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Aegialomys galapagoensis (Rodentia: Cricetidae)

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Abstract: *Aegialomys galapagoensis* (Waterhouse, 1839) is a sigmodontine rodent commonly called the Galapagos rice rat. It is a medium-sized rodent, characterized by dense, soft, yellow or copper, weakly grizzled pelage; the dorsum is grayish or brownish and the ventral pelage is pale. It is endemic to the open habitats of the Galapagos Archipelago, occurring on three islands, Santa Fé Island (Barrington Island), San Cristóbal Island (Chatham Island), and Santiago Island (James Island). Restricted populations are considered a major threat to *A. galapagoensis* conservation throughout most of its range, as well as competition with *Rattus rattus*. *A. galapagoensis* is listed as "Vulnerable" by the International Union for Conservation of Nature and Natural Resources, and is listed as "Critically Endangered" on the Ecuador National list.

Key words: Ecuador, Galapagos, Oryzomyini, rodent, South America

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Aegialomys Weksler, Percequillo, and Voss, 2006

Mus: Waterhouse, 1839:66. Part, not *Mus* Linnaeus, 1758; description of *galapagoensis*.

Hesperomys: Wagner, 1843:517. Part, not *Hesperomys* Waterhouse, 1839; listing of *galapagoensis*.

Oryzomys: Allen, 1892:48. Part, not *Oryzomys* Baird, 1857; description of *bauri*.

Aegialomys Weksler, Percequillo, and Voss, 2006:5. Type species *Oryzomys xanthaeolus* Thomas, 1894, by original designation.

CONTEXT AND CONTENT. Order Rodentia, family Cricetidae, subfamily Sigmodontinae, tribe Oryzomyini, genus *Aegialomys*. The subfamily Sigmodontinae is a monophyletic lineage, comprising 11 tribes (sensu Salazar-Bravo et al. 2016) and 86 genera (sensu D'Elía and Pardiñas 2015). The tribe Oryzomyini is also a monophyletic group (sensu Weksler 2006), and currently comprises 29 genera and 140 species (Pardiñas et al. 2017), occurring from the southeastern portion of the United States to southern Chile and Argentina. The species of the genus *Aegialomys* are distributed throughout arid to semiarid lowland areas of coastal Peru and Ecuador (including some islands of the Galapagos Archipelago) and also localities up to 2,800 m in the Peruvian Andes (Percequillo 2015; Prado and Percequillo 2018).

Fig. 1.—An adult of *Aegialomys galapagoensis* from Santa Fé Island (Barrington Island), Galapagos, Ecuador. Used with permission of the photographer Heidi Snell/Visual Escapes.

Aegialomys currently contains four extant species (sensu Prado and Percequillo 2018): *A. galapagoensis* (Waterhouse, 1839; including *Oryzomys bauri* Allen, 1892), the yellowish rice rat *A. xanthaeolus* (Thomas, 1894), Baron's rice rat *A. baroni* (Allen, 1897), and Ica rice rat *A. ica* (Osgood, 1944). The following key was prepared with characteristics and measurements provided by Prado and Percequillo (2018).

1. Palatal length long (range: 5.1–7.52 mm). Mesopterygoid fossa does not extend anteriorly between the maxillary bones …… …… … ………… … … … .. …. ……………*A. xanthaeolus*

   Palatal length intermediate (range: 4.38–6.60). Mesopterygoid fossa extends anteriorly between the maxillary bones but not between M3s...2

2. Length of the dorsal hairs around 11–13 mm (villiform hairs), 18–20 mm (setiform hairs), 27–29 mm (aristiform hairs) …… …… …… …… …… …… …… …… ...*A. galapagoensis*

   Length of the dorsal hairs around 7–12 mm (villiform hairs), 10–18 mm (setiform hairs), 15–24 mm (aristiform hairs) … ……… ……… ……… ……… …… . .. …..…. ……… ….3

3. Length of the setiform hairs between 10–15 mm.........*A. baroni*

   Length of the setiform hairs between 16–18 mm .... *A. ica*

Aegialomys galapagoensis (**Waterhouse, 1839**)

