

= Frigatebird =

Frigatebirds (also listed as " frigate bird " , " frigate @-@ bird " , " frigate " , frigate @-@ petrel ") are a family of seabirds called *Fregatidae* which are found across all tropical and subtropical oceans . The five extant species are classified in a single genus , *Fregata* . All have predominantly black plumage , long , deeply forked tails and long hooked bills . Females have white underbellies and males have a distinctive red gular pouch , which they inflate during the breeding season to attract females . Their wings are long and pointed and can span up to 2 @.@ 3 metres (7 @.@ 5 ft) , the largest wing area to body weight ratio of any bird .

Able to soar for weeks on wind currents , frigatebirds spend most of the day in flight hunting for food , and roost on trees or cliffs at night . Their main prey are fish and squid , caught when chased to the water surface by large predators such as tuna . Frigatebirds are referred to as kleptoparasites as they occasionally rob other seabirds for food , and are known to snatch seabird chicks from the nest . Seasonally monogamous , frigatebirds nest colonially . A rough nest is constructed in low trees or on the ground on remote islands . A single egg is laid each breeding season . The duration of parental care is among the longest of any bird species ; frigatebirds are only able to breed every other year .

The *Fregatidae* are a sister group to *Suloidea* which consists of cormorants , darters , gannets , and boobies . Three of the five extant species of frigatebirds are widespread , (the magnificent , great and lesser frigatebirds) while two are endangered (the Christmas Island and Ascension Island frigatebirds) and restrict their breeding habitat to one small island each . The oldest fossils date to the early Eocene , around 50 million years ago . Classified in the genus *Limnofregata* , the three species had shorter , less @-@ hooked bills and longer legs , and lived in a freshwater environment .

= = Taxonomy = =

= = = Etymology = = =

The term Frigate Bird itself was used in 1738 by the English naturalist and illustrator Eleazar Albin in his *A Natural History of the Birds* . The book included an illustration of the male bird showing the red gular pouch . Like the genus name , the English term is derived from the French mariners ' name for the bird *la frégate* ? a frigate or fast warship . The etymology was mentioned by French naturalist Jean @-@ Baptiste Du Tertre when describing the bird in 1667 .

Christopher Columbus encountered frigatebirds when passing the Cape Verde Islands on his first voyage across the Atlantic in 1492 . In his journal entry for 29 September he used the word *rabiforçado* , modern Spanish *rabihorcado* or forktail . In the Caribbean frigatebirds were called *Man @-@ of @-@ War* birds by English mariners . This name was used by the English explorer William Dampier in his book *An Account of a New Voyage Around the World* published in 1697 :

The *Man @-@ of @-@ War* (as it is called by the English) is about the bigness of a Kite , and in shape like it , but black ; and the neck is red . It lives on Fish yet never lights on the water , but soars aloft like a Kite , and when it sees its prey , it flys down head foremost to the Waters edge , very swiftly takes its prey out of the Sea with his Bill , and immediately mounts again as swiftly ; never touching the Water with his Bill . His Wings are very long ; his feet are like other Land @-@ fowl , and he builds on Trees , where he finds any ; but where they are wanting on the ground .

= = = Classification = = =

Frigatebirds were grouped with cormorants , and sulids (gannets and boobies) as well as pelicans in the genus *Pelecanus* by Linnaeus in 1758 in the tenth edition of his *Systema Naturae* . He described the distinguishing characteristics as a straight bill hooked at the tip , linear nostrils , a bare face , and fully webbed feet . The genus *Fregata* was defined by French naturalist Bernard Germain

de Lacépède in 1799 . Louis Jean Pierre Vieillot described the genus name *Tachypetes* in 1816 for the great frigatebird . The genus name *Atagen* had been coined by German naturalist Paul Möhring in 1752 , though this has no validity as it predates the official beginning of Linnaean taxonomy .

