A Collection of Benthic Marine Algae from the Aleutian Islands, Alaska

Appendix A

Intertidal Site Summaries

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2008

APPENDIX A: Aleutian EMAP Intertidal Site Summaries
By Mandy Lindeberg

INTRODUCTION

Intertidal habitats of the Aleutians have been poorly documented and the EMAP surveys provided a unique opportunity to visit this remote area. The intent of this appendix is to give brief descriptions of the intertidal habitats investigated during the 2006 and 2007 EMAP surveys. The following appendix includes observations from 31 intertidal sites across the Aleutian Archipelago. The intertidal site summaries are organized chronologically as they were visited (see Table A-1.). Each site has a brief description of geomorphology and biology. Biological observations are organized by intertidal zonation or biobands, flora, and fauna. Narrative within these sections includes some abbreviated nomenclature. Common taxa are referred to by their Latin names but genera are shortened to only the first three letters in capitols (e.g. *Alaria marginata* is ALA *marginata*). The common rockweed (*Fucus distichus* subsp. *evanescens*) is referred to as *Fucus*. Also, the word intertidal is shortened to IT. The narratives of each site are followed by charts (Garmin; MapSource) showing their general location and four photo panels (A-D) which highlight geomorphology, biobands, marine algae, and invertebrates.

Table A-1. A listing of 2006 and 2007 Aleutian EMAP intertidal sites. Coordinates were acquired on site with hand held global positing system technology in decimal degrees.

Island	Location	EMAP Site	Date	N Latitude	W Longitude
Tigalda Is.	Tigalda Bay	AKALE06_test_IT	7/2/2006	54.11884	164.99898
Akun Is.	Akun Bay, Helianthus Cove	AKALE06_0002_IT	7/5/2006	54.23765	165.54140
Unalaska Is.	Nateekin Bay, Unalaska Bay	AKALE06_0021_IT	7/7/2006	53.89371	166.62135
Unalaska Is.	Driftwood Bay	AKALE06_0044_IT	7/8/2006	53.99284	166.81433
Unalaska Is.	Naginak Cove, Anderson Bay	AKALE06_0007_IT	7/9/2006	53.63770	166.85254
Unalaska Is.	Scan Bay	AKALE06_0020_IT	7/10/2006	53.61624	167.05653
Unalaska Is.	Aspid Bay	AKALE06_ALT_0018_IT	7/12/2006	53.42323	167.41336
Unalaska Is.	Kismaliuk Bay	AKALE06_0012_IT	7/13/2006	53.45782	167.27969
Unalaska Is.	Peacock Pt, Station Bay	AKALE06_0027_IT	7/14/2006	53.39331	167.60529
Carlisle Is.	northeastern	AKALE06_0011_IT	7/15/2006	52.89939	169.99757
Umnak	south of Amos Bay	AKALE06_0043_IT	7/19/2006	53.01683	168.59572
Unalaska Is.	Kulilak Bay	AKALE06_ALT_0012_IT	7/20/2006	53.44669	167.05286
Attu Is	Range Pt., Chichagof Harbor	AKALE07_0019_IT	6/25/2007	52.93019	173.25461
Attu Is	Savage Is, Temnac Bay	AKALE07_0004_IT	6/26/2007	52.80082	173.07388
Kiska Is	Harpoon Pt	AKALE07_0017_IT	6/29/2007	51.91801	177.44672
Kiska Is	Haycock Rk	AKALE07_ALT_0048_IT	6/30/2007	52.07271	177.66210
Little Sitkin Is	Finger Pt.	AKALE07_0045_IT	7/1/2007	51.96994	178.45306
Rat Is	south of Banner Bay	AKALE07_ALT_0031_IT	7/1/2007	51.82397	178.27495
Amchitka Is	Kirilof Bay	AKALE07_0016_IT	7/2/2007	51.43343	179.21953
Amchitka Is	Midden Pt	AKALE07_0006_IT	7/3/2007	51.64250	178.75079
Tanaga Is	Tanaga Bay	AKALE07_DD0003_IT	7/7/2007	51.70626	-178.06923
Kanaga Is	Kanaga Sound	AKALE07_ALT_0028_IT	7/8/2007	51.88188	-177.20033
Adak Is	Green Is., Bay of Islands	AKALE07_0005_IT	7/9/2007	51.81647	-176.84029
Adak Is	Kagalaska Strait	AKALE07_ALT_0021_IT	7/10/2007	51.75624	-176.42632
Adak Is	Gannet Rocks, Kuluk Bay	AKALE07_ALT_0014_IT	7/12/2007	51.87030	-176.60593
Little Tanaga Is	Chisak Bay	AKALE07_ALT_0005_IT	7/13/2007	51.82743	-176.15083
Little Tanaga Is	Umak Pass	AKALE07_0018_IT	7/14/2007	51.86605	-176.15359
Umak Is	Umak Bight	AKALE07_0013_IT	7/14/2007	51.89024	-175.97069
Atka Is	North of Deep Bay	AKALE07_0031_IT	7/15/2007	52.14044	-174.60287
Atka Is	Palisades Pt., Nazan Bay	AKALE07_0008_IT	7/17/2007	52.22514	-174.14023
Amlia Is	Cape Idalug	AKALE07_0035_IT	7/18/2007	52.12262	-173.54282

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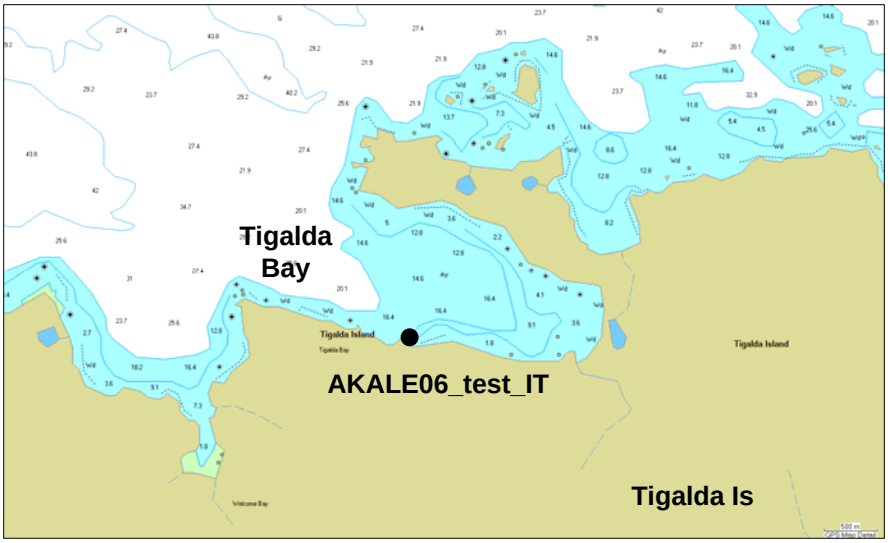
Location: **Tigalda Bay, Tigalda Is.**
Longitude/Latitude: N 54.11884 W 164.99898
Region: Eastern Aleutians
EMAP Site: AKALE06_test_IT
Date: July 2, 2006

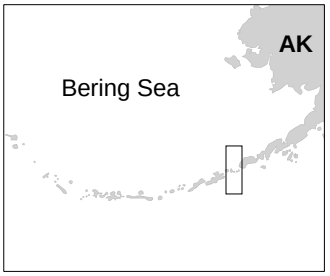
Geomorphology:
Tigalda Bay is located on the northeastern side of Tigalda Island mostly influenced by Unimak Pass and the Alaska Coastal Current. Tigalda Bay is a fairly shallow bay with many rocky reefs scattered throughout. The shoreline in Tigalda Bay is dominated by smooth, basalt bedrock (~ 25 m wide) with a fairly steep slope (Photo A.). Beyond zero tide line the slope tends to level out into shallow reefs. This site is semi-protected (no ocean swell) with a perpendicular fetch of 1.4 km given an easterly aspect (40^{o}). The water was clear with 50 ft. visibility.

Biology:
Biobands – from upper IT to Lower IT banding started with the marine lichen VER (medium wide band), a green filamentous band of ROS (patchy), yellow bands of POR (patchy) and HAL *glandiforme* (patchy), a dark brown bands of ODO *floccosa* fm *comosa* and ALA *marginata*, LAM *longipes*, DRU *fistulosa* (extensive bed) (Photo B.).

Flora – Notable plants on cliffs above MHHW were patchy Goose Tongue (*Plantago maritima*) and flowering Cinquefoil (*Potentilla* sp.) High tidepool had very stunted versions of HAL *glandiforme*, MAS *papillatus* complex, HIL *rubra*, and an encrusting coralline algae (*Clathromorphum* spp.). The upper IT had a filamentous non-branching green matt (*Rosenvingiella polyrhiza* or sp.) on seaward faces of vertical bedrock. Below this zone was a zone of *Bangia* sp., *Prasiola* sp., and POR sp. (spent but probably P. *pseudolanceolata*) (Photo C.). There were also large patches of encrusting species in this zone such as HIL *rubra*, Petrocelis crusts, and a green marine lichen (*Verrucaria mucosa*?). The mid IT had patches of HAL *glandiforme*, END *muricata*, MAS *papillatus* complex, *Fucus*, ACR *coalita*, MIC *borealis*, PAL *mollis*, ODO *floccosa* fm. *Comosa*, and PTE *bipinnata*. The lower IT was dominated by ALA *marginata*, *Clathromorphum* spp., COR *vancouveriensis*, and just below LAM *longipes*. Just offshore was a thick bed of DRU *fistulosa* and a narrow band of NER *luetkeana* on the outside margin.

Fauna – The high tidepools were plugged with LIT *sitkana* and a few tipe pool sculpins. LOT *digitalis* were prominent in the upper IT and their radula scars were all over the rocks (Photo D.). I found MYT *californianus* in the mid IT but MYT *trossulus* was more abundant. SEM *cariosus* dominated the lower IT and orange anemones (*Metridium* sp.) and KAT *tunicata* dotted the spaces between the barnacles. A sea otter practically bumped into my hand at the waters edge and offshore a group of sea lions were very curious of our activities. A flock of Harlequin ducks were circling above.





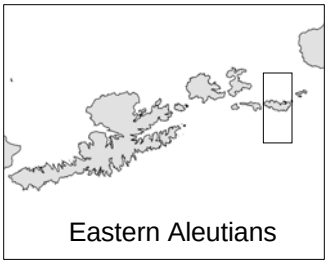


Photo A: Steep, smooth basaltic bedrock.

Photo B: Biobands of VER, ROS, POR, HAL *glandiforme*, and ALA marginata.

Photo C: Height IT encrusting HIL, VER, PET, and *Bangia* sp. Note the radula scars near *Bangia* sp.

Photo D: Group of LOT *digitalis* in the high IT.

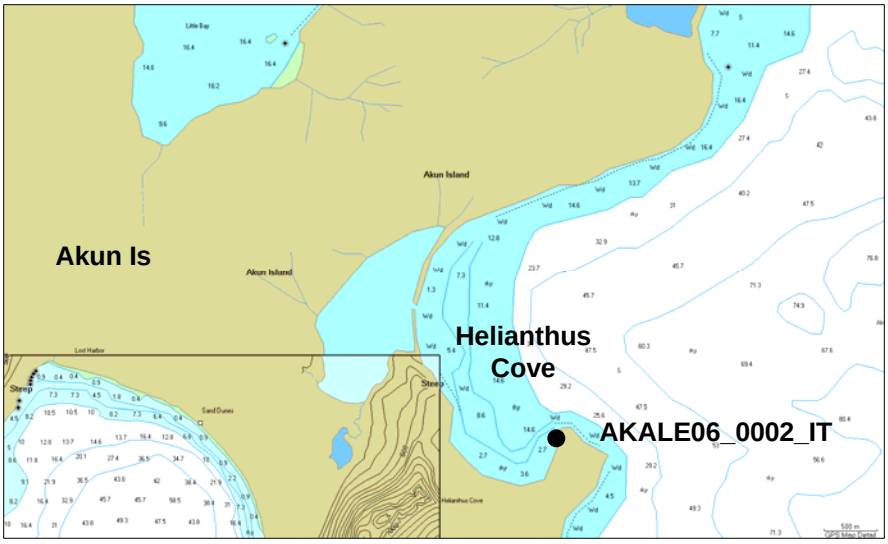
Location: **Helianthus Cove, Akun Bay, Akun Is.**
Longitude/Latitude: N 54.23765 W 165.54140
Region: Eastern Aleutians
EMAP Site: AKALE06_0002_IT
Date: July 5, 2006

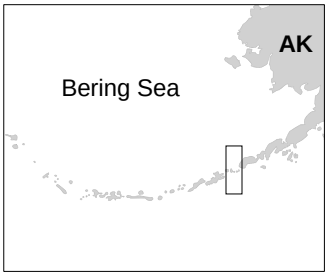
Geomorphology:
Akun Bay is on the eastern side of Akun Island mostly influenced by Unimak Pass. Akun Bay is a large gently curved bay with a lagoon at the head. Helianthus Cove is at the southern entrance with steep cliffs and mainly a cobble boulder IT (Photo A.). I surveyed the southern point entering this cove which had a steep erosional cliff dominated by a boulder field (Photo B.). The upper IT had a cobble storm berm which benched out into rounded boulders with cobble scattered between (~ 50 m wide) . This site is semi-protected (ocean swells) with a perpendicular fetch of 2 km given a northwesterly aspect (340^{o}). I believe this site experiences significant energy during winter storms because waves could wrap around the point.

Biology:
Biobands – The upper IT was mostly bare and the mid to lower IT had very patchy *Fucus* and barnacle. The lower IT had an ALA *marginata* band, LAM (L. *longipies* and S. *subsimplex*) and offshore a dense, wide band of DRU *fistulosa* (extensive bed).

Flora – Above MHHW notable plants were young *Senecio pseudo-arnica*, Oysterleaf (*Mertensia maritma*), and Coastal Paintbrush in bloom (*Castilleja unalaschcensis*). The upper IT was bare and the mid IT had boulders and cobble that were slippery with a film of grazed fine filamentous green algae. The lower IT had END *muricata*, HAL *glandiforme*, *Fucus*, ULV *lactuca*, ULV *linza*, ACR *aculeate*, NEO *aculeata*, MAS *papillatus* complex, POR *abbottiae* or *P. fallax*, POR *sp.*, POR *fucicola*, ANA *japonicus*, PAL *hecatensis*, MAZ *phyllocarpa*, and Petrocelis crusts (Photo D.). Kelps included grazed ALA *marginata* and LAM *longipes* (Photo C.), SAC *subsimplex*, CYM *triplicata*, and a thick bed of DRU *fistulosa*.

Fauna – There were dead carcasses of cows along the hillsides and the storm berm. Cow pies were all over the beach. It must have been a rough winter. I noticed what looked like phalaropes foraging in the DRU fistulosa bed and discovered the kelp covered with millions of amphipods which I assume they were feeding on. I saw one sea otter which was feeding in the kelp bed also. In the IT I found *Halichondria*, orange anemones (*Metridium* sp.), huge KAT *tunicata*, large Buccinum snails, barnacles (BAL *glandula* and SEM *cariosus*), urchins, and MYT *trossulus*. There was also large TEC *scutum*.





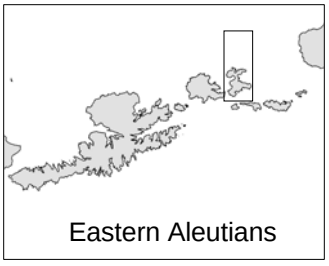


Photo A: Bolders with patchy *Fucus* and barnacles. Note large DRU *fistulosa* bed in background.

Photo B: Erosional bluff with rounded boulders.

Photo C: Grazed ALA *marginata* and LAM *longipies*.

Photo D: Annual matrix of HAL *glandiforme*, MAS, MAZ *phyllocarpa*, ULV, and ACR.

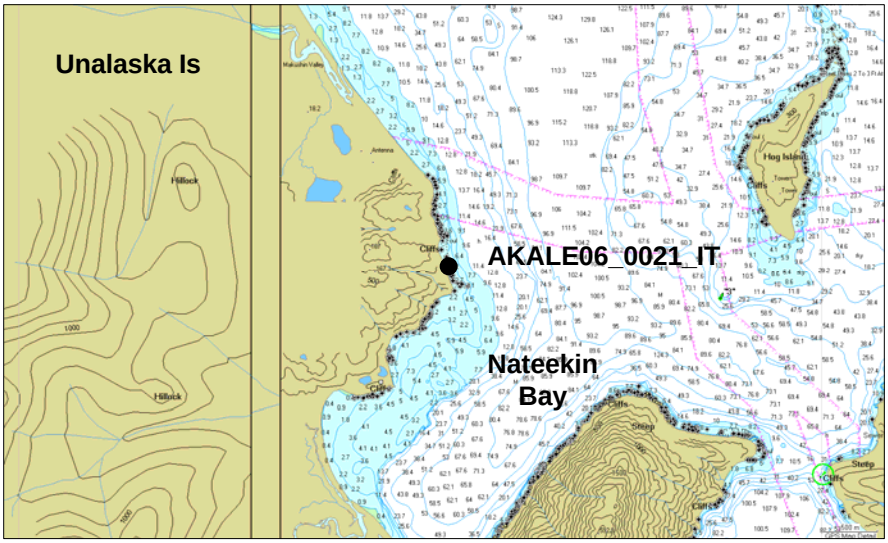
Location: **Nateekin Bay, Unalaska Bay, Unalaska Is.**
Longitude/Latitude: N 53.89371 W 166.62135
Region: Eastern Aleutians
EMAP Site: AKALE06_0021_IT
Date: July 7, 2006

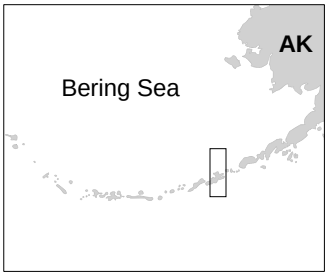
Geomorphology:
Nateekin Bay is ~4 km west of Dutch Harbor, Unalaska Is. facing the Bering Sea. Steep cliffs several hundred meters towered up from the IT at this site. There was a cobble storm berm with a cliff directly behind but the mid and lower IT had a gentle slope (~ 25 m wide) (Photo A.). I started in a pocket beach of huge, rounded boulders with sandy areas between and worked my way out to a point with a boulder, bedrock reef (basalt) offshore. Emergent bedrock at the point was a light green and super smooth being polished by the boulders and sand (Photo B.). This site was semi-protected (no ocean swells) with a perpendicular fetch of 5 km (Amaknak Is.) given an easterly aspect (90^{o}).

Biology:
Biobands – There was no banding in the upper and mid IT but the lower IT had a patchy ALA *marginata* band. LAM *longipes*, SAC *subsimplex*, and DRU *fistulosa* followed offshore.

Flora – Above MHHW notable plants were beach greens, Beach Peas, lupine, Mountain Blue Bells, Cow Parsnip, Coastal Paintbrush, and ferns. The upper IT was bare; the lower IT had a patchy distribution of vegetation. This is probably due to the sand scour experienced at this site. The large boulders had a variety of vegetation some with *Bangia sp.*, and others POR spp. and PAL *hecatensis*. The low IT bedrock had patchy ODO *floccosa* fm *comosa*, MAZ *phyllocarpa*, Petrocelis crusts, NRH *larix*, LEA *difformis*, CRY *woodii*, and a red blade I think is *Kallymeniopsis*. Kelps included LAM *longipes*, SAC *subsimplex*, CYM *triplicata*, and ALA *marginata* (Photo C.). Large patches of encrusting coralline algae were observed (coralline crusts and *Clathromorphum* spp.). I did find AHN *fastigiata* in a mid IT shallow tidepool. A thick DRU fistulosa bed dominated the nearshore.

Fauna – I observed lots of Kittiwakes and Cormorants on a rock outcropping just off the point. IT invertebrates were dominated by SEM *cariosus* with tiny colonial tube worms (black plumes) filling the areas between the barnacle tests (Photo D.). This created solid flat areas sometimes a meter wide. MYT *trossulus* occurred in patches on boulders and CAT *tunacata* were huge. The purple nemertean was observed among the SEM *cariosus* tests.Small squid were observed swimming at the waters edge. Many LIT *sitkana* and LOT *pelta* were observed in the mid and upper IT on boulders along with the little red mite. Large patches of *Halichondria* sp. were observed in the lower IT, and kelps were heavily grazed by urchins.





