

= Louse =

Louse (plural : lice) is the common name for members of the order Phthiraptera , which contains nearly 5 @, @ 000 species of wingless insect . Lice are obligate parasites , living externally on warm @-@ blooded hosts which include every species of bird and mammal , except for monotremes , pangolins , bats and cetaceans . Lice are vectors of diseases such as typhus .

Chewing lice live among the hairs or feathers of their host and feed on skin and debris , while sucking lice pierce the host 's skin and feed on blood and other secretions . They usually spend their whole life on a single host , cementing their eggs , which are known as nits , to hairs or feathers . The eggs hatch into nymphs , which moult three times before becoming fully grown , a process that takes about four weeks .

Humans host three species of louse , the head louse , the body louse and the pubic louse . The body louse has the smallest genome of any known insect ; it has been used as a model organism and has been the subject of much research .

Lice were ubiquitous in human society until at least the Middle Ages . They appear in folktales , songs such as The Kilkenney Louse House , and novels such as James Joyce 's Finnegans Wake . They commonly feature in the psychiatric disorder delusional parasitosis . A louse was one of the early subjects of microscopy , appearing in Robert Hooke 's 1667 book , Micrographia .

= = Classification = =

The order Phthiraptera is clearly a monophyletic grouping , united as the members are by a number of derived features including their parasitism on warm @-@ blooded vertebrates and the combination of their metathoracic ganglia with their abdominal ganglia to form a single ventral nerve junction . The order has traditionally been divided into two suborders , the sucking lice (Anoplura) and the chewing (Mallophaga) ; however , recent classifications suggest that the Mallophaga are paraphyletic and four suborders are now recognized :

Anoplura : sucking lice , occurring on mammals exclusively

Rhynchophthirina : parasites of elephants and warthogs

Ischnocera : mostly avian chewing lice , however , one family parasitizes mammals

Amblycera : a primitive suborder of chewing lice , widespread on birds , however , also live on South @-@ American and Australian mammals

Nearly 5 @, @ 000 species of louse have been identified , about 4 @, @ 000 being parasitic on birds and 800 on mammals . Lice are present on every continent in all the habitats that their host animals and birds occupy . They are found even in the Antarctic , where penguins carry 15 species of lice (in the genera Austrogonoides and Nesiotinus) .

= = Description = =

Sucking lice are small wingless insects ranging from 0 @. @ 5 to 5 mm (0 @. @ 02 to 0 @. @ 20 in) in length . They have narrow heads and oval , flattened bodies . They have no ocelli , and their compound eyes are reduced in size or absent . Their antennae are short with three to five segments , and their mouth parts , which are retractable into their head , are adapted for piercing and sucking . There is a cibarial pump at the start of the gut ; it is powered by muscles attached to the inside of the cuticle of the head . The mouthparts consist of a proboscis which is toothed , and a set of stylets arranged in a cylinder inside the proboscis , containing a salivary canal (ventrally) and a food canal (dorsally) . The thoracic segments are fused , the abdominal segments are separate , and there is a single large claw at the tip of each of the six legs .

Chewing lice are also flattened and can be slightly larger than sucking lice , ranging in length from 0 @. @ 5 to 6 mm (0 @. @ 02 to 0 @. @ 24 in) . They are similar to sucking lice in form but the head is wider than the thorax and all species have compound eyes . There are no ocelli and the mouthparts are adapted for chewing . The antennae have three to five segments and are slender in the suborder Ischnocera , but club @-@ shaped in the suborder Amblycera . The legs are short and

robust , and terminated by one or two claws . Many lice are specific to a single species of host and have co -@-@ evolved with it . They are usually cryptically coloured to match the fur or feathers of the host .

= = Biology = =

Lice are divided into two groups : sucking lice , which obtain their nourishment from feeding on the sebaceous secretions and body fluids of their host ; and chewing lice , which are scavengers , feeding on skin , fragments of feathers or hair , and debris found on the host 's body . Most are found on only specific types of animals , and , in some cases , on only a particular part of the body ; some animals are known to host up to fifteen different species , although one to three is typical for mammals , and two to six for birds . For example , in humans , different species of louse inhabit the scalp and pubic hair . Lice generally cannot survive for long if removed from their host . Some species of chewing lice house symbiotic bacteria in bacteriocytes in their bodies . These may assist in digestion because if the insect is deprived of them , it will die . If their host dies , lice can opportunistically use phoresis to hitch a ride on a fly and attempt to find a new host .

