

Marbled Murrelets *in Southeast Alaska*

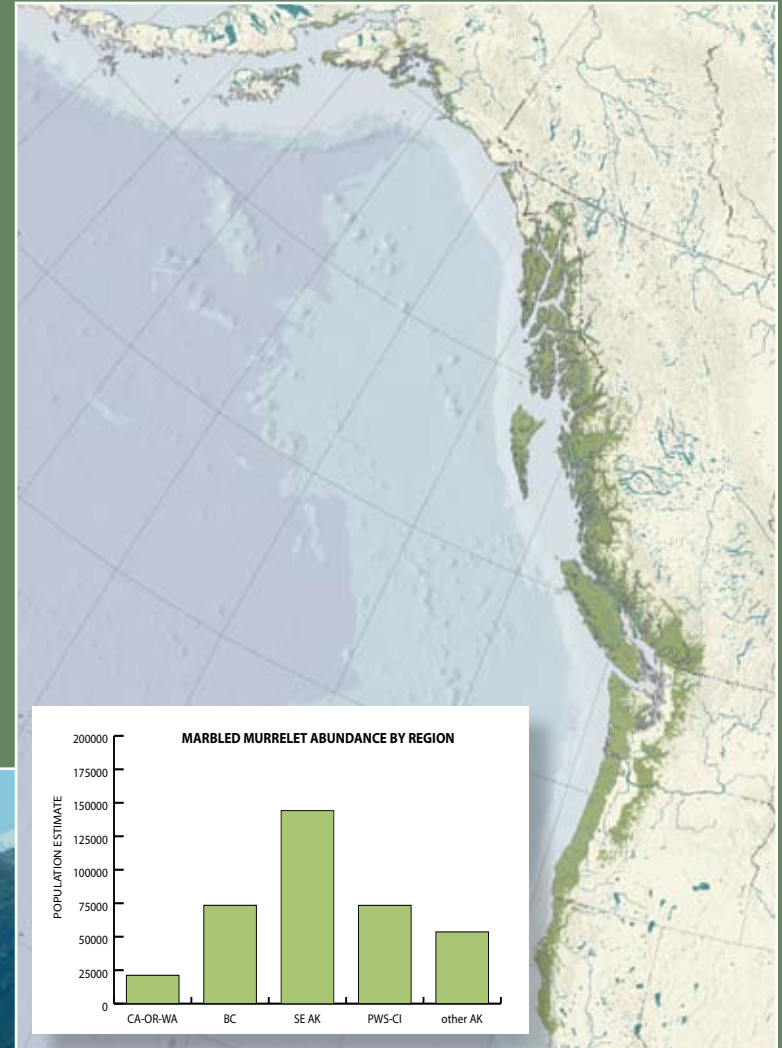


Alaska Department of Fish and Game

Range and Distribution

Southeast Alaska's 'signature' seabird is marvelously adapted to life amidst the emerald-green islands and cold, marine waters along the northwest coast of North America. Unlike typical seabirds that nest in dense colonies on remote islands, the Marbled Murrelet is a solitary, secretive nester, preferring the mossy boughs of centuries-old trees in the coastal rainforest. The bird's unique nesting preference places it squarely in the conservation spotlight, especially in the lower 48 states where old-growth rainforest is a rare resource today. Marbled Murrelets still enjoy 'most abundant seabird' status in Southeast Alaska, but declines have recently become evident here as well. This booklet draws on recent research to describe fascinating aspects of this bird's natural history, and efforts being made by land and wildlife managers to ensure that the Marbled Murrelet's future in Southeast Alaska remains secure.

The adjacent map of the coastal temperate rainforest depicts the general range of the Marbled Murrelet. The species occurs from northern California, along the coasts of Oregon, Washington, British Columbia, and Alaska. In Alaska, the largest populations are in Southeast. The species is less abundant in Prince William Sound, Cook Inlet, Kodiak, the Alaska Peninsula and the Aleutian Islands. Alaska harbors about 75% of the world's population of Marbled Murrelets.