Galapagos Rice Rat

Mus galapagoensis Waterhouse, 1839:66. Type locality "Chatham Island [=San Cristóbal Island], Galapagos Archipelago, Pacific Ocean," Ecuador.
Hesperomys galapagoensis: Wagner, 1843:517. Name combination.
Hesperomys (Oryzomys) galapagoensis: Thomas, 1884:453. Name combination. Part.
Oryzomys bauri Allen, 1892:48. Type locality: "Barrington Island [= Santa Fé Island]," Galapagos Islands, Ecuador.
O[*ryzomys*]. *galapagoensis*: Thomas, 1894:354. Name combination.
[*Oryzomys*] *Bauri*: Trouessart, 1897:527. Name combination.
[*Oryzomys* (*Oryzomys*)] *galapagoensis*: Trouessart, 1904:419. Name combination.
[*Oryzomys* (*Oryzomys*)] *bauri*: Trouessart, 1904:419. Name combination.
Oryzomys galapagensis: Gyldenstolpe, 1932:23. Incorrect subsequent spelling of *Oryzomys galapagoensis* (Waterhouse, 1839).
[*Aegialomys*] *galapagoensis*: Weksler, Percequillo, and Voss, 2006:5. First use of current name combination.

Context and Content. Context as for genus. No subspecies are currently recognized (Pardiñas et al. 2017; Prado and Percequillo 2018).

Nomenclatural Notes. The common name of *Aegialomys galapagoensis* is Galapagos rice rat, or in Spanish, Rata Costera de Galápagos. The generic name is composed of the Greek word *aegialos*, in reference to its coastal distribution (Weksler et al. 2006). Waterhouse (1839) described *galapagoensis* under the genus *Mus*, a genus taxon name that at that historic time (early 19th century) assembled most of the rat-like muroid rodents. Later, *galapagoensis* was transferred to the genus *Hesperomys*, a genus commonly employed for several species groups of South American cricetids (see Cabrera 1961). Later, Thomas (1884) assigned *galapagoensis* to *Oryzomys*, a subgenus of *Hesperomys*, and after that Allen (1892) moved *Oryzomys* to the generic rank, during the description of a new species from the Galapagos Archipelago, *O. bauri* (here assigned as a synonym of *A. galapagoensis*). This scenario remained unchanged for more than a century, upon the allocation of the taxa of the species group name (*galapagoensis* and *bauri*) to a newly described genus *Aegialomys* by Weksler et al. (2006).

DIAGNOSIS

Aegialomys galapagoensis can be distinguished from others species of *Aegialomys* by its very long, dense, and lax pelage. Its viliform, setiform, and aristiform hairs are much longer compared to the other three species of *Aegialomys*, with modal length about 13, 20, 29 mm, respectively. The other three species of *Aegialomys* present a tail length larger than the head–body length, while *A. galapagoensis* exhibits a tail as long as the head–body length in most specimens, although some specimens present a tail length slightly shorter or a little longer than the head–body length, but not as long as the other species; the tail is also bicolored dorsal-ventrally, as in the other species of *Aegialomys* (Prado and Percequillo 2018; Fig. 1). The skull is large and robust (Fig. 2), with one of the greatest overall size of skull in the genus (occipitonasal length range: 31.34–35.85 mm), only comparable to *A. ica* (occipitonasal length range: 28.76–38.39 mm; *A. xanthaeolus* occipitonasal length range: 26.38–35.05 mm, and *A. baroni* occipitonasal length range: 26.92–36.36—Prado and Percequillo 2018). *A. galapagoensis* exhibits the more robust upper molar series (mean length of molars, LM = 5.53 mm, range: 5.35–5.68; mean breadth of the first upper molar, BM1 = 1.74, range: 1.60–1.87) when compared to the other species of *Aegialomys* (*A. xanthaeolus*, LM = 4.81 mm, range: 4.23–5.31, BM1 = 1.41 mm, range: 1.22–1.60; *A. baroni*, LM = 4.99 mm, range: 4.34–5.71, BM1 = 1.52 mm, range: 1.32–2.02; and *A. ica*, LM = 5.42 mm, range: 4.52–6.09, BM1 = 1.64 mm, range: 1.39–1.95). The mesolophid in the lower molars m1 and m2 is always present in *A. galapagoensis*, while in *A. baroni*, *A. ica*, and *A. xanthaeolus*, this character can be found only in less than 25% of the individuals.