A louse 's color varies from pale beige to dark gray ; however , if feeding on blood , it may become considerably darker . Female lice are usually more common than males , and some species are parthenogenetic , with young developing from unfertilized eggs . A louse 's egg is commonly called a nit . Many lice attach their eggs to their hosts ' hair with specialized saliva ; the saliva / hair bond is very difficult to sever without specialized products . Lice inhabiting birds , however , may simply leave their eggs in parts of the body inaccessible to preening , such as the interior of feather shafts . Living louse eggs tend to be pale whitish , whereas dead louse eggs are yellower .

Lice are exopterygotes , being born as miniature versions of the adult , known as nymphs . The young moult three times before reaching the final adult form , usually within a month after hatching .

= = Ecology = =

The average number of lice per host tends to be higher in large @-@ bodied bird species than in small ones . Lice have an aggregated distribution across bird individuals , i.e. most lice live on a few birds , while most birds are relatively free of lice . This pattern is more pronounced in territorial than in colonial ? more social ? bird species . Host organisms that dive under water to feed on aquatic prey harbor fewer taxa of lice . Bird taxa that are capable of exerting stronger antiparasitic defense ? such as stronger T cell immune response or larger uropygial glands ? harbor more taxa of Amblyceran lice than others . Reductions in the size of host populations may cause a long @-@ lasting reduction of louse taxonomic richness , for example , birds introduced into New Zealand host fewer species of lice there than in Europe . Louse sex ratios are more balanced in more social hosts and more female @-@ biased in less social hosts , presumably due to the stronger isolation among louse subpopulations (living on separate birds) in the latter case . The extinction of a species results in the extinction of its host @-@ specific lice . Host @-@ switching is a random event that would seem very rarely likely to be successful , but speciation has occurred over evolutionary time @-@ scales so it must be successfully accomplished sometimes .

Lice may reduce host life expectancy if the infestation is heavy , but most seem to have little effect on their host . The habit of dust bathing in domestic hens is probably an attempt by the birds to rid themselves of lice . Lice may transmit microbial diseases and helminth parasites , but most individuals spend their whole life cycle on a single host and are only able to transfer to a new host opportunistically . Ischnoceran lice may reduce the thermoregulation effect of the plumage ; thus heavily infested birds lose more heat than others . Lice infestation is a disadvantage in the context of sexual rivalry .

The human body louse *Pediculus humanus humanus* had its genome sequenced in 2010 , and at that time it had the smallest insect genome known . This louse can transmit certain diseases while the human head louse (*P. h. capitis*) , to which it is closely related , cannot . With their simple life history and small genomes , the pair make ideal model organisms to study the molecular

mechanisms behind the transmission of pathogens and vector competence . In 2015 there were 5 cases of louse @-@ borne relapsing fever being transmitted to locals reported in Italy .

= = Interaction with humans = =

= = = Prehistory = = =

Humans host three different kinds of lice : head lice , body lice , and pubic lice . Lice infestations can be controlled with lice combs , and medicated shampoos or washes .

Lice have been the subject of significant DNA research in the 2000s that led to discoveries on human evolution . The three species of sucking lice that parasitize human being belong to two genera : *Pediculus* and *Phthirus*. head lice (*Pediculus humanus capitis*) , body lice (*Pediculus humanus corporis*) , and pubic lice (*Phthirus pubis*) . Human head and body lice (genus *Pediculus*) share a common ancestor with chimpanzee lice , while pubic lice (genus *Phthirus*) share a common ancestor with gorilla lice . Using phylogenetic and cophylogenetic analysis , Reed et al. hypothesized that *Pediculus* and *Phthirus* are sister taxa and monophyletic . In other words , the two genera descended from the same common ancestor . The age of divergence between *Pediculus* and its common ancestor is estimated to be 6 @-@ 7 million years ago , which matches the age predicted by chimpanzee @-@ hominid divergence . Because parasites rely on their hosts , host @-@ parasite cospeciation events are likely .

For example , genetic evidence suggests that our human ancestors acquired pubic lice from gorillas approximately 3 @-@ 4 million years ago . Unlike the genus *Pediculus* , the divergence in *Phthirus* does not match the age of host divergence that likely occurred 7 million years ago . Reed et al. propose a *Phthirus* species host @-@ switch around 3 @-@ 4 million years ago . While it is difficult to determine if a parasite @-@ host switch occurred in evolutionary history , this explanation is the most parsimonious (containing the fewest evolutionary changes) .

