWII.

World War II and Cold War era trenches crisscross the landscape at Ainu Bay, Matua Island.

Our archaeological collection strategy for the 2006 field season focused on pottery, stone, and other tools (under analysis and curation at the Sakhalin Regional Museum), and chipped stone waste flakes and faunal materials (under analysis and curation at the University of Washington). Pottery was used for the culture historical analysis already discussed and may also be subject to functional and technological analyses and as a material for luminescence dating in the future. Stone tools include a number of fine projectile points and knifes, scrapers, cores, and utilized flakes. While there are currently few culturally diagnostic stone tool forms for the Kurils, further lithic analysis in conjunction with the radiocarbon dating of artifact-bearing stratigraphic layers may yield data that is useful for developing tool typologies for the region. Lithic raw materials represented among the stone tools and waste flakes include obsidian, basalt, and a variety of red, orange, yellow, beige to pink, and grey cherts. While obsidian sources in the Kuril Islands are not well known, the volcanology team documented an outcrop of low-quality obsidian on Ketoy Island in the central Kurils that we hope will provide a distinct mineralogical/chemical signature for sourcing studies of the archaeological obsidian, along with known sources from Kamchatka and Hokkaido. The multiple colors of chert were duplicated in natural beach gravels in a variety of locations throughout the islands, and for that reason we now believe these materials may not be useful for point-source studies. The chipped stone waste flakes were brought back to the University of Washington where we will begin analysis in the Winter or Spring terms of 2007.

Organic tools were rarely encountered, but where organic preservation was particularly good, we did find both bone and wood tools. The southern end of Urup Island was particularly productive in this regard with the sites of Ainu Creek and Kapsul Cape yielding one or more bone and wood implements. At Ainu Creek, a team of Russian, Japanese and American archaeologists worked for several days exposing and mapping a deeply stratified Epi-Jomon and Okhotsk midden and other areas of the site. Organic materials recovered from this excavation include a wooden spoon and several bone harpoon tips. At Kapsul Cape, a midden excavation turned up a barbed bone harpoon point reminiscent of Aleut and Alutiiq types. It is possible that this point was deposited during the Russian American occupation, when Alutiiq and Aleut sea otter hunters were transplanted to Urup Island (esp. Aleutka Bay about 70 km north on the Pacific side of the island; Shubin 1994). On Simushir, at the site of Vodopadnaya 2, an excavation (TP3) yielded a rich midden deposit with pottery and a unique engraved bone disk (probably spindle whorl). One face of the disk was engraved with concentric circles, some with perpendicular hatch marks. A historic deposit at the northern Urup site of Kompaneyski included a fragment of worked leather, probably not more than 50-100 years in age).

Engraved bone disk, Vodopadnaya 2, Simushir.

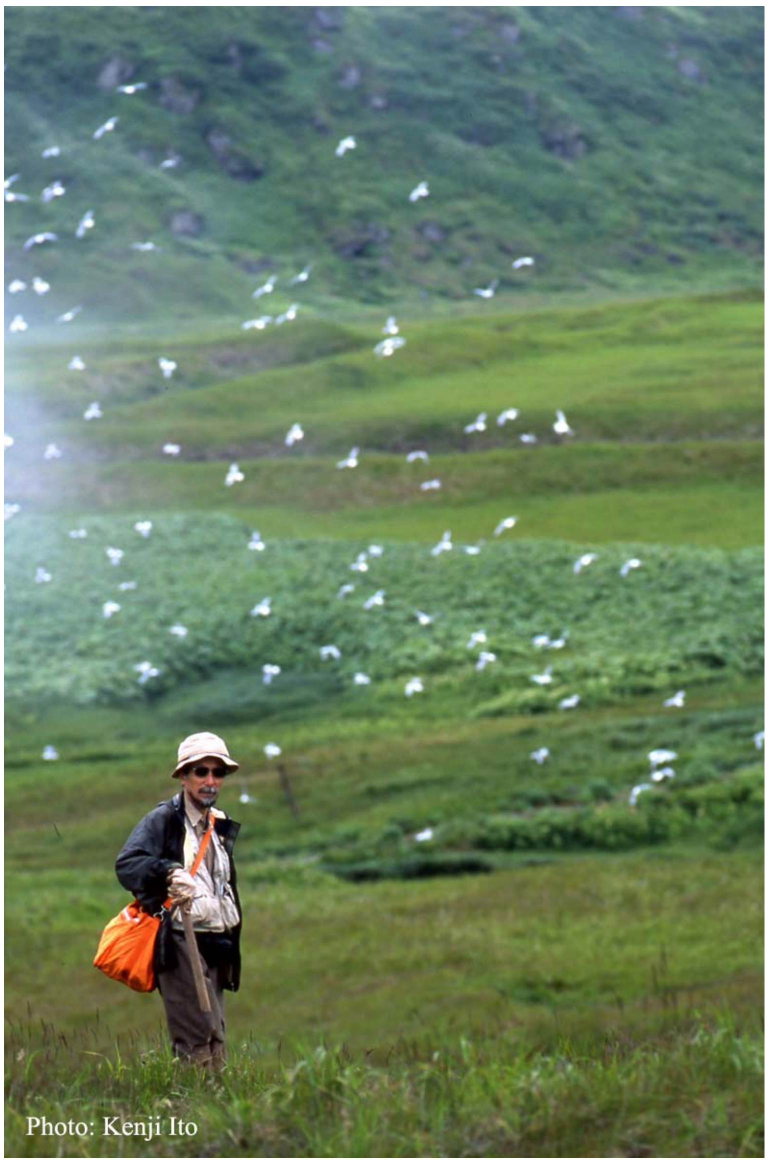
The 2006 field season was successful in recovering faunal samples from a number of sites throughout the island chain. Specifically, 20 of 41 sites yielded fauna, with a total of 183 samples. Samples range in size from a single piece of bone to thousands of pieces of shell, fish bone, bird bone, and mammal bone (primarily, but not exclusively, from sea mammals). Even so, we were initially concerned about the potential to locate good fauna-bearing archaeological sites. As it turned out the slow beginning was due, in large part, to the nature of the sites we visited at the beginning of the field season. Many of the first sites we visited were heavily eroded sand dune sites, with little or no buried component. These sites were characterized by extremely poor faunal preservation. As the season progressed, however, greater effort was put into investigating buried sites that were more likely to have faunal remains preserved, with greater success.