Fig. 2.—Dorsal, ventral, and lateral views of skull and lateral view of mandible of an adult female *Aegialomys galapagoensis* (MVZ [the Museum of Vertebrate Zoology at Berkeley] 145376) from Santa Fé Island (Barrington Island), Galapagos, Ecuador. Occipitonasal length is 35.23 mm.

GENERAL CHARACTERS

Aegialomys galapagoensis is the largest species in the genus (Percequillo 2015; Pardiñas et al. 2017; Prado and Percequillo 2018), similar in size to *A. ica*, a species from Southern Peru (Prado and Percequillo 2018). It is a medium-sized rodent (total body length: 203–350 mm) characterized by very long, dense, and soft pelage. Dorsal coloration yellow or copper weakly grizzled; ventral pelage grayish-yellow (Fig. 1). Pelage is a combination of short (11–13 mm) viliform hairs, long (18–20 mm) wavy setiform hairs, and very long (27–29 mm) and wide aristiform hairs. Tail length (range: 136–165 mm) as long as or slightly shorter or slightly longer than head–body length, and slightly pilose with hairs on dorsal and ventral regions, apparently extending over three ventral scales. Tail scales are generally dark and about 20 per cm; tail bicolor (dark above and light below). Pinnae are long and densely haired on internal and external surfaces. Vibrissae moderately dense, not reaching beyond ears. Mystacial vibrissae not extending posteriorly beyond the caudal margins of the pinnae when laid back, and superciliary vibrissae not extending posteriorly beyond pinnae. Although no sexual dimorphism in *Aegialomys* was found by Prado and Percequillo (2011, 2018), Clark (1980) found significant differences in body size and weight with males heavier and with longer head–body length than females.

DISTRIBUTION

Known localities for *Aegialomys galapagoensis* occur on three islands of the Galapagos Archipelago, Santa Fé Island (Barrington Island), San Cristóbal Island (Chatham Island), and Santiago Island (James Island). Prado and Percequillo (2018) presented evidence for the presence of this species in Santiago Island, but discussed the validity of this record, based on specimens from the Natural History Museum (London, United Kingdom). These authors suggest that one specimen may have been mislabeled, being originally from San Cristóbal Island; the other specimen was more likely obtained at Santiago Island. The population of *A. galapagoensis* in San Cristóbal Island has been considered extinct since the early 1900s (Heller 1904): recent surveys performed by Patton and Hafner (1983) and Dowler et al. (2000) recovered no specimens on this island (Fig. 3).

FOSSIL RECORD

Steadman et al. (1991:131, table 4) reported fossils of *Aegialomys galapagoensis* on San Cristóbal Island, associated with a Holocene vertebrate fauna with an estimated date range of 8,500–500 years before present.

FORM AND FUNCTION

Form.—The external morphology of *Aegialomys galapagoenis* follows the general pattern typical of *Aegialomys*. Digits II to V of the manus and pes have ungual tufts that are longer than claws, and dI has ungual tufts as long as claws. The length of claws is about 1 mm in the manus and about 2.5 mm in the pes. The pes is long and wide, dorsally covered with white hairs, with dI and dV smaller than the three central digits. The claw of dI extends slightly beyond one-half the length of the third phalanx of digit II, and digit V with claw extending to base of second phalanx of digit IV. The pes has six plantar pads, four interdigital at base of digits, one thenar, and one hypothenar (Prado and Percequillo 2018).

