

= 56 , FNa =

56) . The autosomes include 26 pairs of acrocentric chromosomes , with a long and a very short arm , and one medium @-@ sized submetacentric pair , with one arm shorter than the other . The X chromosome is either acrocentric , with a long and a short arm , or subtelocentric , with a long and a vestigial arm . The form of the sex chromosomes has been used to distinguish the marsh rice rat from *Oryzomys couesi* , but there are no consistent differences between the two .

As is characteristic of Sigmodontinae , *Oryzomys couesi* has a complex penis , with the baculum (penis bone) ending in three cartilaginous digits at its tip . The outer surface of the penis is mostly covered by small spines , but there is a broad band of nonspinous tissue . The papilla (nipple @-@ like projection) on the dorsal (upper) side of the penis is covered with small spines , a character *Oryzomys couesi* shares only with *Oligoryzomys* and the marsh rice rat among oryzomyines examined . On the urethral process , located in the crater at the end of the penis , a fleshy process (the subapical lobule) is present ; it is absent in all other oryzomyines with studied penes except the marsh rice rat and *Holochilus brasiliensis* .

= = = Skull = = =

The nasal and premaxillary bones do not extend back beyond the point where the lacrimal , frontal , and maxillary bones meet . The zygomatic plate , the flattened front part of the zygomatic arch , is broad and develops a notch at its front end . The plate 's back margin is located before the first upper molar . The jugal bone , part of the zygomatic arch , is reduced , as usual in oryzomyines . The sphenopalatine foramen , a foramen (opening) at the side of the skull above the molars , is small ; it is much larger in the marsh rice rat . The narrowest part of the interorbital region is towards the front and the edges are lined by prominent shelves . The parietal bones extend to the sides of the braincase . The interparietal bone is narrow and wedge @-@ shaped , so that the parietal and squamosal bones meet extensively .

The incisive foramina , openings in the front part of the palate , reach backward between the molars . The palate is long , extending substantially beyond the third molars , the usual condition in oryzomyines . The back part , near the third molars , is usually perforated by prominent posterolateral palatal pits , which are recessed into fossae (depressions) . Sphenopalatine vacuities are usually absent , but have been reported in some populations . There is no alisphenoid strut , an extension of the alisphenoid bone that in some oryzomyines separates two foramina in the skull . The condition of the arteries in the head is highly derived . The subsquamosal fenestra , an opening in the back part of the skull determined by the shape of the squamosal bone , is present . The squamosal lacks a suspensory process that contacts the tegmen tympani , the roof of the tympanic cavity , a defining character of oryzomyines . There are some openings in the mastoid bone .

In the mandible (lower jaw) , the mental foramen , an opening just before the first molar , opens sideways , not upwards as in a few other oryzomyines . The upper and lower masseteric ridges , which anchor some of the chewing muscles , join at a point below the first molar and do not extend forward beyond that point . The capsular process , a raising of the bone of the back of the mandible that houses the back end of the incisor , is large .

= = = Teeth = = =

The dental formula is $1 \text{ @.} 0 \text{ @.} 0 \text{ @.} 31 \text{ @.} 0 \text{ @.} 0 \text{ @.} 3 \times 2 = 16$ (one upper and one lower incisor and three upper and three lower molars on each side of the jaws) , as usual in muroid rodents . The upper incisors are opisthodont , with the chewing edge located behind the vertical plane of the teeth . The molars are bunodont , with the cusps higher than the connecting crests , and brachydont , low @-@ crowned , as in most other oryzomyines . Many accessory crests , including the mesoloph on the upper molars and the mesolophid on the lower molars , are present , another trait *O. couesi* shares with most but not all other oryzomyines . The flexi and flexids (valleys between the cusps and crests) at the labial (outer) side of the molars are closed by cingula

(ridges) .

On the first and second upper molars , the flexi do not extend to the midline of the molars . The anterocone , the front cusp of the upper first molar , is not divided in two by an indentation at its front (anteromedian flexus) . A crest , the anteroloph , is present behind the labial cuspule . As in most oryzomyines , the upper molars all have one root on the inner (lingual) side and two on the outer (labial) side ; in addition , the first upper molar usually has another small labial root .

On the first lower molar , the labial and lingual conules of the anteroconid , the frontmost cusp , are separated by an anteromedian fossette . The second lower molar bears a crest , the anterolophid , before the two cusps , the protoconid and metaconid , that form the front edge of the molar in some other oryzomyines . There is a distinct ridge (anterolabial cingulum) at the outer front (anterolabial) edge of the molar , before the protoconid . The third lower molar also bears an anterolophid and an anterolabial cingulum . The first lower molar has large roots at the front and back of the tooth and two smaller ones in between , at the labial and lingual side . The second and third lowers molars have two large roots , one at the front and one at the back .

= = = Postcranial skeleton = = =

As usual in oryzomyines , there are twelve ribs . The first rib articulates with both the last cervical (neck) and first thoracic (chest) vertebrae , a synapomorphy of the Sigmodontinae . Anapophyses , processes at the back of a vertebra , are absent from the fifth lumbar . Between the second and third caudal vertebrae , hemal arches (small bones) are present with a spinous back border . The entepicondylar foramen is absent , as in all members of the Sigmodontinae ; if present , as in some other rodents , this foramen perforates the distal (far) end of the humerus (upper arm bone) .