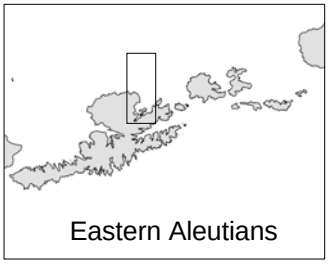


Photo A: Rounded boulders, cobble and sand.

Photo B: Emergent bedrock. Very smooth, with greenish banding.

Photo C: Reef on point with SAC *subsimplex* and ALA *marginata*.

Photo D: SEM *cariosus* with colonial tubeworms and LOT *pelta*.

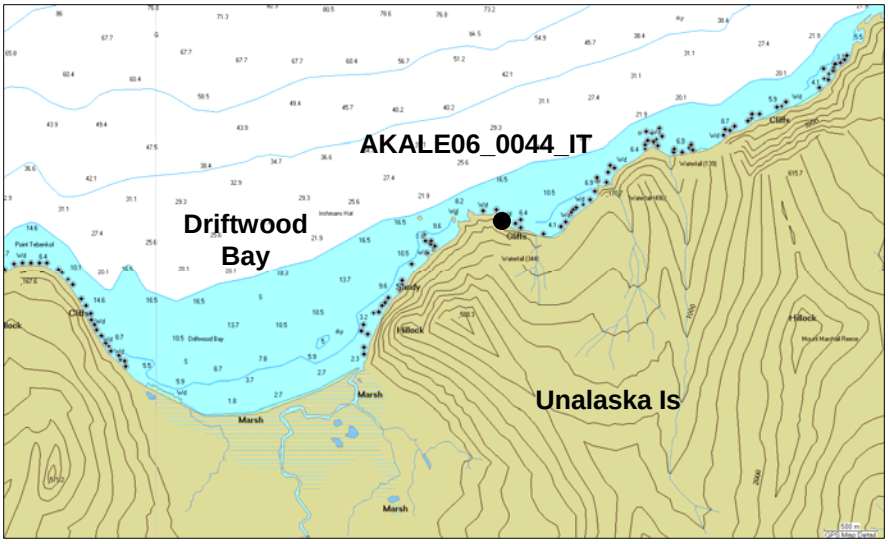
Location: **Driftwood Bay, Unalaska Is.**
Longitude/Latitude: N 53.99284 W 166.81433
Region: Eastern Aleutians
EMAP Site: AKALE06_0044_IT
Date: July 8, 2006

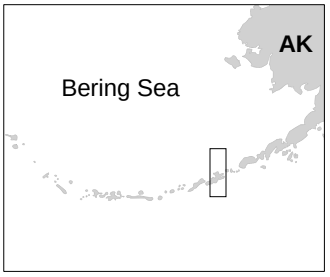
Geomorphology:
Driftwood Bay faces the Bering Sea side of Unalaska Is. Incredible cliffs (~350 m high) with waterfalls meet the shoreline containing mixed geologic layers of columnar basalt, many convoluted layers of volcanic rock, sea caves, and sea stacks. The IT site was a pocket beach with a large, deep cobble berm in the upper IT and large boulders in the lower IT (Photo A.). The IT to the east was mainly huge boulder rubble (breccias) which created tidepools and large spaces under boulders (~ 50 m wide). This is an exposed site (ocean swells) with an infinite fetch into the Bering Sea (northeasterly aspect, (50^{o}). The weather was calm, sunny with incredible visibility into the water.

Biology:
Biobands – There really was no biobanding where I sampled but bedrock shores had a bare zone (where POR *pseudolanceolata* probably was), patchy HAL *glandiforme*, barnacle, and ALA *marginata*. Subtidal included a dense bed of DRU *fistulosa* (wide bed). Boulder cobble areas had patchy banding of POR *tasa*, HAL *glandiforme*, MAZ *parksii*, barnacles, ODO *floccosa* f. *comosa*, ALA *marginata*, *Clathramorphum* sp., and THA *clathrus* (Photo B.).

Flora – The cobble pocket beach to the west had a bare upper IT. The lower IT had small boulders covered with ACR *coalita*, ULO *flacca*, PAL *hecatensis*, or ALA *marginata*. Kelps were very thick here and included mainly LAM yezoensis with SAC *subsimplex*, DRU fistulosa and THA *clathrus*. The huge bolder field to the east had VER sp. (V. *mucosa*), POR spp (P. *pseudolanceolata?* and P. *tasa*), MAZ *parksii*, MAS *papillatus* complex, big patches of Petrocelis crusts, HAL *glandiforme*, and END *muricata* in the upper elevations. In the middle elevations of the boulders there was *Fucus*, PAL *hecatensis*, POR *abbottiae*, ULV *lactuca*, MAZZ *phyllocarpa*, ODO *floccosa* f. *comosa*, and *Ulothrix flacca* on cobble. The lower elevations had tidepools with THA *clathrus*, ALA *marginata*, PTE *bipinnata*, *Kallymeniopsis* sp. (Photo C.). The boulders in the lower IT had 100% cover of encrusting coralline algae *coralline crusts* and *Clathramorphum* sp.(*C. loculosum*?). The outer edge of the beach had DES *viridis*, which I couldn't reach to collect. The caves around the point had extensive carpets of *Rhodochorton purpureum*.

Fauna – The cliffs had nesting Puffins, Oystercatchers, Bald Eagles and Pigeon Guillemonts. There were 4-5 seals just offshore and one sea lion. The middle IT had patchy mussels (MYT *trossulus*), BAL *glandula, and a few* NUC *sp. (N. lima or N. canaliculata?)*. The lower IT had an incredible matrix of SEM *cariosus*, orange and crimson anemones (*Epiactis prolifera* and *Metridium* sp.), *Spirorbis* sp., TEC *scutum*, urchins, sea stars (vermillion), tunicates, sponges (in addition to *Halichondria*), and many species of polychaet worms (Photo D.). Lemon dorids, *Tonicella* sp., KAT *tunicata*, and Lottidae (covered with *Clathromorphum* spp.) were also in abundance. The anemones were eating small squid, similar to the ones observed the previous day at Nateekin Bay.





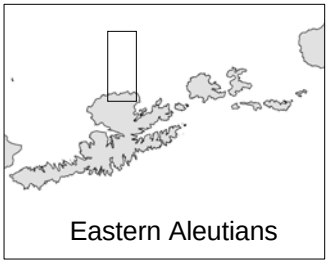


Photo A: Steep cliffs with large boulders.

Photo B: IT with large boulders, cobble berm, and patchy biobands of HAL *glandiforme*, ODO, and ALA *marginata*.

Photo C: *Thalassiophyllum clathrus* commonly found at waters edge in boulder field.

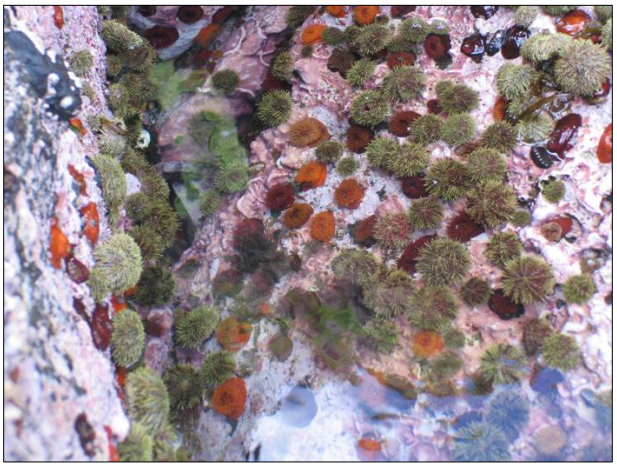


Photo D: *Clathramorphum* sp. with many invertebrates – urchins, anemones, chitons, sponges, tunicates and limpets.

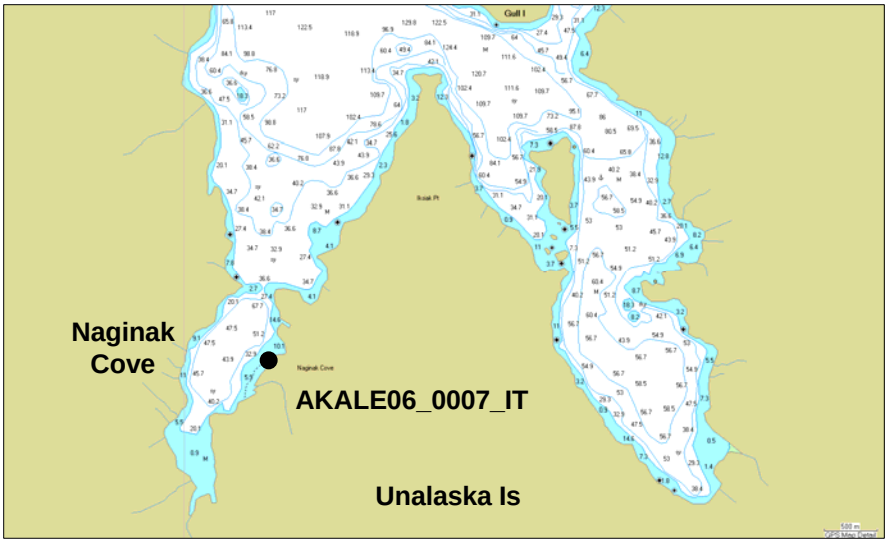
Location: **Naginak Cove, Anderson Bay, Unalaska Is.**
Longitude/Latitude: N 53.63770 W 166.85254
Region: Eastern Aleutians
EMAP Site: AKALE06_0007_IT
Date: July 9, 2006

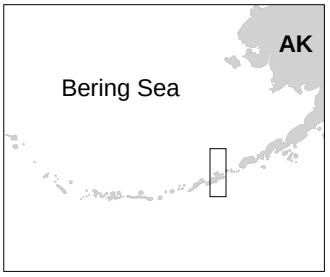
Geomorphology:
Naginak Cove lies in the southwestern arm of Anderson Bay which is located within Makushin Bay, Unalaska Island. Naginak Cove appears to have experienced glaciation with features such as U-shaped valleys and a fjord like deep bay with a terminal moraine (submarine; half way out bay). This site was a cobble pebble stream delta. Cobble storm berms were in the supra-tidal hidden by dune grass (Photo A.). The beach profile was nearly flat but just beyond zero tide the stream delta drops off (~ 50 m wide). The IT site was protected (no ocean swells) with a perpendicular fetch of half a kilometer given a northwesterly aspect (315^{o}). The water in the stream was crystal clear. During our visit to this site we experienced very impressive williwaws which lifted water off the sea surface. Wind also traveled up and down the hillsides laying down the grass like waves on the water.

Biology:
Biobands –Biobands were continuous dune grass, patchy sedges, *Fucus*, and no subtidal bands such as understory kelps or canopy kelps. The mussels were low lying dug into the substrate so the bed was not readily visible.

Flora – The high upper IT had sedges (*Carex* sp) and Dune Grass (*Elymus* sp). Wildflowers included Paint Brush, Monkey Flower, Wild Geraniums, Cow Parsnip, Beach Peas, Daisies, and lupine. The intertidal was dominated by *Fucus*, but I also observed cobble covered with encrusting algae such as Petrocelis crusts and *Hildenbrandia rubra* (Photo B.). Other species included MAS *papillatus* complex, NEO *oregona* (Photo C.), GLO *furcata* (Photo D.), ULV *lactuca*, and *Pylaiella* sp. Below the zero tide line I found sparse ALA *marginata*, DIC *foeniculaceous*, ULV *radiata*, and patchy coralline crusts.

Fauna – A flock of 6 or so Oystercatchers was on the beach working a mussel bed, and a seal was observed by the stream mouth. MYT *trossulus* were fairly large here (~30-40 cm), but their shells were severely worn probably from ice scour in the winter.





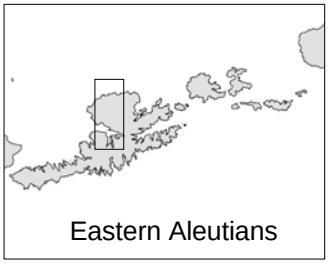


Photo A: Continuous stand of Dune grass above MHHW on stream delta.

Photo B: *Hildenbrandia rubra* on cobble in upper IT.

Photo C: *Neorhodomela oregona* on pebble.

Photo D: *Gloiopelis furcata* on cobble.

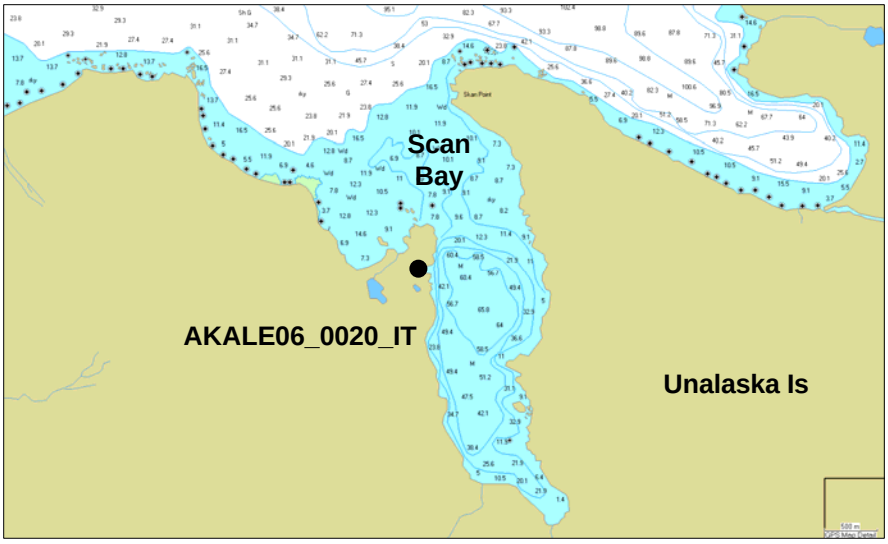
Location: **Scan Bay, Unalaska Is.**
Longitude/Latitude: N 53.61624 W 167.05653
Region: Eastern Aleutians
EMAP Site: AKALE06_0020_IT
Date: July 10, 2006

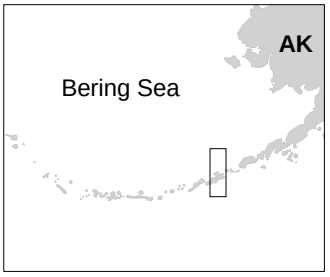
Geomorphology:
Scan Bay is located at the southern entrance to Makushin Bay, Unalaska Island. Scan Bay appears to have a glacial history with a sill (terminal moraine) feature at the entrance seen as a shallow kelp bed and a deep drop off just inside with anoxic sediments (from sediment grab). Most of the bay was steep bedrock but I was able to sample a small cobble pocket beach with bedrock on either side (Photo A.). Selendang Ayu tar balls were observed in the upper IT on boulder cobble. The beach was fairly steep but there was not a significant storm berm (~ 25 m wide). Offshore the slope dropped off quickly following the beach contour. With a fetch of just over a kilometer (easterly aspect, 90^{o}) this site has a protected exposure (no ocean swells). There was very poor visibility in the water.

Biology:
Biobands - The dominant biobanding for Scan Bay was VER (narrow band), *Rosenvingiella polyrhiza* or sp. in the upper IT, bare (had POR *pseudolanceolata* in spring), SEM *cariosus*, and ALA *marginata* (Photo B.). Subtidal had a very narrow band of DRU *fistulosa* and NER *luetkeana*.

Flora – Brown algae were prevalent here. The upper IT was fairly bare but the lower IT had lots of ANA *japonicus* (some heavily epiphitized with SAU *simplex*) (Photo C.), CHO *flagelliformis,* ALA *marginata*, and PET *fascia*. Other taxa included ACR *coalita*, *Kallymeniopsis* sp, MAZ *phyllocarpa*, MAS *papillatus* complex, Petrocelis crusts, GLO *furcata*, END *muricata*, HAL *glandiforme*, POR sp., ULV *fenestrate*, MON *grevillei*, ULV *intestinalis*, and *Fucus*. Tidepools included RAL *fungiformis*, coralline crusts, *Clathromorphum* spp., and some articulated corallines. Subtidal had LAM *longipies*, SAC *subsimplex,* DRU *fistulosa* and NER *leutkeana.*

Fauna – The point around the corner had Cormorants and a sea otter with a pup. Intertidal invertebrates were dominated by a wide band of SEM *cariosus*, sea stars (*Solaster* and *Henrichia*), URT *crassicornis*, NUC *canulicalata*, and MYT *trossulus*. Urchins had grazed the ALA *marginata* pretty heavily in some of the boulder areas (Photo D.).





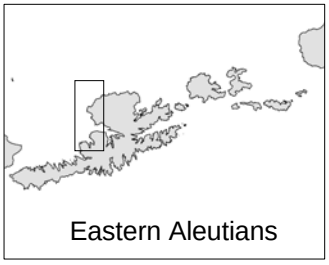


Photo A: Patchy nature of boulder cobble substrate.

Photo B: Distinct banding of ROS, bare, patchy HAL *glandiforme*, ODO with mussels and ALA *marginata*.

Photo C: *Analipus japonicus* with epiphytic *Saundersella simplex*.

Photo D: Pocket beach with vegetated area in foreground.

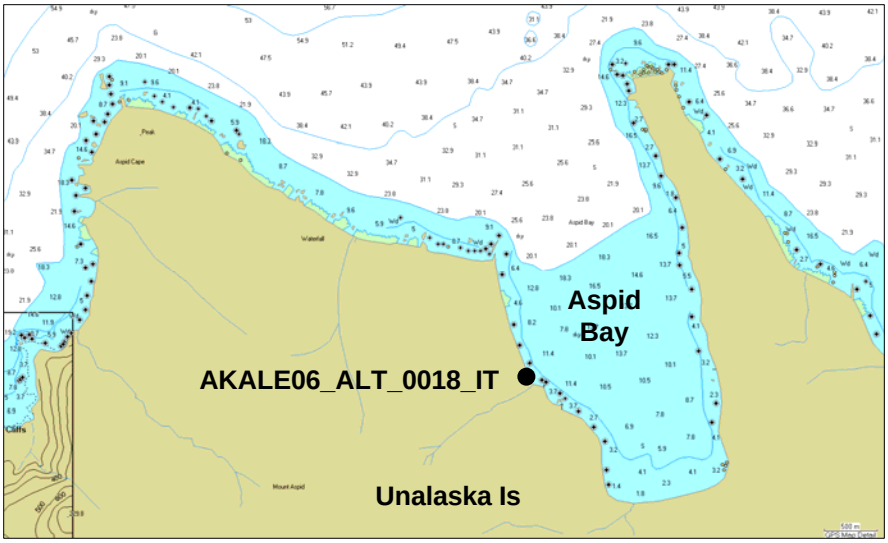
Location:	**Aspid Bay, Unalaska Is.**
Longitude/Latitude:	N 53.42323 W 167.41336
Region:	Eastern Aleutians
EMAP Site:	AKALE06_ALT_0018_IT
Date:	July 12, 2006

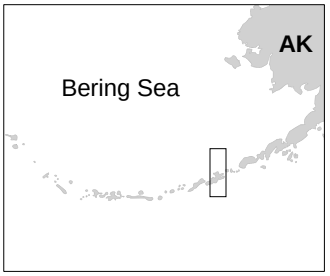
Geomorphology:
Aspid Bay had gently sloping mountains down to a wide rock platform in the IT. Substrate consisted of volcanic bedrock with chunks of basalt embedded. Well rounded cobble and green feldspar pebbles formed a storm berm in the high IT but were scattered throughout the beach. The beach profile was a platform ~50 m wide with the outer edge dropping off about 2 m (Photo A.). The rock bench had features such as shallow tidepools, wave cut channels, and dykes. This site was semi-protected (slight ocean swell) with a perpendicular fetch of 3.4 km (Umak Is.) given an easterly aspect (45º).

Biology:
Biobands – VER (narrow band), ULV *intestinalis* band, patchy *Fucus*, LAM *longipes*. Subtidal included patchy DRU *fistulosa* (extensive bed) and NER *luetkeana*, which extended way offshore.

