

Macrocystis Kelp: Mapping its Distribution in the Kodiak Island Archipelago

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Background and Summary

In 2002, during aerial surveys in the northern Kodiak Island archipelago, *Macrocystis* kelp beds were documented on the west side of Afognak Island, just north of the mouth of Foul Bay. In May 2005 voucher samples were collected and provided to taxonomists for confirmation. Additional aerial surveys in 2005 documented a few smaller *Macrocystis* beds in the Kodiak Island archipelago: two small beds on the southwest corner of Shuyak Island and a small bed in Kiliuda Bay. Vessel and dive surveys in 2006 and 2009 documented the spatial extent of the individual beds, the distribution of individual kelp plants along the coast, and kelp plant densities and species associations. Plant tissues were collected in 2009 and are being provided for DNA analyses to extend a recent international study that reclassified five species of *Macrocystis* kelp, worldwide, into one species, *M. pyrifera*.

In the eastern Gulf of Alaska, *Macrocystis* is well documented in the more oceanic, outer coast areas of southeast Alaska, but is not described north of Icy Bay. In the western Gulf of Alaska, the range has been reported to include Kodiak Island but, until now, specific locations were not recorded nor have established kelp beds been described. Future surveys will also include other western Gulf of Alaska areas where individual plants or kelp beds have been reported, including several plants documented on the outer Kenai Peninsula coast and a bed that has been observed during sea otter surveys near western Montague Island in Prince William Sound.

Please help! Have you seen me?



We need your help to learn more about *Macrocystis* in the Kodiak and surrounding areas:

- Have you seen the *Macrocystis* kelp beds described below? If so, we let us hear about your observations and impressions.
- Have you seen *Macrocystis* in other Kodiak areas or in other areas of the western Gulf of Alaska? If so, please let us know where and when.
- If you see *Macrocystis* kelp plants (attached, not drift) in the future, please document its presence (digital photo and/or exact location) and pass on the information (saupe@circac.org)

Your information will help as we seek answers to:

- How long have *Macrocystis* beds persisted in the Kodiak area?
- Will its distribution change locally or geographically with warming trends?
- What are the environmental conditions that promote or limit settlement and growth of *Macrocystis*?

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Canopy Kelps in the Gulf of Alaska

For subtidal rocky habitats in coastal Alaska, kelp beds can provide significant habitat complexity for seaweeds, invertebrates, fish, and marine mammal species and a major source of fixed carbon to nearshore food webs.

Of the more than 20 species of kelp that occur in Alaska, there are three major canopy kelps that use gas-filled bladders, allowing the kelps to attach to deeper substrate since photosynthetic tissues in the fronds and blades are raised to the surface.

The three canopy kelps differ in their geographic distributions in the Gulf of Alaska, as shown by the ShoreZone survey data below (www.shorezone.org):



Bull Kelp (*Nereocystis luetkeana*) is the dominant canopy kelp for most of coastal Alaska and is suited for high energy, open coast environments or high current areas. This fast-growing kelp is an annual (although it has persisted for more than a year in some areas). Its range is southern California to the eastern Aleutian Islands.

Dragon Kelp (*Eularia (Alaria) fistulosa*) is also a fast-growing annual, although it is an opportunistic perennial in the outer Aleutians. It does not occur as far south as *Nereocystis* or *Macrocystis* and its western extension extends beyond the western Aleutians into Russia and Japan. It prefers cold, semi-protected to exposed habitats.

