

**Invertebrate Inventory
of the
Alaska Peninsula**

A Progress Report for 2004



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ABSTRACT

The composition and distribution of invertebrate species on the Alaska Peninsula is not well known. This pilot project was intended to test methods and to document the presence of specific insect groups on the Peninsula. We also looked for freshwater mussels as part of a statewide monitoring project. From 12 July to 29 August 2004, we collected specimens at seven locations clustered around the town of King Salmon, Alaska and at six locations in Alaska Peninsula/Becharof National Wildlife Refuge in conjunction with a small mammal inventory. A total of 118 insect specimens were collected. We identified three species of dragonfly, two species of damselfly and three species of butterfly. The remaining unidentified specimens include 32 moths, four grasshoppers, 27 bees, and two insects of unknown order. This year was a good start; continuing to survey in the future and including more flight periods such as May and June would give us a more complete picture of specific insect communities on the Alaska Peninsula.

INTRODUCTION

Little is known about the composition and distribution of invertebrate species on the Alaska Peninsula, with very little material collected here (K. Philip, Institute of Arctic Biology, personal communication). This is due to the remoteness of the refuge, being accessible only by boat or small aircraft. An inventory of specific invertebrate groups in the Alaska Peninsula/Becharof National Wildlife Refuge was attempted for the first time during the 2004 field season. The inventory was conducted in conjunction with a small mammal inventory project. The purpose of this inventory was to test methods and document species presence. Specific taxa were targeted so that collectors would not be overwhelmed. This information will be used to establish baseline data for certain insect groups. This will enable future studies to detect any changes or shifts in the composition of insect communities that will likely occur as habitats available are altered by changes in global climate. Insects are ideal for monitoring changes in the environment because of their relatively short generation times and sensitivity to changes in habitats.

STUDY AREA

The study was conducted in the Alaska Peninsula/Becharof National Wildlife Refuge and in the vicinity of King Salmon, Alaska. The refuge encompasses approximately 4.6 million acres from the Big Creek drainage flowing into the Naknek River in the north to Port Moller in the south. The Gulf of Alaska forms the southeastern boundary and the northwestern boundary is a human defined line approximately half way across the Bristol Bay lowlands. The refuge encompasses a broad spectrum of landscapes from rugged volcanic peaks, large sea-size lakes, meandering rivers and sloughs, white water creeks, rolling hills, and expanses of flat lowlands. Much of the landscape is glacially affected. A wide diversity of habitat types are available on the refuge; vegetation includes the southern edge of the boreal forest, expansive shrublands, tundra, graminoid and forb meadows, multiple wetland types, and a few cottonwood forests. Locations for this inventory work included sites on the refuge that are previous or current survey sites for landbirds or shorebirds (Table 1 and Figure 1). Plots for current landbird work included

10 x 10 km blocks defined by USGS personnel from the Alaska Science Center in Anchorage, Alaska and exclude large water bodies, glaciers and steep terrain; these are randomly selected. Shorebird plots subdivide these same 10 x 10 km blocks into 5 x 5 km blocks and include those that are predominantly below 100 m elevation and stratified on wetland habitat percentage; these are systematically selected. The seabird field camp at Puale Bay was also a site.

The inventory effort in the area surrounding King Salmon was based on or near the road system, from the boundary of Katmai National Park to the east, to halfway between King Salmon and Naknek to the west. These habitats include the southwestern extent of the boreal forest and various wetland and tundra habitats.

Table 1. Invertebrate collection locations and dates on the Alaska Peninsula in 2004. Collector initials are also included. See Staffing and Logistics for full names of collectors.