Faunal remains found on Urup Island.

Because this initial field season was primarily designed to be extensive, rather than intensive, in nature, field recovery techniques for fauna were typically limited to hand-sorting of sediment, with occasional use of 1/4" (3.2 mm) mesh hardware cloth. In some cases, the nature of the faunal deposit dictated that 1/8" (6.4 mm) mesh hardware cloth be used. Finally, some faunal deposits were so densely packed with shell and bone that the most efficient means of sampling was to bring bulk samples back to be screened and sorted in the lab (either ship-board or at the University of Washington).

The 2006-2007 lab analysis is focusing primarily on general identifications of faunal remains. Preliminary results indicate that for mammals, harbor seal, sea otter, and Steller sea lion are ubiquitous. Shellfish are dominated by marine gastropods such as whelks and periwinkles. Birds consist primarily of various species of auklets, with low frequencies of sea eagle. And fish consist of salmon, cod, and halibut, with low frequencies of a large shark species.

With few exceptions, the species represented in the faunal samples are locally common in the Kurils today. In that regard, the faunal data we have thus far provide few surprises. Subsequent analyses of the 2006 samples, along with increased sample sizes in coming years will establish, age and sex composition, differential body-part representation of selected species, metrics for examining degrees of resource depression, isotopic analyses to detect marine productivity and trophic complexity. These derived data will be used to evaluate the hypotheses that the ancient distributions of the resource species were significantly affected by changes in climate or as a consequence of human predation pressure.



Amano surveys an archaeological site on Matua Island.

IV. COASTAL PROCESSES GEOLOGY

Geologists record terrain profiles on Urup Island.

TEAM:

DR. JOANNE (JODY) BOURGEOIS, PROJECT CO-DIRECTOR AND TEAM LEADER
DR. TATIANA K. PINEGINA, TEAM LEADER

M. ELIZABETH MARTIN, GRADUATE STUDENT
BREANYN MACINNES, GRADUATE STUDENT
EKATERINA KRAVCHUNOVSKAYA, GRADUATE STUDENT

JESSE EINHORN, UNDERGRADUATE STUDENT
DENA BERKEY, UNDERGRADUATE STUDENT

In addition, we consulted in particular in the field (and on ship) with Dr. Nadia Razhegaeva, of the Volcanology team, who sampled peat sections for tephrochronology and paleoecology. We plan to consult post-field with Drs. Ishizuka and Nakagawa, as well as other experts on the geological history of the Kuril Islands outside of our KBP group, particularly Dr. Vera Ponomareva.

In addition, we had the help of Misty Nikula-Ohlsen, resident middle-school teacher, and we interacted with all other teams. We provided to other teams some basic training in geological techniques, and also consulted with other teams to assure consistency in sampling and other protocols.

GOALS:

Our primary objectives in this first field season were geological reconnaissance, and assisting other teams in understanding the geological histories of their sites. In particular our aims for this first stage of the KBP are

5) to develop a tephrochronological framework for (relevant sites in) the Kuril Islands;
6) to develop a paleoseismological framework for the same, including earthquake and tsunami history; and
7) to develop a coastal and relevant geological history of studied sites.

FIELD ORGANIZATION:

Typically we were divided into three different groups or teams:

1) a geological group developing framework information;
2) one or more geologists working directly with archaeologists on their excavations; and
3) a geological group working on-site with paleoecology camps.

FIELD OUTPUT:

Our primary field output, already completed includes:

1) 170 described sections, most already drawn to scale – about half of our geological sections are tied directly to archaeological site information and test pits, including tentative correlations of tephra and other marker layers
2) 625 samples organized and catalogued [divided between Bourgeois and Pinegina; Razhegaeva's samples are not included in this number but we have noted them on drawn sections]
    a. tephra (volcanic ash) samples [303 samples to UW]
    b. charcoal samples for radiocarbon dating—turned over to a combined collection with archaeological samples [see Table
    c. peat samples for paleoecological analysis and radiocarbon dating—split amongst Razhegaeva, Bourgeois and Pinegina [100 samples to UW]
    d. sand and other sediment samples for evaluation of origin (e.g., diatom analysis for tsunami deposits) [52 samples to UW]
3) about 20 measured profiles (not including simple beach profiles), tied to excavations and outcrops, already entered as spreadsheets, calculated and plotted
4) notes on geomorphology, especially marine terraces and coastal morphology
5) notes on vegetation distribution, including a comparison of landsat-interpreted data [student project of Jesse Einhorn]

