

= 54 , and its fundamental number = 70 .

= = Taxonomy and naming = =

It was first described in the scientific literature in 1884 by Clinton Hart Merriam with its original name , *Atophyrax bendirii* (a monotypic taxon at the time) . The first specimen was obtained 18 mi (29 km) southeast of Fort Klamath in Klamath County , Oregon , at a location 1 mi (1 @. @ 6 km) from the Williamson River . Merriam obtained the specimen from Charles Bendire , an ornithologist and army captain stationed at Fort Klamath . The shrew was caught in late July or early August by one of the dogs in the camp , and a soldier gave it to Bendire . Merriam named it Bendire 's shrew (*Atophyrax bendirii*) in appreciation of Bendire 's contribution . Merriam reported that the animal represented a new genus , *Atophyrax* , deriving from the Greek and meaning " anomalous sorex " . The marsh shrew was later reclassified in the genus *Sorex* .

The marsh shrew and the American water shrew (*Sorex pallustris*) share many physical characteristics . The former is found in a narrower area from the northwest coast to the lower slopes of the inland mountains . The American water shrew is more widely distributed across the western mountains and through the subarctic regions of Canada and the eastern U.S. The species ' ranges are primarily allopatric ; although they may overlap (sympatry) in coastal regions of the Pacific Northwest , differences in elevation tend to separate them . Early taxonomists placed these mammals into separate subgenera ; Merriam assigned the marsh shrew to *Atophyrax* , and Jackson (1928) assigned the Pacific water shrew to *Neosorex* . A closer , dentition @-@ based relationship was assigned by Findley (1955) , with both species assigned to the subgenus *Otisorex* . Findley hypothesized that in the early Pleistocene , the ancestors of masked and vagrant shrews (*Sorex cinereus* and *Sorex vagrans* , respectively) diverged ; during the Yarmouth interglacial , the American water shrew and marsh shrew diverged from their vagrant @-@ shrew ancestors . Three other *Sorex* species evolved during the Sangamonian : the dwarf shrew (*S. nanus*) , the southeastern shrew (*Sorex longirostris*) and the ornate shrew (*Sorex ornatus*) . Findley 's assignment of the marsh shrew and the American water shrew to *Otisorex* was later reinforced by biochemical and genetic studies . In 2005 , findings were published (based on mitochondrial DNA analysis) which better defined the nature of the relationships between marsh shrews , Pacific water shrews and their respective subspecies . Variations in the sequencing of cytochrome b mitochondrial DNA were assessed , and the results of the 2005 phylogeny for the marsh shrew are shown below in detail .

= = = Subspecies = = =

The marsh shrew has three subspecies :

S. bendirii albiventer (Merriam , 1895)

S. bendirii bendirii (Merriam , 1884)

S. bendirii palmeri (Merriam , 1895)

S. b. albiventer is found on the Olympic Peninsula of Washington , *S. b. bendirii* in the Cascades and southwestern British Columbia and *S. b. palmeri* in coastal Oregon . These specifications have historically been based on fur markings , skull shape and dental details of unclear significance , and their validity is uncertain .

= = Distribution and habitat = =

The geographic range of the marsh shrew extends from southwest British Columbia , along the western regions of the U.S. states of Washington and Oregon and through northwestern California to the area north of San Francisco . The subspecies *S. b. albiventer* is found on the Olympic Peninsula . *S. b. palmeri* is found from western Oregon (south of the Columbia River) to extrema northwestern California . *S. b. bendirii* is found from the northern parts of the range (except for the

Olympic Peninsula) south along the eastern range to the remaining range in California . In British Columbia the eastern limits are the Chilliwack River and Agassiz , and the northern limits are the low elevations on the north shore of Burrard Inlet .

Marsh shrews typically live in wetlands (such as marshes) , and their habitat includes extensive forest canopy and ground cover from shrubs , logs , and debris ; they may also be found in riparian environments . During cold , rainy seasons , they may travel as much as a kilometer from wet areas to more sheltered habitats ; these generally include mixed deciduous or coniferous forest with downed logs and surface cover . Marsh shrews have been collected from near sea level to as high as 4 @, @ 356 ft (1 @, @ 328 m) in the Cascades . They may inhabit forests of red alder , bigleaf maple , western hemlock or redcedar , often near marshes with western skunk cabbage . In British Columbia the marsh shrew is generally found below 600 metres (2 @, @ 000 ft) , but it has been collected at 850 metres (2 @, @ 790 ft) in Mount Seymour Provincial Park . Environmental officials in British Columbia believe that marsh shrews are one of the rarest small mammals in the province . In 1992 , Carlos Galindo @-@ Leal and Gustavo Zuleta trapped 1 @, @ 000 small mammals at 55 locations in a large area of southwestern British Columbia ; only three were Pacific water shrews .