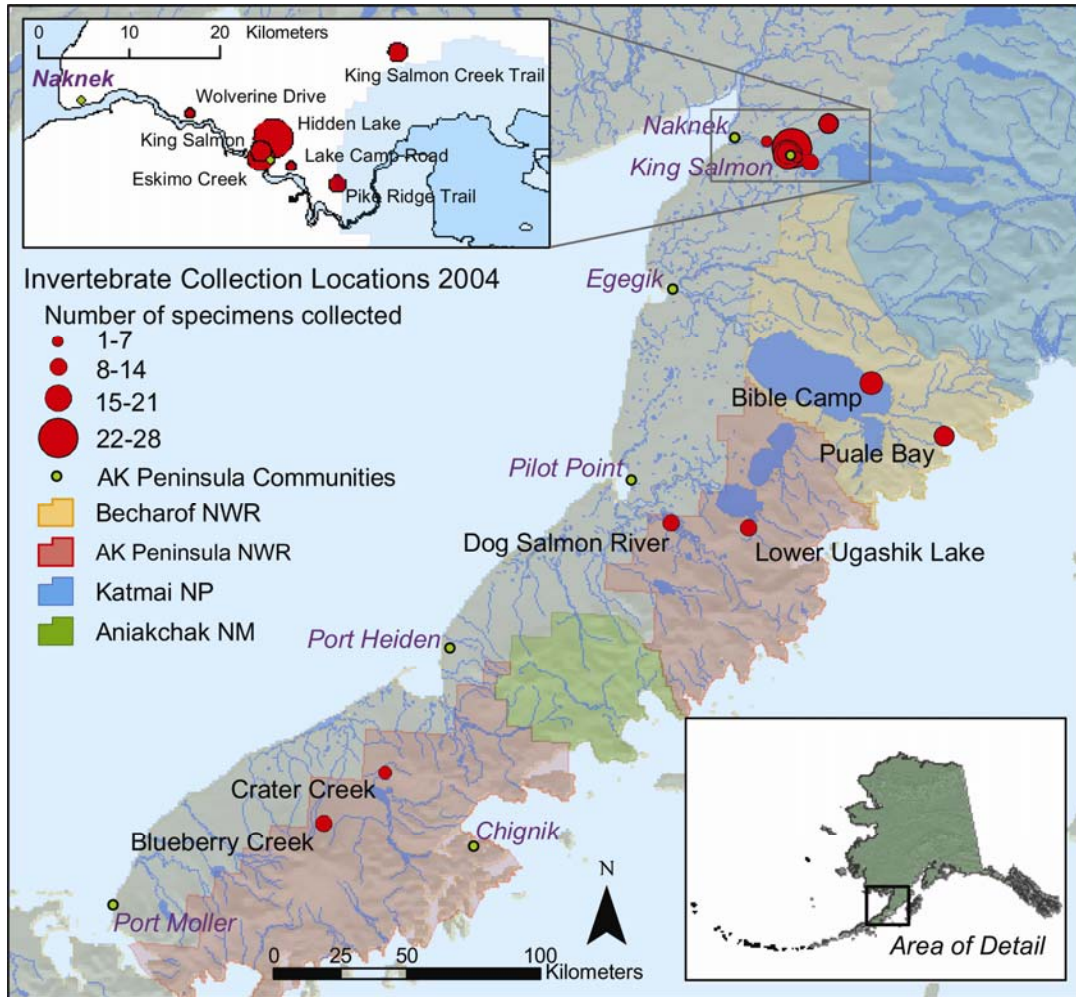
Location	Collection Dates 2004	Collectors
<u>King Salmon/Naknek</u>		
Eskimo Creek	21 July	GJ, JAE
Hidden Lake	30 July – 6 Aug	RBR
King Salmon Creek Trail	2-15 Aug	GJ, RBR
King Salmon (town)	30 July – 20 Aug	JAE, SAK, RBR
Lake Camp Road	20 July	EMA
Pike Ridge	20 July	EMA, GJ, SMS, ME
Wolverine Dr.	22-24 July	SES
<u>Becharof NWR</u>		
Bible Camp	12–16 July	GJ, JAE, SES, EMA
Puale Bay	28 July – 10 Aug	GJ, SES, SMS, KAS
<u>Alaska Peninsula NWR</u>		
Lower Ugashik Lake	22-26 July	GJ, RSAK, JAE
Dog Salmon River	22-24 July	KAS
Crater Creek	30 July	EMA
Blueberry Creek	8-9 Aug	GJ

METHODS

Staffing and Logistics

The refuge component of the invertebrate inventory in 2004 was performed in conjunction with the small mammal inventory (Andersen 2005). Those that participated in the collection of specimens include Biological Technicians Erik M. Andersen, Gretchen Jehle, Robb S. A. Kaler, Sarah M. Schuster, and Kristin A. Sesser as well as intern Jessica A. Eyster and refuge Wildlife Biologist Susan E. Savage. The inventory work performed in the King Salmon area included local naturalists Richard B. Russell and Mark Emery as collectors as well as refuge personnel.

Figure 1. Map of invertebrate collection locations along Alaska Peninsula in 2004



Access to the refuge via fixed-wing aircraft was provided by refuge pilot Dave Cox and Birchwood Air's Cecil Shuman. Camp facilities and equipment included: North Face VE-25 tents, Garmin GPSMAP 76S GPS units, and Pentax Optio 43WR digital cameras, and a Weatherport at Puale Bay. Safety equipment included: two VHF radios, two Iridium satellite phones, two Mini B2 personal EPIRB units, signaling mirrors, and a first-aid kit. Specialized equipment for bear safety included an electric fence, a 12-gauge shotgun per person with rifled slugs and bear hazing supplies (cracker shells and rubber slugs), air horns, and bear-proof food storage drums.