Skull is robust and strongly built. Rostrum is relatively long and wide (nasal length range: 11.76–15.09 mm; rostrum

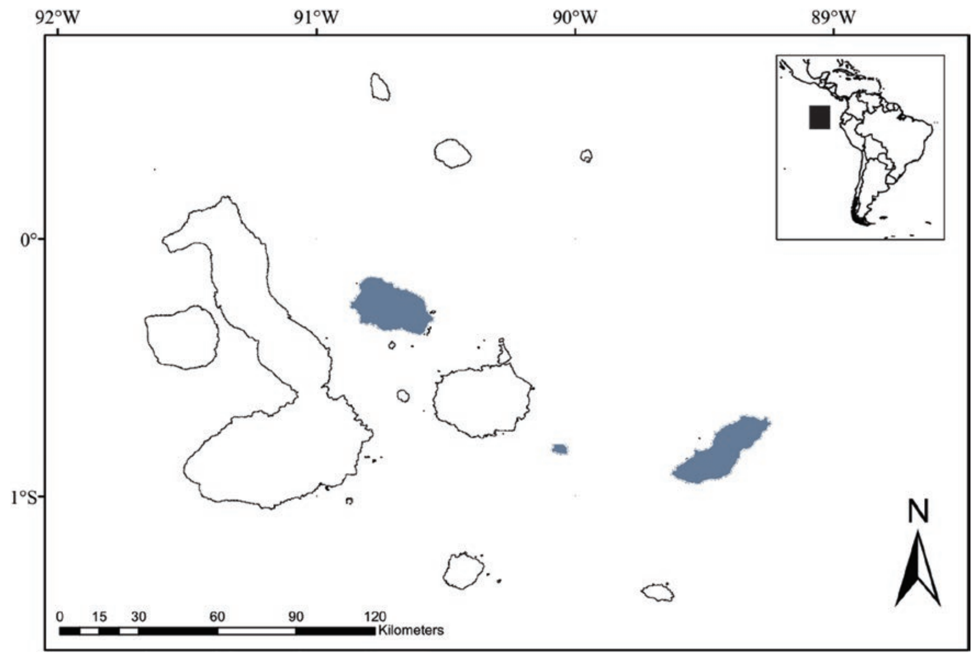

Fig. 3.—Shading indicates presumed distribution area of *Aegialomys galapagoensis* based on collecting localities and corresponds (left to right) to Santiago Island, Santa Fé Island, and San Cristobál Island, Galapagos, Ecuador.

breadth range: 5.6–6.92 mm); zygomatic notch deep and wide; lacrimal small and in contact with frontal and maxillary. The zygomatic arches are robust, divergent posteriorly, wider near the zygomatic root (zygomatic width range: 16.25–19.78 mm). The interorbital region is strongly divergent posteriorly, with supraorbital margins sharp and acute, forming developed crests (interorbital width range: 4.92–5.91 mm). The braincase is elongated with a marked temporal bead. The parietals expand over the lateral surface of temporal region; lambdoidal and occipital crests are sharp. Rostrum with nasal projected anteriorly, greatly surpassing premaxillary and incisors. Jugal is present. The stapedial foramen is very small or absent (in some specimens, it is not discernible in the suture of the ectotympanic and petrosal; this latter condition was not mentioned by Voss 1988, but reported also for other genera of the tribe Oryzomyini, *Cerradomys*, *Drymoreomys*, and *Sooretamys* by Percequillo et al. 2008, Percequillo et al. 2011, and Chiquito et al. 2014, respectively). Carotid circulatory pattern 3 is present (Voss 1988; Carleton and Musser 1989; Weksler 2003). The basicranial flexion is weakly pronounced with foramen magnum oriented caudally. Rostrum with incisive foramen long (occupying most of the diastema), with lateral margins wider medially and anteroposterior margins rounded, configuring a long and convex foramen. The posterior margins of incisive foramina penetrate between first molars in most specimens (ca. 36% in *A. galapagoensis*, 4% in *A. xanthaeolus*, 13% in *A. baroni*, and 48% in *A. ica*—Prado and Percequillo 2018), or leveled with the alveoli of first molars, or almost reaching the alveoli (length of incisive foramen range: 6.42–7.59 mm, width of incisive foramina range: 2.23–2.71 mm); posterior margin of zygomatic plate anterior to M1; palate intermediate (sensu Weksler 2003) with palatal bridge flat (palatal bridge length range: 5.41–6.55 mm, palatal width range: 6.37–7.60 mm). The mesopterygoid fossa has an anterior margin that is variable in shape and extending above the maxillary bones. Auditory bullae inflated, with short and wide Eustachian tube. Mandible is robust, the ramus deep, with coronoid and condyloid processes well developed. (Fig. 2; Prado and Percequillo 2018).