During spring and summer 1983 , biologists in western Oregon studied small @-@ mammal distribution (including marsh shrews) near streams and along the riparian fringes of coniferous forests . " Riparian fringe " was defined as at least 15 ? 20 m from a stream . The North American deer mouse was caught in greater numbers than any other mammal , representing around 80 % of all captures . Sixteen species were trapped , with the marsh shrew representing less than two percent of mammals captured in this study . All the marsh shrews were trapped at streamside , and were found in all three ages of coniferous forests : old @-@ growth , mature and young growth .

= = Behavior and ecology = =

The marsh shrew eats invertebrates , including spiders , earthworms , sowbugs , centipedes , termites and other terrestrial and aquatic arthropods . It was observed in captivity pursuing and killing a goldfish , but not eating it . In contrast , the American water shrew has been observed killing and eating fish . A study of the gastric contents of marsh shrews in Oregon indicated that at least 25 % of their diet is aquatic , including insect larvae , slugs and snails , mayfly naiads and other , unidentified invertebrates . Other researchers have reported that their diet may also include aquatic insects (water beetles and stonefly nymphs) , crane flies , ground beetles , spiders , harvestmen , centipedes , earthworms , slugs and small terrestrial snails . The marsh shrew swims , making short dives in search of food ; its mobile snout , whiskers and lips are used to find and capture underwater prey . Before eating , it returns to land . Air trapped in its fur provides buoyancy , and marsh shrews can run for as long as 3 to 5 seconds along the top of the water . According to mammalogist Donald Pattie , they can " scull on the surface like whirligig beetles " . The air trapped in its fur gives it a silvery sheen . On land , its foreleg and opposite hind leg move at the same time .

It is active throughout the year , primarily at night . Gestation is about three weeks , and the female has a litter of three or four young . Nests in the wild , built from shredded bark , are in a tunnel or under a log . Marsh shrews typically live about 18 months , and males are not thought to reach sexual maturity during their first summer . Since their lifespan is short , they apparently breed for only one season . Although no breeding data exist for British Columbia , the breeding season elsewhere is from late January to late August ; most young are born in March . The number of litters a female rears is unknown .

The strong odor associated with marsh shrews (in common with other long @-@ tailed shrews) may be a means of communication . Similar to other shrews , they have poor eyesight . If a marsh shrew is placed in a foreign environment (such as along an edge of a raised surface) , it will run off the edge and continue to run after landing on the surface below . Landing in water , it dives beneath the surface . Marsh shrews are easily trapped in sunken cans , possibly due to their inability to see where the edges of surfaces drop . In captivity they vocalize when they are displaced or scuffle with other animals in their cage , twittering shrilly if disturbed while eating or in a confrontation over food (such as a worm) . Although it is uncertain whether marsh shrews cache (or hoard) food in the wild

, in captivity they set aside nightcrawlers in a corner of the cage for later consumption ; no other food items were set aside in this fashion .

Acarine parasites include the Glycyphagidae (*Glycyphagus hypudaei* and *Orycterovenus soricis*) ; the Laelapidae (*Androlaelaps fahrenheitii* , *Echinonyssus obsoletus* , *Haemogamasus occidentalis* and *Haemogamasus reidi*) ; the Listrophoridae (*Listrophorus mexicanus*) ; the Myobiidae (*Amorphacarus hengererorum* , *Amorphacarus soricis* , *Protomyobia atophyracis* and *Protomyobia brevisetosa*) , and the Pygmephoridae (*Pygmephorus horridus* and *Pygmephorus whitakeri*) . Probable predators include owls , fish and the Pacific giant salamander .

= = Human interaction = =

Before Donald Pattie 's research during the late 1960s , when his team studied marsh shrews in captivity , little was known about their behavior . Before then , most information about the marsh shrew was from notes about the mammal 's habitat and information about trapping it . Its descriptions in the literature were largely derived from the examination of museum specimens .

= = = Conservation status = = =

Marsh shrews are listed as " Endangered " by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) , their habitat in British Columbia limited to the lower Fraser Valley . Their available habitat continues to degrade as a result of economic activity in the area ; with little chance of the trend reversing , they are rare in that part of Canada . COSEWIC designated the marsh shrew as " Threatened " from April 1994 until May 2000 , updating its status in April 2006 to " Endangered . " According to the IUCN , marsh shrews are of " Least Concern " in terms of conservation . Although the shrew is considered a rare mammal and its numbers are thought to be in decline , no population estimates are currently provided and its rate of decline is not considered fast enough to warrant placing it in a more @-@ threatened category . Suitable wetland habitat is declining , due primarily to urbanization and the conversion of habitat to agriculture , and areas of protected habitat are expected to be provided in the shrew 's broad geographic range .