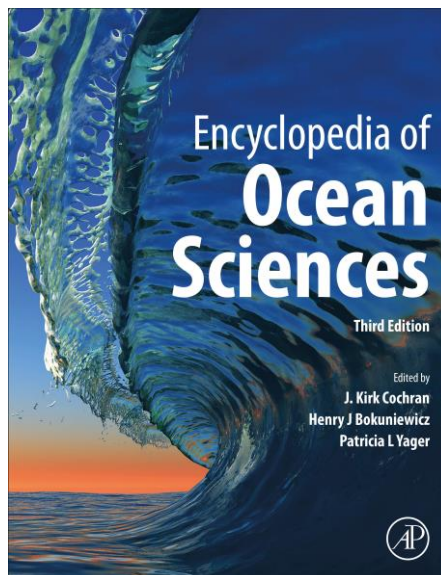


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## Gulls

Matthew Fuirst, Stony Brook University, Stony Brook, NY, United States

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### Introduction

Gulls are a well-recognized group of seabirds that belong to the family *Laridae* in the order *Charadriiformes*. They are adaptive and resourceful and exhibit intricate means of feeding and communicating. These birds have a global distribution and are known to breed on every continent. Gulls populate a suite of ecoregions ranging from the northern reaches of the Arctic Circle to interior deserts in South America. Usually medium to large-bodied, these birds inhabit pelagic, coastal, agricultural, urban, and arid habitats. Gulls have a maritime life history and are extremely adept at exploiting human modified environments. Massive population increases and range expansions began during the 1800s and continued through the 20th century, throughout the world due to a surge of edible human waste. With recent changes in waste management practices and handling of fisheries discards, these population increases have leveled off or reversed. While many gulls subsist on offal, gull diets typically include a variety of other food types. Gulls consume small prey such as fish, crustaceans, and bivalves but also human refuse and many species eat insects, rodents, and berries. The methods that gulls use to acquire food have evolved in the face of human development as well. This family of birds includes the world's most generalist species such as the herring and yellow-legged gull as well as some of the most understudied and isolated seabirds like the gray-headed and Ross's gull.

As colonial breeding birds, gulls nest in large congregations of individuals usually laying two to four eggs. Many gull species are migratory; however, the extremity of their movements varies greatly by species. Due to their cosmopolitan nature, gulls have become an important family of birds in marine science. Their ability to adapt to new environments and their variable movements can provide insight into how changes in land use and oceanographic features can alter seabird populations.

### General Morphology

Due to their physical appearance, flight behavior, and posture, gulls are easily distinguished from other seabirds. Males are generally larger than females in both body and bill size. They usually are medium and large-bodied, experience heavy to light flapping when flying, have long, pointed wings, and relatively longer legs than other *Charadriiformes* (terns and skimmers). However, the variation in these traits is species-dependent and gulls require 2–5 years to achieve adult plumage, which can complicate identification of species and age. Most birds have three basic plumages throughout their lifetime. First, there is the juvenile plumage which occurs in the first year of a bird's life. Once sexually mature, breeding and nonbreeding plumages alternate throughout a bird's adult life. This does not occur in most gulls, making their plumage process unique. Many gull species require several years before young birds get to sexual maturity and reach a complete adult plumage. Each year following the juvenile stage shows a different plumage. As gulls age, the color of their feathers, legs, and bill changes, eventually reaching an adult plumage which is usually bolder. In some gull species, this involves the final transition into a fully white body that in many species is often complemented by black or gray wings and a black or white head color. Some exceptions to this appearance are gulls that are uniform in their plumage throughout their lives. For example, the ivory gull, a species endemic to the Arctic Circle, is completely white, and although juvenile and first winter birds experience brownish speckling, this bird completes its plumage process as a completely white bird.

## Breeding

Gulls breed once a year in which they establish a mate, build a nest, and raise a clutch of eggs until fledging with many factors playing a role in breeding success. Clutch sizes can range from 1 to 4 eggs depending on the species and eggs usually have tan to brown color with brown or black splotches and markings. The breeding period of gulls usually last between 3 and 6 months and occurs once a year with incubation periods lasting around 25 days and chick brooding occurring for 1–2 weeks after hatching. Fledglings, which usually are speckled in appearance, will usually remain near the nest for the first week. Males and females share the duty of incubating and feeding which limits the temporal and spatial extent of foraging bouts during the breeding season. However, in many species males predominantly are responsible for acquiring food and females fill the duties of nest attendance. Most gulls nest in colonies, which, can vary substantially in size (Dozens or thousands of individuals) depending on the landscape and/or species. Colonies can be restricted to one species or part of a mixed species colony with other gulls and waterbirds. For example, great black-backed gulls and herring gulls often nest together on the same islands, but the two species choose slightly different microhabitats for their nests. Gulls usually build their nests with their mate and exhibit high mate fidelity throughout much of their adult life. This nest-building is a part of the pair-bonding process; an important process for monogamous seabirds. Nests are usually built on the ground from plant materials, inorganic materials found near the colony, or in high places or cliffs. Generalist gull species are increasingly building their nests on rooftops or on/near urban structures.