In 1874 , English zoologist Alfred Henry Garrod published a study where he had examined various groups of birds and recorded which muscles of a selected group of five they possessed or lacked . Noting that the muscle patterns were different among the steganopodes (classical *Pelecaniformes*) , he resolved that there were divergent lineages in the group that should be in separate families , including frigatebirds in their own family *Fregatidae* . Unless N. Lanham observed in 1947 that frigatebirds bore some skeletal characteristics more in common with *Procellariiformes* than *Pelecaniformes* , though concluded they still belonged in the latter group (as suborder *Fregatae*) , albeit as an early offshoot . Martyn Kennedy and colleagues derived a cladogram based on behavioural characteristics of the traditional *Pelecaniformes* , calculating the frigatebirds to be more divergent than pelicans from a core group of gannets , darters and cormorants , and tropicbirds the most distant lineage . The classification of this group as the traditional *Pelecaniformes* , united by feet that are totipalmate (with all four toes linked by webbing) and the presence of a gular pouch , persisted until the early 1990s . The DNA ? DNA hybridization studies of Charles Sibley and Jon Edward Ahlquist placed the frigatebirds in a lineage with penguins , loons , petrels and albatrosses . Subsequent genetic studies place the frigatebirds as a sister group to the group *Sulioidea* , which comprises the gannets and boobies , cormorants and darters . Microscopic analysis of eggshell structure by Konstantin Mikhailov in 1995 found that the eggshells of frigatebirds resembled those of other *Pelecaniformes* in having a covering of thick microglobular material over the crystalline shells .

Molecular studies have consistently shown that pelicans , the namesake family of the *Pelecaniformes* , are actually more closely related to herons , ibises and spoonbills , the hamerkop and the shoebill than to the remaining species . In recognition of this , the order comprising the frigatebirds and *Sulioidea* was renamed *Suliformes* in 2010 .

In 1994 the family name *Fregatidae* , cited as described in 1867 by French naturalists Côme @-@ Damien Degland and Zéphirin Gerbe , was conserved under Article 40 (b) of the International Code of Zoological Nomenclature in preference to the 1840 description *Tachypetidae* by Johann Friedrich von Brandt . This was because the genus names *Atagen* and *Tachypetes* had been synonymised with *Fregata* before 1961 , resulting in the aligning of family and genus names .

= = = Fossil record = = =

The Eocene frigatebird genus *Limnofregata* comprises birds whose fossil remains were recovered from prehistoric freshwater environments , unlike the marine preferences of their modern @-@ day relatives . They had shorter less @-@ hooked bills and longer legs , and longer slit @-@ like nasal openings . Three species have been described from fossil deposits in the western United States , two ? *L. azygosternon* and *L. hasegawai* ? from the Green River Formation (48 ? 52 million years old) and one ? *L. hutchisoni* ? from the Wasatch Formation (between 53 and 55 million years of age) . Fossil material indistinguishable from living species dating to the Pleistocene and Holocene has been recovered from Ascension Island (for *F. aquila*) , Saint Helena Island , both in the southern Atlantic Ocean , and also from various islands in the Pacific Ocean (for *F. minor* and *F. ariel*) .

A cladistic study of the skeletal and bone morphology of the classical *Pelecaniformes* and relatives found that the frigatebirds formed a clade with *Limnofregata* . Birds of the two genera have 15 cervical vertebrae , unlike almost all other *Ciconiiformes* , *Suliformes* and *Pelecaniformes* , which have 17 . The age of *Limnofregata* indicates that these lineages had separated by the Eocene .

= = = Living species and infrageneric classification = = =

The type species of the genus is the Ascension frigatebird (*Fregata aquila*) . For many years , the consensus was to recognise only two species of frigatebird , with larger birds as *F. aquila* and

smaller as *F. ariel* . In 1914 the Australian ornithologist Gregory Mathews delineated five species , which remain valid . Analysis of ribosomal and mitochondrial DNA indicated that the five species had diverged from a common ancestor only recently ? as little as 1 @.@ 5 million years ago . There are two species pairs , the great and Christmas Island frigatebirds , and the magnificent and Ascension frigatebirds , while the fifth species , the lesser frigatebird , is an early offshoot of the common ancestor of the other four species . Three subspecies of the lesser and five subspecies of the great frigatebird are recognised .