Additionally , the DNA differences between head lice and body lice provide corroborating evidence that humans used clothing between 80 @,@ 000 and 170 @,@ 000 years ago , before leaving Africa . Human head and body lice occupy distinct ecological zones : head lice live and feed on the scalp , while body lice live on clothing and feed on the body . Because body lice require clothing to survive , the divergence of head and body lice from their common ancestor provides an estimate of the date of introduction of clothing in human evolutionary history .

The mitochondrial genome of the human species of body lice (*Pediculus humanus humanus*) , the head louse (*Pediculus humanus capitis*) and the pubic louse (*Phthirus pubis*) fragmented into a number of minichromosomes , at least seven million years ago . Analysis of mitochondrial DNA in human body and hair lice reveals that greater genetic diversity existed in African than in non @-@ African lice . Human lice can also shed light on human migratory patterns in pre @-@ history . The dominating theory of anthropologists regarding human migration is the Out of Africa Hypothesis . Genetic diversity accumulates over time , and mutations occur at a relatively constant rate . Because there is more genetic diversity in African lice , the lice and their human hosts must have existed in Africa before anywhere else .

= = = Modern history = = =

Lice have been intimately associated with human society throughout history . In the Middle Ages , they were essentially ubiquitous . At the death of Thomas Becket , Archbishop of Canterbury in 1270 , it was recorded that " The vermin boiled over like water in a simmering cauldron , and the onlookers burst into alternate weeping and laughing " . A mediaeval treatment for lice was an ointment made from pork grease , incense , lead , and aloe .

Robert Hooke 's 1667 book , *Micrographia* : or some physiological descriptions of minute bodies made by magnifying glasses with observations and Inquiries thereupon , illustrated a human louse , drawn as seen down an early microscope .

Margaret Cavendish 's satirical The Description of a New World , Called The Blazing @-@ World (1668) has " Lice @-@ men " as " mathematicians " , investigating nature by trying to weigh the air like the real scientist Robert Boyle .

In 1935 the Harvard medical researcher Hans Zinsser wrote the book Rats , Lice and History , showing that both body and head lice transmit typhus between humans . Despite this , the modern view is that only the body louse can transmit the disease .

Soldiers in the trenches of the First World War suffered severely from lice , and the typhus they carried . The Germans boasted that they had lice under effective control , but themselves suffered badly from lice in the Second World War on the Eastern Front , especially in the Battle of Stalingrad . " Delousing " became a grim euphemism for the extermination of Jews in concentration camps such as Auschwitz under the Nazi regime .

In the psychiatric disorder delusional parasitosis , patients express a persistent irrational fear of animals such as lice and mites , imagining that they are continually infested and complaining of itching , with " an unshakable false belief that live organisms are present in the skin " .

= = = In literature and folklore = = =

James Joyce 's 1939 book Finnegans Wake has the character Shem the Penman infested with " foxtrotting fleas , the lieabed lice , ... bats in his belfry " .

Clifford E. Trafzer 's A Chemehuevi Song : The Resilience of a Southern Paiute Tribe retells the story of Sinawavi (Coyote) ' s love for Poowavi (Louse) . Her eggs are sealed in a basket woven by her mother , who gives it to Coyote , instructing him not to open it before he reaches home . Hearing voices coming from it , however , Coyote opens the basket and the people , the world 's first human beings , pour out of it in all directions .

The Irish songwriter John Lyons (b . 1934) wrote the popular song The Kilkenny Louse House . The song contains the lines " Well we went up the stairs and we put out the light , Sure in less than five minutes , I had to show fight . For the fleas and the bugs they collected to march , And over me stomach they formed a great arch " . It has been recorded by Christie Purcell (1952) , Mary Delaney on From Puck to Appleby (2003) , and the Dubliners on Double Dubliners (1972) among others .

Robert Burns dedicated a poem to the Louse , inspired by witnessing one on a lady 's bonnet in church : " Ye ugly , creepin , blastid wonner , Detested , shunn 'd , by saint and sinner , How dare ye set your fit upon her , sae fine lady ! Gae somewhere else , and seek your dinner on some poor body . " John Milton in Paradise Lost mentioned the biblical plague of lice visited upon pharaoh : " Frogs , lice , and flies must all his palace fill with loathed intrusion , and filled all the land . " John Ray recorded a Scottish proverb , " Gie a beggar a bed and he 'll repay you with a Louse . " In Shakespeare 's Troilus and Cressida , Thersites compares Menelaus , brother of Agamemnon , to a louse : " Ask me not what I would be , if I were not Thersites ; for I care not to be the louse of a lazar , so I were not Menelaus . "