Materials

The materials used for collection of invertebrates included aerial nets, aquatic nets for mussels, glassine envelopes in assorted sizes, small glass vials with alcohol, and small plastic containers to protect insects while in the field. For euthanizing the specimens we used pint-sized mason jars with cardboard bottoms and Ammonium Carbonate as the killing agent. We chose to use Ammonium Carbonate because we would not have to pay hazardous material transport fees and this substance was generally less toxic to collectors

than other agents. For the odonates, we used acetone as a killing agent and to preserve colors.

The materials used for the processing of specimens once out of the field included spreading boards, mounting tape, No. 2 insect pins, blunt end forceps, glass-headed pins, labels, pinning blocks and pinning boxes to store the specimens. When relaxing chambers were used, we used a pint-sized mason jar with the bottom lined with slightly wet paper towels, cardboard and an antifungal agent (Lysol).

Collection Methods

The inventory was focused on the insect orders Lepidoptera (butterflies and moths), Hymenoptera (bees), Odonata (dragonflies and damselflies), and Orthoptera (Grasshoppers), and the mollusk order Unionoidea (freshwater mussels).

The methods for insect collection are outlined in two refuge documents: (1) "Insect Sampling and Monitoring, Alaska Peninsula/Becharof NWR" (USFWS 2004 – draft Wildlife Inventory Plan [WIP]) adapted from a document prepared for Kanuti NWR by Dr. Jim Kruse of the University of Alaska and (2) a summary of methods from various internet and published resources collected in "Methods for Insect Collection" (USFWS 2004 – draft Supporting Protocol for WIP). Freshwater mussels were collected on behalf of the Alaska Freshwater Mussel Project (Smith and Foster 2004) and their protocol and instructions were followed.

During 2004, collection of invertebrates on the refuge was conducted in conjunction with small mammal trapping. Refuge personnel were present at each site for 3-5 days. Invertebrates were collected subjectively as time and weather permitted. When suitable freshwater streams were present, they were surveyed for the presence of freshwater mussels. Insects were sought and collected using aerial nets, primarily on warm, sunny days. Insects are extremely sensitive to the temperature of their surroundings. Our target species, butterflies and dragonflies, depend upon the sun's warmth to stimulate their flight muscles; most butterflies and dragonflies are only active when the ambient temperature is at least 65°F. On cool, cloudy or rainy days, these insects tend to hide in the vegetation making them difficult to collect.

Invertebrate collection in the King Salmon area was predominantly incidental, although trips to Hidden Lake and Eskimo Creek were aimed at collecting specimens.

RESULTS AND DISCUSSION

Weather

According to the preliminary local climatological data from the National Weather Service, the months of July and August 2004 were warmer and somewhat dryer than average in King Salmon. Daily highs during the survey period ranged from 58 - 81°F and the average temperatures for July and August were 0.7 and 4.8°F higher than normal, tying the record highs twice in July and setting new record highs three days in August. Levels of precipitation were about average for July and below average for August. However, numerous overcast and rainy days prevented collecting.

Invertebrate Collection

A total of 118 insect specimens were collected from 12 July - 29 August 2004 at thirteen locations throughout the Alaska Peninsula. A total of 42 specimens were collected from six locations in Alaska Peninsula/Becharof NWR and 76 specimens were collected from seven locations clustered around King Salmon (Table 2). Preliminary identifications of Lepidoptera and Odonata specimens were made by refuge personnel using identification keys (Paulson 2004, Internet) and photographic guides (Opler et al. 1995, Internet) (Table 3).

Table 2: Number of insect specimens collected at each location on Alaska Peninsula in 2004.

Location	Specimen Type						Total
	Butterfly	Moth	Dragonfly / Damselfly	Grasshopper	Bee	Unknown	
<u>King Salmon and Naknek</u>							
Eskimo Creek	4	2	1		3		10
Hidden Lake	1	1	26				28
King Salmon Creek Trail	2	5	1	1			9
King Salmon (town)	2	12	1			1	16
Lake Camp Road			2		1		3
Pike Ridge	1	1	3		1		6
Wolverine Drive, Naknek	1			3			4
<u>Alaska Peninsula/Becharof NWR</u>							
Bible Camp		3	3		5		11
Blueberry Creek		2			4		6
Dog Salmon River	1	1			3	1	6
Lower Ugashik Lake		2	1		3		6
Puale Bay		2	3		4		9
Crater Creek		1			3		4
Total	12	32	41	4	27	2	118

Table 3: Currently identified insect specimens collected from the Alaska Peninsula in 2004.