= = Description = =

Frigatebirds are large slender mostly black @-@ plumaged seabirds , with the five species similar in appearance to each other . The largest species is the magnificent frigatebird , which reaches 114 cm (45 in) in length , with three of the remaining four almost as large . The lesser frigatebird is substantially smaller , at around 71 cm (28 in) long . Frigatebirds exhibit marked sexual dimorphism ; females are larger and up to 25 percent heavier than males , and generally have white markings on their underparts . Frigatebirds have short necks and long , slender hooked bills . Their long narrow wings (male wingspan can reach 2 @.@ 3 metres (7 @.@ 5 ft)) taper to points . Their wings have eleven primary flight feathers , with the tenth the longest and eleventh a vestigial feather only , and 23 secondaries . Their tails are deeply forked , though this is not apparent unless the tail is fanned . The tail and wings give them a distinctive ' W ' silhouette in flight . The legs and face are fully feathered . The totipalmate feet are short and weak , the webbing is reduced and part of each toe is free .

The bones of frigatebirds are markedly pneumatic (filled with air) , making them very light and contribute only 5 % to total body weight . The pectoral girdle (shoulder joint) is strong as its bones are fused . The pectoral muscles are well @-@ developed , and weigh as much as the frigatebird 's feathers ? around half the body weight is made up equally of these muscles and feathers . The males have inflatable red @-@ coloured throat pouches called gular pouches , which they inflate to attract females during the mating season . The gular sac is , perhaps , the most striking frigatebird feature . These can only deflate slowly , so males that are disturbed will fly off with pouches distended for some time .

Frigatebirds remain in the air and do not settle on the ocean . They produce very little oil from their uropygial glands so their feathers would become sodden if they settled on the surface . In addition , with their long wings relative to body size , they would have great difficulty taking off again .

= = Distribution and habitat = =

Frigatebirds are found over tropical oceans , and ride warm updrafts under cumulus clouds . Their range coincides with availability of food such as flying fish , and with the trade winds , which provide the windy conditions that facilitate their flying . They are rare vagrants to temperate regions and not found in polar latitudes . Adults are generally sedentary , remaining near the islands where they breed . However , male frigatebirds have been recorded dispersing great distances after departing a breeding colony ? one male great frigatebird relocated from Europa Island in the Mozambique Channel to the Maldives 4 @,@ 400 km (2 @,@ 700 mi) away , and a male magnificent frigatebird flew 1 @,@ 400 km (870 mi) from French Guiana to Trinidad . Great frigatebirds marked with wing tags on Tern Island in the French Frigate Shoals were found to regularly travel the 873 km (542 mi) to Johnston Atoll , although one was reported in Quezon City in the Philippines . Genetic testing seems to indicate that the species has fidelity to their site of hatching despite their high mobility . Young birds may disperse far and wide , with distances of up to 6 @,@ 000 km (3 @,@ 700 mi) recorded .

= = Behaviour and ecology = =

Having the largest wing @-@ area @-@ to @-@ body @-@ weight ratio of any bird , frigatebirds

are essentially aerial . This allows them to soar continuously and only rarely flap their wings . One great frigatebird , being tracked by satellite in the Indian Ocean , stayed aloft for two months . They can fly higher than 4 @, @ 000 meters in freezing conditions . Like swifts they are able to spend the night on the wing , but they will also return to an island to roost on trees or cliffs . Field observations in the Mozambique Channel found that great frigatebirds could remain on the wing for up to 12 days while foraging . Highly adept , they use their forked tails for steering during flight and make strong deep wing @-@ beats , though not suited to flying by sustained flapping . Frigatebirds bathe and clean themselves in flight by flying low and splashing at the water surface before preening and scratching afterwards . Conversely , frigatebirds do not swim and with their short legs cannot walk well or take off from the sea easily .