Upper molar series robust, long, and wide. First upper molar with anterocone divided by anteromedian flexus in about 27% of specimens analyzed by Prado and Percequillo (2018), first lower molar with anteroconid undivided; mesoloph present in the first and second molars; mesolophid present in the first molar in all specimens, and in the second molar in 78% of specimens analyzed by Prado and Percequillo (2018; Fig. 4).

Fifth lumbar vertebra with well-developed anapophysis; hemal arch between second and third caudal vertebrae with spiny posterior process; hemiglandular and unilocular stomach without extension of glandular epithelium in the corpus. The phallus presents glans penis complex, with small distal and trifurcated bacular cartilage (with a central, short and thin digit), a pair of preputial glands present, smooth tissues (not spiny) on margin of terminal crater rim do not hide bacular projections; spineless dorsal papilla; urethral processes without subapical lobes; the phallus is elongated, with a length/diameter ratio of 1.8. The male accessory reproductive glands consist of a pair of preputials, bulbourethral, ampullary, vesiculars, and four pairs of prostate, very similar to other oryzomyines (Patton and Hafner 1983).

Function.—The shape of the hindfeet, assessed by length and width, and the length of the claws along with the very large and fleshy plantar pads (thenar and hypothenar pads large and distinct), with interdigital pads set close together, suggest that

Fig. 4.—Occlusal view of the maxillary and mandibular molar rows of *Aegialomys galapagoensis* (MVZ [the Museum of Vertebrate Zoology at Berkeley] 125470) from Santa Fé Island (Barrington Island), Galapagos, Ecuador.

Aegialomys galapagoensis is a terrestrial species with some scansorial abilities.

The current concept of the tribe Oryzomyini includes pentalophodont, typical forest-specialist genera and also tetralophodont, open-dweller genera (sensu Weksler et al. 2006). Some genera in the tribe are transitional habitat specialists, such as *Microakodontomys*, *Oligoryzomys* (Hershkovitz 1993), and *Cerradomys* (Percequillo et al. 2008), that exhibit polymorphism regarding the mesoloph, which is reduced or absent in some individuals or species. Similarly, *A. galapagoensis* is also a specialist in open, transitional habitats (halophytic vegetation mixed with cacti forest) and as such exhibits reduced or absent mesolophid in some specimens. Therefore, there is a well-known correlation between the presence of the mesoloph and mesolophid and habitat, although there is not a clear relation on their form and function.

ONTOGENY AND REPRODUCTION

There is no sexual dimorphism during age development, and the ontogenetic variation described for *Aegialomys galapagoensis* follows the pattern described for *A. xanthaeolus* (Prado and Percequillo 2011) and other rodents of the tribe Oryzomyini (see Carleton and Musser 1989; Voss 1991): the variation is larger in measurements related to craniofacial and incisor components, as these have more conspicuous growth related to ontogenetic development. But the dimensions of the molars and the measurements of the neurocranium, which complement the growth in the early postnatal life (Voss 1991), are relatively less variable.

The sex ratio of *A. galapagoensis* was biased toward males, as males were trapped significantly more than females (Clark 1980). Dowler et al. (2000) recovered similar results, with a sex ratio favoring males (1.3:1). Harris and MacDonald (2007) also recovered a bias toward males in the Santiago Galapagos mouse *Nesoryzomys swarthi*, another Galapagos endemic oryzomyine rodent. They hypothesized that transient males caused this asymmetry, as males and females exhibit similar survival rates, although males present a lower interannual capture rate. Harris and MacDonald (2007) concluded that transient males could also explain the sex ratio biased towards males in *A. galapagoensis*, and added, that home range sizes in males are larger in both species.