GOALS FOR YEAR 2

Our primary goals for this coming year (before next field season) are:

1) clean tephra samples – identify key samples, share with other team members
2) analyze tephra samples
    a. petrographically
    b. chemically
3) prioritize radiocarbon dates, in consultation with archaeologists, paleoecologists and volcanologists

4) develop tephra stratigraphy, by testing field correlations with analyses
5) develop tephra chronology with radiocarbon dates and correlations with known and dated tephra layers
6) develop (preliminary) earthquake and tsunami chronologies, once geochronology and tephra chronology are established
7) evaluate other geomorphic and geologic observations, work with volcanologists' reports
8) put data onto a project website; develop best means to share data within project and also with other scientists
9) collaborate with Misty Nikula-Ohlsen and other educators on ways to utilize our results for various forms of public education
10) work to develop next year's field plan; identify key sites

V. Geophysical Studies of Seismicity

Team:

Dr. Nikolai F. Vasilenko, Field co-investigator

Dr. Dmitri I. Frolov, Field co-investigator

Field Objectives of Year one:

The GPS team was included in the KBP summer 2006 field expedition on a space available basis to link the studies of past earthquakes and tsunamis, conducted by the Costal Processes Team, with the studies of the mechanical coupling between the subducting Pacific plate and overlying North American (or Okhotsk) plate by methods of precise space geodesy. Continuous or repeated GPS position measurements with the millimeter accuracy on many islands along the whole 1200-km long arc from Hokkaido to Kamchatka allow us to determine interseismic surface velocities, which can be inverted for the distribution of the strength of coupling within the seismogenic and tsunamigenic plate interface. Drs. Vasilenko (IMGG, Yuzhno-Sakhalinsk) and Frolov (Physical Technic Institute, St. Petersburg) joined the expedition and performed survey-mode GPS (SGPS) observations on several islands: Ketoy, Matua, Kharimkotan, and Paramushir (southern end). They also installed a continuous GPS (CGPS) station in the town of Severo-Kurilsk, an important extension of the Kuril CGPS network, which also comprises Urup, Iturup, Kunashir, andf Shikotan Islands.

Primary Field Output:

1. Established survey-mode GPS stations on Ketoy, Matua, Kharimkotan, and southern Paramushir Islands. Stations were installed and left recording for periods of between 2 hours and several days.
2. Installed a continuous GPS station on northern Paramushir Island.

The great Mw=8.3, November 15, 2006 Kuril earthquake happened in the seismic gap of the central/northern Kurils, the region with no big earthquakes for over a century. This event, which occurred after the 2006 field season, dramatically modified the scientific goals of the GPS component of KBP. It has given a chance to examine the great earthquake and its transient response, a daring scientific challenge. Specifically, we will study the following problems: (1) coseismic surface displacements and their inversion for the spatial distribution of the coseismic slip in the rupture: (2) rapid postseismic signal and its interpretation in terms of the afterslip; (3) slow postseismic signal and its analysis to understand viscous relaxation in the mantle.

GOALS FOR YEAR 2:

If possible and consistent with overall expedition priorities:

1. Reoccupy GPS stations on Ketoy, Matua, Kharimkotan, and the southern end of Paramushir, and convert them to continuously operating stations powered by air-cell batteries.

If this happens, we will capture coseismic (by comparison with 2006) and postseismic signals at the sites nearest to the November 15, 2006 earthquake rupture as outlined by its vigorous aftershocks. The NetRS GPS systems with Zephyr geodetic antennas will collect the data continuously until the next field season in 2008. These observations will allow us to make a step forward in understanding how much of the strain built up from the subduction of the Pacific plate has been released in the great 2006 earthquake coseismically and postseismically, and what is the danger of further great earthquakes in the central and northern Kurils.

We do not need to visit permanent stations on Kunashir, Shikotan, Iturup, and Paramushir, since we receive the data from these sites by regular mail about every three months. The permanent station on Urup (a lighthouse with a permanent service team at it) is scheduled for a visit with a Russian hydrographic ship by the end of summer. If, however, there is a chance to visit one or both sites on Urup with the KBP cruise, it will be fine.

VALUE ADDED SCIENCE:

Project PIs approved the addition of the geophysical team to the 2006 Kuril expedition when it became apparent that there would be room on the research vessel and that the logistics of the main project could support the addition of this team. Importantly, this geophysical research is already shedding new light on the dynamics of the Kuril subduction zone that will help us to parameterize the Geological Events simulator, with regard to the periodicity, magnitudes and probabilities of infrequent large tsunamigenic earthquakes in the central and northern Kurils.

The fact that the Geophysical team conducted GPS measurements on Ketoy and Matua in late July and early August and the Coastal Processes team conducted benchmark work from camps on northeast Simushir and southern Matua in early August 2006 provides critical background data given that these locations were likely impacted 3 months later by the 8.3Mw earthquake and tsunami on November 15th 2006. That event was historic as the first large magnitude earthquake recorded in the historic period in what has been known as the "Central Kuril gap." Revisiting these camps and upgrading survey-mode GPS stations in this region to the continuous recording in 2007 will show both how much plate movement was generated by the Nov. 15th event and related aftershocks and provide greater context for interpreting the geological record of past tsunamis in the region.

A memorial in Severo-Kurilsk dedicated to the 1952 tsunami that devastated the settlement.

VI. PALEOECOLOGY AND PALEOCLIMATE

Dwarfed trees dot the landscape of Urup Island.