The average life span is unknown but in common with seabirds such as the wandering albatross and Leach 's storm petrel , frigatebirds are long @-@ lived . In 2002 , 35 ringed great frigatebirds were recovered on Tern Island in the Hawaiian Islands . Of these ten were older than 37 years and one was at least 44 years of age .

Despite having dark plumage in a tropical climate , frigatebirds have found ways not to overheat ? particularly as they are exposed to full sunlight when on the nest . They ruffle feathers to lift them away from the skin and improve air circulation , and can extend and upturn their wings to expose the hot undersurface to the air and lose heat by evaporation and convection . Frigatebirds also place their heads in the shade of their wings , and males frequently flutter their gular pouches .

= = = Feeding = = =

Frigatebirds ' feeding habits are pelagic , and they may forage up to 500 km (310 mi) from land . They do not land on the water but snatch prey from the ocean surface using their long , hooked bills . They mainly catch small fish such as flying fish , particularly the genera *Exocoetus* and *Cypselurus* , that are driven to the surface by predators such as tuna and dolphinfish , but they will also eat cephalopods , particularly squid . Menhaden of the genus *Brevoortia* can be an important prey item where common , and jellyfish and larger plankton are also eaten . Frigatebirds have learned to follow fishing vessels and take fish from holding areas . Conversely tuna fishermen fish in areas where they catch sight of frigatebirds due to their association with large marine predators . Frigatebirds also at times prey directly on eggs and young of other seabirds , including boobies , petrels , shearwaters and terns , in particular the sooty tern .

Frigatebirds will rob other seabirds such as boobies , particularly the red @-@ footed booby , tropicbirds , shearwaters , petrels , terns , gulls and even ospreys of their catch , using their speed and manoeuvrability to outrun and harass their victims until they regurgitate their stomach contents . They may either assail their targets after they have caught their food or circle high over seabird colonies waiting for parent birds to return laden with food . Although frigatebirds are renowned for their kleptoparasitic feeding behaviour , kleptoparasitism is not thought to play a significant part of the diet of any species , and is instead a supplement to food obtained by hunting . A study of great frigatebirds stealing from masked boobies estimated that the frigatebirds could at most obtain 40 % of the food they needed , and on average obtained only 5 % .

Unlike most other seabirds , frigatebirds drink freshwater when they come across it , by swooping down and gulping with their bills .

= = = Breeding behaviour = = =

Frigatebirds typically breed on remote oceanic islands , generally in colonies of up to 5000 birds . Within these colonies , they most often nest in groups of 10 to 30 (or rarely 100) individuals . Breeding can occur at any time of year , often prompted by commencement of the dry season or plentiful food .

Frigatebirds have the most elaborate mating displays of all seabirds . The male birds take up residence in the colony in groups of up to thirty individuals . They display to females flying overhead by pointing their bills upwards , inflating their red throat pouches and vibrating their outstretched

wings , showing the lighter wing undersurfaces in the process . They produce a drumming sound by vibrating their bills together and sometimes give a whistling call . The female descends to join a male she has chosen and allows him to take her bill in his . The pair also engages in mutual " head @-@ snaking " .

After copulation it is generally the male who gathers sticks and the female that constructs the loosely woven nest . The nest is subsequently covered with (and cemented by) guano . Frigatebirds prefer to nest in trees or bushes , though when these are not available they will nest on the ground . A single white egg that weighs up to 6 ? 7 % of mother 's body mass is laid , and is incubated in turns by both birds for 41 to 55 days . The altricial chicks are naked on hatching and develop a white down . They are continuously guarded by the parents for the first 4 ? 6 weeks and are fed on the nest for 5 ? 6 months . Both parents take turns feeding for the first three months , after which the male 's attendance tails off leaving the mother to feed the young for another six to nine months on average . The chicks feed by reaching their heads in their parents ' throat and eating the part @-@ regurgitated food . It takes so long to rear a chick that frigatebirds generally breed every other year .