The bars on the graph represent population estimates for California-Washington-Oregon, British Columbia, Southeast Alaska, Prince William Sound-Cook Inlet, and other coastal regions. Coastal temperate rainforest map reprinted by permission of Ecotrust. www.ecotrust.org

The islands and productive marine waters of Southeast Alaska are important habitat for Marbled Murrelets. The region constitutes over 1,000 islands, 14,000 miles of shoreline and five million acres of productive old-growth forest. Photo by John Schoen

Alcid Family History

The Marbled Murrelet spends most of its life at sea, coming to land only in the summer to nest. It is a member of the Auk, or Alcid, family—a group of seabirds found in the northern hemisphere at higher latitudes. This family is distinguished by the fact that they ‘fly’ underwater using their small powerful wings to pursue fish. Penguins are an unrelated but ecologically similar group of birds in the polar south. They have evolved pursuit diving to the extreme. Unlike marbled murrelets, they have completely foregone flight in favor of underwater swimming efficiency.

Marbled Murrelets are relatively small seabirds, about 9 inches long and weighing 7-8 ounces. In contrast to other seabirds, Marbled Murrelets transition to cryptic plumage during the breeding season, trading a crisp black and white plumage for a marbled brown coloration. This coloration camouflages the bird on its nest. Males and females are the same size and color and are indistinguishable even in the hand. On the water, Marbled Murrelets are often seen in pairs, although large flocks may aggregate around dense schools of small fish.

An adult Marbled Murrelet in winter plumage.



© Milo Burcham



Gus Van Vliet

The brown coloration of adult birds in summer helps them blend in with the natural surroundings of the rainforest. By nesting at low densities across large areas, they maximize access to food while minimizing attention to their nest locations from predators.

Gone Forever

One related species of alcid, the Great Auk (*Pinguinus impennis*), followed the same evolutionary path as the penguin. It gave up the ability to fly altogether, freeing it to evolve great size and weight (2.6 ft. tall, 11 lbs). Over centuries, whalers, commercial fisherman and merchants exploited these docile birds on their North Atlantic breeding islands, killing them by the tens of thousands for their meat, eggs, oil and down. The last birds ever seen, a mated pair, were killed by a collector in 1844.



The Natural History Museum, London, England

Searching for Nests

Marbled Murrelets have been called the ‘enigma of the Pacific’, a label that speaks to the long standing mystery surrounding their nesting habits. Although people could hear and sometimes see the birds flying through the forest, presumably heading to nests, no one knew where they nested. In fact, this species was the last in North America to have its nest located. In 1974, a tree climber removing storm-damaged limbs high in the canopy of an old-growth tree in California literally stumbled upon one. The nest, which consisted of a natural mat of moss on a stout limb, still held the flightless juvenile Marbled Murrelet. The climber collected the limb, the nest, and the bird, and after a century and a half of uncertainty, the mystery was finally solved.



Andy Romanoff

Marbled Murrelets nest high in the canopy of old-growth trees, arriving and departing at dawn and dusk, and make little or no sound while on the nest. It wasn't until 1974 that the first confirmed nest was found.

Advances in technology have allowed researchers to attach tiny radio-transmitters to adults captured at sea, and follow them back to their nests. To date, several hundred Marbled Murrelet nests have been located and described. We've learned that Marbled Murrelets mostly nest in trees, and while the species of tree doesn't appear to matter, the age of the tree is quite important. The primary requirement is that the tree be old enough to have large moss covered limbs or platforms in the upper canopy. The nest platform is usually near the trunk of the tree, often with overhanging vegetation to protect the nest from weather and hide it from predators. It also must be situated to allow the bird easy access, provided by an adjacent gap in the canopy or by trees growing on a steep slope. Biologists sum it up simply, ‘They need a room with a view.’



Jeff Hughes © ADF&G

This picture is the first ever taken of a Marbled Murrelet on its nest. It was taken in 1984 by Jeff Hughes, an ADF&G biologist who conducted pioneering research with Sue Quinlan on Marbled Murrelets using radio transmitters.