Flora – Above MHHW notable plants were beach greens, lupine, Cow Parsnip, Coastal Paintbrush, Senecio, Buttercups and ferns. The wave cut platform had shallow tidepools crowned with NRH larix or ULV *intestinalis* (Photo B.). Tidepools farther to the east were lined with coralline crusts and *Clathromorphum* spp. (*C. loculosum*?) (Photo C.). and loads of articulated corallines (COR *vancouveriensis*). The flat rock ramp had POR *tasa*, END *muricata*, *Fucus*, LEA *difformis*, SOR *ulvoidea*, and MAS *papillatus* complex in the mid IT. Below the platform was an incredible biomass of kelps, mainly LAM *longipies* and ALA *marginata* with scattered SAC *subsimplex* and CYM *triplicata*. Under the kelps were PAL *mollis* and PAL *hecatensis*, PTI *sp.*, TOK *bullata*, *Kallymeniopsis* sp., MAZ *phyllocarpa*, ODO *flocossa* and Petrocelis crusts. Offshore had DRU *fistulosa* and huge adult NER *luetkeana*.

Fauna – Observed 20 or so Harlequin Ducks and a Bald Eagle. Mussels (MYT *trossulus*) were scattered throughout the platform along with LIT *sitkana*. SEM *cariosus* was caked with a colonial tube worms and accompanied by TEC *scutum*, KAT *tunicata*, *Epiactis prolifera*, and *Metridium* sp. The lower IT was loaded with *Halichondria*, a bright red ascidian, lemon dorids, *Flustrella* sp.(huge quantities living among the stipes of LAM *longipies*) (Photo D.) and other bryozoans, TON *lineata*, urchins, hydroids, and lots of bright yellow but very small snail fish all over the kelps.





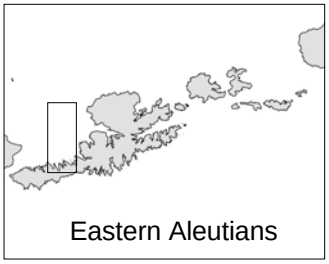


Photo A: Outer edge of rock platform (~50m wide).

Photo B: High tidepools on rock ramp with *Ulva intestinalis*.

Photo C: High tidepools with encrusting coralline algae.

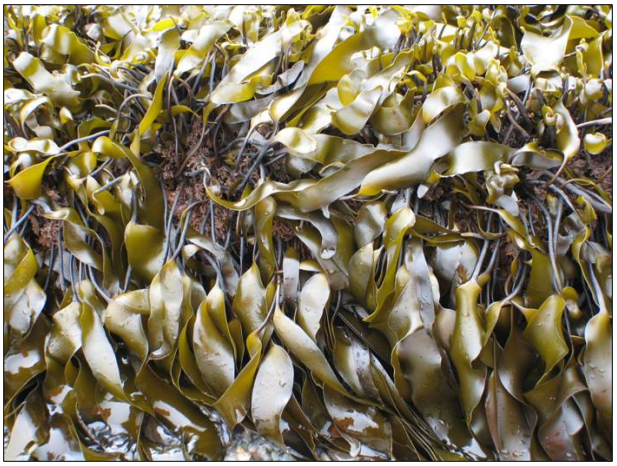


Photo D: LAM *longipies* with dense colonies of *Flustrella* sp. at base of stipes.

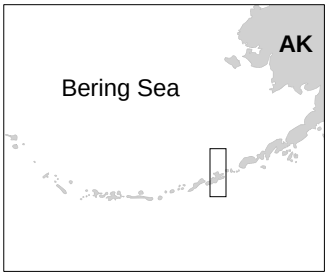
Location: **Kismaliuk Bay, Unalaska Is.**
Longitude/Latitude: N 53.45782 W 167.27969
Region: Eastern Aleutians
EMAP Site: AKALE06_0012_IT
Date: July 13, 2006

Geomorphology:
Kismaliuk Bay is located near the western end of Unalaska Is., on the Bering Sea coast. This IT site had a wide rock platform (~75m) of basalt, and an outcropping of columnar basalt (~15m high) (Photo A.). Upper IT had a pebble cobble berm and scattered boulders. Large sections of almost perfectly flat rock were in the mid IT (Photo B.). Lower IT had gradually sloping rock ridges with shallow channels. This site was semi-protected (no ocean swells) with a perpendicular fetch less than 1 km given a southwesterly aspect (200^{o}).

Biology:
Biobands – The most distinctive bands would be bare boulder, HAL *glandiforme*, and HED sessile, and LAM *longipies*. Offshore was a mixed bed of NER *luetkeana* and DRU *fistulosa* (extensive bed).

Flora - The storm berm had lots of white sun dried fragments of *Clathromorphum* and plants above this zone were Dune Grass, lupine, Yarrow, and Monkeys Flower. Some spray zone boulders had the orange discoid lichen. The upper IT had mostly bare boulder and bedrock with some barnacles and a kelp flotsam band. Very shallow tidepools (2-5 cm deep) on the flat sections of rock were packed with short articulated corallines, coralline crusts, *Clathromorphum* spp., RAL *fungiformis* and patchy LEA *difformis*. There were some patches of GLO *furcata* and END *muricata* on boulders and flat bedrock. The mid IT had bedrock outcroppings running diagonally offshore which were dominated by NEO *aculeata, Fucus*, and MAS *papillatus* complex. Mid IT areas with flat benches had huge patches of HAL *glandiforme* with MAZ *phyllocarpa* and short articulated corallines scattered throughout. ANA *japonicus* formed curious bands fringing shallow tidepool (Photo C.) and ULV *lactuca* formed small patches throughout. Just below this zone on the flat benches was a matrix of SAC *sessile* (Photo D.), grazed LAM *longipes*, and corallines. The lower IT was 100% cover of understory kelps such as SAC *sessile*, ALA *marginata*, LAM *longipes*, and SAC *subsimplex*. Under the kelp was NPT *asplenioides, Kallymeniopsis*, and MAZ *phyllocarpa*.

Fauna – A female fox and her 2 pups were on the beach and a seal just offshore. Harlequin ducks and cormorants were also observed. Invertebrates in the upper IT had tons of LIT *sitkana* and Lottidae. Mid to lower IT included huge patches of *Halichondria*, patchy MYT *trossulus*, SEM *cariosus*, KAT *tunicata*, *Pentidotea* sp., *Henrichia*, many urchins, *Tonicella*, tunicates, bryozoans, and hydroids. I did find one large crescent gunnel under a boulder.



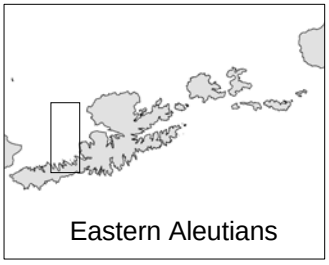


Photo A: Columnar basal and very flat smooth rock ramp.

Photo B: Rock platform with carpet of NEO *aculeata* and *Fucus* .

Photo C: Curious band of *Analipus japonicus* and HAL *glandiforme* with articulated coralline algae on high IT rock ramp.

Photo D: Rock ramp with extensive stands of HAL *glandiforme* and SAC *sessile*.

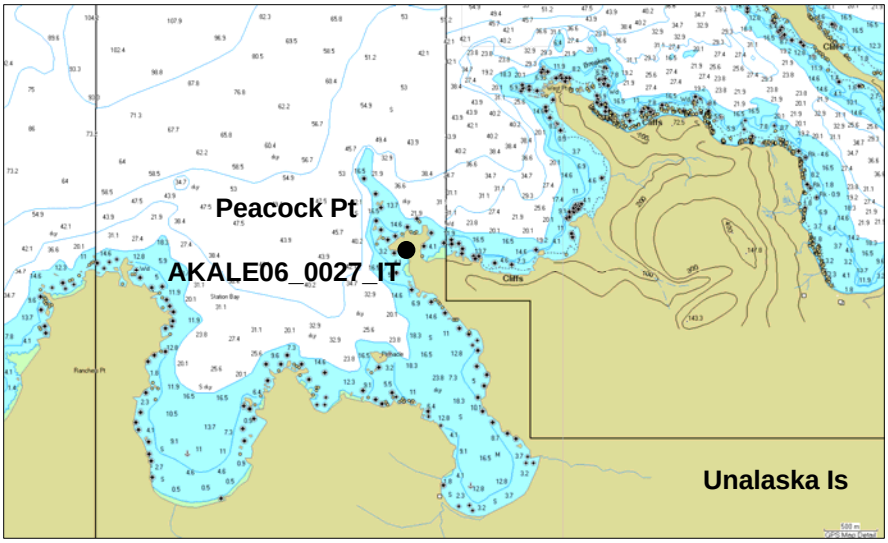
Location:	**Peacock Pt, Station Bay, Unalaska Is.**
Longitude/Latitude:	N 54.39331 W 167.60529
Region:	Eastern Aleutians
EMAP Site:	AKALE06_0027_IT
Date:	July 14, 2006

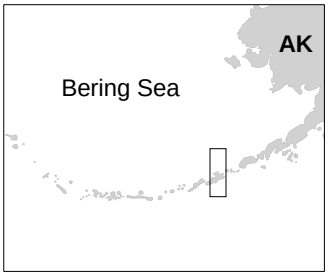
Geomorphology:
Peacock Pt. is located at the northeastern entrance to Station Bay. Station Bay is on the western end of Unalaska Is. facing the Bering Sea. The IT site was located just inside the exposed Peacock Pt. which has a reef that extends way out into the Bering Sea. With a perpendicular fetch of 1.5 km (southwesterly aspect, 225º) this site was semi-protected (no ocean swells). I landed in a pocket beach of loosely stacked, rounded boulders and large cobble with an outcropping of columnar basalt on either side (less than 25 m wide). The columnar basalt had eroded into nice stair-step benches (Photo A.). The morning greeted us with glassy seas and fog that rolled in as we arrived at the site.

Biology:
Biobands – The banding is rather bare for the upper IT but there was VER (narrow band), a patchy band of *Fucus*, LAM *longipes*, DRU *fistulosa* (extensive bed) and NER *luetkeana*.

Flora – Above MHHW had the orange lichen on bedrock and other vegetation such as Cow Parsnip, Cinquefoil, Monkey Flower, and Monkshood (*Aconitum maximum*). The intertidal boulder field had PRA *meridionalis*, *Bangia*, END *muricata*, MAS *papillatus* complex, *Fucus*, and POR sp. in the upper to mid IT. The lower IT had POR *abbottiae*, POR *pseudolinearis*, POR *fucicola*, MAZ *phyllocarpa*, ULV *intestinalis*, and PAL hecatensis (Photo B.). At this site I saw PAL *hecatensis* looking like PAL *mollis*. I'm not sure both species were present or it was just PAL *hecatensis* showing PAL *mollis* characteristics. The bedrock benches of columnar basal were fairly bare with patches of MAS *papillatus* complex, Petrocelis crusts and *Fucus* (Photo C.). At the zero tide line I started to see ALA *marginata* and LAM *longipes*. This extended out ~10m and turned into a dense bed of DRU *fistulosa* for ~75m with NER *luetkeana* on the outside margin.

Fauna – Wildlife included Bald Eagles, Cormorants, nesting gulls, and seals. I found sheep dung from a handful of animals observed on the hillside. I also heard a funny suck/pop sound near the waters edge. I couldn't figure it out for the longest time and finally I just stared at the DRU *fistulosa* bed until I saw fish hitting the surface. I'm guessing they were greenling or Atka mackerel feeding on thick concentrations of juvenile Gadids (feeding on swarms of mysids) we saw throughout the bed. IT invertebrates were not dominant and I saw a few MYT *trossulus*, barnacles, and sea stars (*Pycnopodia* and *Henricia*). *Metridium* sp. was found in some high tidepools (Photo D.).





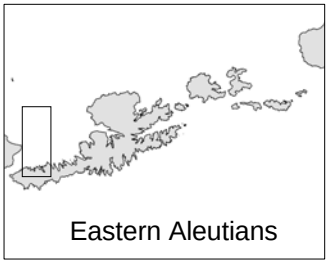


Photo A: Columnar basalt with fairly bare rock ramp.

Photo B: Rounded boulders with POR, *Fucus*, filamentous greens and ALA *marginata* and *Palmaria* sp. at base.

Photo C: Stair-step erosion of columnar basalt with encrusting Petrocelis crusts, barnacles, and *Fucus*.

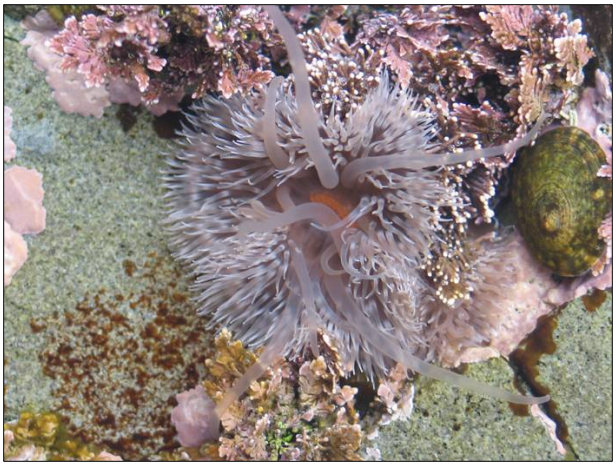


Photo D: Anemone (*Metridium* sp) and articulated coralline algae in tidepool.

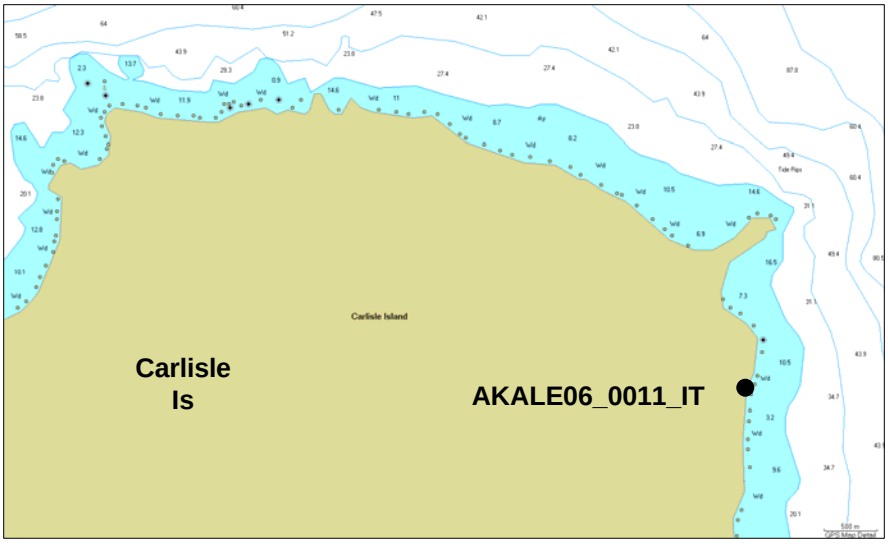
Location: **Carlisle Is., Island of Four Mountains**
Longitude/Latitude: N 52.89939 W 169.99757
Region: Central Aleutians
EMAP Site: AKALE06_0011_IT
Date: July 15, 2006

Geomorphology:
Carlise Is. is part of the Islands of the Four Mountains with a volcano that is 5,283 ft high (Photo A.). This site receives the full brunt of the Bering Sea. We were fortunate to be able to see the whole mountain as the fog lifted and calm waters allowed me to tour the beach. This site was semi-exposed with a perpendicular fetch of 9 km (Chuginadak Is.) given a southeasterly aspect (210^{o}) and a fairly good current occurred just outside the DRU fistulosa bed. The supra-tidal is an erosional cliff ~20 m high with grassy sod hanging over sandy (ashy) sediment. At the base of the bluff well rounded cobble was piled up into a storm berm (moderate plastic garbage was also present). Most of the intertidal is loosely stacked, large rounded boulders with cobble rubble between. The rocks are basalt in a wide variety of colors or lava. The beach is fairly steep in the upper IT and then benches out in the lower IT (~ 50 m wide). It is obvious this site experiences high energy and boulders a meter across are being rolled around. The water was incredibly clear with at least 80 ft visibility.

Biology:
Biobands – A red band of HAL *glandiforme*, PAL, and POR dominated the low IT (Photo B.). A narrow band of LAM *longipes* and DRU *fistulosa* (patchy bed) occurred beyond the urchin barrens.

Flora – The supra-tidal has a narrow patchy band of Dune Grass, lupine, and Senecio. The upper and mid IT are bare with the lower IT having a narrow band of vegetation (~3 m wide). The boulders in the lower IT had a 100% cover of algae but the species varied. Most boulders were covered with a crown of HAL *glandiforme* and a skirt of PAL *hecatensis* (Photo C.). Others were covered with only POR *pseudolinearis* (Photo D.). More stable boulders had more diversity such as MAZ *parksii*, HAL *glandiforme*, PAL *hecatensis*, MAS *papillatus* complex, *Fucus*, POR sp., and ALA *marginata*. At zero tide there was a narrow band of LAM *longipes* and SAC *subsimplex* before an extensive urchin barren began. Offshore beyond the urchin barren was an extensive bed of DRU fistulosa.

Fauna – A seal was trying to haul out right were I was, two gulls and a sparrow closely monitored my actions on the beach and Oystercatchers were in their usual worried state. In the intertidal were huge TEC *scutum* limpets and I found a few chitons (*Schizoplaz brandtii*). The invertebrates were very sparse but urchins were very evident in the subtidal.



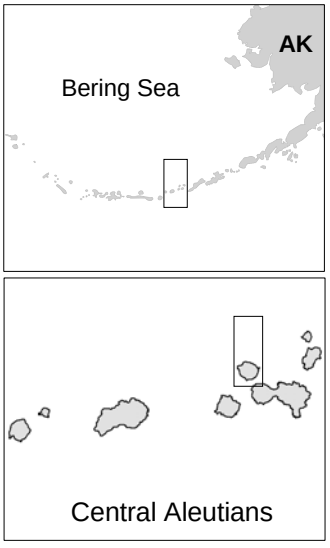


Photo A: Carlisle Volcano with steep erosional bluff (~50m high).

Photo B: Dominate red bioband comprised of HAL *glandiforme*, PAL, and POR.

Photo C: Boulder with HAL *glandiforme* on top and PAL *hecatensis* on lower half.

Photo D: Boulder with 100% POR *pseudolinearis*.

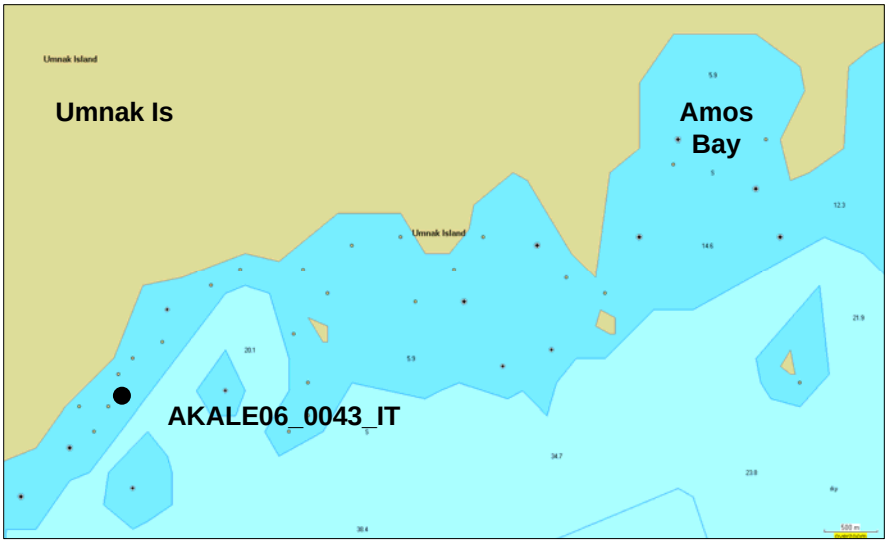
Location:	**South of Amos Bay, Umnak Is.**
Longitude/Latitude:	N 53.01683 W 168.59572
Region:	Central Aleutians
EMAP Site:	AKALE06_0043_IT
Date:	July 19, 2006

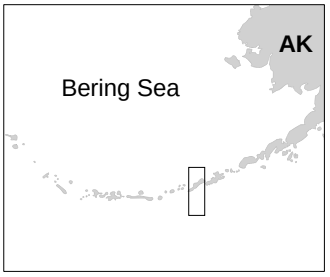
Geomorphology:
Located on the Pacific side of the Aleutians, this site was a rock platform separated from the main shoreline but extending several hundred meters offshore. Portions of the platform clearly showed the hexagonal footprint of columnar basalt. The seaward side of the reef receives the full brunt of ocean breakers but a +4 ft tide didn't flood it. Pacific Ocean low frequency ground swell was steady at this site but the rock platform absorbed much of the wave energy. There were many wave cut platforms and tidepools (Photo A.). With an infinite perpendicular fetch given a southeasterly aspect (125^{o}) this site was semi-exposed to exposed (large ocean swells). The fog burned off fairly early, and we were treated to a sunny day and a beautiful view of Vsevidof volcano (Photo B.).