The duration of parental care in frigatebirds is among the longest for birds , rivalled only by the southern ground hornbill and some large accipitrids . Frigatebirds take many years to reach sexual maturity . A study of great frigatebirds in the Galapagos Islands found that they only bred once they have acquired the full adult plumage . This was attained by female birds when they were eight to nine years of age and by male birds when they were ten to eleven years of age .

= = = Parasites = = =

Frigatebirds are unusual among seabirds in that they often carry blood parasites . Blood @-@ borne protozoa of the genus *Haemoproteus* have been recovered from four of the five species . Bird lice of the ischnoceran genus *Pectinopygus* and amblyceran genus *Colpocephalum* and species *Fregatiella aurifasciata* have been recovered from magnificent and great frigatebirds of the Galapagos Islands . Frigatebirds tended to have more parasitic lice than did boobies analysed in the same study .

A heavy chick mortality at a large and important colony of the magnificent frigatebird , located on Île du Grand Connétable off French Guiana , was recorded in summer 2005 . Chicks showed nodular skin lesions , feather loss and corneal changes , with around half the year 's progeny perishing across the colony . An alphaherpesvirus was isolated and provisionally named *Fregata magnificens* herpesvirus , though it was unclear whether it caused the outbreak or affected birds already suffering malnutrition .

= = Status and conservation = =

= = = Populations and threats = = =

Two of the five species are considered at risk . In 2003 , a survey of the four colonies of the critically endangered Christmas Island frigatebirds counted 1200 breeding pairs . As frigatebirds normally breed every other year , the total adult population was estimated to lie between 1800 and 3600 pairs . Larger numbers formerly bred on the island , but the clearance of breeding habitat during World War II and dust pollution from phosphate mining have contributed to the decrease . The population of the vulnerable Ascension frigatebird has been estimated at around 12 @, @ 500 individuals . The birds formerly bred on Ascension Island itself , but the colonies were exterminated by feral cats introduced in 1815 . The birds continued to breed on a rocky outcrop just off the shore of the island . A program conducted between 2002 and 2004 eradicated the feral cats and a few birds have returned to nest on the island .

The other three species are classified by the International Union for Conservation of Nature as being of Least Concern . The populations of all three are large , with that of the magnificent

frigatebird thought to be increasing , while the great and lesser frigatebird decreasing . Monitoring populations of all species is difficult due to their movements across the open ocean and low reproductivity . The status of the Atlantic populations of the great and lesser frigatebirds are unknown and possibly extinct .

As frigatebirds rely on large marine predators such as tuna for their prey , overfishing threatens to significantly impact on food availability and jeopardise whole populations . As frigatebirds nest in large dense colonies in small areas , they are vulnerable to local disasters that could wipe out the rare species or significantly impact the widespread ones .

= = = Hunting = = =

In Nauru , catching frigatebirds was an important tradition still practised to a some degree . Donald W. Buden writes : " Birds typically are captured by slinging the weighted end of a coil of line in front of an approaching bird attracted to previously captured birds used as decoys . In a successful toss , the line becomes entangled about the bird 's wing and bringing [sic] it to ground . " Marine birds including frigatebirds were once harvested for food on Christmas Island but this practice ceased in the late 1970s . Eggs and young of magnificent frigatebirds were taken and eaten in the Caribbean . Great frigatebirds were eaten in the Hawaiian Islands and their feathers used for decoration .

= = Cultural significance = =

The great frigatebird was venerated by the Rapa Nui people on Easter Island ; carvings of the birdman Tangata manu depict him with the characteristic hooked beak and throat pouch . Its incorporation into local ceremonies suggests that the now @-@ vanished species was extant there between the 1800s and 1860s .

Maritime folklore around the time America was discovered held that frigatebirds were birds of good omen as their presence meant land was near .

There are anecdotal reports of tame frigatebirds being kept across Polynesia and Micronesia in the Pacific . A bird that had come from one island and had been taken elsewhere could be reliably trusted to return to its original home , hence would be used as a speedy way to relay a message there . There is firmer evidence of this practice taking place in the Gilbert Islands and Tuvalu .