TEAM:

DR. PATRICIA ANDERSON TEAM LEADER
DR. ANATOLY LOZHKIN TEAM LEADER

Dr. Pavel Minyuk, Geochemist
Dr. Alexander Pakhomov, Geomorphologist

Paul Hezel, Graduate Student, Atmospheric Sciences
M. Elizabeth Martin, Graduate Student, Earth & Space Sciences
Misty Nikula-Ohlsen, Resident Middle School Teacher

In addition, we consulted with Dr. Joanne Bourgeois, Dr. Tatiana Pinegina, Dr. Nadia Razhegaeva, Dr. Valery Shubin, and Ekaterina Kravchunovskaya about history and development of island landforms and with the Dr. Cecelia Bitz about climate dynamics.

FIELD OBJECTIVES OF YEAR ONE:

1) Collect multiple sediment cores from 3 lakes in the central and northern portions of the Kuril Island chain;

2) Document modern vegetation, lake bathymetry, and lake catchment characteristics needed for interpretation of paleodata obtained from lake sediments;

3) Work in conjunction with the geological team to compare tephras found in lake and nonlake deposits as aids for development of a tephrochronology;

4) Collect modern reference material for use in calibration of pollen, diatoms, radiocarbondates, and water chemistry;

The lake coring team typically comprised 4-5 people. When not coring, the group broke into smaller groups to document characteristics of the site and its surroundings. Evenings were typically spent in discussion with members of the geological team, including making preliminary descriptions of the lake cores. Final core description and subsampling were done at NEISRI in Magadan, Russia, by Anderson, Lozhkin and Minyuk. Parallel cores were supplied to Dr. Pinegina for further examination in her Kamchatka lab of tephra and tsunami deposits.

Minyuk (left) and Lozhkin (right) prepare a platform for lake coring.

PRIMARY FIELD OUTPUT:

1) 11 lake cores from 3 lakes, totaling ~40 m of sediment (see Table).
2) Modern water, diatom, and pollen samples from the 3 sites.
3) Compilation of a photo-archive of vegetation (plant communities and species) surrounding the lakes (over 1000 photographs).
4) Collection and documentation of over ca. 1775 subsamples for pollen, diatom, paleomagnetics and elemental and isotopic geochemistry.

Additionally, we had discussions with Dr. Marina Cherepanova (Institute of Biology & Soil Science, Russian Academy of Sciences) in Vladivostok concerning diatom analysis. She will provide her services at no charge to the project. We finalized plans with Dr. Thomas Brown (CAMS, Lawrence Livermore National Laboratory) to work with us at no additional cost to the project to develop high quality chronologies for the tephra and tsunamis deposits using AMS dating of peat and lake materials.

SITE NAME	ISLAND	LAT/LONG	ELEV (M)	# CORES COLLECTED
Tokotan	Urup	45 51.345 N 149 47.963 E	10	4
Lazurnoye	Kharimkotan	49 09.32 N 154 27 598 E	12	3
Pernatoye	Paramushir	50 02.429 N 155 23.711 E	20	4

PRIMARY RESEARCH GOALS OF YEAR 2, PRIOR TO FIELD WORK IN 2007:

(note: much of the lake sediment analysis is being done at NEISRI at no cost to the NSF budget):

1) Photograph, describe and subsample lake cores (this work to be done at the North East Interdisciplinary Scientific Research Institute (NEISRI) Russian Academy of Sciences).
2) Analyze modern pollen samples from lake sediments as aids for interpretation of fossil pollen spectra.
3) Prepare lake-core samples for pollen counting and paleomagnetic and geochemical analyses.
4) Construct a preliminary pollen diagram for each of the three lakes.
5) Construct final diagrams of paleomagnetic and geochemical changes for the lake cores.
6) Prepare and count pollen samples from key peat sections from Paramushir, Urup, and Kharmikotan islands (collected by Pinegina and Kravchunovskaya).
7) Prepare preliminary pollen diagrams for the peat sections.

8) Work with Brown and Geology team to target, prepare and submit radiocarbon dates from peat samples. Work with NEISRI and Geology team to target, prepare, and submit radiocarbon dates for the lakes.
9) Construct preliminary to final chronologies for the lake and peat records.
10) Prepare final bathymetric maps of each lake site.
11) Complete documentation and plant identification of the photo archive.
12) Work with other project members to develop itinerary and strategy for field work, 2007.
13) Work with Misty Nikula-Ohlsen and other educators to disperse information about the project to students and the general public.

VII. CLIMATE MODELING:

Clouds and fog form around the shores of Paramushir.

TEAM:

DR. CECILIA BITZ, CO-PI
PAUL HEZEL, GRADUATE STUDENT

PRIMARY ACTIVITIES:

The climate modeling team spent the year gathering information about basic climate interactions and existing paleoclimate data. In our working group, we are gathering information about how climate affects Kuril Island and Okhotsk Sea ecosystems. We are working with the simulation modeling team to incorporate the leading-order relations into our model of Kuril Island ecology and human settlements. We are also working in collaboration with Dr LuAnne Thompson on the development of a high-resolution ocean and sea ice model of the Okhotsk Sea to investigate the coupled dynamics that give rise to variability in the sea ice and ocean conditions that affect fisheries and marine mammals. A present day climatology (averaging the instrumental record into twelve monthly means) of surface temperature precipitation, and sea ice cover was constructed to facilitate selection of field sites and to inform estimates about current vegetation being prepared by the botany group.

