= Sublingua =

The sublingua (" under @-@ tongue ") is a muscular secondary tongue found below the primary tongue in tarsiers and living strepsirrhine primates , which includes lemurs and lorisoids (collectively called " lemuriforms ") . Although it is most fully developed in these primates , similar structures can be found in some other mammals , such as marsupials , treeshrews , and colugos . This " second tongue " lacks taste buds , and in lemuriforms , it is thought to be used to remove hair and other debris from the toothcomb , a specialized dental structure used to comb the fur during oral grooming .

A rigid structure called the plica mediana or lytta runs from the front to the back , down the center of the sublingua to give it support . The plica mediana is usually made of cartilage and attaches the sublingua to the underside of the tongue . In lemuriforms , the sublingua mostly consists of two plicae fimbriatae (singular : plica fimbriata) , which run along the sides of the plica mediana and end in comb @-@ like serrated edges that are hardened with keratin . The plicae fimbriatae move freely over a limited range . The plica sublingualis , which is found in all primates , but is particularly small in lemuriforms , attaches the tongue and sublingua to the floor of the mouth . Tarsiers have a large but highly generalized sublingua , but their closest living relatives , monkeys and apes , lack one .

The sublingua is thought to have evolved from specialized folds of tissue below the tongue , which can be seen in some marsupials and other mammals . Simians do not have a sublingua , but the fimbria linguae found on the underside of ape tongues may be a vestigial version of the sublingua . Because of widely variable appearance of sublingual tissue in primates , the term " sublingua " is often confused with the frenal lamella , lingual frenulum , and other sublingual tissues .

= = Anatomical structure = =

The sublingua , or " under @-@ tongue " , is a secondary tongue located below the primary tongue in tarsiers , lemuriform primates , and some other mammals . This structure does not have taste buds or salivary glands . In lemuriforms , the sublingua is relatively large and its front edge is usually lined with keratinized serrations (sometimes called " denticles ") .

Down the middle of the sublingua is a thick strengthening rod called the plica mediana or lytta , which connects the sublingua to the underside of the tongue , and is part of the lingual septum (septum of the tongue) . The thickness and size of the plica mediana can vary between species , and except in treeshrews , it is cartilaginous and provides support for the sublingua .

Only the serrated and often keratinized tip of the sublingua is free to move small distances along the underside of the tongue , while the majority of its length adheres to the underside of the tongue . These free @-@ moving folds or filaments are called the plica fimbriata and attach to the base of the sublingua and are supported at the midline by the plica mediana . The plica fimbriata is highly developed and specialized in lemurs , and makes up the majority of the sublingua .

The fold that connects the back of the sublingua and tongue to the rear floor of the mouth is called the plica sublingualis . In lemurs , this is an underdeveloped structure consisting of only a tiny outgrowth on the floor of the mouth . The point where the plica sublingualis attaches to the rear floor of the mouth marks the location of the submandibular salivary glands .

= = = Differences between species = = =

In the aye @-@ aye , the sublingua is not shaped like a brush like it is in most lemurs . Instead , there is a thickened area along the plica mediana or lytta which has a hook @-@ shaped structure on the end . Within cheirogaleids , the sublingua lacks cartilage , and the sublingua of the gray mouse lemur has a distinct plica mediana and ends in two lobe @-@ like projections that lack keratinized serrations , but have three keratinized ridges which make the sublingua rigid .

In tarsiers , the sublingua does not have serrations along its tip and is much simpler and generalized in structure , making it clearly distinguishable from that of the lemuriform primates . The

tarsier has a distinct plica mediana and its plicae fimbriatae are large and stick to the entire underside of the tongue . The plica sublingualis is also prominent .

Marsupials such as opossums and the common brushtail possum have also developed noticeable sublingua with a plica mediana and a less specialized , but conspicuous , plica fimbriata .

= = Function = =

Originally , the sublingua in lemurs was thought to be a vestigial organ inherited from their mammalian ancestors . In lemuriform primates , the sublingua is used to remove hair and debris from the highly specialized toothcomb , an arrangement of four or six long , forward @-@ facing teeth in the lower jaw used in oral grooming . The toothcomb of lemuriforms consists of both incisors and canine teeth (which reinforce the incisors) , and together , these finely spaced teeth act like teeth on a comb . Although the cleaning function has been suspected for nearly a century , there has been no clear confirmation of this . However , a study from 1941 presented evidence that the toothcomb accumulated a mat of hair during oral grooming , and the author did observe that lemurs extend and retract their tongue rapidly , possibly to use the sublingua to clean the toothcomb .

In the aye @-@ aye , which has replaced the toothcomb by evolving continually growing , rodent @-@ like incisors , the hook @-@ shaped tip of the sublingua fits precisely within the gap between the two lower incisors and keeps the area clean . Tarsiers lack a toothcomb , which may explain why their sublingua lacks the serrations typically found on the sublingua of lemuriforms . Although colugos also have a toothcomb , consisting of serrated edges on the tips of their incisors instead of finely spaced , elongated teeth , they do not have a sublingua . Instead , their toothcomb is cleaned by the tongue , which has serrated edges at the front that match the serrations on the incisors .

= = Evolution and development = =

The sublingua in lemuriform primates and tarsiers may have evolved from the specialized folds of tissue below that tongue , as seen in some marsupials , such as sugar gliders , as well as some embryonic eutherian mammals , such as whales and dogs . It is also found in some adult eutherian mammals , such as treeshrews , colugos , and rodents . The sublingua of treeshrews , close relatives of primates , is less developed than in lemuriforms and tarsiers , but suggests a phylogenetic relationship .

The sublingua in lemuriform primates is fully developed and particularly unique . Tarsiers , which are most closely related to monkeys and apes (collectively called simians) , also have a well @-@ developed but non @-@ specialized sublingua . Simians , however , do not have a sublingua , although some , such as titis have a highly specialized frenal lamella (plica sublingualis) . All primates have a plica sublingualis , and the fimbria linguae (plica fimbriata) found under the tongue of apes may be a vestigial version , although that is still disputed . The structure and appearance of the sublingua , frenal lamella , lingual frenulum , and other sublingual tissue vary greatly between primates , and as a result , their terminology is often confused .

In the species that have cartilage in the sublingua or lytta , that cartilage is not derived from the hyoid bone or hyoid arch (the bone and cartilage that supports the tongue) . Instead , the cartilage of the sublingua is a separately developed structure specifically adapted to support the sublingua .