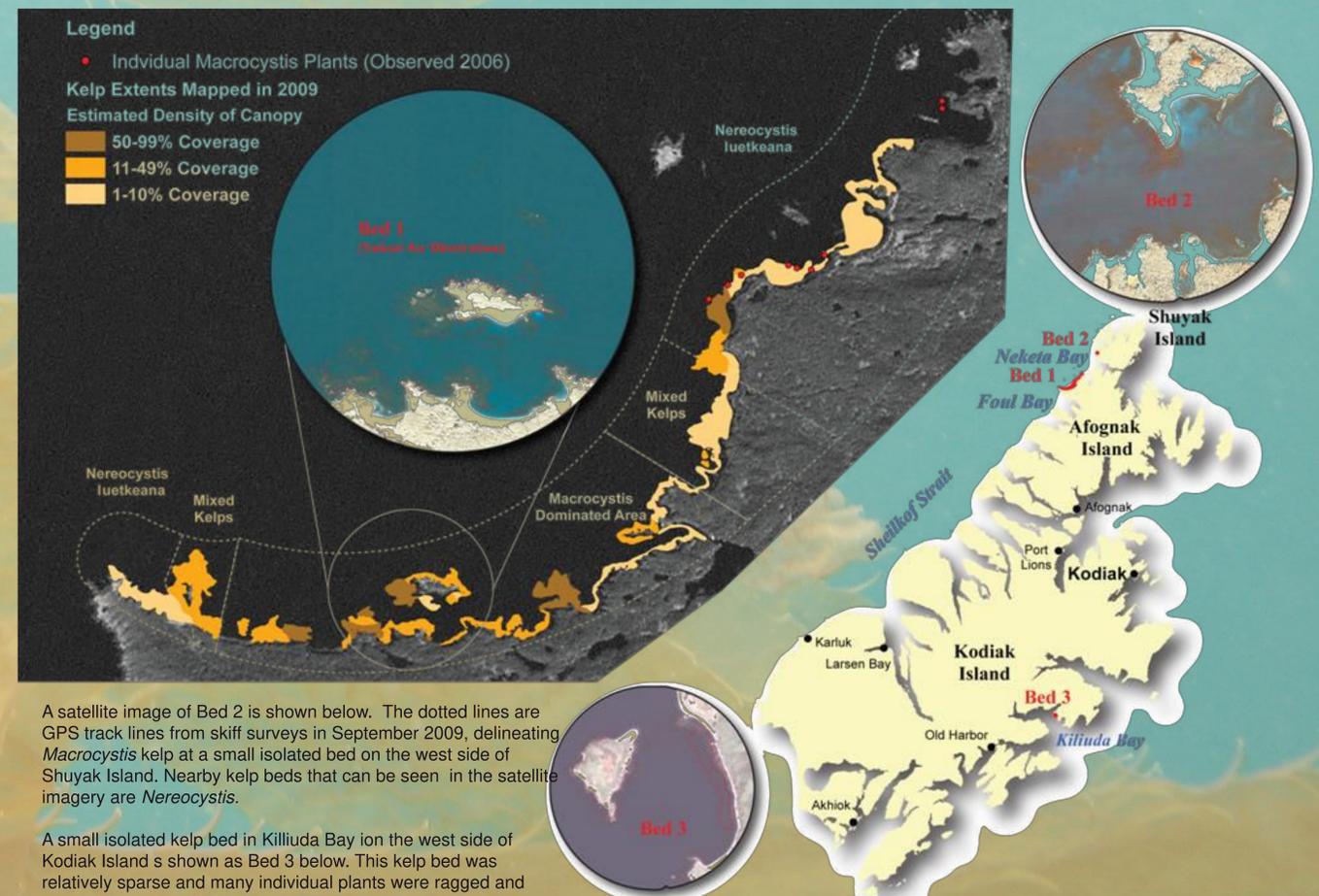
Giant Kelp (*Macrocystis* spp.) is a fast-growing perennial kelp that often occurs just shoreward of *Nereocystis* beds when they co-occur along a rocky shore. It prefers semi-exposed oceanic habitat. Prior studies in Alaska identified *Macrocystis integrifolia* as the common species in much of southeast Alaska.

Until now, there was no information available on the ecology of *Macrocystis* north or west of the southeast Alaska Panhandle. Many seaweed, invertebrate, and fish (including juvenile stages of several commercially important species) were observed during dive surveys on the Kodiak area *Macrocystis* beds. If this kelp were to expand its range due to warming trends or other environmental factors, one potential effect might be that its perennial nature might provide a more constant source of structure and habitat that annual canopy kelps do not.

Macrocystis Kelp in the Kodiak Area

In 2006 and 2009, GIS data were collected by skiff using Garmin Recreational-grade GPS to map the extent and shape of *Macrocystis* kelp beds at 3 locations around the Kodiak Island Archipelago.

The distribution of *Macrocystis* and *Nereocystis* kelps at Bed 1 on the west side of Afognak Island are shown below. The polygons were generated from a combination of complementary data sources; field collected GPS track lines were overlaid on high resolution 2009 satellite imagery (where available) and density estimates were made from a combination of the imagery and field observations. The resolution of the satellite imagery did not allow for resolving species. Thus, field observations were key to delineating species-level polygons. The dotted lines reflect transitions of species as documented in the field. Red dots reflect individual or small clusters of *Macrocystis* plants within *Nereocystis* dominated areas and reflect the geographical extent of visible *Macrocystis* plants in the Bed 1 study area. Polygon data are plotted on top of LandSat 2000 imagery since portions of the coastline were hidden by clouds in the satellite imagery.



A satellite image of Bed 2 is shown below. The dotted lines are GPS track lines from skiff surveys in September 2009, delineating *Macrocystis* kelp at a small isolated bed on the west side of Shuyak Island. Nearby kelp beds that can be seen in the satellite imagery are *Nereocystis*.

A small isolated kelp bed in Kiliuda Bay on the west side of Kodiak Island is shown as Bed 3 below. This kelp bed was relatively sparse and many individual plants were ragged and stunted (see photo below).