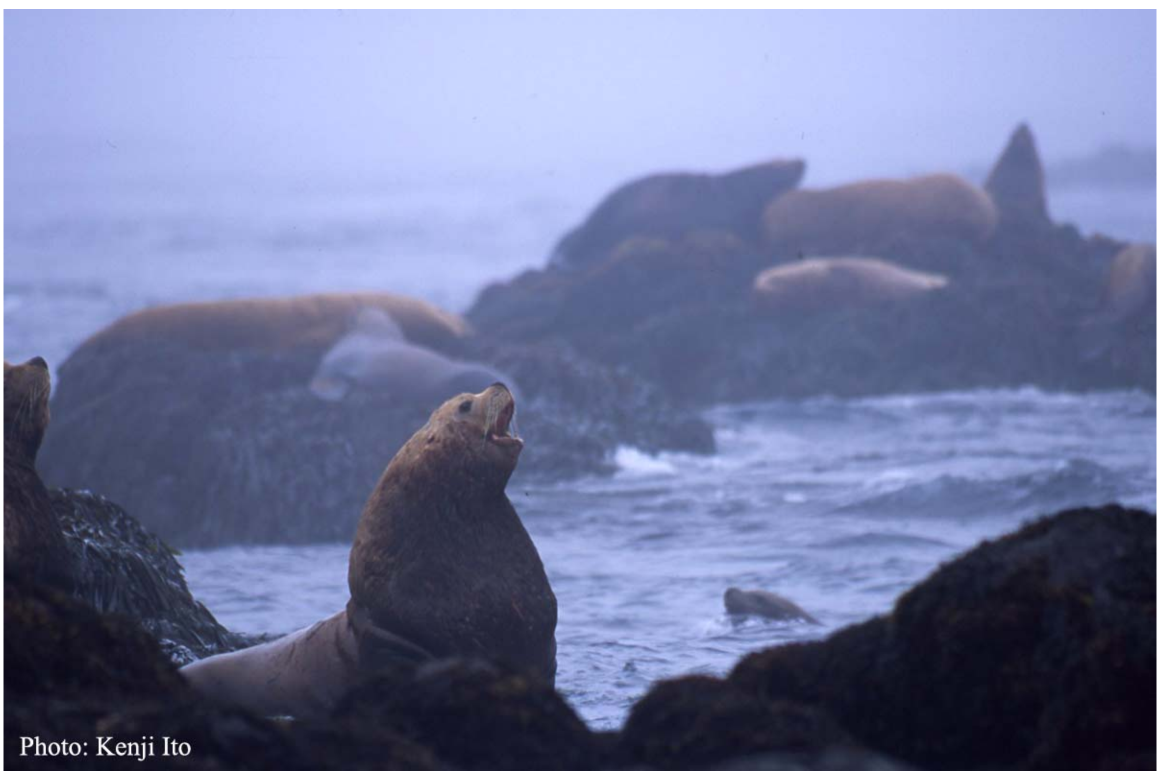
VIII. PaleoGeoChemistry:

Team:

Dr. Bruce P. Finney, UAF subcontract PI
Dr. Amy Hirons, senior researcher

Primary Activities:

Activities in the first year included consultation with Pat Anderson's team (Paleoecology and Paleoclimate) on the sub-sampling of lake sediment cores for isotopic indicators of paleo-productivity (Nitrogen and Carbon). Water samples from lakes, streams, and similar settings were collected in the field and sent to the University of Alaska Fairbanks (UAF) for analysis of modern delta ^{18}O concentrations. These analyses will guide calibrations of paleo-productivity and temperature measures from archaeological midden samples and lake cores. This team also participated in planning sessions and modeling discussions throughout the year via teleconference and email, and Dr. Finney traveled to Seattle and presented a talk in the Modeling seminar in Winter 2006.



Marine productivity affects abundances of most sea life (such as these sea lions on Matua).

IX. VOLCANOLOGY:

Researchers observe a volcanic fumeral on Ketoy Island.

TEAM:
DR. ALEXANDER V. RYBIN, TEAM LEADER
DR. ALEXANDER B. BELOUSOV
DR. NADEZHDA G. RAZZHIGAEVA
DR. IGOR G. KOROTEYEV
DR. ANDREE A. KHARLAMOV

INTRODUCTION:
The Kurile Islands occupy a region of intensive volcanism since Pleistocene times. Different researchers have distinguished 68-70 (Markhinin 1985; Fedorchenko 1969; Fedorchenko et al. 1989), 104 (Submarine Volcanism..., 1992), 160 (Gorshkov 1967) and more subaerial volcanoes in Kurile arc as well as from 55 (Bezrukov et al. 1958) to 98 submarine volcanoes (Submarine Volcanism..., 1992).

Volcanoes of the Kurile arc are characterized by highly explosive and thus very dangerous types of eruptions, with radius of devastation zones exceeding 30 km. Such eruptions are commonly associated with formation of hot pyroclastic flows and surges, as well as lahars with lengths exceeding several tens of kilometers.

Volcanoes of Kurile Islands produced more than 15 large caldera-forming eruptions during last 45,000 years with the total volume of ejected pyroclastic material about 720 km^3. The violence of some of these eruptions exceeded that of such famous historical eruptions as Tambora (1815), Krakatau (1823), and Katmai (1912).