Natural History



© Milo Burcham

Courtship

Beginning in spring, murrelets begin arriving on the inside waters for breeding. In their marbled grey-brown breeding plumage, groups of males and females gather to perform the rituals of courtship. While rapidly swimming side by side, the birds point their bills skyward, uttering shrill 'keer' calls. Mating occurs on the water. Mated birds remain monogamous through the breeding season, and they may pair for life. In seabirds, mate fidelity is generally high, because both members of the pair are heavily invested in incubation and chick rearing.

Egg-Laying

The search for a suitable nest site begins early, possibly even in mid winter. Once a good nest site is found, a pair may return to use it in successive years.

The peak of egg-laying occurs in May, although there is considerable variation around that date. This is known as 'asynchronous' nesting,



© Mark Hobson

and it ensures that for at least some portion of the birds, hatching will coincide with an abundant and readily available food supply. The female lays a single egg in a shallow depression in a bed of moss. The egg is mottled green and brown to camouflage it from predators. It is also large—about 15% of the female's body weight.



Jack Withrow

Males and females share the incubation duties equally, in alternate 24 hour shifts for 28-30 days. The exchange typically takes place in the hour before sunrise. Once the adult is settled on the egg, they stay quiet and motionless to avoid detection.



Gus van Vliet

Chick Rearing

Once hatched, the chick is brooded for 12-24 hours, and then the adult departs. From this point onward, parents are away from the nest most of the day foraging. The downy chick remains silent and motionless, well camouflaged on the nest.



Peter Halasz

Natural History

Feeding Chicks

As dusk approaches, adults may be seen holding whole fish, mostly sand lance and capelin, as they wait for twilight to make a clandestine delivery to the chick. As the chick grows, however, so too does its food requirement. Making multiple deliveries of fish per day, including some during daylight hours, exposes the nest to increased predation and represents a dangerous time for the chick.

Fledging

If the young chick successfully makes it to 30 days of age, it faces a truly daunting task. The young bird, one that has never flown before, must leap off of the nest limb, drop to gain flight speed, and instinctively start flying in the right direction, all the way to the marine waters. The distance is typically measured in miles, and is a critical test of the fledgling's strength and stamina. What percentage pass the test is unknown, but it is suspected to be low. Should a young bird be grounded short of its goal, death is almost certain.



Adult murrelet holding a sand lance in bill. © Milo Bercham



© Rich MacIntosh

Juvenile Marbled Murrelet

Juveniles

For the ones that do reach the sea successfully, their chances of survival improve dramatically. The young birds instinctively know how to dive, swim underwater with their wings, and catch their prey (zooplankton and small fish) in shallow waters or kelp beds. From 60-80% of these newly fledged birds survive to one year old, depending on marine conditions. Within 2-4 years, these individuals will be ready to breed themselves, and start the cycle anew.

The Missing Murrelets

By late August, murrelets of all ages go 'missing' in the inside waters of Southeast Alaska. The adults will soon be going through a post-breeding molt, where they synchronously shed their flight feathers and grow new ones. They also transition from their summer plumage (brown) to their distinctive winter plumage of black and white. While temporarily flightless, the birds must be able to find adequate food close at hand, without threat from predators. No one knows with certainty where the birds go, but circumstantial evidence suggests offshore - a place where thousands of flightless seabirds could effectively 'disappear' for a month or two.

The Remarkable Marbled Murrelet

In the Air

During flight, the heavy bodied Marbled Murrelets must flap their wings continuously and rapidly to stay airborne. Murrelets sometimes need to bounce off a wave to get airborne.



Matt Kirchoff, ©ADF&G

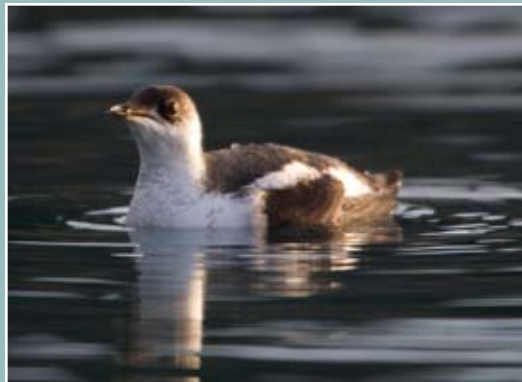
The ratio of body weight to wing area, called ‘wing loading’ in Marbled Murrelets is relatively high. High wing loading necessitates high flight speeds up to 60 mph. This has some advantages for a seabird like the Marbled Murrelet, allowing it to cover large areas in search of food.