Biology:
Biobands – The flat nature of the reef does not lend itself to biobanding but the following were dominant: MAZ *parksii*, NRH *larix*, SEM *cariosus*, ALA *marginata*, and NER *luetkeana*.

Flora – The higher regions of the reef had PRA *meridionalis*, POR *tasa*, MAZ *parksii*, and Petrocelis crusts (Photo C.). The flats had NRH *larix*, *Fucus*, LEA *difformis*, SOR *ulvoidea*, *Chaetomorpha* sp., MIC *borealis*, and ALA *marginata*. tidepools in the flats were choked with articulated corallines (*Corallina vancouveriensis, Pachyarthron cretaceum*, and CLA *reclinatum*) (Photo D.) and also had RAL *fungiformis*, HIL *rubra*, *Clathromorphum* spp., coralline crusts. I found it curious that there was little or no HAL *glandiforme and* MAS *papillatus* complex (not enough high IT substrate available?).

Fauna – There were cows on the hillside above the beach, harlequin ducks, cormorants, Oystercatchers, and a small flock of shore birds (small sand pipers?). I found huge NUC *lamellosa* on the reef along with a good band of SEM *cariosus* and an occasional MYT *californianus*. MYT *trossulus* was also present. Low IT tidepools had anemones (*Metridium* sp.) and higher tidepools were loaded with littorines. Littorines also seemed to be grazing the heck out of POR *tasa*. There was a NER *luetkeana* (very large, old, adult plants) bed just offshore. These invertebates are all adaped to high energy environments.





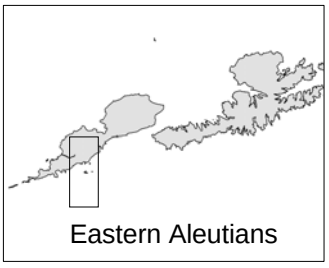


Photo B: Fore-reef which receives high energy Pacific Ocean swells, favorable conditions for coralline algae.

Photo A: Mt. Vsevidof in the background and the rock platform with wave cut channels in the foreground.

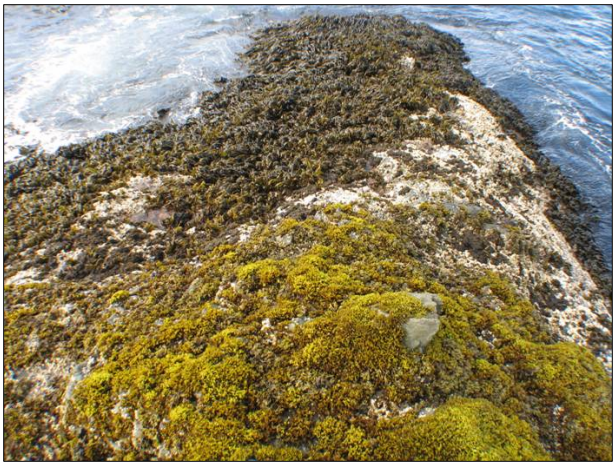


Photo C: MAZ *parksii* in foreground, a disturbed area with barnacles to the right, and ALA *marginata* at top left.

Photo D: *Pachyarthron cretaceum* in tidepool.

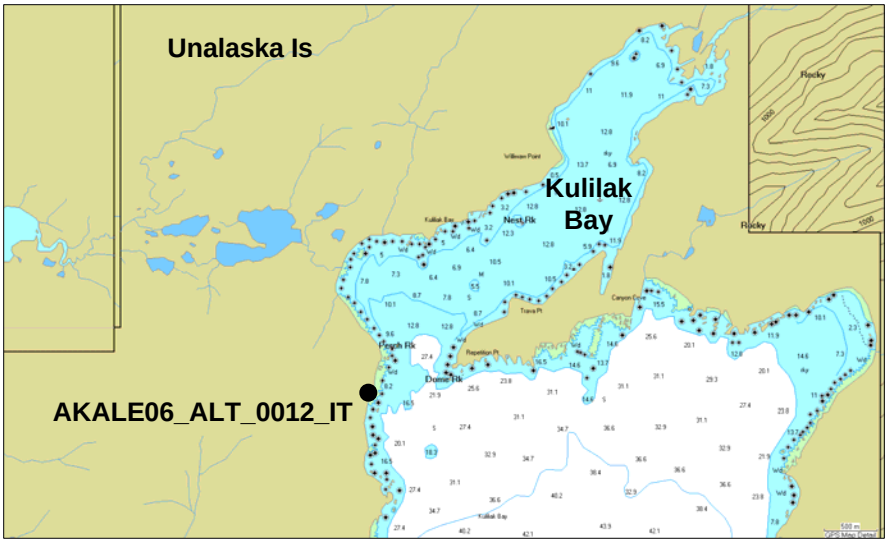
Location:	**Kulilak Bay, Unalaska Is.**
Longitude/Latitude:	N 53.44669 W 167.05286
Region:	Eastern Aleutians
EMAP Site:	AKALE06_ALT_0012_IT
Date:	July 20, 2006

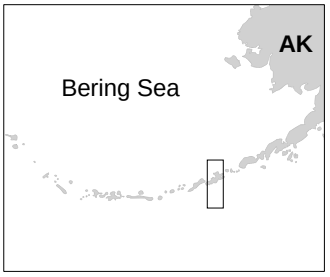
Geomorphology:
This site was located at the entrance to Kuliak Bay on the southern Pacific Ocean side of Unalaska Island. The beach profile is a wave cut platform which extends out ~50 m. The upper IT is a rubble pile of huge boulders from an erosional cliff that avalanched directly above. The bedrock ramp is smooth rock with a green tint. The cliffs rise over 75 m with sections of columnar basalt visible (Photo A.). This site is semi-exposed (ocean swells) with a perpendicular fetch of 4 km given a southeasterly aspect (100^{o}).

Biology:
Biobands – The upper IT was bare and the ramp could be divided into two bands, an *Odonthalia/Neorhodomelas* band and an ALA *marginata* band. Offshore was a NER *luetkeana* band.

Flora – Above MHHW there was scattered beach greens and lupine. The boulder field had no vegetation but the ramp had a 100% cover. The upper portions of the ramp were dominated by ODO *floccosa* fm *comosa* or NEO *aculeata* with LEA *difformis*, SOR *ulvoidea* and *Chaetomorpha* sp. Patches were found of MIC *borealis*, HAL *glandiforme*, PAL *mollis*, CRY *woodii*, MAS *papillatus* complex, Petrocelis crusts, PTE *bipinnata*, POR *tasa*., *Fucus*, HIL *rubra*, ACR *arcta*, ULV sp. and END *muricata* (Photo B.). The lower portion of the ramp was covered with ALA *marginata*, COR *vancouveriensis*, *Clathromorphum* spp., and coralline crusts. Just below this zone was LAM *longipes*. At the transition between the upper and lower ramp I found a small patch of ODO *floccosa*. A surge channel had POR sp.and PAL *hecatensis* in it. Offshore was a bed of huge adult NER *luetkeana*.

Fauna – MYT *californianus* was present in the mid section of the ramp (Photo C.) and MYT *trossulus* was a little higher. There were also large patches of *Halichondria* all over the ramp (Photo D.). SEM *cariosus* formed a wide band on the lower half of the ramp where KAT *tunicata*, TEC *scutum*, and anemones (*Metridium* sp.) were scattered throughout. LOT pelta and other Lottidae were scattered throughout the mid to upper IT. Littorines were grazing the upper ramp where NEO *aculeata* dominated.





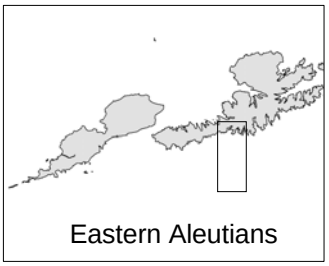


Photo A: Erosional bluff (~75 m high), boulder rubble, and a rock ramp in the lower IT (waves breaking over ramp).

Photo B: Upper IT with LEA *differmis*, SOR *ulvoidea* ephiphytic on NEO *aculeata*.

Photo C: MYT *californianus*, SEM *cariosus*, HAL *glandiforme*, ARC, ULV, PTE, ODO, *Fucus*, and articulated coralline algae.

Photo D: Tidepool in lower IT with large colony of *Halichondria*, PAL *hecatensis*, and ALA *marginata*.

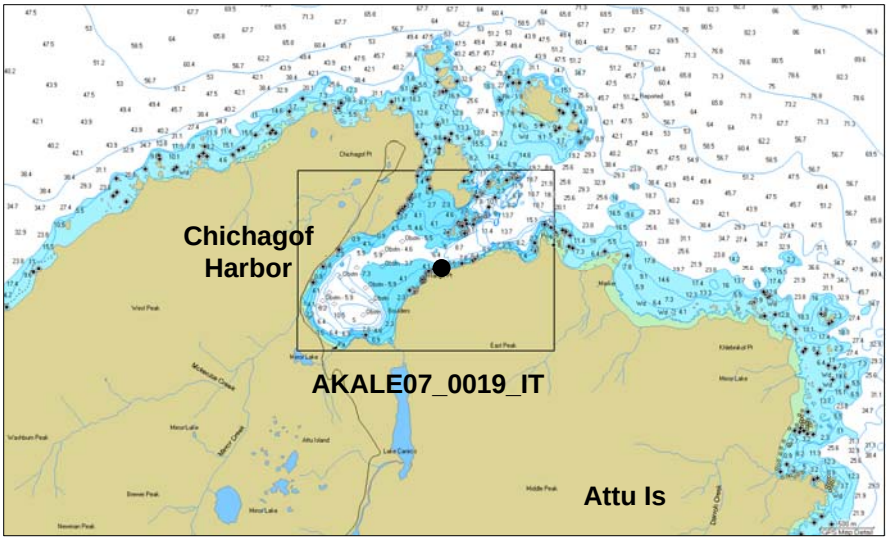
Location: **Range Pt., Chichagof Harbor, Attu Is.**
Longitude/Latitude: N 52.93019 W 173.25461
Region: Western Aleutians
EMAP Site: AKALE07_0019_IT
Date: June 25, 2007

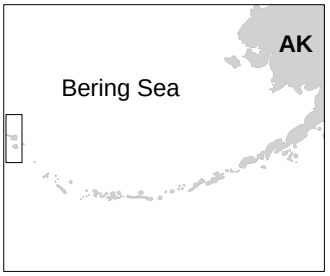
Geomorphology:
Chichagof Harbor is a fairly shallow embayment on the northeastern side of Attu Island facing the Bering Sea. The shoreline at this site consists of basalt outcroppings, a narrow rock ramp (~35 m), and rounded cobble and boulder scattered in the upper IT (Photo A.). High IT ramp areas had shallow tidepools and bedrock ramps continued into the subtidal forming shallow reefs. This site was semi-protected (no ocean swell) with a perpendicular fetch no longer than 1 km facing northwesterly (~345^{o}).

Biology:
Biobands – There were two types of dominant IT biobanding on bedrock outcroppings. The first type was dominated by algae and consisted of VER (narrow band), ROS (wide), POR(wide), HAL/*Fucus* (narrow), and ALA *marginata*. The second type was dominated by invertebrates: BAR (wide), Mussels, and ALA *marginata*. Major subtidal biobands were SAC sp. (short stype) and DRU *fistulosa* (extensive bed) (Photo B.).

Flora – Above MHHW notable plants were beachgreens, Dune grass, beach peas, Cenesio, Cinquefoil, wild geraniums, chocolate lillys, Beach Lovage (*Ligusticum* sp.), Cow Parsnip, lupine, Large leafed Aven, and salmon berries. Upper IT biobands had ROS *polyrhiza*., POR *pseudolinearis* complex, POR *schizophylla*, POR *fucicola*, END *muricata*, GLO *furcata*, and MAS *papillatus* complex (Clade 1) (Photo C.). Large upper IT tidepools were choked with UVL *intestinalis* or what appeared to be a stunted morph of HAL *glandiforme*. Mid to low IT had ACR *coalita*, *Ulvaria obscura* var. *blyttii*, *Fucus*, LEA *differmis*, SOR *ulvoidea*, SCY cf. *tenellus*, ANA *japonicus*, ALA *marginata*, HAL *glandiforme*, NEO *oregona*, ODO *floccosa* fm. *comosa*, PTE *bipinnata*, PAL *hecatensis*, PAL *callophylloides* complex, HIL *rubra*, and petrocelis. Subtidal vegetation included a short styped SAC sp. and DRU *fistulosa*.

Fauna – Avian activity included Cormorants, gulls, nesting Geese (Aleutian Canada Goose), Pigeon Guillemots, Murrs, Loons, and sparrows. Marine mammals observed were Steller Sea Lions hauled out at the entrance to the harbor. Common IT invertebrates included Littorines, large LOT *pelta*, SB *balanoides*, MYT *trossulus* (fairly large and dense bands; collected), SEM *cariosus* (Photo D.), and very common *Halichondria* sp.





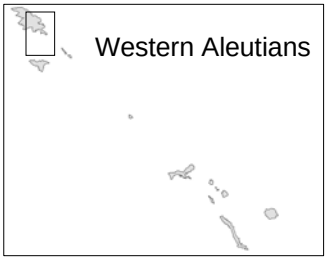


Photo A: Upper intertidal with distinct *Verrucaria maura* (black marine lichen) bioband and boulder/cobble rubble.

Photo B: Shallow subtidal reef with short styped *Saccharina* sp. and DRU *fistulosa* beds.

Photo C: Algal biobands of VER, ROS, POR, HAL/*Fucus*, and ALA *marginata*.

Photo D: Invertebrate biobands of barnacles and mussels.

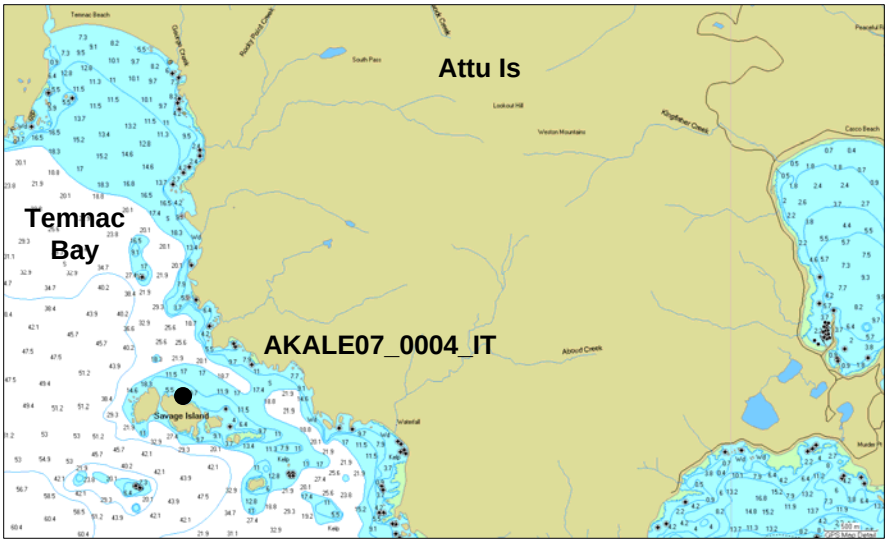
Location: **Temnac Bay, Savage Is. (Attu Is.)**
Longitude/Latitude: N 52.80082 W 173.07388
Region: Western Aleutians
EMAP Site: AKALE07_0004_IT
Date: June 26, 2007

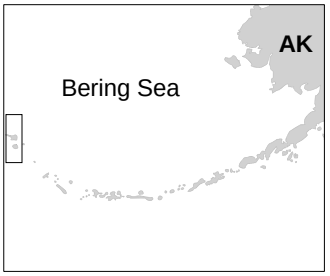
Geomorphology:
Savage Island is part of an island group located in the southeastern region of Temnac Bay. Temnac Bay is on the Pacific Ocean side of Attu Island. Savage Island's shoreline was a patchwork of alongshore segments alternating from cobble pocket beaches to bedrock outcroppings (Photo A.). Well rounded cobble was stacked up in a storm berm in the upper IT and formed a mobile veneer over bedrock in the lower IT (~ 25 m wide). Bedrock outcroppings of basalt formed distinct, very steep profiles which rose into pinnacles (Photo B.). The Savage Is. site was in the lee facing directly northeast (45º). This site was semi-protected (with ocean swell) with a perpendicular fetch no longer than 750 m (Attu Is).

Biology:
Biobands – The major IT biobands on bedrock were VER (wide), PRA, POR, HAL (wide), *Fucus* (very narrow), and ALA *marginata*. Major subtidal biobands were LAM *longipes* and DRU *fistulosa* (extensive beds).

Flora – Above MHHW notable plants were beachgreens, Dune grass, and the larged leafed Aven. Upper IT biobands had PRA *meridionalis*, POR *pseudolinearis* complex, POR *tasa*, HAL *glandiforme*, MAZ *parksii*, and Petrocelis crusts. Mid to low IT had *Fucus*, PAL *callophylloides* complex, ODO *floccosa* fm. *comosa*, and ALA *marginata* (Photo C.). One large tidepool was plugged with COR *vancouveriensis*, *Pachyarthron cretaceum*, ACR *coalita*, and NEO *aculeata*. Subtidal vegetation included LAM *longipes* and DRU *fistulosa* (extensive beds). Pocket beaches with rounded cobble and boulder were covered with either Ulothrix *flacca* or POR *pseudolinearis* (Photo D.). Emergent bedrock next to these areas had dense bands of PAL *callophylloides* complex.

Fauna – Avian activity included many nesting Puffins and gulls just above MHHW, Murrs, Stellers Eider, and a few sparrows. Marine mammals observed included one curious seal just at the waters edge. Common IT invertebrates included a few scattered mussels, SEM *cariosus*, *Halichondria* sp., LOT *pelta*, and Littorines.





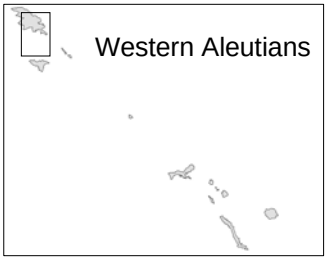


Photo A: Basaltic bedrock with fairly steep profile and biobands of VER, PRA, HAL, and ALA *marginata*.

Photo B: Tidepool in foreground and prominent pinnacles in background.

Photo C: Steep rock wall with patchy HAL, *Fucus*, PAL and ALA *marginata*.

Photo D: Boulder/cobble veneer on bedrock. Note some substrates colonized by ULO *flacca* and others with POR *pseudolinearis*.

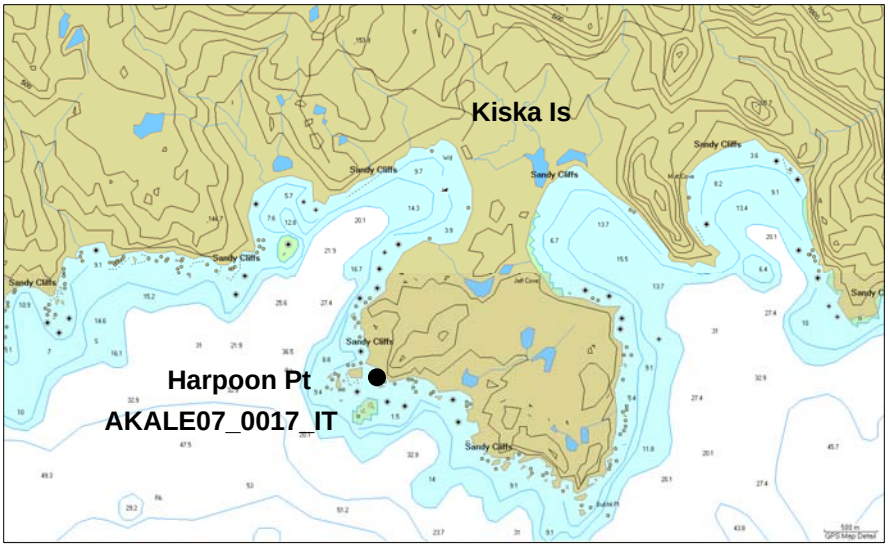
Location:	**Harpoon Pt., Kiska Is.**
Longitude/Latitude:	N 51.91801 W 177.44672
Region:	Western Aleutians
EMAP Site:	AKALE07_0017_IT
Date:	June 29, 2007

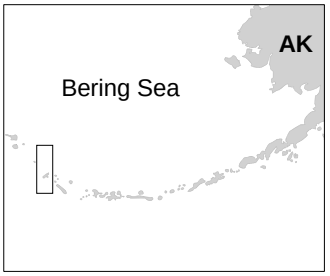
Geomorphology:
Harpoon Pt. is located on the Pacific Ocean side of Kiska Island towards the mid point of its eastern shore. It is part of a very large peninsula, almost tombolo-like that extends ~3 km out into the ocean. The Harpoon Pt. site is defined by prominent columnar basalt cliffs (~100 m high) and a flat rock ramp ~100 m wide (Photo A.). This site was semi-protected on the inside of the reef and semi-exposed on the outer edge. The site faced southwest (225^{o}) with a perpendicular fetch no longer than 11 km.