Thirteen active volcanoes are located in the central part of the Kurile arc; eight of them erupted in the 20-th century. Although currently there is no permanent population in the region, the volcanoes of Central Kurils pose serious volcanic hazard, generating volcanic clouds (dangerous for aircraft traffic) and potentially tsunamis of volcanic origin. Even so, the volcanoes of Central Kurils are poorly studied. The main source of information about their geological structure is the famous book of G.S. Gorshkov, published in 1967, as well as few papers of researchers of Sakhalin and Kamchatka conducted more than 25 years ago.

GOALS OF OUR WORK

1) To compose detailed sketches of geological structures of the volcanic edifices.
2) To suggest composite geochronological scale frequencies of catastrophic events in Pleistocene-Holocene for the region (for biocomplexity modeling).
3) To help estimate impact of the volcanism on past human activity in the region.

METHODS OF THE STUDY IN 2006:

1. Estimation of the present-state activity of the volcanoes: general description of morphology of crater areas, measurements of temperatures of fumaroles and hot springs; determination of their changes in comparison with the published data.
2. Echosounding of caldera and crater lakes for determination of their bottom morphology, search of underwater hydrothermal vents, submerged craters etc.
3. Tephrachronological studies of soil and peat sections to reconstruct past activity of the volcanoes in Holocene (with sampling of organic matter for radiocarbon dating and sampling of soil and surface waters for pollen spectrums and diatom analyses).
4. Large-scale geological mapping of Pleistocene-Holocene deposits of catastrophic volcanic events to get general view of the volcanic history of the islands.
5. Sampling of the erupted products with the goal to investigate their mineralogy and geochemistry.

OBJECTS STUDIED IN 2006:

Ketoy Island: July 20 - August 8

1. We completed investigation of the main stratigraphic units of volcanic rocks composing the island.
2. Rocks erupted before, during and after the caldera-forming eruptions of the Pallas volcano were distinguished.
3. 96 rock samples for petrological studies were collected.
4. The first ever echosounding surveys of the Malakhitovoe caldera lake and Glazok crater lake were completed; these data will allow to make digital maps of bottom morphology of the lakes.

5. To investigate past activity of the Pallas volcano, 5 sections of paleosol containing tephra layers, as well as 6 profiles of soils formed under different types of vegetation were studied.
6. A cross section of peat (altitude 70 m., N 47°18.008' E 152°30.629' thickness 2.82 m.) in the southern part of the island includes 24 layers of volcanic ash from the Pallas volcano as well as ash from distant volcanoes of the arc. We believe that this section will serve as the reference section of the Holocene for the Central Kurils. 17 samples for C14 dating and 67 samples for pollen and diatom analysis were taken from the section.
7. Additionally, from different deposits in different parts of the island 23 samples of soil for pollen spectrum and 7 water samples (from rivers and springs) were taken for diatom analyses.

Rasshua Island: August 9 – 11

1. We completed an investigation of the main stratigraphic units of Holocene volcanic rocks composing the SW part of the caldera and NE part of the island. Twenty six rock samples were collected for petrological and geochemical studies were collected.
2. We sampled a section of lake deposits in the SE part of the caldera (section 7406, N 47°43.195', E 153°.125'), where lakes Beloye and Tikhoe are located. The section includes 17 tephra layers. Nine samples were taken from the section for C^{14} dating and 46 samples for pollen and diatom analysis. The tephra layers were sampled as well.
3. Additionally, water samples and sediment samples for diatom and pollen analyses were taken from the lakes.

Harimkotan Island: August 12

1. A cross section of peat (section 8106, N 49°09.330', E 154°27.364', thickness 0.88 m.) located to the E from the Lazurnoye Lake. The peat rests on the surface of the deposit of large-scale volcanic landslide about 2000 years old.
2. Three samples for C^{14} dating and 18 samples for pollen and diatom analysis were taken from the section.
3. Water samples and sediment samples for diatom and pollen analyses have been taken from the Lazurnoye Lake and two other small lakes.
4. Three echosounding profiles of the submarine part of the large-scale volcanic landslide about 2000 years old were completed in order to determine their surface morphology as well as to try to identify the outer (submarine) boundary of the landslide deposit.

Shiashkotan Island: August 13-16

1. Volcanic rocks of Pleistocene-Holocene age were studied in the sea cliffs from the Grotovy Cape to Obval'ny Cape.
2. Reconnaissance of the debris avalanche from Sinarka volcano was completed. This avalanche probably destroyed an Ainu village in the middle of 19th century as reported by Captain Snow (1910).

3. On the Grotovy Cape (sections 8306 and 8706, N 48°46.766’, E 154°2.203'; N 48°46.873’, E 154°02.046', altitude 60m) two peat sections were studied. Six samples for C^{14} dating and 46 samples for pollen and diatom analysis were taken from the thickest section (1.9m).

Onekotan Island: August 17-24

1. We have completed investigation of the main stratigraphic units of volcanic rocks composing the SW part of the island.
2. Rocks erupted before, during and after the caldera-forming eruption of the Krenitsyn volcano were identified.
3. Fifty two rock samples were collected for petrological studies.
4. In the Koltsevoye caldera lake several echosounding profiles were made for the first time; the data will allow to make digital maps of bottom morphology of N and NW part of the lake.
5. To investigate past activity of the volcanoes of Onekotan, 2 sections of peat were examined, one in the upper part of Olkhovaya river (section 9606, altitude 200 m., N 49°26.954’, E 154°45.051';) and one on the slope of Tao-Rusyr caldera (section 9706, N 49°23.243’, E 154°42.606'; altitude 430 м). Thickness of these peat sections was about 2.05 m. Each section included multiple layers of volcanic ash (more than 30). In the bases of the sections the key tephra of Kurilskoye Lake was identified. Ten samples for C^{14} dating and multiple samples were systematically collected at 5cm intervals throughout each section for pollen and diatom analysis.
6. Additionally, 8 samples of surface soils formed under different types of vegetation were collected for pollen spectrum.
7. Water samples from Koltsevoye Lake and small marshes and lakes were collected for diatom analyses.