In the Water

Underwater flight requires penetrating a medium that is 800 times denser than air, overcoming the buoyancy created by air trapped in their feathers and lungs, and swimming with enough speed and maneuverability to catch pelagic fish.

Morphology

A number of special adaptations help Marbled Murrelets compete in both the above-water and underwater world. The short neck and torpedo-shaped body minimize drag underwater. Their feet, placed well to the rear, make walking on land awkward, but are ideally suited to helping the bird maneuver underwater. Marbled Murrelets have



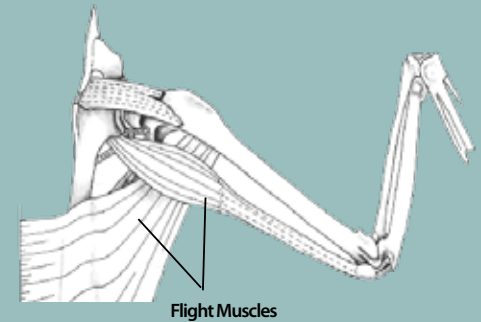
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a dense layer of overlapping waterproof feathers that keep the bird dry, preserving the insulating value of underlying down. The outer contour feathers present a smooth surface important for minimizing drag when flying underwater. At depth, water pressure squeezes the air from the downy feathers, reducing buoyancy, and making underwater flight more efficient.

Physiology

Murrelet respiratory systems are very efficient at delivering oxygen to muscles. They have a high percentage of red-blood cells and oxygen-transporting hemoglobin molecules in their blood. Their muscles are heavily infused with capillary blood vessels that transport oxygen-rich blood to the individual muscle cells.

The flight muscles of Alcids contain a large proportion of aerobic (oxidative) muscle fibers and oxygen-carrying myoglobin. These fibers are capable of producing rapid, powerful wing beats for aerial flight, and storing large quantities of oxygen for increased aerobic capacity during wing-propelled diving.



Switching between aerial and aquatic environments poses challenges beyond simple locomotion. The way an animal's eyes focus in air and water is distinctly different due to the refractory characteristics of the two mediums. Focusing is done not through changes in the shape of the cornea, but by



relatively dramatic changes in the lens itself. To adjust to low light levels, pupils tend to be large and the retina packed with high numbers of rods. These rods enhance motion detection in low light levels.

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Conservation

Due to their unusual natural history, Marbled Murrelets are closely linked to both marine and terrestrial ecosystems, making them a valuable indicator of the health of the overall ecosystem.



Gus van Vliet

Marbled Murrelets are relatively abundant in Alaska compared with populations in British Columbia, Washington, Oregon, and California, where they are listed as 'threatened'. Their numbers in Alaska, however, may be a misleading indicator of the bird's security. In 2007, the US Geological Survey published a status report on Marbled Murrelets in Alaska and British Columbia. Extrapolating from declines in multiple study areas in Alaska, the report concludes that populations in Alaska have undergone a 71% decline since the early 1990's, dropping from nearly a million birds to about 271,000 today. Scientists do not know the exact cause of the decline, but suspect multiple factors are involved.

The health and productivity of marine waters throughout their range has been degraded due to chronic pollution (sewage, oil, and farm run-off) and habitat destruction (productive eel-grass beds and estuaries). These effects are greater outside of Alaska where there is a larger human population and a longer history of development. Other factors may operate range-wide. Climate change may trigger shifts in fish assemblages important to

Marbled Murrelets for food. Commercial fishing may deplete important forage fish stocks directly through harvesting, and may also contribute to mortality of adult murrelets through incidental by-catch in fishing nets. And finally, avian predators may be increasing, especially species that are relatively tolerant of human activity and development. The greatest avian threats are posed by the Common Raven, Northwestern Crow, Steller's Jay, Northern Goshawk and Peregrine Falcon.