Herring gull chick on Long Island, New York. (Photograph: M. Fuirst.)

## Feeding Strategies

As with many seabirds, gulls osmoregulate via salt glands that help them process high amounts of salt consumed during drinking and feeding events. This adaptation allows gulls to eat a large variety of marine prey types. Gulls primarily use feeding strategies such as aerial predation, surface feeding, and scavenging to obtain food. Gulls often steal food from other birds (kleptoparasitism) and this is common in large, aggressive gulls such as great black-backed gulls. Surface feeding is a common foraging strategy across many gull species since gulls are unable to dive deep to obtain prey. Gulls peck or grab prey items from the water's surface and do this either while sitting on the water or during flight. Many gulls scavenge on fisheries discards, human refuse, or carrion. When foraging on land, gulls also consume small birds, amphibians, wild fruits, invertebrates, eggs, and rodents. Some foraging tactics, such as "shell-dropping", are a creative way in which gulls feed, although this doesn't occur in all gull species. Shell-dropping entails dropping clams, snails, or mollusks from some height to break them apart and gain access to the meat inside.

## Gull Movement

The distance and destination of gull migratory and foraging movements are different across species and geographic regions. However, most gulls migrate to their colony during their respective breeding seasons and during this time and some species don't migrate, instead shifting towards coastlines and dispersing short distances from breeding sites. During the nonbreeding season, gull movements are more variable and individuals may travel further to acquire food. Recent developments in tracking technologies have enabled ecologists to monitor gull movements around the world. Biologging studies have revealed new wintering grounds of Ross's gulls in the arctic and provided insight into the generalist behavior of Western gulls.

### *Leucophaeus*

This genus is comprised of just a small set of species, most usually exhibiting a darker plumage, white half-circles above and/or below the eye, and medium body size. *Leucophaeus* are New World gulls only inhabiting North and South America. Species in this genus include the dolphin (*L. scoresbii*), gray (*L. modestus*), and Franklin's (*L. pipixcan*) gull. The gray gull is a unique member of this genus as it is one of the only seabird species that nests in the desert.



Gray gull in Chilean desert. (Photograph: C. Catoni.)

### *Ichthyæetus*

*Ichthyæetus* gulls are like that of *Leucophaeus* species but are slenderer in their appearance. Species usually have a narrower neck and, in some cases, longer bills relative to most other gull genus and smaller heads. Gulls of this genus usually have white crescents above and below their eye and medium-sized bodies. Members of this genus include Mediterranean and Middle Eastern endemic species such as Audouin's (*I. audouinii*), white-eyed (*I. leucophthalmus*) and sooty (*I. hemprichii*) gulls. Laughing gulls (*I. atricilla*) a conspicuous species of North America and parts of South America also belongs to this genus.



Laughing gull in New Jersey marsh. (Photograph: Z. Adams.)

### *Larus*

This is the largest genus of gulls encompassing species endemic to North and South America, Europe, Asia, and Africa. *Larus* gulls are stocky with a medium to large body size and usually have thicker bills. Members of this genus have a white or gray plumage frequently complemented by dark wing tips or head markings. However, the black coloration on the wings or head is not always present in some species. For example, glaucous gulls (*L. hyperboreus*), one of the larger of the "pale gulls" does not have black wing tips during any stage of its life. Species in this genus usually have a much heftier flight pattern and, in some cases, can be aggressive towards conspecifics and other species, especially within breeding colonies. The largest gull in the world, the great black-backed gull (*L. marinus*) is a member of the *Larus* genus. The lava gull (*L. fuliginosus*), the world's rarest gull is also a member of the *Larus* genus. This species is endemic to the Galapagos islands with an estimated 300 breeding pairs left in the wild.



Yellow-footed gull in La Paz, Mexico. (Photograph: M. Furst.)