Scientific Name	Common Name	Number specimens
<u>Dragonflies/Damselflies</u>		
<i>Aeshna eremita</i>	Lake Darner	5
<i>Aeshna juncea</i>	Sedge Darner	7
<i>Sympetrum danae</i>	Black Meadowhawk	11
<i>Enallagma cyathigerum</i>	Northern Bluet	5
<i>Lestes disjunctus</i>	Common Spreadwing	13
<u>Butterflies</u>		
<i>Pieris angelika</i>	Arctic White	1
<i>Nymphalis antiopa</i>	Mourning Cloak	6
<i>Nymphalis milberti</i>	Milbert's Tortoiseshell	5

On warm, sunny days, dragonflies and damselflies were typically numerous. A total of 41 specimens of five species within Odonata were collected. The Hidden Lake area was especially productive where 26 of the 41 identified specimens were collected. Black Meadowhawks (*Sympetrum danae*) and Sedge Darners (*Aeshna juncea*) were the most common dragonflies, along with Lake Darners (*Aeshna eremita*). The most common damselfly was the Common Spreadwing (*Lestes disjunctus*) along with the Northern Bluet (*Enallagma cyathigerum*). The Odonata specimens were verified by Odonata expert John Hudson (Juneau, Alaska). The results from these identifications were sent back to the refuge and the specimens were sent to the University of Alaska Museum of the North in Fairbanks, Alaska to be included in their collection.

Butterflies were not numerous during the survey period and only 12 specimens consisting of three species were collected (Appendix 1). We collected six specimens of Mourning Cloak (*Nymphalis antiopa*), five of Milbert's Tortishell (*Nymphalis milberti*), and one Arctic White (*Pieris angelika*). In March 2005, these butterflies and 32 unidentified moths were sent to be identified by Kenelm W. Philip of the Alaska Lepidoptera Survey and the Institute of Arctic Biology in Fairbanks, along with other Lepidoptera experts. After identification of the specimens, they will be housed with the Alaska Lepidoptera Survey collection and eventually the Smithsonian Institution.

Freshwater mussels were collected at two sites near King Salmon by R. Russell. These specimens were sent to the Alaska Natural Heritage Program per their instructions. They were identified by the Alaska Freshwater Mussel Project as *Anodonta beringiana*, which is the most common and widespread freshwater mussel in the state. No freshwater mussels were found at the sites visited in the refuge during this invertebrate inventory.

The other insect groups collected during the inventory period are more difficult to identify with the resources available at the refuge and will eventually be sent to experts to be identified. These include four grasshoppers, 27 bees, and two unknown insects.

CONCLUSION

This year was a pilot study to test the methods and the feasibility of the project. Future surveys will be needed in order to provide a more complete picture of the invertebrate communities on the Alaska Peninsula. Kenai NWR is evaluating the feasibility of invertebrate surveys at the refuge level. Additionally, the time of survey needs to be modified. The prime flight time for the best variety of species is typically from May through mid-July depending upon temperature. The 2004 survey was conducted only during the months of July and August; this time period is just after the time when target species are typically most active. Also, some species fly only in spring while others fly during the summer. A longer survey period or a spring and summer survey would help create a more complete picture.

Technical Recommendations

- Freezing butterfly specimens until able to pin them onto a spreading board worked better than using the killing jar/relaxing jar combination. Butterflies killed in a killing jar and then relaxed were much more fragile than those frozen and thawed. If using a relaxing chamber, leave the butterflies in for at least one entire day depending on the size of the butterfly and the humidity inside the chamber. Of course, the ability to freeze specimens will be limited to sites with refrigeration capabilities.
- The relaxing jar worked very well for dried grasshopper specimens; leave them in the jar overnight.
- We used Ammonium Carbonate as a killing agent, using approximately 1-2 teaspoons, but did not have much success. Most likely we didn't use enough in the killing jar and suggest one or more tablespoons for the next collecting effort.
- Photographing dragonflies
 - It is important that we know which specimen each photo references; make sure the specimen number, or some kind of marker is in the photograph somewhere, so the photo is labeled correctly as soon as it is downloaded.
 - It is also important to not block the tip of the abdomen, as the number of appendages there can help with identifying the specimen later.
 - It is best to photograph dragonflies using natural light with a dark, matte background.
 - Photographing while still alive allows photo to capture eye color of the specimen which fades soon after death.

ACKNOWLEDGEMENTS

Many thanks to all our collectors; most of our specimens from the King Salmon area were collected with the invaluable help of local naturalists R. Russell and M. Emery. A special thanks to G. Jehle for her help in researching invertebrate experts and her dedication to the project. We greatly appreciate the assistance given by several experts on dragonflies and butterflies of Alaska. John Hudson was encouraging throughout the project, and verified our identification of dragonflies and damselflies. Dennis Paulson provided essential information on how to collect and preserve odonates. Ken Philip informed us of what is known and unknown regarding Alaska butterflies and agreed to identify our specimens and add them to the Alaska Lepidoptera Survey collection. Thanks also to our pilots Dave Cox and Cecil Shuman for safely transporting us on numerous flights out to the refuge. We thank Refuge Manager Daryle Lons for his support, and we thank the entire refuge staff for keeping us safe and well-supplied while in the field.

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APPENDIX

Appendix 1. Photograph of butterfly specimens collected in 2004 on Alaska Peninsula.