According to Clark (1980), reproduction occurs in the hot season, with young individuals collected in May and March, while Brosset (1963) collected young specimens in March, July, and December. Sampling in August 1995, Dowler et al. (2000) observed no lactating females, but reported males with scrotal testis (11 individuals of 27). The number of embryos per female was 2–7 (Brosset 1963; Clark 1980), and it was suggested that embryo production is limited by the amount of rainfall which is associated with food availability (Clark 1980; Harris and MacDonald 2007). Harris and MacDonald (2007:216) stated "females adjust their reproductive output according to resource availability, perhaps through failed implantation or embryo reabsorption." Brosset (1963) revealed that the young are born completely naked and blind; they develop fur and open their eyes from day 4 to day 9; adult pelage starts appearing at day 13. The dynamics of body size revealed that there were two recruitment periods throughout the year: young individuals appear during the warmer season, coupled with the presence of many large year-old rats. In the nonbreeding season, young rats grow and old rats die, compressing the size distributions toward normality (Clark 1980).

ECOLOGY

According to Clark (1980) the population of *Aegialomys galapagoensis* on Santa Fé Island was remarkably stable, when compared to other Oryzomyini (see also Harris and MacDonald 2007). The number of individuals is highly correlated with the density of vegetation, and this relation between vegetation density and population density varies seasonally, suggesting that this species is "resource-limited." This fact may be related to available food and protection from aerial predators, with food being the finite resource, instead of cover (Clark 1980; see also Harris and MacDonald 2007). As reported by Prado and Percequillo (2018), James Patton (pers. comm.) indicated that he trapped 39 specimens in 100 traps (39%), a large trapping success, at Barrington Cove on Santa Fé Island in only one night. Dowler et al. (2000), trapping also on Santa Fé Island, obtained a capture success of 82%, with 69 specimens caught in 84 traps. More recently, Tirira (2007) also reported this rodent as a common species on Santa Fé Island.

The population is remarkably dense around beaches because *A. galapagoensis* is highly attracted to fish waste left on the beaches by fishermen (Brosset 1963). In agreement with Brosset (1963), Prado and Percequillo (2018:108) reported that Patton's specimens were trapped in "rough ground of large boulders covered by a narrow strip of very dense but low halophytic vegetation about 5–10 m wide before it opens to *Opuntia echios* forest with a sparse understory." In these areas, *A. galapogoensis* was found to only occupy shelters under lava blocks and under the shrubs of *Scutea spicata* (Brosset 1963).

Aegialomys galapagoensis exhibits great longevity: the maximum survival in the wild was 599 days for one male and one female. The median survival time for recaptured animals was 165 days for males and 167 days for females, and 37% of these individuals were alive 365 days after first capture, and 13% were alive after 500 days (Clark 1980).

Clark (1980) hypothesized that *A. galapagoensis*, exhibiting high survival and low reproduction, could be categorized as a pulse averager, a demographic trait exhibited by desert rodents of the family Heteromyidae. These pulse averagers "are temporally fixed, once-a-year breeders that rely on general predictability of environmental seasonality" (Harris and MacDonald 2007:208). This hypothesis was confirmed by studies conducted by Harris and MacDonald (2007) with the Santiago Galapagos mouse, which exhibits a demographic history very similar to *A. galapagoensis*.

Aegialomys galapagoensis has been described as predominantly nocturnal, although during reproductive season it becomes more active during the day (Brosset 1963); however, Dowler et al. (2000) reported that individuals were active, running through lava fields before dark, with some captures occurring during the day. *A. galapagoensis* is omnivorous, but has a preference for insects and fish remains (Brosset 1963). According to Tirira (2007), researchers have to maintain their belongings (including food) in metal containers to keep them protected from *A. galapagoensis*, as otherwise it will eat or gnaw at the items. Data on captivity show that in a period with less food they may practice cannibalism (Brosset 1963).

The predation of a young individual of *A. galapagoensis* by a centipede (*Scolopendra galapagoensis*) on Santa Fé Island has been reported (Clark 1979). The specimen inside the nest was only slightly furred, with closed eyes, and about 40 mm of body length.. The centipede measured about 200 mm and it held the rat in its anterior appendages, carrying the individual out of the nest. *A. galapagoensis* has a host-specific ectoparasite, the laelapine mite (Acari: Mesostigmata: Laelapidae) *Gigantolaelaps galapagoensis* (Gettinger et al. 2011).

