

Figure 1. Diagram of a typical kayak interaction. The number and type of kayakers are recorded, and the paddle route (solid arrows) is sketched. The seals being observed are on the iceberg within the red box on the right. Previously disturbed seals are in the water, within the red oval. The dashed line indicates an open field of view between the kayakers and seals on the iceberg.

Integration of Tourism Into the Marine Ecosystem

By Caroline Jezierski, Anne Hoover-Miller, and Brenda Norcross

Marine- and eco-tourism are among the fastest growing industries in Alaska and worldwide. With increased human presence in remote locations, there is growing concern about the potential impact of tourist activities on wildlife and wilderness ecosystems. Kenai Fjords National Park (Figure 2) is a coastal park located on the Kenai Peninsula, outside of Seward, Alaska. Visitation to the park increased nearly 300% from the early 1980s to the late 1990s (Colt *et al.* 2002). Sea kayaking is a popular recreational activity in the park; sea kayakers have the ability to paddle close to shore and among floating glacial ice near tidewater glaciers. It is here that they may encounter harbor seals.

Harbor seals (*Phoca vitulina*) are the most widely distributed pinniped, ranging throughout the coastal areas of the North Atlantic and North Pacific Oceans. On the west coast of North America, harbor seals are found in most nearshore habitats from Baja California to the Bering Sea. Harbor seals in southeastern and southcentral Alaska have the unique opportunity to haul out on ice calved by tidewater glaciers, where they can rest, give birth to their pups, and molt. In summer, the seals

undergo an annual molt when they shed and regenerate new hair. During this time, seals bask on the haulout to increase their skin temperature which facilitates hair growth.

Aialik Bay in Kenai Fjords National Park has three tidewater glaciers, Aialik, Holgate and Pedersen Glaciers that produce ice used by harbor seals. Both Aialik and Holgate Glaciers are accessible to large motor vessels and are regularly visited by tour boats. In the past, harbor seals primarily hauled out on the ice in front of Aialik Glacier. Recently, Pedersen Lake's expanding ice habitat created by the recession of Pedersen Glacier, has become the preferred haul out area for harbor seals during the molt.

Ice calved from Pedersen Glacier tends to be larger and persist longer than ice calved from Aialik Glacier. Due to the relatively shallow recessional moraines or gravel bars located throughout the lake, icebergs often are grounded for extended periods of time. In addition, the narrow outlet stream entraps ice within the lake. Because of its relative isolation and persistent glacial ice, Pedersen Lake has become a popular destination for seals and sea kayakers.

Between 1980 and 1989, the number of harbor seals in the Aialik Bay area declined by more than 80% (Hoover-

Miller 1994), paralleling trends found throughout the Gulf of Alaska (Pitcher and Calkins 1979, Small *et al.* 2003) and Prince William Sound (Frost *et al.* 1999). Although the decline of the harbor seals was likely related to changes affecting marine mammals elsewhere in the Gulf of Alaska, there has been concern about added stress of human disturbance resulting from tourism. In 1979 and 1980, only one to three boats visited upper Aialik Bay daily and most did not venture into the glacial ice, a practice that resulted in few seals abandoning the ice (Murphy and Hoover 1981). In 1980, Kenai Fjords National Park was established and visitation increased. Several tour operators are now offering day-tips into the park, in tour boats carrying 12 to more than 100 passengers. Another popular way to explore the fjords is by sea kayak. Water taxis shuttle sea kayakers, paddlers and guides from Seward into the fjords for one or multiple day adventures.

Goals of the study

The overall goals of the project were to assess and reduce the impact of kayaking on harbor seals. Initially, we assessed interactions to determine the extent sea kayakers were disturbing seals and causing them to abandon ice haulouts. Next, we reviewed interactions in order to

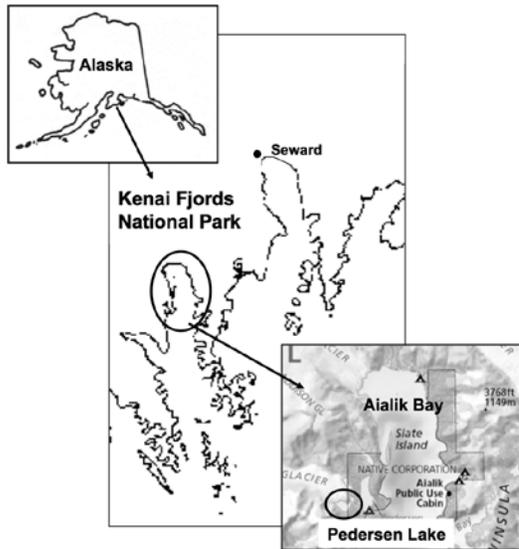


Figure 2. Location of Pedersen Lake in Aialak Bay, Kenai Fjords National Park.

identify specific kayaker behaviors that caused seals to enter the water. We then proposed paddling techniques to help reduce disturbance and presented them to kayakers through training workshops. Finally, we evaluated whether the paddling recommendations and mitigation trainings were effective at reducing disturbance to harbor seals.

Harbor seal behavior and sea kayaker activity were monitored from mid-July to mid-September, when harbor seals were molting. We collected data from 2004-2006 using a series of remotely operated cameras designed by SeeMore Wildlife Systems Inc. and operated out of the Alaska SeaLife Center in Seward, Alaska (see *Maniscalco et al. in this issue*). Data were also collected while camped along the shores of Pedersen Lake in 2005 and 2006 (Figure 3).