Biology:
Biobands – The major IT biobands on bedrock were PRA, POR, Barnacle, and ALA *marginata*. Major subtidal biobands were LAM *longipes*, and DRU *fistulosa* (extensive beds) (Photo B.).

Flora – Upper IT biobands had PRA *meridionalis*, POR *tasa*, MAS *papillatus* complex (Clade 1), MAZ *parksii* (fertile), HAL *glandiforme*, END *muricata*, and petrocelis. Mid to low IT had ACR *arcta*, *Fucus*, PAL *callophylloides* complex, ODO *floccosa* fm. *comosa*, ALA *marginata*, and HIL *rubra*. Tidepools were filled with articulated corallines such as *Corallina* sp. and *Bossiella* sp. Subtidal vegetation included extensive beds of LAM *longipes* (Photo C.), SAC *sessile*, SAC *subsimplex*, THA *clathrus*, NPT *asplenioides*, *Ptilota sp.*, MIK *ruprechtiana, Cirrulicarpus ruprechtiana, Euthora cristata,* and DRU *fistulosa*.

Fauna – Avian activity included Pigeon Guillemots, Cormorants, and Eiders. Common IT invertebrates included *Littorines* (Photo D.), LOT *digitalis*, SB *glandula*, *Siphonaria thersites*, *Onchidella borealis*, in the upper IT and LOT *pelta*, KAT *tunicata*, *Spongioradsia aleutica* (ID R. Clark), *Leptasterias* sp, *Henricia* sp, many urchins, sponges, tunicates, and tube worms in the lower to subtidal zones. MYT *trossulus* were extremely rare.





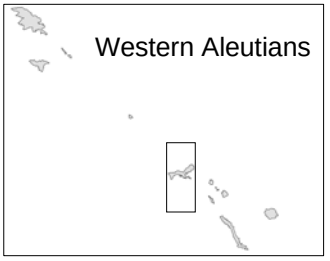


Photo A: Columnar basalt cliffs in upper right.

Photo B: Low IT vegetation of ALA *marginata*, SAC *subsimplex*, and DRU *fistulosa*.

Photo C: Rock Ramp with 100% cover of LAM *longipes*.

Photo D: High IT basalt with POR *tasa* being grazed by Littorines.

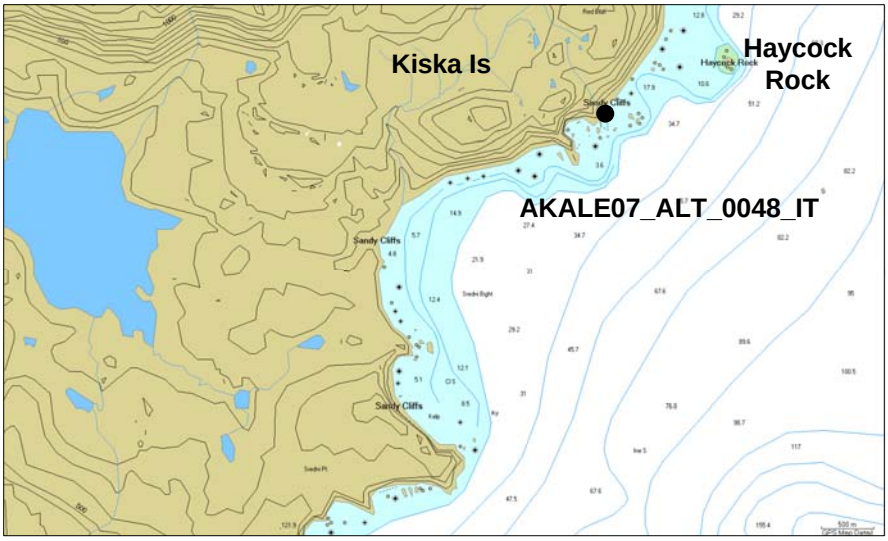
Location: **Haycock Rock, Kiska Is.**
Longitude/Latitude: N 52.07271 W 177.66210
Region: Western Aleutians
EMAP Site: AKALE07_ALT_0048_IT
Date: June 30, 2007

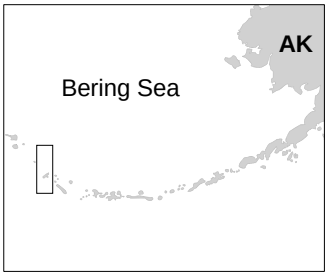
Geomorphology:
The Haycock Rock lies ~700 m off the northeastern shore of Kiska Is. The IT site lies ~1 km south of Haycock Rk. at the base of Kiska Volcano. The red bluffs (~500 m high) above this site are scarred and steaming with geothermal activity (Photo A.). The IT site has erosional cliffs just above MHHW, the upper IT a storm berm of rounded cobble, and the lower IT a basalt rock ramp (~25 m). Other features include deep and shallow tidepools, wave cut channels, and small pinnacles. The subtidal profile consists of a shallow bench extending ~ 500 m offshore with huge coralline algae covered boulders and reefs breaking the surface throughout. There was very clear water here with good visibility into the subtidal. This site was Semi-protected (with ocean swell) with a perpendicular fetch no longer than 30 km (Segula Is.) facing almost directly east (95º).

Biology:
Biobands – The major IT biobands on bedrock were VER (wide), ROS, POR, MAZ, and ALA *marginata* (Photo B.). Major subtidal biobands were LAM *longipes*, SAC *subsimplex*, and DRU *fistulosa* (extensive beds).

Flora – Upper IT biobands had ROS *polyrhiza*, POR *tasa*, PAL sp, MAZ *parksii* (Photo C.), Petrocelis crusts, and patchy *Fucus*. I found it noteworthy that HAL *glandiforme* and MAS *papillatus* complex didn't show up here only very sparsely in the lower IT. Cobble areas had ULO *flacca*, HAL *glandiforme*, PAL *hecatensis*, POR *tasa*, and Petrocelis crusts. Mid to low IT had was dominated by ALA *marginata*, SAC *sessile* and corallines such as *Corallina* sp., *Bossiella* sp., *Clathromorphum* spp., and coralline crusts MIC *borealis* was observed in a tidepool. Subtidal vegetation included LAM *logipies* with patches of *Phycodrys* sp., *Cirrulicarpus ruprechtiana*, and *Ptilota* sp. underneath. Other kelps included SAC *subsimplex*, CYM *triplicata*, and DRU *fistulosa*.

Fauna – Avian activity included a juvenile Steller's Eagle who perched on a pinnacle right next to me being very curious until a pair of Oystercatchers decided its presence was a threat and chased him away. Common IT invertebrates included Littorines in the upper IT and in the low IT to subtidal areas LOT *pelta*, *Metridium* sp., large patches of *Halichondria* sp. (Photo D.), *Henricia* sp., a few scattered mussels, *Spongioradsia aleutica* (ID R. Clark), and tunicates.





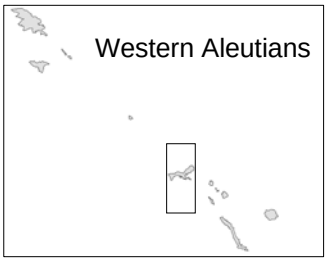


Photo A: Red Bluff with geothermal hot spot.

Photo B: Basalt bench with biobands of ROS, POR, MAZ, ALA *marginata*, LAM *longipes*, and SAC *subsimplex*.

Photo C: Close up of dominate POR *tasa* and MAZ *parksii*.

Photo D: Under kelps were *Halichondria* sp. and red algae such as *Ptilota sp.* and PHY *fimbriata*.

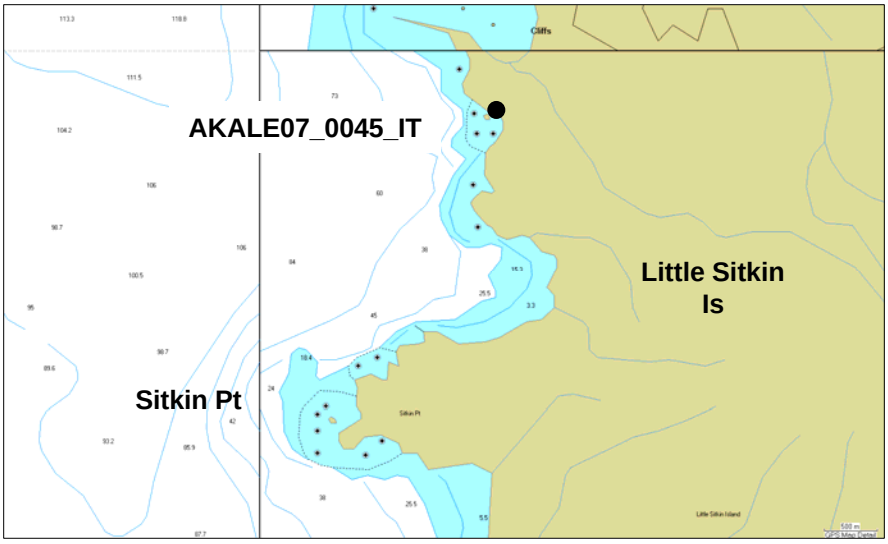
Location: **Finger Pt., Little Sitkin Is.**
Longitude/Latitude: N 51.96994 W 178.45306
Region: Western Aleutians
EMAP Site: AKALE07_0045_IT
Date: July 1, 2007

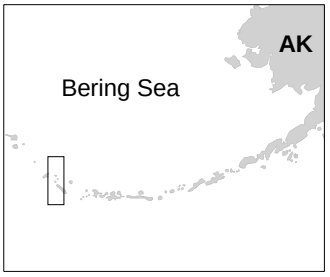
Geomorphology:
This site was located on the northwestern side of Little Sitkin Is, between William Cove and Sitkin Pt. It probably gets more influence from the Bering Sea than the Pacific Ocean. The IT site was in the lee of a small islet and consisted of large rounded boulders (~ 25 m wide) (Photo A.). The bluff above the site had erosional sediments and to the east geothermal steam was visible at the crest (Photo B.). The point to the west was basalt bedrock and giant boulders. This site was semi-protected (no ocean swell) with a perpendicular fetch no longer than 25 km (islet) and a southwesterly aspect (220º). The IT shows signs of sand scour.

Biology:
Biobands – The IT biobands are not distinct on boulders but were generally VER, PRA, POR, and ALA *marginata*. Major subtidal biobands were LAM *longipes* and DRU *fistulosa* (patchy beds).

Flora – Above MHHW notable plants were beachgreens, Dune grass, Cenesio, Cinquefoil, lupine, Buttercups, Daisys, and diverse lichens on high boulders. Upper IT biobands had PRA *meridonalis*, POR *tasa*, and MAZ *parksii*. Mid to low IT had a mixture of HAL *glandiforme*, *Fucus*, MAS *papillatus* complex (Clade 1), HIL *rubra*, Petrocelis crusts, PAL *callophyloides* complex, PAL *hecatensis*, and ALA *marginata* (Photo C.). Subtidal vegetation included *Clathromorphum* spp., LAM *longipes*, CYM *triplicata*, SAC *subsimplex*, and DRU *fistulosa*.

Fauna – Avian activity included nesting Pigeon Guillemot with chicks. Marine mammals observed were one seal and a small sea otter feeding just offshore. Common IT invertebrates included giant Littorines, *Nucella lima*, and LOT *pelta* grazing on large boulders (Photo D.), and subtidally urchins. There were no mussels observed.





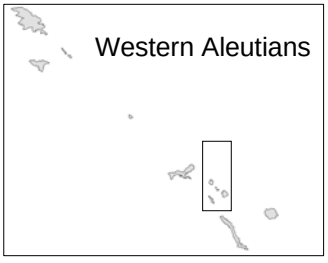


Photo A: Islet in front of site with erosional bluff behind..

Photo B: Geothermal hot spots on crest of bluff and boulder rubble at base.

Photo C: Dense vegetation on with no real biobands typical of large boulder habitats.

Photo D: Dense aggregation of Littorines and few *Nucella lima.*

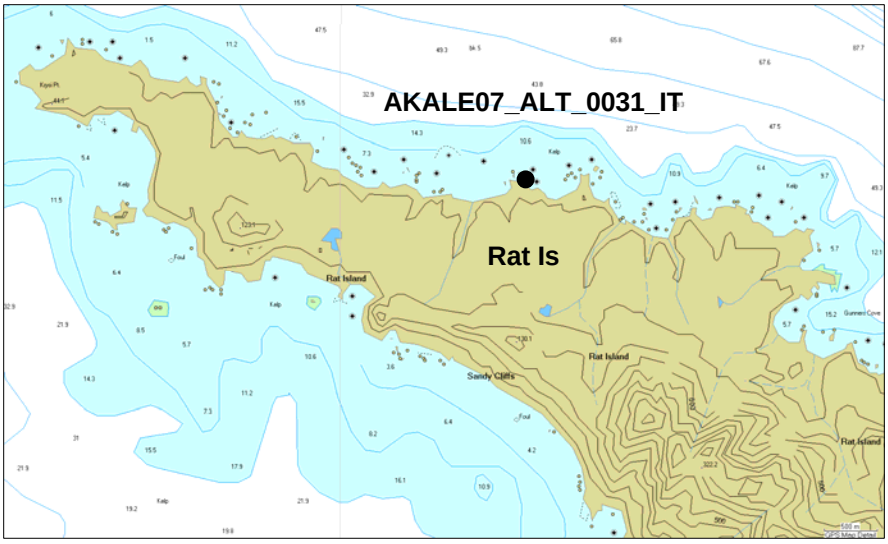
Location: **South of Banner Bay, Rat Is.**
Longitude/Latitude: N 51.82397 W 178.27495
Region: Western Aleutians
EMAP Site: AKALE07_ALT_0031_IT
Date: July 1, 2007

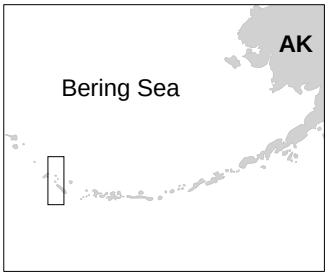
Geomorphology:
This site is located on the Bering Sea side of Rat Island between Deep Bay and Banner Bay. The IT is a basalt rock ramp (~50 m wide) with wave cut channels, a very large tidepool, and complex reef systems offshore. The breccia-like basalt was infused with angular, cobble size chunks and the outer edge of the ramp dropped vertically ~2 m into the water (Photo A.). Huge boulders are scattered in the upper IT. This site was semi-protected (no ocean swell) with a perpendicular fetch no longer than 15 km (Davidof Is.) with an aspect just off true north (10^{o}). There was very clear water here with good visibility into the subtidal.

Biology:
Biobands – The major IT biobands on the bedrock ramp were patchy ROS, POR, MAZ, and ALA *marginata* (Photo B.). These bands were generally vary narrow. Major subtidal biobands were LAM *longipes* (very wide), SAC *subsimplex* and DRU *fistulosa* (extensive beds).

Flora – Above MHHW notable plants were Dune grass and Buttercups. Upper IT biobands had ROS *polyrhiza*., POR sp.(*P. pseudolanceaolata*?), HAL *glandiforme*, POR *tasa*. MAZ *parksii*, and Petrocelis crusts. Mid to low IT had patchy *Fucus*, MIC *borealis*, and continuous ALA *marginata*. Subtidal vegetation included large stands of LAM *longipes* with impressive colonies of *Clathromorphum* spp., *Ptilota sp.*, NPT asplenioides, *Callophyllis* sp, DEL *decipiens*, *Cirrulicarpus ruprechtiana*, ODO *setacea*, PYC *fimbriata*, CON *rosa-marina*, *Polysiphonia* sp, VER sp. (*V. mucosa?*), *Ulvaria obscura* var. *blyttii*, and ULV *lactuca*. Below this zone additional species were THA *clathrus*, SAC sp. (short stype), SAC *subsimplex*, LAM *yezoensis* (Photo C.), and DRU *fistulosa*.

Fauna – Avian activity included a pair of nesting Oystercatchers. Marine mammals observed was a female seal and pup hauled out on the rock ramp. Common IT Invertebrates included extensive urchins in a large tidepool, and in the lower IT and subtidal large LOT *pelta*, *Metridium* sp., *Henricia* sp., *Halichondria* sp., *Buccinum* sp., *Hiatella* sp., brittle stars, smooth *Margarites*, an unidentified chiton, and tunicates. Most of these species were associated with *Clathromorphum* spp. (Photo D.) and there were probably many more unseen boring species inside. MYT *trossulus* was collected but not abundant.





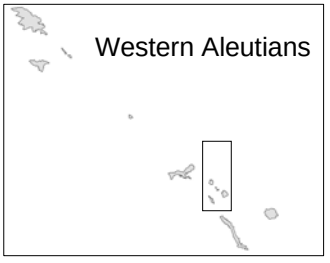


Photo A: Breccia-like basalt above MHHW with narrow biobands of ROS, POR, MAZ, and ALA *marginata*.

Photo B: Rock ramp with LAM *longipes* and ALA *marginata*.

Photo C: Mixed bed of THA clathrus, SAC subsimplex, and LAM *yezoensis*.

Photo D: *Clathromorphum* spp. with large LOT *pelta* under LAM *longipes*.

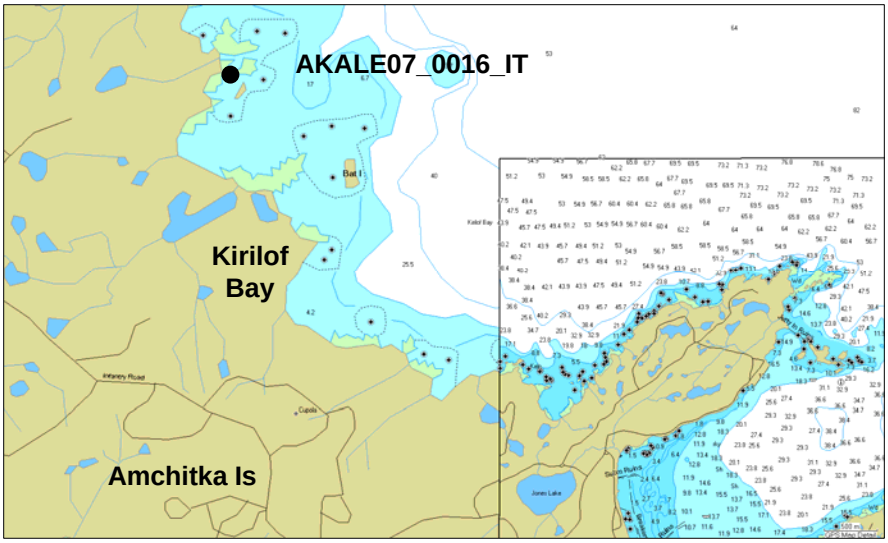
Location: **Kirilof Bay, Amchitka Is.**
Longitude/Latitude: N 51.43343 W 179.21953
Region: Western Aleutians
EMAP Site: AKALE07_0016_IT
Date: July 2, 2007

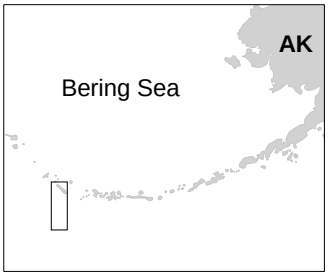
Geomorphology:
Kirilof Bay is located on the Bering Sea side of Amchitka Island northwest of Constantine Harbor. The IT site is just beyond Bat Is. and only ~8.5 km away from the Cannikin test site of 1971. This site is also ~2.5 km away from Square Bay where 1968-73 IT study sites were established for the Cannikin test (very similar to this one). A breccia rock ramp infused with angular basalt (2-50 cm) extends ~100 m offshore (Photo A.). A breccia cliff ~25 m tall intersects the ramp in the upper IT. Physical features include pinnacles, wave cut channels with rounded cobble, and shallow tidepools. This site faced due west (90^{o}) and was Semi-protected on the inside of the reef and semi-exposed on the outside (with ocean swells). The perpendicular fetch is longer than 125 km (Ulak Is.).