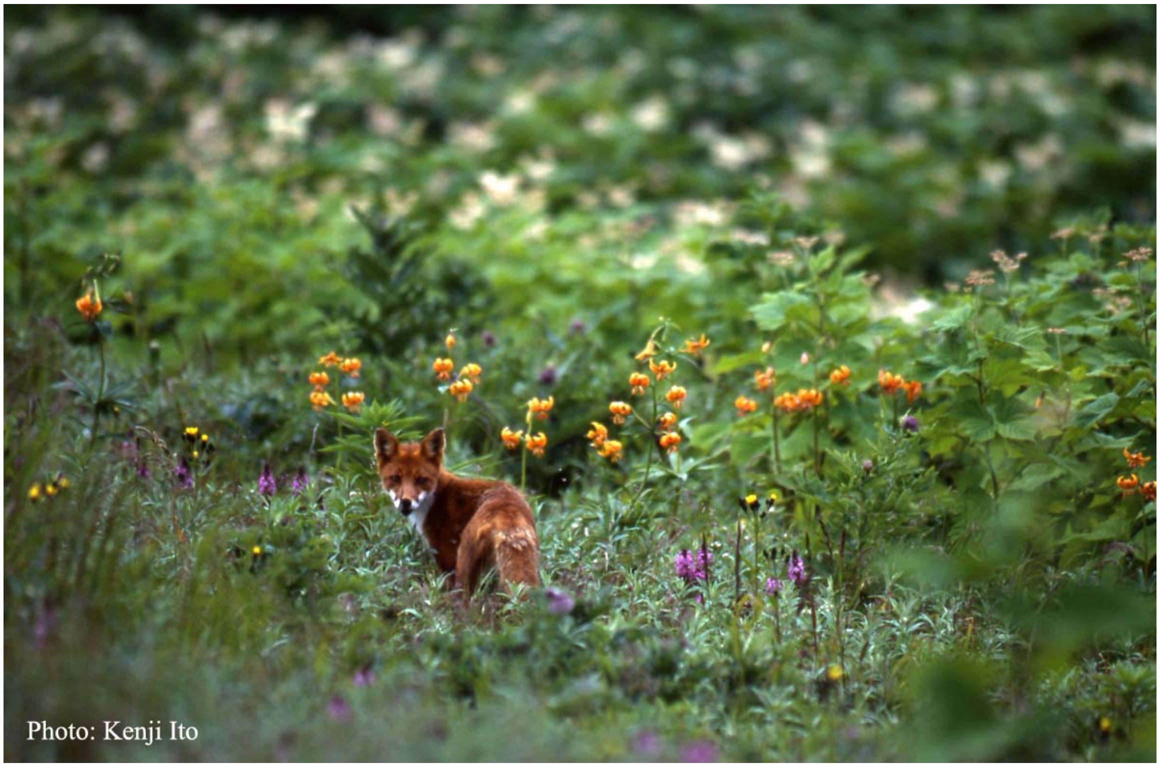
Simushir Island: August 25-26

1. Erupted products of Goriashaya Sopka volcano were investigated (very briefly).
2. Eight samples of surface soils were collected for pollen spectrum.

PRIMARY RESEARCH GOALS OF YEAR 2:

Analyses will be conducted on samples from the 2006 expedition at the Institute of Marine Geology and Geophysics in Yuzhno-Sakhalinsk, at the Pacific Institute of Geography in Vladivostok,

X. Ecology



Red fox and flowers on Matua Island.

Team

Dr. Andree K. Klitin
Tatiana Nyushko

Dr. Klitin and Ms. Nyushko worked independently but on related contemporary phenomena. Dr. Klitin's work was focused on contemporary entomology as well as the biogeograpical of plants. Ms. Nyushko's work was focused more exclusively on contemporary floristics/botany. Both were oriented to the study of contemporary ecological patterning in the Kuril Islands. Their work builds on the research of the International Kuril Island Project (IKIP) from 1994-2000, by studying particular locations for several days or weeks, allowing for longer time series of collecting (over multiple diurnal cycles) than was possible given IKIP logistics. Ms. Nyushko was unable to provide a summary report of her field research in the short time available, however, her work was very successful and she studied and collected a large variety of plant samples from Ketoy, Rasshua, and Onekotan islands as a member of the volcanology team. Dr. Klitin joined the archaeology camp in southern Urup between July 21 and August 1, participated in the ship based mobile surveys from August 2 through August 17, and joined the volcanology team on southern Onekotan from August 18-23. He provided the following report on his activities.

SUMMARY OF A. KLITIN'S SUMMER 2006 FIELD RESEARCH

During the 2006 field expedition on RV Gipanis through the Kuril Islands, Andrea Klitin conducted research on entomofauna and variation in vegetative communities on Krenitsina volcano (Onekotan Island). He gathered invertebrates and seaweed on the coasts of Urup, Shaishkotan, and Onekotan islands for their further definition in SaxNIRO (СахНИРО), and he gathered herbarium and geological samples for the Sakhalin Regional Museum of Local Lore. In the course of the expedition route and survey of the sea coast by small boat, all land and sea mammals encountered were inventoried. Additionally, all waterfalls were counted. Many of the waterfalls deserve the designation of nature monument (first and foremost those on the island of Urup). All items gathered are being turned over for care and storage to the Sakhalin Regional Museum of Local Lore.