Counts and Distribution of Seals

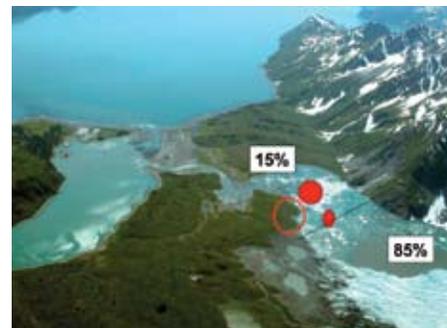
We counted seals daily from about 8am

to 5pm. This is when the greatest numbers of harbor seals haul out on glacial ice and the most popular time for kayakers to be in the lake. We divided the lake into six sections based on easily recognizable topographic features. The number of seals for each section of the lake was recorded. We conducted 106 counts of seals during 2005 and 2006 that documented the distribution of up to 340 seals. We observed from zero to 340 seals hauled out on the ice. Eighty-five percent of the seals were counted in the upper portion of Pedersen Lake, while only 15% were in the lower portion of the lake (Figure 4). Thus, one of our recommendation was to propose preferred visitation areas. If visitors kayaked or walked along the shore in the lower portion of the lake, they would interact with fewer seals. The majority of the seals in the upper lake could be viewed with binoculars from the lower end of the lake and would be less threatened by the presence of humans.



Photograph by Anne Hoover-Miller

Figure 3. Aerial view of Pedersen Glacier on right. The stream, in center of image, connects Pedersen Lake to Pedersen Lagoon, and then to Aialik Bay. Locations of cameras and field observation sites border the lake.



Photograph by Anne Hoover-Miller

Figure 4. Observed distribution of harbor seals hauled out on glacial ice. Red circles are the location of features that mark the division between the upper and lower lake.

Seal Behavior

In order to determine whether humans were altering the “normal” behavior of the seals, we observed seals when humans were not in the lake, and when humans were sea kayaking or walking nearby. We used the seal behaviors collected when humans were not in the lake as the “normal” behavior of the seals. To do this, we selected a group of seal(s) hauled out together on one iceberg and recorded their behaviors. When humans were present, the activity of the kayakers and walkers were monitored. Harbor seal behavior was categorized as resting, alert, or abandoning. A behavior was recorded every ten seconds for ten minutes; this series of behaviors made up one behavioral observation. Nearly 2,000 behavioral observations of seals were recorded.

We found that when humans were present, harbor seals rested less and abandoned the ice more than they



Figure 5. Harbor seals as seen through the spotting scope.

did when humans were absent. The ramification of increased amount of time spent alert and decreased time hauled out are unknown, but disturbing seals from their haulout may increase energy expenditure and potentially prolong the molt process. The extent to which these factors affect the health and survival of the seals are poorly understood.

Outreach and Education

Four companies in Seward offered guided sea kayak tours in Kenai Fjords National Park during the years of the study. Every year, the guides employed by these companies undergo a period of training. During May 2006 we presented the preliminary results from the 2005 season in which kayakers and walkers were identified as disturbing harbor seals. As a means to mitigate disturbance to harbor seals we provided paddling recommendations. We recommended:

- 1) Choose the route with the least number of seals hauled out.
- 2) Observe the seal behavior. Resting seals are usually lying flat on the ice. If they lift their heads and stare, they are alert.
- 3) Halt the approach or alter the route so the seals may return to the resting state. If the approach is continued, the seals will abandon the iceberg and enter the water.

Recently disturbed seals are often observed swimming in a group. The seals, once they are in the water, will approach kayakers with apparent curiosity. They will also approach groups of seals still hauled out and flipper-slap an alarm. This

behavior frequently causes the seals on ice to enter the water. Once the seals have been disturbed from the ice, they may not haul out again for several hours or days.

To test whether our recommendations were effective, we contrasted the responses of seals to kayakers receiving different levels of training. During the 2006 field season, when a group of kayakers entered the lake, they were classified as a guided or unguided group, a group receiving or not receiving mitigation training, or a group of unknown/mixed training level. The difference in the behavior of the kayakers between guided and unguided groups was apparent. Guided groups stayed together better, minimizing their appearance to one larger group instead of several smaller groups. In addition, the guided groups tended to be quieter and explore the lake with more caution. When a group with a guide who had received training was paddling in the lake, their concern for minimizing their

disturbance of seals was apparent. They entered the lake slowly, seeking out the route through the ice with the fewest seals. They observed the behavior of the seals. If they observed seals becoming alert they readjusted their route. Often times, if they observed seals abandoning an iceberg, they paddled to the shore and continued their exploration of the lake from the shore. For the time these groups spent in the lake, the number of seals disturbed was greatly reduced from groups observed in previous years. The results of the educational training were evident. The guides were aware of their potential to disturb seals and actively modified their behaviors to minimize this disturbance.

Observing animals in the wild is exciting and should be considered a privilege. We are the visitors. By educating ourselves about the area we are visiting and the wildlife we may encounter, we can help minimize adverse impacts on the resident wildlife.

Acknowledgements

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Photograph by Caroline Jezewski

Figure 6. Sea kayaking with Pedersen Glacier in the background.

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