Biology:
Biobands – The major IT biobands on bedrock were VER (narrow), POR, *Fucus*, HAL, SAC *sessile*, and ALA *marginata* (Photo B.). Major subtidal biobands were SAC *longipes* and DRU *fistulosa* (extensive beds).

Flora – Above MHHW notable plants were beachgreens, Cenesio, Dune Grass, and Cow Parsnip. Upper IT biobands had POR *pseudolanceolata* and POR *tasa*. In the mid IT the upper portions of the rock ramp had a matrix of patchy *Fucus*, continuous mats of HAL *glandiforme* and MAZ *parksii*, PAL *hecatensis*, MAS *papillatus* complex, and Petrocelis crusts. The lower protion of the ramp often had large patches of SAC *sessile* with associated species of HAL *glandiforme*, MAZ *phyllocarpa*, ULV sp, and articulated corralines (Photo C.). Shallow tidepools had RAL *fungiformis*, ULV sp., and *Corallina* sp. Below this zone and on the edge of the ramp was ALA *marginata*. Subtidal vegetation included LAM *longipes*, SAC *subsimplex*, LAM yezoensis, *Clathromorphum* spp., and extensive beds of DRU *fistulosa* (Photo D.).

Fauna – Avian activity included Bald Eagles, Cormorants, Oystercatchers (several pairs), and Green Winged Teal (2 females). Common IT invertebrates included a few small MYT *trossulus*, *Halichondria* sp., tunicates, and urchins. Not as diverse under LAM *longipes* canopy as one might expect.





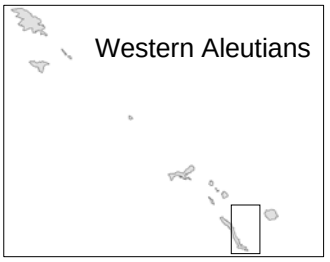


Photo A: Cliffs with rock ramp covered with Matrix of HAL, PAL, MAZ, and *Fucus*.

Photo B: Upper IT showing bands of VER, POR, and *Fucus*. Note the embeded chunks of basalt.

Photo C: SAC sessile and associated species of HAL, MAZ phyllocarpa, and articulated corallines.

Photo D: Outer, more exposed edge of ramp with HAL, ALA *marginata*, LAM *longipes* and *Clathromorphum* spp.

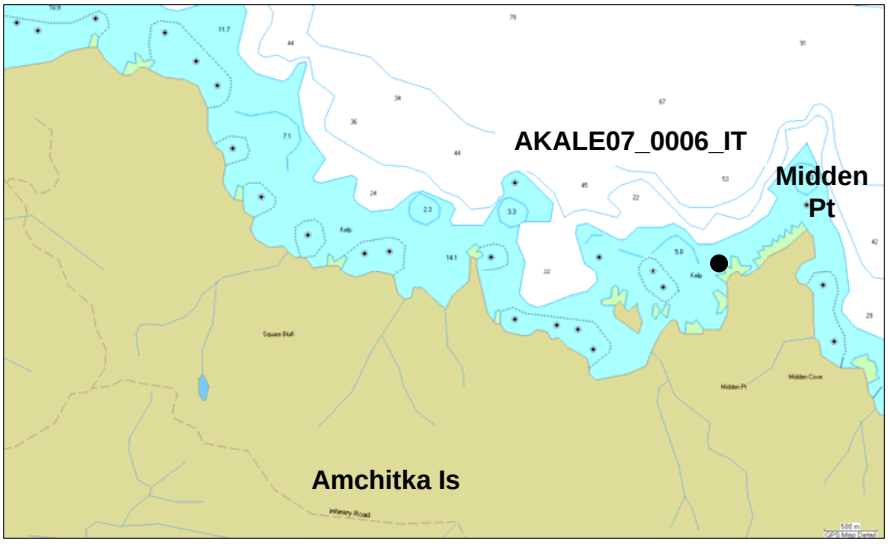
Location: **Midden Pt, Amchitka Is.**
Longitude/Latitude: N 51.64250 W 178.75079
Region: Western Aleutians
EMAP Site: AKALE07_0006_IT
Date: July 3, 2007

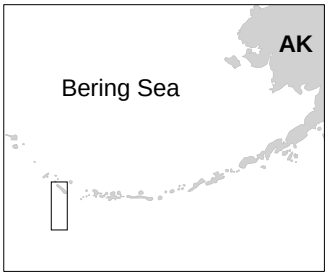
Geomorphology:
This IT site occurs on the Bering Sea side of northwestern Amchitka Island. It is located on the western side of Midden Pt. ~7 km from Bird Cape. The Midden Pt. site was dominated by fairly steep basalt (less than 25 m wide) (Photo A.). This site was semi-protected (with ocean swells) with a perpendicular fetch ~ 30 km (Little Sitkin Is.) and a northwesterly aspect (330^{o}). There was very clear water here with good visibility into the subtidal.

Biology:
Biobands – The major IT biobands on bedrock were VER (wide), ROS and PRA, POR, patchy MAZ and HAL, a bare zone, and ALA *marginata*. Major subtidal biobands were LAM *longipes* and DRU *fistulosa* (dense but patchy beds). Note the bare zone would normally be colonized with ALA *marginata* but they seem heavily grazed (urchins).

Flora – Upper IT biobands had ROS *polyrhiza*, PRA *meridionalis* (Photo B.), POR *pseudolanceolata*, POR *tasa*, and matrix of PAL sp. (long narrow form), HAL *glandiforme*, MAZ *parksii* (with ACR *arcta* growing on tips), and patchy END *muricata* (Photo C.). Mid to low IT had *Fucus*, MAS *papillatus* complex (Clade 1), COR *vancouveriensis* (Photo D.), coralline crusts, *Kallymeniopsis* sp., HIL *rubra*, Petrocelis crusts, and ALA *marginata*. Subtidal vegetation included LAM *longipes*, SAC *subsimplex*, *Clathromorphum* spp., and DRU *fistulosa*.

Fauna – Avian activity included a nesting pair of Oystercatchers and a male Green Winged Teal. Marine mammal observations included a seal. Common IT invertebrates were Littorines, LOT *digitalis*, LOT *pelta*, SB *balanoides*, SEM *cariosus*, *Metridium* sp, urchins, and MYT *trossulus* (good patches; medium size; collected).





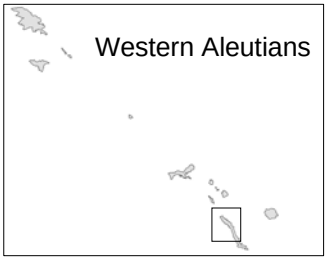


Photo A: Basalt cliffs with bands of ROS, POR, MAZZ, and LAM *longipes*. Note bare ALA *marginata* zone.

Photo B: Oyster Catcher with *Prasiola meridonalis* in the foreground.

Photo C: Upper IT matrix of POR tasa, HAL *glandiforme*, and PAL sp (long narrow form).

Photo D: Lower IT with *Corallina vancourveriensis*, mussels, and barnacles.

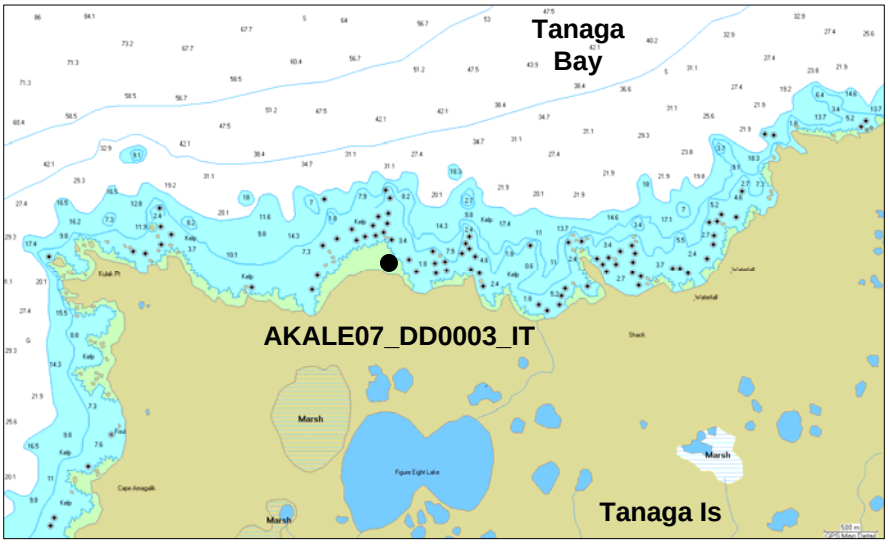
Location: **Tanaga Bay, Tanaga Is.**
Longitude/Latitude: N 51.70626 W -178.06923
Region: Central Aleutians
EMAP Site: AKALE07_DD0003_IT
Date: July 7, 2007

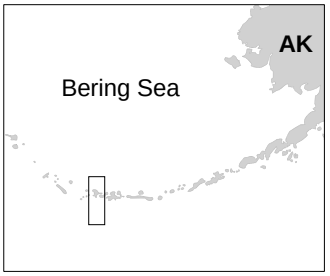
Geomorphology:
This site is located on the southern shore of Tanaga Bay approximately 3 km east of Kulak Pt. The IT site had an expansive rock platform (~300 m wide) and complex, shallow reefs offshore (Photo A.). The ramp was basalt with many wave cut channels. The upper IT had a patchwork of cobble, pebble, and sandy flats. The most significant feature on this site was the IT geothermal hot spots (Photo B.). High IT areas of sand were steaming and visible from several kilometers offshore. Random areas of sand and basalt were warm to the touch. Basalt surfaces were dry and cracked. It was clear that the hot spots were very dynamic and occupied different regions of the rock ramp in the past. This site was semi-protected (no ocean swells) with a perpendicular fetch no longer than 9.5 km and has an aspect of due north.

Biology:
Biobands – IT biobands on bedrock were not well defined but unusual. The upper half of the rock ramp was dominated by a strinking combination of a bright yellow-orange lichen (*Caloplaca* sp.) and the black lichen VER (narrow band) (Photo C.). The lower portion of the ramp had patchy bands of barnacles, HAL, *Fucus*, and ALA *marginata*. Major subtidal biobands were LAM sp and DRU *fistulosa* (dense, extensive beds).

Flora – Above MHHW notable plants were beachgreens, Cenesio, Dune Grass, and Cinquefoil. Upper IT tidepools and sand flats had mats of ULV *radiata*, *Ulva intestinalis*, and bacteria. Mid to low IT had MAZ *parksii*, HAL *glandiforme*, NEO *aculeata*, *Fucus*, MAS *papillatus* complex, Petrocelis crusts, PAL *callophylloides* complex, ULV *lactuca*, SAC *sessile*, and ALA *marginata*. Subtidal vegetation included LAM *longipes*, SAC sp. (short stype), SAC *subsimplex*, and DRU *fistulosa*. On the east side of the rock ramp was a very extensive bed of SAC sp. (short stype) similar to Chernofsky Harbor on Attu Is.

Fauna – Avian activity included a large flock of Green Winged Teals hanging out in large high tidepools. Flocks of Shore Birds were also observed in this area. Marine mammals observed were 3-4 Sea Otters with at lease a mother and pup. Two pairs of Minke Whales were observed feeding for several hours around tide rips near Kulak Pt. Common IT invertebrates included Littorines, SB *glandula* (best biobanding so far in western Aleutians), and urchins. A unique field of worm mounds with coiled, fecal casts (Lugworm?) were evident in the geothermally active sands (Photo D.). Mussels were not observed or collected.





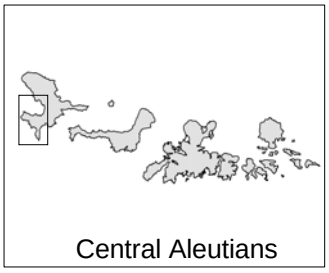


Photo A: Example of extensive rock ramps (looking back inshore).

Photo B: Example of geothermal hot spot in sandy area with mat of *Cladophora* sp.

Photo C: Upper IT biobanding of a yellow-orange lichen (*Caloplaca* sp) and the black lichen *Verrucaria maura*.

Photo D: Example of worm mounds along perimeter of geothermal hot spot.

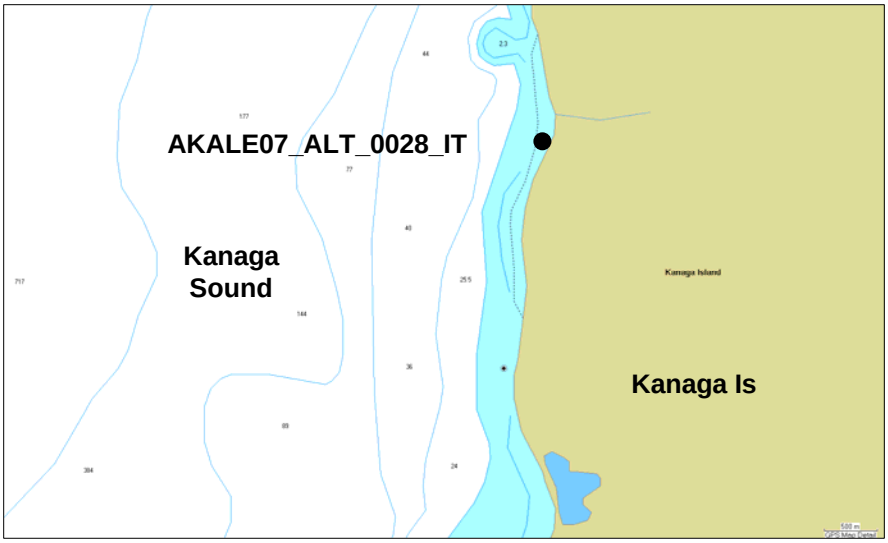
Location:	**Kanaga Sound, Kanaga Is.**
Longitude/Latitude:	N 51.88188 W -177.20033
Region:	Central Aleutians
EMAP Site:	AKALE07_ALT_0028_IT
Date:	July 8, 2007

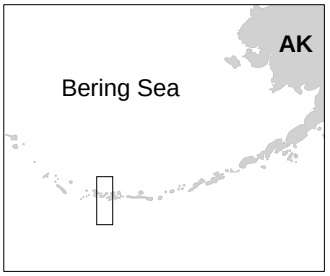
Geomorphology:
This site was located on the Bering Sea side of Kanaga Is. in the northwestern region. Specifically, the site is located ~6 km south of Cape Miga and ~5 km north or Lakeside Pt. Kanaga Volcano dominates this region with steep erosional cliffs spilling into the IT (Photo A.). The IT is a fairly steep with well rounded boulders and cobble extending no more than 100m to the water's edge at a low tide. This site was semi-protected (with ocean swell) with a perpendicular fetch no longer than 15.5 km (Bobrof Is.) and an aspect just of due west (280^{o}).

Biology:
Biobands – The IT biobands were poor due to the mobile nature of boulders and cobble and occurred only in the low IT and subtidal. Low IT banding was mostly POR, PAL, and ALA *marginata* (Photo B.). Subtidal biobands were LAM *longipes* and DRU *fistulosa* (dense beds).

Flora – Above MHHW notable plants were beachgreens, Dune Grass, lupine, Beach Lovage (*Ligusticum* sp.), Yarrow, Buttercups, Cow Parsnip, Saxifrage (*Saxifraga punctata*), Dwarf Dogwood (bunchberry), and a variety of mosses (Photo D.). Upper IT biobands were mainly bare. Mid to low IT had POR *pseudolinearis* complex, MAS *papillatus* complex (Clade 1), Palmaria sp (long narrow), PAL *callophyllloides* complex, PAL *mollis*, and ALA *marginata* (narrow form) (Photo C.). HAL *glandiforme* was not found. Subtidal vegetation included LAM *longipes* and DRU *fistulosa*.

Fauna – Marine mammals observed were one male Sea Lion. Common IT invertebrates included aggregations of LOT pelta on the backsides of large boulders, SB glandula, and urchins.





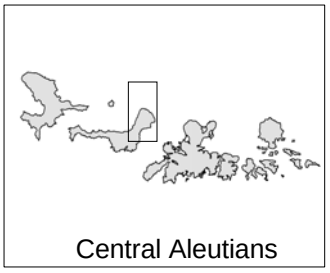


Photo A: Alongshore view of boulder IT with dense bed of DRU *fistulosa* offshore.

Photo B: Large boulders with patchwork of red algae - mainly *Porphyra* and *Palmaria*.

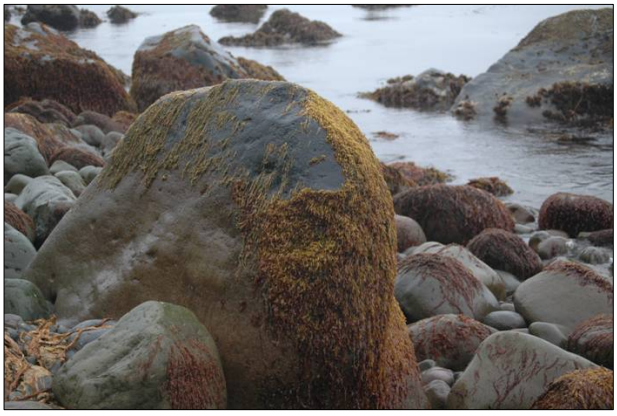


Photo C: Close-up of *Palmaria* sp. (long narrow form).

Photo D: Example of vegetated cliffs with Buttercups, lupine, Saxifrage and mosses.

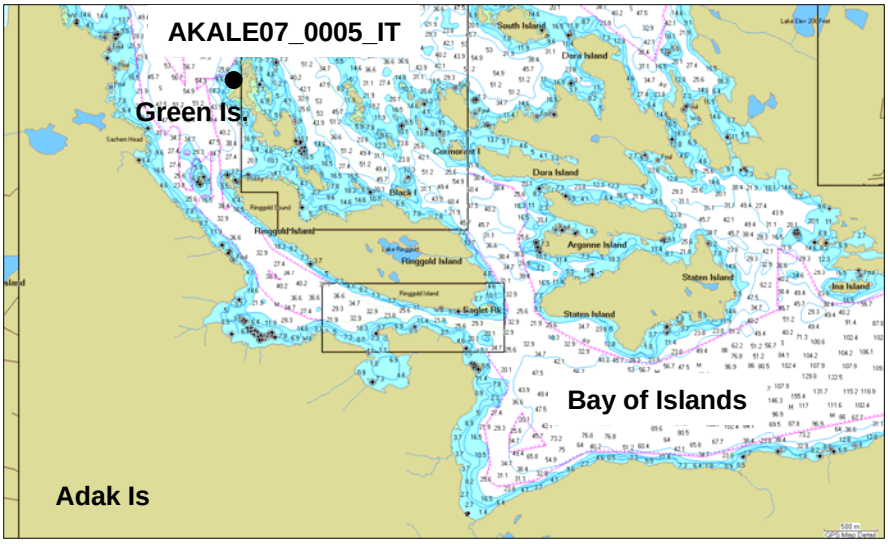
Location: **Green Is., Bay of Islands, Adak Is.**
Longitude/Latitude: N 51.81647 W -176.84029
Region: Central Aleutians
EMAP Site: AKALE07_0005_IT
Date: July 9, 2007

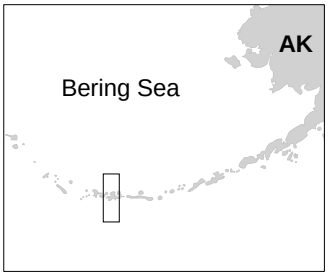
Geomorphology:
This site was located on the western side of Adak Is. just off Adak Striat. Specifically, on the northern region of Green Is., in Bay of Islands. The IT site was steep bedrock (basalt) cliffs less than 25 m wide (Photo A.). This site was semi-exposed (with ocean swells) with a perpendicular fetch ~2 km (Adak Is.) given a northwesterly aspect (300º). Note the northern tip of Green Is. has an infinite fetch into the Bering Sea and receives a large ground swell from the north.