### *Chroicocephalus*

This small genus includes medium to small-sized species that are like those from the genus *Ichthyiaetus*. *Chroicocephalus* gulls commonly have broader wing tips, shorter legs, and a squareish and/or sloping head shape. Species in this genus include New Zealand endemics such as the black-billed (*C. bulleri*) and red-billed (*C. scopulinus*) gulls. Other species include the black-headed (*C. ridibundus*), Bonaparte's (*C. philadelphia*), silver (*C. novaehollandiae*), and Andean gull (*C. serranus*) to name a few.



Silver gull on beach in Australia. (Photograph: N. Bonomo.)

### *Rissa*

The *Rissa* genus is exclusive to small, white, gull-like seabirds called kittiwakes. They are identifiable by their stout appearance, colored legs (red or black), and yellow bill. This genus includes two distinctive species, the black-legged (*R. tridactyla*) and red-legged (*R. brevirostris*) kittiwake. Both species are cliff-nesting and red-legged and black-legged kittiwakes breed in the North Pacific and Atlantic respectively.



Pair of black-legged kittiwakes sitting by cliff nest in Alaska. (Photograph: N. Bonomo.)

## Sole Member Genera

The *Hydrocoloeus* genus includes notably smaller and compact gulls. This genus includes the little gull (*H. minutus*) the world's smallest gull and can be found in North America, Europe, Asia, and north Africa. The Ross's gull (*R. rosea*), one of the most understudied gulls, is the sole member of the *Rhodostethia* genus. This species breeds in High Arctic tundra and marshes although its breeding and nonbreeding range is poorly known. The *Xema* genus is specific to the Sabine's gull (*X. sabini*), a large, fork-tailed gull that breeds in the arctic tundra and outside of the breeding season is almost exclusively pelagic. The only member of the *Pagophila* genus is the ivory gull (*P. eburnea*) an unmistakably white and stocky species native to the Arctic. The *Creagus* genus includes the swallow-tailed gull (*C. furcatus*), an endemic species to South America that has charismatic broad wings and a deeply forked tail.



Sabine's gull in flight in California offshore waters. (Photograph: N. Bonomo.)

## Population Shifts

From the 1800s to present day exponential increases of many gull species have occurred. An influx of edible refuse and fisheries waste from human practices in the 20th century triggered an increase of several gull species around the world. This growth in anthropogenic food sources, complemented by bans in egg collecting, allowed for gulls to thrive. Yellow-legged, herring, ring-billed, great black-backed, lesser black-backed, and laughing gulls all are examples of species that benefitted from the abundance of landfills, discards, and other forms of human waste. Although this response to urbanization was positive for many gulls, the expansion of gull populations has impacted other seabirds that nest with gulls. The inflation of gulls has negatively affected populations of terns, alcid, storm-petrels, and some shorebirds by increasing predation rates and competition for breeding habitat. During the current 21st century however, some gull species population increases have halted, or even begun to decline, in response to alterations in dump/landfill management, sewage treatment, and fishery waste protocols.

## Threats and Conservation

Even though some generalist gulls have thrived in the face of anthropogenic change, several species are of conservation concern according to the IUCN and many are experiencing regional declines. Black-billed gulls (*L. bulleri*) are endangered due to invasive rats and modifications to riverine breeding habitat in New Zealand. The primary threat to this species is egg and juvenile predation by brown rats, feral cats, mustelids, and hedgehogs. In addition, breeding habitat is declining as coastal areas are increasingly developed and invasive grasses outcompete native species used for nesting material. The lava gull (*L. fuliginosus*) is vulnerable due to bycatch-induced mortality from commercial fishing activities. Both the Saunders' (*C. saundersi*) and relict (*L. relictus*) gulls are declining because of reductions in breeding habitat along the coasts of China from changes in water levels and increased development.

Anthropogenic development has benefitted many gull species, but their growing presence in human-altered habitats has also led to harmful effects to some species. Environmental toxins such as pesticides, organic pollutants, and heavy metals are impacting many gull populations due to their status as high trophic level consumers in the food web. Mercury (Hg) contamination is becoming more prevalent in species such as herring, great black-backed, Siberian, California, black-tailed, Franklin's, black-headed, glaucous-winged, and Bonaparte's gulls. These birds accumulate Hg (and other heavy metals) through ingestion of contaminated prey which then is processed through the body and transferred to feathers or eggs. Persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs) have been increasingly detected in herring, ivory, yellow-legged, Audouin's, and glaucous gulls and are known to impact body condition and breeding success.

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