= = Ecology and behavior = =

The distribution of *Oryzomys couesi* extends from southern Texas and central Sonora , but not the central plateau of Mexico , through Central America south and east to northwestern Colombia ; see under " Taxonomy " for details . The species has also been found in late Pleistocene cave deposits in Mexico and Honduras . It is common in watery habitats , such as marshes and small streams , but also occurs in forests and shrublands with sufficient cover . In addition , it is found in sugarcane and rice fields . In Texas , it occurs in marsh vegetation along resacas (oxbow lakes) and in Veracruz , it has even been found on the dry coastal plain among shrubs . It occurs from 2 @, @ 300 m (7 @, @ 500 ft) altitude down to sea level . On Cozumel , the proportion of juveniles and females is higher near roads that function as habitat edges . Cozumel rice rats rarely cross roads , which may isolate subpopulations on the island .

Oryzomys couesi lives on the ground and is semiaquatic , spending much time in the water , as Alston in his original description already recognized , but is also a good climber . A study in Costa Rica found that *O. couesi* is an excellent swimmer , diving well and using its tail to propel itself . It is probably able to forage underwater , which may help differentiate its niche from that of the ecologically similar cotton rat *Sigmodon hirsutus* , which also swims well , but does not dive . When disturbed , *O. couesi* will enter the water and swim away . It is primarily active during the night . *Oryzomys couesi* builds globular nests of woven vegetation suspended among reeds , about 1 m (3 @. @ 3 ft) above the water or the ground ; in Texas , larger individuals make larger nests . It does not usually make its own runways in vegetation , but may use those of other rodents , such as cotton rats .

Population densities range from 5 to 30 per ha (2 to 12 per acre) . On Cozumel , density is around 14 @. @ 5 to 16 @. @ 5 per ha (5 @. @ 9 to 6 @. @ 7 per acre) , but shows large seasonal variation . In western Mexico , one study found densities of 3 per ha (1 @. @ 2 per acre) in cloud forest and 1 per ha (0 @. @ 4 per acre) in a disturbed area . In 24 hours , male Texas *O. couesi* move up to 153 m (502 ft) and females up to 126 m (413 ft) . The diet includes both plant material , including seeds and green parts , and animals , including small fish , crustaceans , snails , insects like ants and beetles , and other invertebrates . It probably breeds around the year and after a

pregnancy of 21 to 28 days , the female produces litters of two to seven young , with an average of 3 @. @ 8 , according to Reid 's Mammals of Central America & Southeast Mexico . In 28 pregnant females from Nicaragua , litter size varied from one to eight , averaging 4 @. @ 4 . The young become reproductively active when seven weeks old and the life cycle is short .

The introduced snake *Boa constrictor* preys on *O. couesi* on Cozumel . Parasites recorded on *O. couesi* in Veracruz include unidentified ticks , mites , fleas , and fly larvae . The flea *Polygenis odiosus* was found on an *Oryzomys couesi* from Cozumel . Out of ten *O. couesi* in San Luis Potosí , five each were infected by the nematode worms *Hassalstrongylus musculi* and *H. bocqueti* , with about 25 worms per rat , and two were infected by one or two cestodes of the genus *Raillietina* . The mites *Eubrachyla elaps circularis* and *Gigantolaelaps boneti* have been found on *Oryzomys couesi* in Oaxaca , the sucking louse *Hoplopleura oryzomydis* in Nicaragua , the mites *Laelaps oryzomydis* , *Echinonyssus microchelae* , *Ornithonyssus bacoti* , *Prolistophorus frontalis* , and *Prolistophorus bakeri* in Colima , and the apicomplexan *Eimeria couesii* in Mexico . The species is infected by two hantaviruses ? *Catacamas virus* in Honduras and *Playa de Oro virus* in western Mexico ? which are related to the Bayou virus infecting the marsh rice rat , a common cause of hantavirus infections in the United States . No hantavirus infections in humans have been linked to *O. couesi* hantaviruses , however . Chiapas *O. couesi* easily survive experimental infection with several arboviruses , including the Venezuelan equine encephalitis virus , suggesting that the species may serve as a reservoir for that virus .

= = Conservation status = =

The IUCN lists *Oryzomys couesi* as " Least Concern " , because it is a widely distributed , common species with broad habitat tolerance that occurs in many protected areas . Habitat destruction , such as drainage of wetlands , may threaten some populations . In many areas , it is so common that it is considered a plague species . Populations even persist in the Valley of Mexico , as evidenced by a photograph published in 2006 . However , it is listed as threatened in Texas , where its distribution is very limited , because of habitat loss . In 1979 , Benson and Gehlbach estimated the size of the Texas population to be about 15 @, @ 000 . A 2001 study predicted that climate change would drive the Texas population to extinction , because no suitable habitats would continue to exist . The Cozumel population has declined substantially since the mid @- @ 1980s , perhaps due to habitat disturbance and predation by introduced species .