Biology:
Biobands – The major IT biobands on bedrock were VER (wide), ROS, BAR, HAL, and ALA *marginata*. Major subtidal biobands were LAM *longipes* and DRU *fistulosa* (dense beds offshore).

Flora – Upper IT biobands had ROS *polyrhiza*, POR *pseudolanceolata*, and HAL *glandiforme*. Mid IT had *Fucus*, POR *tasa*, END *muricata*, CAL *pikeanum*, MAS *papillatus* complex, PAL *hecatensis*, ACR *arcta*, *Ulvaria obscura* var. *blyttii*, MAZ *phyllocarpa*, and Petrocelis crusts (Photo B.). Low IT had ODO *floccosa* fm. *comosa*, PTE *bipinnata*, Subtidal vegetation included LAM *longipes* (Photo D.), *Clathromorphum* spp., and DRU *fistulosa*.

Fauna – Avian activity included nesting Pigeon Guillmont feeding babies fish and Oystercatchers. Marine mammals observed were six Sea Otters. Common IT invertebrates included Littorines, LOT *digitalis*, LOT *pelta*, SB *glandula*, SB *cayosis*, BAL *nubilus*, MYT *trossulus* (Photo C.), KAT *tunicata*, *Mopalia* sp., *Halichondria* sp., *Metridium* sp., URT *crassicornis*, and urchins.





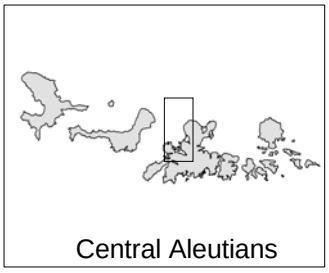


Photo A: Steep bedrock with biobands of ROS, BAR, HAL, ALA *marginata*. Note MYT *trossulus* in barnacle band.

Photo B: Matrix of HAL *glandiforme*, ACR *arcta*, POR tasa, and ALA *marginata*.

Photo C: Dense patches of SEM *cariosus* and MYT *trossulus* in mid to lower IT.

Photo D: Lower IT with grazed ALA *marginata* and LAM *longipes*.

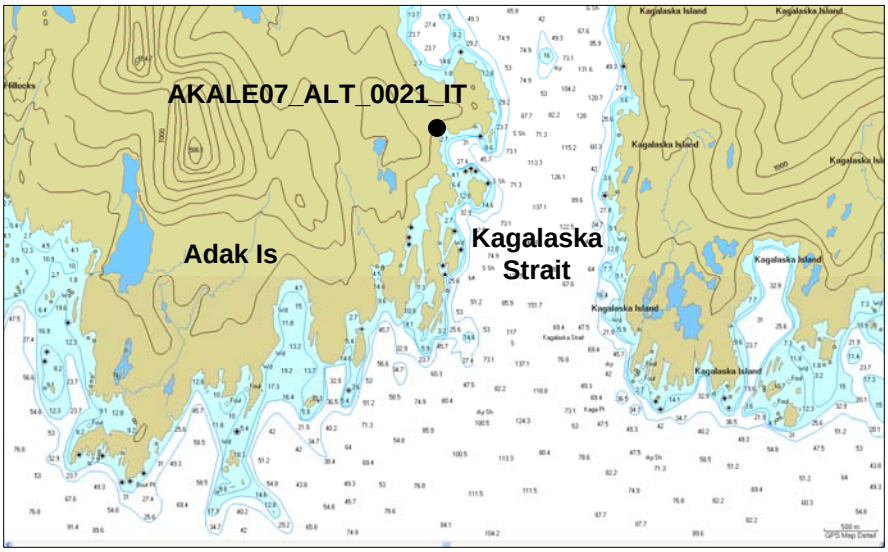
Location:	**Kagalaska Strait, Adak Is.**
Longitude/Latitude:	N 51.75624 W -176.42632
Region:	Central Aleutians
EMAP Site:	AKALE07_ALT_0021_IT
Date:	July 10, 2007

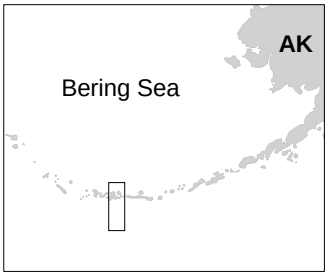
Geomorphology:
This site is located in a cove on the southwestern side of Kagalaska Strait, Adak Island. Cliffs of basalt rise ~50 m all around this cove except for a low lying cobble pocket beach in the back where the IT site was located. A few bedrock outcroppings interrupt the rounded cobble beach (Photo A.). The upper IT has a steep cobble storm berm (~ 25 m wide) (Photo B.). This site was semi- protected (with ocean swells) with a perpendicular fetch no longer than 2 km given an southeasterly aspect (125^{o}). The semi-circular shape of the cove and close proximity to the Kagalaska Strait including the Gulf of Alaska probably allow for higher exposure than it appears (ie. GOA ground swells curl into cove during storms). There was very clear water here with good visibility into the subtidal.

Biology:
Biobands – IT biobands on bedrock were VER (wide), ROS, POR, MAZ, PAL, and ALA *marginata* (Photo C.). Major subtidal biobands were LAM *longipes*, and DRU *fistulosa* (dense, extensive beds).

Flora – Above MHHW notable plants were beachgreens, Dune Grass, Cinquefoil, Buttercups, Chocolate Lilies, and Mountain Blue Bells. Upper IT biobands had VER *maura*, orange lichen (*Caloplaca* sp.), ROS *polyrhiza*, *Bangia* sp. POR *tasa*, and HAL *glandiforme*. Mid to low IT had *Fucus*, MAZ *parksii* (fertile), MAZ *phyllocarpa* (fertile), Petrocelis crusts, ACR *arcta*, PAL *hecatensis*, ALA *marginata*. Cobble and boulder areas in the lower IT had a dense cover of *Ulothrix* sp. with POR *pseudolinearis*, PAL *hecatensis*, and ALA *marginata* (Photo D.). Subtidal vegetation included LAM *longipes*, CYM *triplicata*, SAC *subsimplex*, and DRU *fistulosa*.

Fauna – IT invertebrates were very sparse observing just Littorines, LOT *pelta*, SB *glandula*, and urchins.





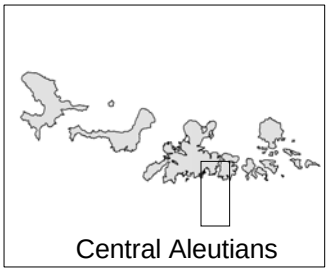


Photo A: Basalt cliffs dominating most of the cove.

Photo B: Upper IT of pocket beach with rounded cobble storm berm.

Photo C: Bedrock walls had biobands of VER, ROS, POR, MAZ, PAL, and ALA *marginata*.

Photo D: Boulder and cobble in pocket beach covered with *Ulothrix* sp. and POR *pseudolinearis*.

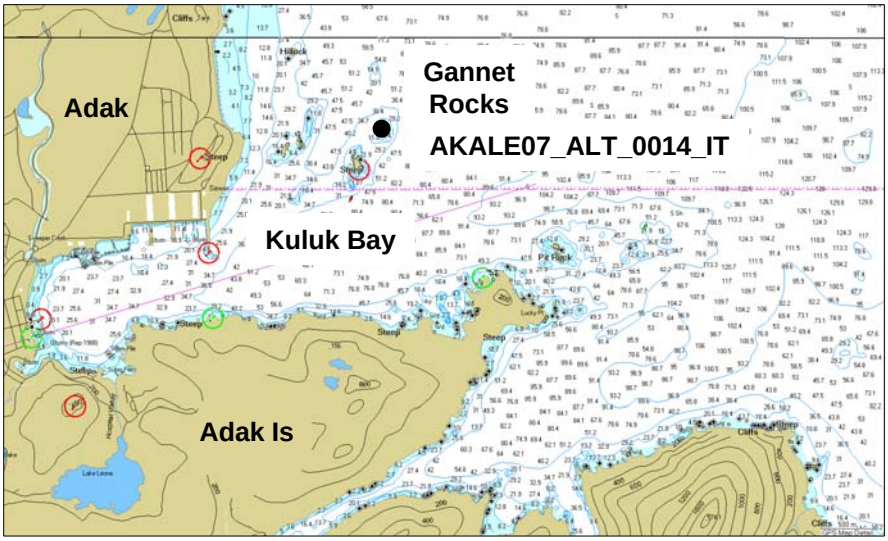
Location: **Grannet Rocks, Kuluk Bay, Adak Is.**
Longitude/Latitude: N 51.87030 W -176.60593
Region: Central Aleutians
EMAP Site: AKALE07_ALT_0014_IT
Date: July 12, 2007

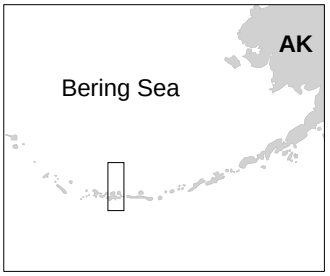
Geomorphology:
The site was located on a group of rocks just outside Kuluk Bay on the eastern side of Adak Island. The rocks were fairly steep and smooth basalt (Photo A.). This site was semi-exposed with a perpendicular fetch due north of 4 km (Adak Is.) and 17 km (Kagalaska Is) due east. The northeast exposure is infinite into the Bering Sea just missing Great Sitkin Is.

Biology:
Biobands – The major IT biobands on bedrock were PRA, POR, HAL, Fucus, and ALA *marginata*. Major subtidal biobands were LAM *longipes*, SAC *subsimplex* and DRU *fistulosa* (continous bed around rocks) (Photo B.).

Flora – Upper IT biobands had PRA *meridionalis*, POR *pseudolanceolata*, HAL *glandiforme*, and POR *tasa*. Mid to low IT had *Fucus*, ODO *floccosa* fm *comosa*, ACR *arcta*, ULV sp., and ALA *marginata*. Subtidal vegetation included LAM *longipes* (Photo C.), SAC *subsimplex*, and DRU *fistulosa*.

Fauna – Avian activity included a Bald Eagle that was being harrased by an Arctic Tern. Common IT invertebrates included Littorines, SB *glandula*, SEM *cariosus* (very dense and huge) (Photo D.), MYT *trossulus* (scattered adults and many ~1mm), KAT *tunicata*, *Metridium* sp, urchins, and on vertical walls bright orange colonies of sponges and tunicates.





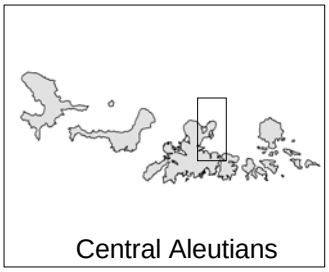


Photo A: Adjacent rock with biobands of PRA, POR, HAL, *Fucus*, ALA *marginata*, LAM *longipes*, and DRU *fistulosa*.

Photo B: Lee side of rock with a wide barnacle band, patchy ALA *marginata*, sponges, and SAC *subsimplex*.

Photo C: Lower IT biobands of LAM *longipes* and SAC *subsimplex*.

Photo D: Close-up of SEM *cariosus* and grazed ALA *marginata*.

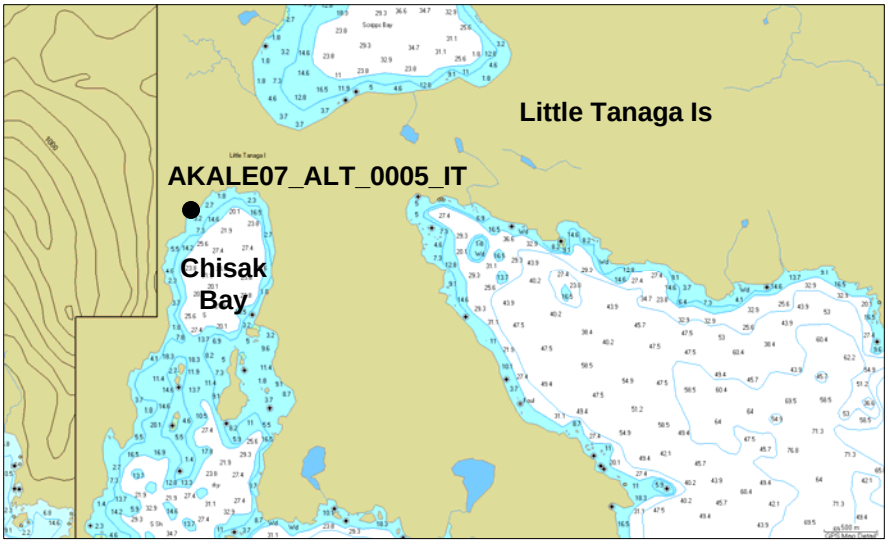
Location:	**Chisak Bay, Little Tanaga Is.**
Longitude/Latitude:	N 51.82743 W -176.15083
Region:	Central Aleutians
EMAP Site:	AKALE07_ALT_0005_IT
Date:	July 13, 2007

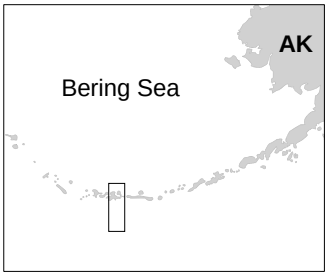
Geomorphology:
This site was located way in the back of Chisak Bay on the southern side of Little Tanaga Island. With low lying hills the IT site was a gently sloping boulder and cobble field (somewhat angular basalt) no more than 50 m wide at low tide (Photo A and B.). This site was protected with a perpendicular fetch no longer than 1 km given a southeasterly aspect (135^{o}). Note we experienced a 5.8 magnitude earthquake while anchored here. It occurred at approximately 12:55 pm (epicenter ~30 south) and shook the hull of our vessel. Chisak Bay is fairly shallow (only 25 m at its deepest point) with a pebble, sand and mud bottom.

Biology:
Biobands – The major IT biobands on bedrock were VER (narrow band), barnacle, and *Fucus*. Major subtidal biobands were LAM *longipes* but no DRU *fistulosa*.

Flora – Above MHHW notable plants were Dune Grass, unknown sedge, Cow Parsnip, Beach Lovage, and lupine. Upper IT biobands had VER *maura* and orange lichen (*Caloplaca* sp.). Mid to low IT had MAS *papillatus* complex (huge), Petrocelis crusts, HAL sp. (large bullate form), *Fucus*, MAZ *phyllocarpa*, ACR *arcta*, ULV *lactuca*, *Ulvaria obscura* var. *blyttii*, ALA *marginata*, and SAC *sessile*. Subtidal vegetation included LAM *longipes* (Photo C.), SAC sp. (short stype), *Clathromorphum* spp. (many patches bleached white), *Ptilota sp.*, *Membranoptera spinulosa*, TOK *bullatum*, and *Kallymeniopsis* sp.

Fauna – Avian activity included Oystercatchers, Green Winged Teals, and a Loon. Marine mammals observed were ~5 Sea Otters and at the entrance to the bay on the exposed Pacific Coast were Sea Lions hauled out (western shore). Upper IT invertebrates included lots of Littorines associated with the VER and just below this zone a dense band of SB *glandula*. Common invertebrates in the mid IT included SEM *cariosus*, MYT *trossulus* (adults; collected) (Photo D.), and URT crassicornis. IT invertebrates were incredibly diverse in the lower IT where lots of interstitial space was created by the angular boulders and a canopy of kelps. This zone included SEM *cariosus*, LOT pelta, *Styela* sp., large species of chiton (*Psolus chitonoides*-like), an orange compound tunicate, *Hiatella* sp., colonial tube worms, KAT *tunicata*, *Buccinum* sp., brittle stars, and an urchin barren at the water's edge into the subtidal. Given more time more invertebrates could have been discovered.





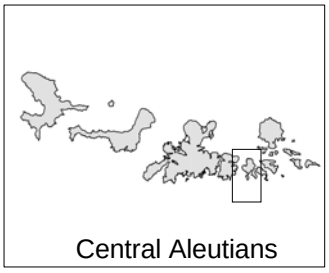


Photo A: Alongshore looking southwesterly at angular boulder field.

Photo B: Alongshore looking northeasterly at IT boulder field. Note VER and barnacle bands.

Photo C: Boulder with LAM *longipes* and the anemone URT *crassicornis* below right.

Photo D: Subtidal boulder with dense stand of SEM *cariosus* and MYT *trossulus*. Note orange tunicates in urchin barrens.

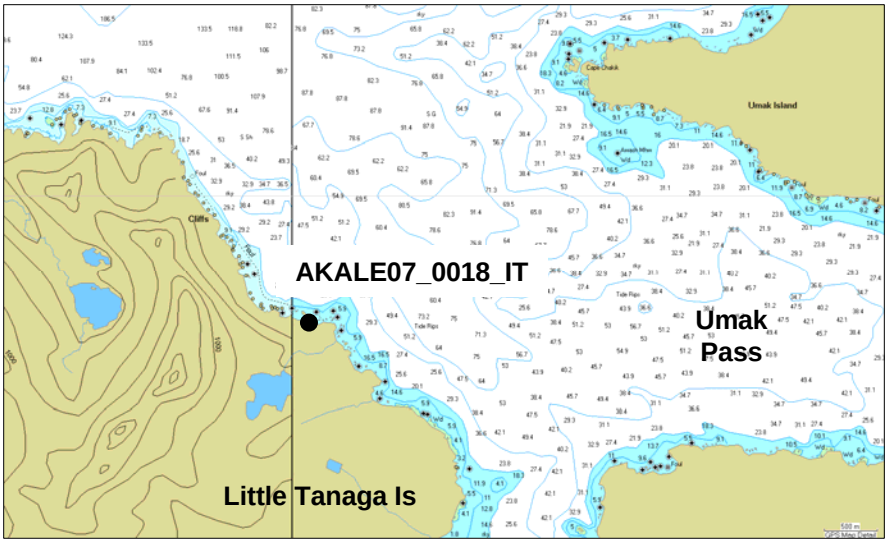
Location: **Umak Pass, Little Tanaga Is.**
Longitude/Latitude: N 51.86605 W -176.15359
Region: Central Aleutians
EMAP Site: AKALE07_0018_IT
Date: July 14, 2007

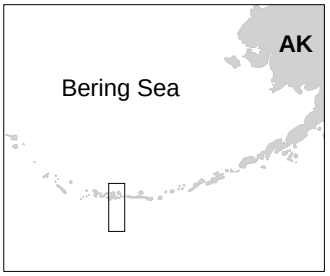
Geomorphology:
This site was located on the northeast coast of Little Tanaga Is. in Umak Pass. Cliffs rise several hundred meters directly behind the IT site and tide rips from Umak Pass occur ~100 m offshore. The IT site was one of many eroded pinnacles (basalt) scattered alongshore flanked by large boulder rubble, small pocket beaches with rounded cobble, and vertical bedrock walls (~ 50 m wide) (Photo A.). This site was semi-protected (with ocean swell) with a perpendicular fetch of 9 km (Aziak Is.) given an aspect of due north. The very clear waters indicate the Bering Sea is probably more of an influence on this site than the Gulf of Alaska.

Biology:
Biobands – The major IT biobands on bedrock were VER (wide band), ROS, POR, HAL, MAZ, *Fucus*, and ALA *marginata* (Photo B.). Major subtidal biobands were LAM *longipes*, THA *clathrus*, and DRU *fistulosa* (very thick, dense beds).

Flora – Above MHHW and the VER band was an impressive white lichen on vertical cliff faces. Upper IT biobands were very striking and similar to the Tigalda Bay IT site. A wide band of ROS *polyrhiza* dominated the upper zone with a matrix of HIL *rubra*, VER sp. (V. *mucosa*?) and Petrocelis crusts. Below this zone was a zone mixed with POR *tasa*, HAL *glandiforme*, MAZ *parksii*, and PAL sp. (long narrow form). Mid IT had *Fucus*, MAS *papillatus* complex, Petrocelis crusts, END *muricata*, CAL *pikeanum*, ODO *floccosa*, fm. *comosa*, PTE bipinnata, and ALA *marginata*. Subtidal vegetation included LAM *longipes*, SAC *subsimplex*, THA *clathrus* (very good band), *Clathromorphum* spp. (bleached colonies could be seen from offshore near the water's edge), and DRU *fistulosa* (Photo C.).

Fauna – Avian activity included a pair of Oyster Cacthers and gulls. Nesting Falcons (Peregrine Falcons?) could be heard tending to chick high up on the cliffs. Common IT invertebrates included Littorines, SB *glandula*, SEM *cariosus*, patchy MYT *trossulus* (collected), LOT *digitalis*, LOT *pelta*, and urchins. Tidepools had the bright orange anemone (*Epiactis prolifera*?) (Photo D.) and *Nucella canaliculata*.