The entomological research involved installation of "Barbera" ground traps on the islands of Urup, Ketoy, Rasshua and Onekotan, as well as observations enroute. The most detailed researches were conducted on the island Urup where four lines of ground traps were installed (three in the south end of the island and one at the isthmus at Tokotan). In this research, Klitin collected representative series of *Carabus opaculus*, *C. arcensis*, *C. kurilensis*, *Cychrus morawitzi* and other beetles (*Carabidae*, ground beetles), including the local subspecies of rare beetles *Carabus kolbei*. From these collections and observations, such quantity indicators as a relative abundance, frequency of occurrence, etc. are being calculated. Additionally, on Urup I. three kinds of butterfly (Macrolepidoptera) were noted. The ground traps that were established on a slope of the sea terrace of Ketoy I. were plundered by foxes. Nevertheless even here we captured the local subspecies *Carabus kolbei* (exclusive to Central Kuriles). This subspecies had never before been observed on Ketoy Island. Research visits to Rasshua and Onekotan islands were brief and during periods of prevailing rainy and cold weather, but even there entomological materials were collected.

Among the botanical finds we must note the Yatabe orchid that we found on Urup and Rasshua islands, which had not been documented previously on these islands. Without a doubt the Krenitsina volcano in the Tao-Rusyr caldera (Onekotan Island) should be recognized as one of the unique natural phenomena of Kurils. With volcanist A. Belousov, we carried out ecosounding of the bottom of the Koltseva (Ring) caldera lake surrounding the volcano and a maximal (but not limiting) depth of 264 m was documented. Currently this is the deepest internal body of water of the Sakhalin Oblast. It is possible that the Koltseva Lake surpasses other fresh bodies of water in the Sakhalin Oblast in volume of a fresh water. Several morphometric parameters of the Krinitisina volcano were carried out in particular the height of the lava dome which emerged during the 1952 eruption, which measured 464 m or 64 m above the level of the caldera lake. Of the higher altitude plants only the Saxifraga merki reaches the top of Krinitsina volcano.

References

Baba, M. O. 1934 Archaeological investigations in Shumushu Islands (Kurile Island). *Anthropological Society of Tokyo. Journal* 49:39-63.

Baba, M. O. 1935 Second archaeological investigation at Shumshir, an island of the Kuriles. *Anthropological Society of Tokyo. Journal* 51:91-115.

Baba, M. O. 1937 Hunting and fishing impliments of the Kuril Islands. *Minzokugaka Kenkyu* 3(2):295-337.

Baba, M. O. 1939 The northern Kurile Islands from the viewpoint of archaeology. Reprinted in *Archaeology and Ethnology of Sakhalin and the Kuriles* (Dr. O. Baba's Collected Papers, vol. 3), pp. 6-162 (in Japanese). Sapporo: Hokkaido Shupan Kikaku Senta, 1979.

Baba, M. O. and M. Oka 1938 Archaeological investigations of Shumushu in the Kuril Islands and Tariaka, Sakhalin. *Minzokugaka Kenkyu* 4(3):117-180.

Bezrukov et al. 1958

Chard, Chester S. (ed.) 1960 Japanese Source Materials on the Archaeology of the Kuril Islands. Archives of Archaeology, No. 7, University of Wisconsin Press. Madison.

Fedorchenko 1969

Fedorchenko V.I., Shilov V.N. (1963) The eruption of Chikurachki volcano in 1961 (Paramushir island). Bulletin of Volcanological Stations, v. 34, p.36-43 (in Russian)

Fedorchenko V.I., Abdurakhmanov A.I., Rodionova R.I. (1989). Volcanism of the Kurile Island arc. Geology and petrogenesis. Moscow, Nauka, 239 p (in Russian)

Fitzhugh, B., S. Moore, C. Lockwood, and C. Boone. 2004. Archaeological Paleobiogeography in the Russian Far East: The Kuril Islands and Sakhalin in Comparative Perspective. *Asian Perspective*. 43(1):92-122.

Gorshkov G.S. (1967) Volcanism of the Kurile Island arc. Moscow, Nauka, 270 p. (in Russian).

Krasheninnikov, Stepan P. 1972 *Explorations of Kamchatka, 1735-1741*. Translation of the original 1955 Russian publication, translated by E. A. P. Crownhart-Vaughan. Oregon Historical Society, Portland.

Markhinin E.K. (1985) Volcanism. Moscow, Nedra. 285 p. (in Russian).

Snow, (Captain Henry James, 1897, *Notes on the Kuril Islands*, Royal Geographical Society, John Murray, London.

Snow, (Captain) Henry James 1910. *In forbidden seas. Recollections of sea-otter hunting in the Kurils.* London, E. Arnold.

Snow, H. J., 1897, Notes on the Kuril Islands.

Snow, H. J. 1910 *In forbidden seas. Recollections of sea-otter hunting in the Kurils*. London: E. Arnold.

(Submarine Volcanism) Underwater volcanism and zones of the Kurile Island arc (1992) Moscow, Nauka, 528 p. (in Russian).