David Harris, ©ADF&G

In Alaska, scientists are doubling their monitoring efforts to track the population trends of Marbled Murrelets over larger areas, and with greater sensitivity. A variety of survey methods may be used, but all will require more effort and more resources. In addition, research on nesting habits, movements, predation, and diet are needed to help identify the causes for the declines, and mitigate them if possible. In pursuing a mission of 'keeping common species common', no species is more deserving than Southeast Alaska's 'signature seabird', the Marbled Murrelet.



© Bob Armstrong

Avian predators such as this Common Raven, are the main threats to Marbled Murrelet eggs and young. Birds that nest farther from shore may have reduced exposure to some of these predators.

Survey Methods

Audio-visual dawn counts are typically conducted 1-2 hours before dawn, from ground sites below murrelet "commuter" routes to and from nests. Observers estimate numbers based on number and frequency of "keer" calls.

At-sea surveys are the primary method of monitoring murrelets in California, Oregon and Washington. They are conducted by 3-person teams from small boats. As the boat follows a fixed course, observers count all birds on the water within a certain distance of the center line. Because rough seas can hide distant birds, adjustments must be made to correct for undetected birds.

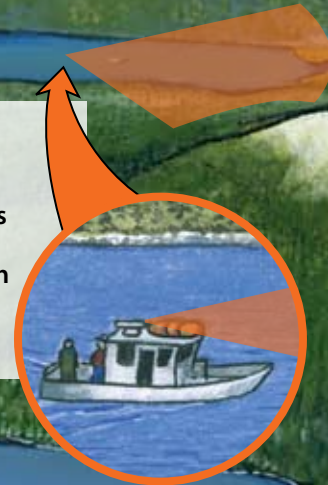
Boat-based radar counts are conducted in the early morning hours and detect murrelets flying inland. Radar is able to detect more birds, with greater precision, than audio-visual dawn counts can. However, the radar needed to detect small birds in flight is specialized, and expensive, which limits its application. Radar counts are the main method used to monitor Marbled Murrelets in British Columbia.



Flyway counts are done from the beach with spotting scopes. Spotters observe birds flying over the water en route to nests and/or foraging areas. Because this method counts both breeders and non-breeders as they pass, it tends to garner large numbers of birds. This technique is well-suited to volunteer efforts.



ADF&G is studying several methods for long-term monitoring of Marbled Murrelets in Southeast Alaska: **at-sea surveys**, **audio-visual dawn counts**, **flyway counts**, and **radar counts**. These methods will be applied and evaluated at representative monitoring stations across the Alexander Archipelago.



Murrelet Watch:

A Citizen Science Monitoring Program



Matt Kirchoff © ADF&G

You Can Help!

Do you enjoy watching birds? Would you like to learn more about murrelets while making an important contribution to research and conservation in Alaska? Here's your chance! Murrelet Watch, a new citizen science monitoring program, provides an opportunity for private citizens to assist biologists in gathering information about the distribution and abundance of Marbled Murrelets in Southeast Alaska.

Southeast Alaska is considered the epicenter for Marbled Murrelets in North America, yet we lack information about how these birds are distributed across the region and how populations may be changing. There are thousands of bays and inlets where murrelets may be foraging and nesting in Southeast Alaska, making it virtually impossible to survey the entire region. Instead, we have established a number of survey sites where volunteers and biologists will be able to regularly monitor these birds over consecutive years. This information

is vital to conserving Marbled Murrelets and the habitats they depend upon. Volunteers conduct surveys from designated points along the shoreline (see previous page for description of surveys). Most sites are easily accessible from participating communities. Surveys are conducted once a week in the early morning or early evening during the months of June and July.

We'll give you all of the training and tools you'll need to become a certified volunteer. Training is offered in all participating communities during the month of May. You don't have to be an expert to make a contribution, all you need is an interest in learning and enjoy being outdoors!



Craig Flatten © ADF&G

If you are interested in participating in Murrelet Watch or have any questions, please contact:

Kristen Romanoff at the Alaska Department of Fish and Game
phone: (907) 465-4292
email: kristen_romanoff@fishgame.state.ak.us

To learn about additional Citizen Science Programs in Alaska, check out the ADF&G website at www.wildlife.alaska.gov

Go to Nongame, Citizen Science



Marbled Murrelet diving.

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