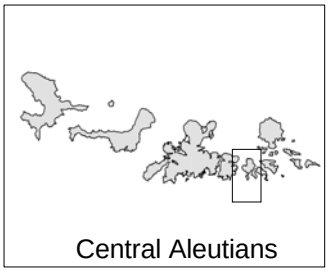


Photo A: Cliffs with cobble in the upper IT and large boulder rubble in the lower IT.

Photo B: Upper IT biobanding of VER, ROS, POR, and a patchwork of encrusting HIL *rubra*, VER sp. (*V. mucosa*?), and Petrocelis crusts.

Photo C: Subtidal zone with LAM *longipes*, *Clathromorphum* spp., and a dense zone of THA *clathrus*.

Photo D: Tidepool with the bright orange anemone *Epiactis prolifera*. There are budding young at the base of adults.

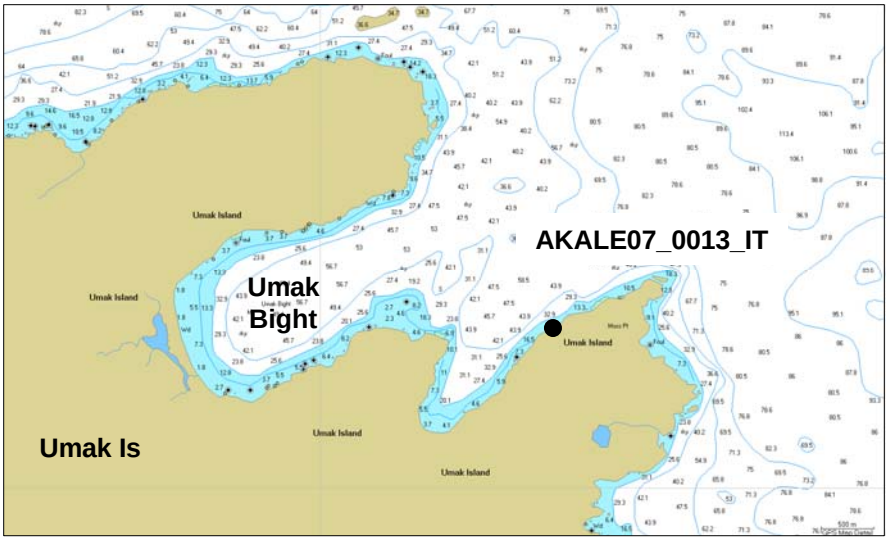
Location: **Umak Bight, Umak Is.**
Longitude/Latitude: N 51.89024 W -175.97069
Region: Central Aleutians
EMAP Site: AKALE07_0013_IT
Date: July 14, 2007

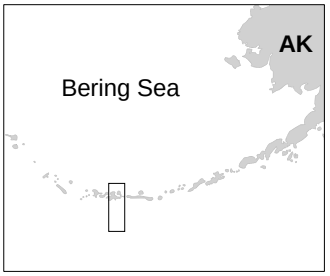
Geomorphology:
This site was located on the eastern side of Umak Is. in Umak Bight but just 1 km inside Moss Pt. The IT site had gently sloping, smooth basalt (blocky, probably worn vertical columnar basalt) with wave cut channels, benches, and tidepools (less than 25 m wide) (Photo A.). This site was semi-protected (with ocean swells) with a perpendicular fetch ~ 2.5 km given a north by northwesterly aspect (330^{o}). There was very clear water here with good visibility into the subtidal.

Biology:
Biobands – The major IT biobands on bedrock were VER (medium wide), POR, BAR, HAL, MAZ, and ALA *marginata*. Major subtidal biobands were LAM *longipes* and DRU *fistulosa* (somewhat narrow but dense band right next to shoreline).

Flora – Above MHHW notable vegetation included an incredible diversity of lichens and Cinquefoil, Beach Lavage, lupine, Chocolate Lilies, Dune Grass, Cow Parsnip, sedges, mosses, ferns, saxifarage, Wild Geraniums, Crowberry, and Nagoon Berry. Upper IT biobands had PRA *meridionalis*, POR *pseudolanceolata*, HIL *rubra*, POR *tasa*, HAL *glandiforme*, *Fucus*, MAZ *parksii*, Petrocelis crusts, MAS *papillatus* complex, and ACR *arcta* (Photo B.). Low IT had ODO *floccosa* fm. *comosa*, PAL *callophylloides* complex, and ALA *marginata*. Shallow tidepools had dense stands of articulated coraline algae (*Bossiella* sp.) crowned with ULV sp. Subtidal vegetation included LAM *longipes*, *Clathromorphum* spp. (Photo C.), THA *clathrus*, SAC *subsimplex*, and DRU *fistulosa*.

Fauna – Avian activity included several Oystercatchers. Common IT invertebrates included Littorines, SB *glandula*, SEM *cariosus*, LOT *digitalis* (very worn shells and various algae growing on them) (Photo D.), LOT *pelta*, MYT *trossulus* (few adults), KAT *tunicata*, *Metridium* sp, and urchins (intact tests were found way up on the bluff in the Dune Grass).





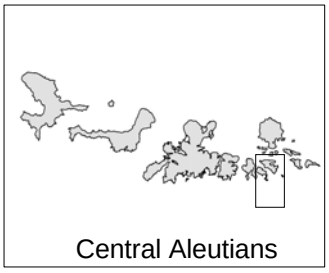


Photo A: Gently sloping basalt with DRU *fistulosa* bed up to water's edge.

Photo B: Upper IT bands with barnacles, HAL, and MAZ *parksii*.

Photo C: Lower IT with LAM *longipes* and *Clathromorphum* spp.

Photo D: High IT LOT digitalis with very worn shells.

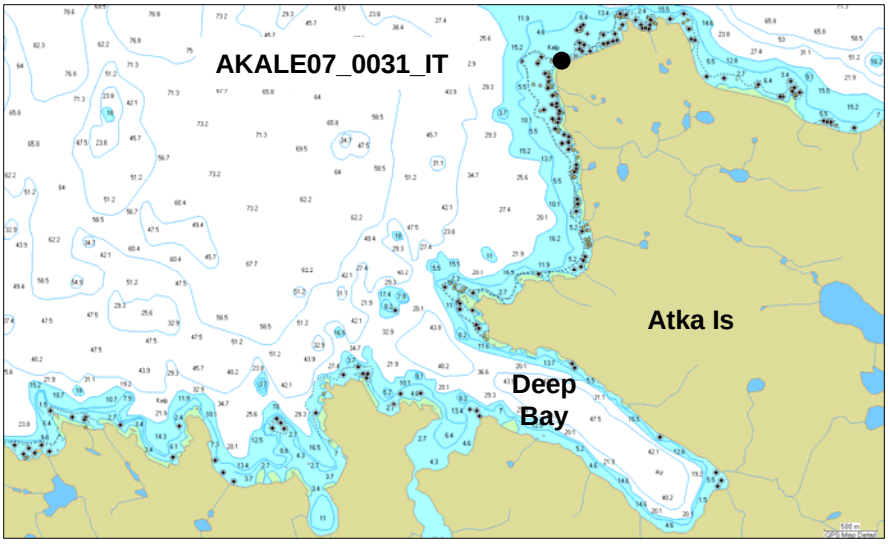
Location:	**North of Deep Bay, Atka Is.**
Longitude/Latitude:	N 51.14044 W -174.60287
Region:	Central Aleutians
EMAP Site:	AKALE07_0031_IT
Date:	July 15, 2007

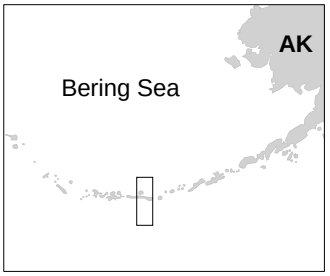
Geomorphology:
This site is located on the Bering Sea side of Adak Island. Specifically, the IT site is located on a point between Deep Bay, Banner Bay, and behind Salt Island. A shallow reef extends from the point to Salt Is. with a huge kelp bed going all the way across. This site is characterized by steep slopes with pinnacles, cobble rubble in the high IT, and basalt outcroppings (columnar basalt in horizontal orientation) forming shallow reefs 150 m offshore (Photo A and B.). This site was semi-protected (no ocean swells) with a perpendicular fetch of ~4 km given a northwesterly aspect (215^{o}). The complex reefs just offshore absorb much of the energy at this site.

Biology:
Biobands – The IT biobands on bedrock were very patchy and not distinct. General biobands were VER (narrow band), POR, barnacles, HAL/MAZ and ALA *marginata* (much of this zone is grazed by urchins). Major subtidal biobands were LAM *longipes* and DRU *fistulosa* (very dense, wide bed).

Flora – Above MHHW notable plants were an orange lichen (*Caloplaca* sp.), Dune Grass, lupine, Buttercups, and Cow Parsnip. Upper IT biobands had patchy ROS *polyrhiza*, POR *pseudolanceolata*, POR *tasa*, HAL *glandiforme*, MAZ *parksii*, END *muricata*, POR *fucicola*, *Fucus*, CAL *pikeanum*, and MAS *papillatus* complex (Clade 1) (Photo C.). Mid to low IT had NEO *aculeata*, MAS *jardinii*, Petrocelis crusts, ACR arcta, ODO *floccosa* fm. *comosa*, PAL hecatensis, and ALA *marginata*. Subtidal vegetation included LAM *longipes*, *Clathromorphum* spp, THA *clathrus*, and DRU *fistulosa*.

Fauna – Avian activity included several Bald Eagles and gulls. Common IT invertebrates included Littorines, SB *glandula*, SEM *cariosus*, LOT *pelta*, MYT *trossulus* (scattered adults with many ~2mm young; collected), *Halichondria* sp., red anemones (*Epiactis prolifera*?), and many urchins (Photo D.).





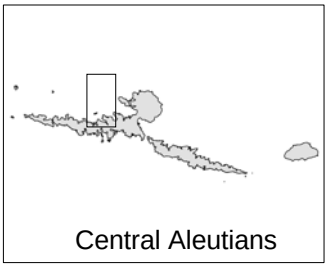


Photo A: Alongshore profile showing reef forming basalt.

Photo B: Outcropping of columnar basalt in a horizontal orientation with barnacle zone below (in foreground).

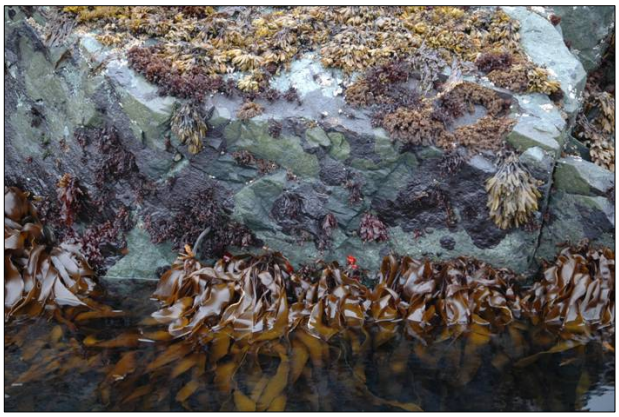


Photo C: ALA *marginata* zone grazed back by urchins leaving MAS *jardinii* and Petrocelis crusts visible.

Photo D: Subtidal zone showing LAM *longipes*, *Clathromorphum* spp., and urchins.

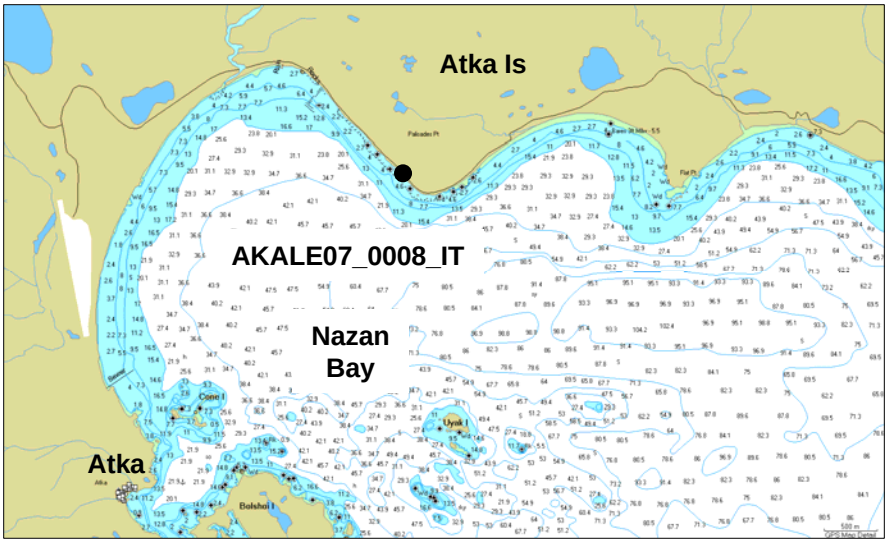
Location: **Palisades Pt., Nazan Bay, Atka Is.**
Longitude/Latitude: N 52.22514 W -174.14023
Region: Central Aleutians
EMAP Site: AKALE07_0008_IT
Date: July 17, 2007

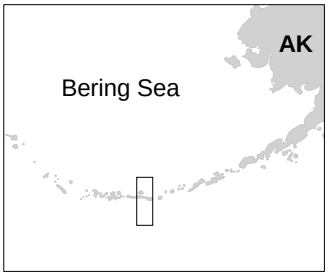
Geomorphology:
This site was located near the village of Adak in Nazan Bay. The IT site was on the northeastern shore on Palisades Pt. Steep slopes intersected the IT which was mainly very large basalt boulders (~ 25 m wide). Sandy areas could be found between the large boulders giving everything a smooth scoured look. This sand extended beyond the IT well offshore (~250 m). The lower IT had emergent rock ramps (narrow) rising ~1 m above the water line (Photo A.). Beach width did not exceed 50 m. This site was semi-protected (slight ground swell) with a perpendicular fetch no longer than 3.5 km given a southwesterly aspect (225º).

Biology:
Biobands – The major IT biobands were VER (narrow) (Photo B.), barnacle, *Fucus*, and ALA *marginata*. Major subtidal biobands were LAM *longipes* and DRU *fistulosa* (patchy offshore).

Flora – Above MHHW notable plants were Dune Grass, Beach Peas, and Cow Parsnip. Mid IT had *Fucus*, POR *tasa*., MAZ *parksii*, END *muricata*, and MAS *papillatus* complex. Low IT had areas had ODO *floccosa* fm. *comosa*, PTE *bipinnata*, and ALA *marginata*. Subtidal vegetation included LAM *longipes*, SAC *subsimplex* and DRU *fistulosa*.

Fauna – Avian activity included several Bald Eagles. Common IT invertebrates were Littorines, SB *glandula*, SEM *cariosus* (very dense on rock ramps) (Photo C.), MYT *trossulus* (many adults; collected) (Photo D.), LOT *pelta*, NUC sp. (N. *emarginata*?), Hairy *Fusitriton*, and *Metridium* sp.





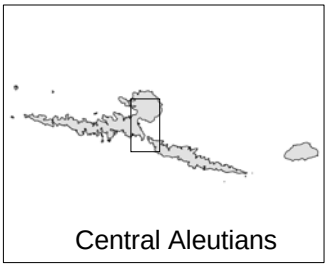


Photo A: Alongshore view looking southeasterly. Note boulder rubble with narrow rock ramp.

Photo B: Biobands of VER, barnacles, a patch of MAZ *parksii*, and *Fucus*.

Photo C: Dense stand of SEM *cariosus*.

Photo D: Adult MYT *trossulus* mixed in with SEM *cariosus*, and *Fucus*.

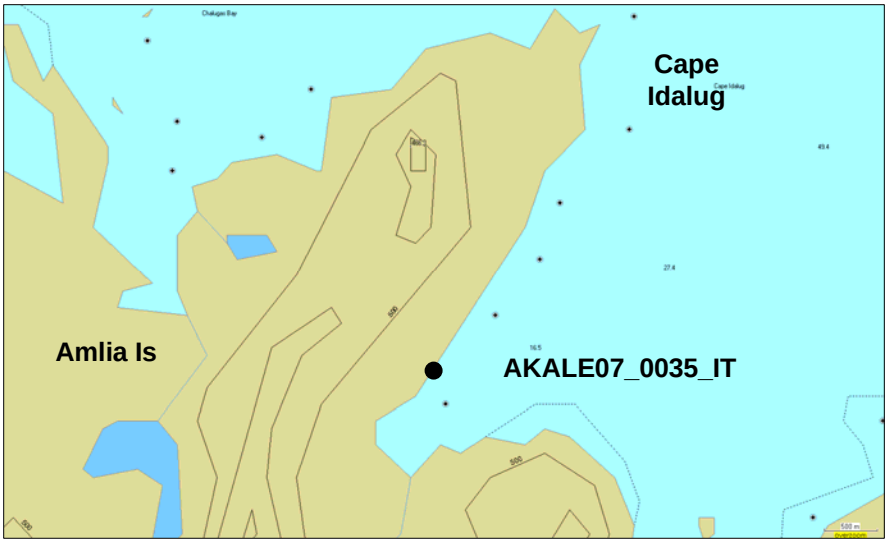
Location: **Cape Idalug, Amlia Is.**
Longitude/Latitude: N 51.12262 W -173.54282
Region: Central Aleutians
EMAP Site: AKALE07_0035_IT
Date: July 18, 2007

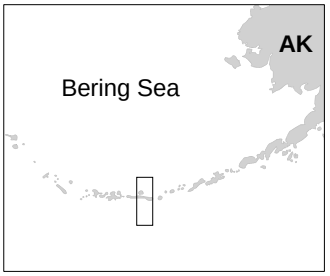
Geomorphology:
This site is located on the Bering Sea side of Amlia Island (central). The IT site was just inside Cape Idalug. Incredible cliffs showing bands of lava and ash rise over 200 m in this area (Photo A.). The IT is mainly low lying reefs of breccia with cobble size basalt infused into its surface. Cobble debris at the base of the cliffs had worn smooth bedrock ramps in the lower IT (~ 50 m wide) (Photo B.). This site was semi-protected (slight ground swell) with a perpendicular fetch no longer than 1.2 km given a southeasterly aspect (120^{o}). Northeasterly shores in the back of the bay have an infinite fetch into the Bering Sea.

Biology:
Biobands – The major IT biobands on bedrock were VER (narrow band), PRA, POR, barnacle, *Fucus*, ALA *marginata* (Photo C.). Major subtidal biobands were LAM *longipes* and DRU *fistulosa*. Several low lying rock outcroppings had bleached white bands of POR and MAZ *parksii*.

Flora – Above MHHW notable plants were beachgreens, Cenesio, Dune Grass, Caryx sp., Yellow Monkey Flower (*Mimulus guttatus*), lupine, Cow Parsnip, and on the cliff walls Cinquefoil and an orange lichen. Upper IT *biobands* had PRA *meridionalis*, POR *pseudolanceolata*, POR *tasa*, POR *schizophylla*, HAL *glandiforme*, and MAZ *parksii* (Photo D.). Mid to low IT had *Fucus*, MAS *papillatus* complex (Clade 1), ODO *floccosa* fm. *comosa*, ULV *lactuca*, ULV *intestinalis*, PAL *hecatensis*, and ALA *marginata*. Subtidal vegetation included LAM *longipes*, SAC *subsimplex*, *Clathromorphum* spp., and DRU *fistulosa*.

Fauna – Avian activity included some Common Eiders, Oystercatchers, Harlequin Ducks, Murrs, Puffins, and a sparrow. Marine mammal observations included 4-5 seals, at least one mother with 2 pups. Common IT invertebrates included Littorines, SB *glandula*, SEM *cariosus*, MYT *trossulus* (very small), LOT *pelta*, and urchins.





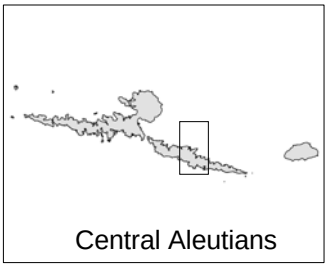


Photo A: Dynamic geology of cliffs showing layers of volcanic ash and lava.

Photo B: Smooth ramp in upper IT.

Photo C: Breccia with chunks of basalt. Biobands are POR, *Fucus*, ODO with ALA *marginta*, and DRU *fistulosa*.

Photo D: Close-up of bleached POR and MAZ *parksii* which were very striking and visible from offshore.