GENETICS

The karyotype of *Aegialomys galapagoensis* has a diploid number (2n) of 56 chromosomes and a fundamental number (FN) for autosomes of 58 (Gardner and Patton 1976). The autosomes include two pairs of small meta-submetacentrics, one pair of distinctive and large acrocentrics, and 24 additional pairs from small to large. Concerning the sex chromosomes, the X is a large acrocentric and the Y, a small acrocentric.

There is little information regarding population genetics of *A. galapagoensis.* In a study about population genetics of the native rodents of the Galápagos Islands, microsatellite and mtDNA markers were employed to examine genetic differentiation between two sampling periods (1997 and 2006—Johnson 2009). Genetic differentiation between the two sampling periods was high and it is possible that this represents a cyclic population bottleneck related to El Niño Southern Oscillation events. Also high haplotype diversity and low nucleotide diversity suggest closely related haplotypes in the populations.

Prado and Percequillo (2018) recovered *A. galapagoensis* as sister to all other species of the genus employing Cytb and Adh1-I2 genes and as sister to the two southern forms of the genus, *A. baroni* and *A. ica*, with only the Adh1-I2 marker. Despite this incongruence, Prado and Percequillo (2018) established that *A. galapagoensis* represents a unique lineage, falsifying the hypothesis of Patton and Hafner (1983) that sailors brought *Aegialomys* from Galapagos to the island from the Peruvian coast.

CONSERVATION

Charles Darwin was the first collector of *Aegialomys galapagoensis*, and about it he commented "This mouse or rat is abundant in Chatham Island, one of the Galapagos Archipelago. I could not find it on any other island of the group. It frequents the bushes, which sparingly cover the rugged streams of basaltic lava, near the coast, where there is no fresh water, and where the land is extremely sterile" (cited in Waterhouse, 1839:66). It now has been pointed out in the literature (Heller 1904; Patton and Hafner 1983; Tirira 2001, 2011) that the population from San Cristobál Island is extinct, and except for data associated with the specimen that Darwin secured all available data is from the population of Santa Fé Island.

On Santa Fé Island, *A. galapagoensis* is considered "Vulnerable" by the International Union for Conservation of Nature and Natural Resources (Weksler 2018). This listing follows D2 criterion which describes populations that occupy a limited number of locations (typically five or less) or the population occupies restricted areas (typically less than 20 km^2). In addition, the restricted population "is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period" (International Union for Conservation of Nature and Natural Resources Standards and Petitions Subcommittee 2017:69). In the Libro Rojo de los Mamiferos del Ecuador (Tirira 2011), this species is currently considered "Critically Endangered," under the criteria B1ac(i), that is related to extreme fluctuations in extent of occurrence. Jiménez-Uzcátegui et al. (2007) stated that the major threat to this species is introduced rats, although on this island the presence of such rats was not recorded. The Charles Darwin Foundation and Galapagos National Park Service monitors the presence of the black rat (*Rattus rattus*) on islands with endemic native species (Jiménez-Uzcátegui et al. 2007).

Brosset (1963) stated that the two elements that promote extinction of this species were the considerable population of feral cats and the population of *R. rattus*. But according to Clark (1980) this species is not a threatened species: he estimated that the population numbers vary between 10^4 and 10^5 individuals and he believes that the only danger to *A. galapagoensis* would be the presence of *R. rattus*. Further, the great temporal differentiation found in Johnson (2009) following an El Niño Southern Oscillation event may be a signal of the potential impacts of global climate change.

As all modern records are from Santa Fé Island (one of the few islands without rodent invasive species of genus *Rattus*), there are some concerns about the conservation of *A. galapagoensis*. Dowler et al. (2000) stressed that there are few data for the ex situ management of this species (and other endemic species of Galapagos, as the small Fernandina Galapagos mouse *Nesoryzomys fernandinae*), and that such programs should be started as soon as possible to protect *A. galapagoensis* from extinction.

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