

***Rhinemys rufipes* (Spix 1824) –
Red Side-necked Turtle, Red-footed Sideneck Turtle, Perema**

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SUMMARY. – *Rhinemys rufipes* is a small colorful reddish side-neck turtle (Family Chelidae) restricted to small shallow black-water closed-canopy streams in forested regions of the upper Amazon River Basin in Brazil and Colombia. Females reach a carapace length (CL) of about 256 mm, maturing at about 195 mm CL; males are slightly smaller at about 230 mm CL. Clutch size varies from 3 to 12 eggs, but natural nesting in the wild has never been recorded. Although once considered uncommon, the species is perhaps much more abundant than museum records indicate, since it is a secretive nocturnal species rarely seen, and does not occur in larger rivers. Extensive trapping in small streams in the Amazon Basin may show this species to be one of the most abundant turtles in South America. Many Brazilian forest reserves are located in regions that may have high densities of the species. The only potential threats for this species at present are development and agriculture pressures leading to forest destruction and degradation.

DISTRIBUTION. – Brazil, Colombia, Venezuela (?). Known only from parts of the upper northwestern Amazon Basin in Colombia and Brazil in the states of Amazonas and Pará. May also occur in southern Venezuela.

SYNONYMY. – *Emys rufipes* Spix 1824, *Hydraspis rufipes*, *Rhinemys rufipes*, *Chelys (Hydraspis) rufipes*, *Chelys rufipes*, *Platemys rufipes*, *Phrynops rufipes*.

SUBSPECIES. – None currently recognized.

STATUS. – IUCN 2014 Red List: Near Threatened (NT, assessed 1996); TFTSG Draft Red List: Least Concern (LC, assessed 2011); CITES: Not Listed.

Taxonomy. – The species was described as *Emys rufipes* by Spix (1824). It is distinctive, and the small number of specimens in collections and limited geographical variation has not been conducive to the description of subspecies. Vanzolini (1981) considered Spix's *Emys stenops* to be a

synonym for *Phrynops rufipes*, though Spix must not have seen the specimen alive, as he did not mention the brilliant pink feet and head that are typical of juvenile *P. rufipes*, and most researchers currently synonymize *E. stenops* with *Mesoclemmys gibba*. In addition to its original placement in



Figure 1. Adult male (left) and female (right) *Rhinemys rufipes* from Reserva Ducke, Amazonas, Brazil. Photo by Richard C. Vogt.



Figure 2. Adult male (left) and female (right) *Rhinemys rufipes* from Reserva Ducke, Amazonas, Brazil. Photo by Richard C. Vogt.

the genus *Emys*, the species has been included in five other genera (*Chelys* [= *Chelus*], *Rhinemys*, *Hydraspis*, *Platemys*, and *Phrynops*), with the majority of the pertinent literature found under *Phrynops*. The genus *Rhinemys* was resurrected for the species in 2001 (McCord et al. 2001) and it is currently placed in that genus.

Description. — The carapace, except in hatchlings, has a distinct medial keel and is only slightly wider posteriorly. The anterior lobe of the plastron is wider than the posterior lobe. The intergular plate of the plastron is wide and protrudes anterior to the gulars. The anal notch is deeper and more triangular in males. Males also differ from females in having a concave plastron, and a longer, thicker tail.

Distinct growth rings are present in juveniles, but the centers of scutes are remodeled and adults usually have only about 7 closely-spaced rings (Magnusson et al. 1997b). The most distinctive characteristic of the species is the pink to red coloration of the legs, neck, and head. Juveniles are brightly colored but the intensity fades with age. The feet, upper surface of the legs, and the dorsal surface of the neck are darker than the rest of the soft parts, and in some individuals



Figure 3. Subadult *Rhinemys rufipes* from Presidente Figueiro, Amazonas, Brazil. Photo by William E. Magnusson.

may be dark brown. There is a black medial stripe on the head and a black lateral stripe through each eye. These stripes may become indistinct in large specimens. The dorsal surface of the carapace is brown, becoming darker around the border. The ventral surfaces of the carapace and plastron are light yellow.

The largest female in a series of 24 specimens from Colombia measured 256 mm carapace length (CL) (Lamar and Medem 1982). The largest male in the series measured only 199 mm CL and those authors assumed that females reach larger sizes than males, but only five of their turtles were males. In a series of 23 females and 19 males from central Amazonia, the five largest females ranged from 222 to 250 mm CL. The five largest males ranged from 204 to 230 mm CL and only one was larger than 211 mm (Magnusson et al. 1997b). This supports the previous authors' conclusion that the species is dimorphic in size. Lamar and Medem (1982)



Figure 4. Hatchling *Rhinemys rufipes* from Reserva Ducke, Amazonas, Brazil. Photo by Richard C. Vogt.

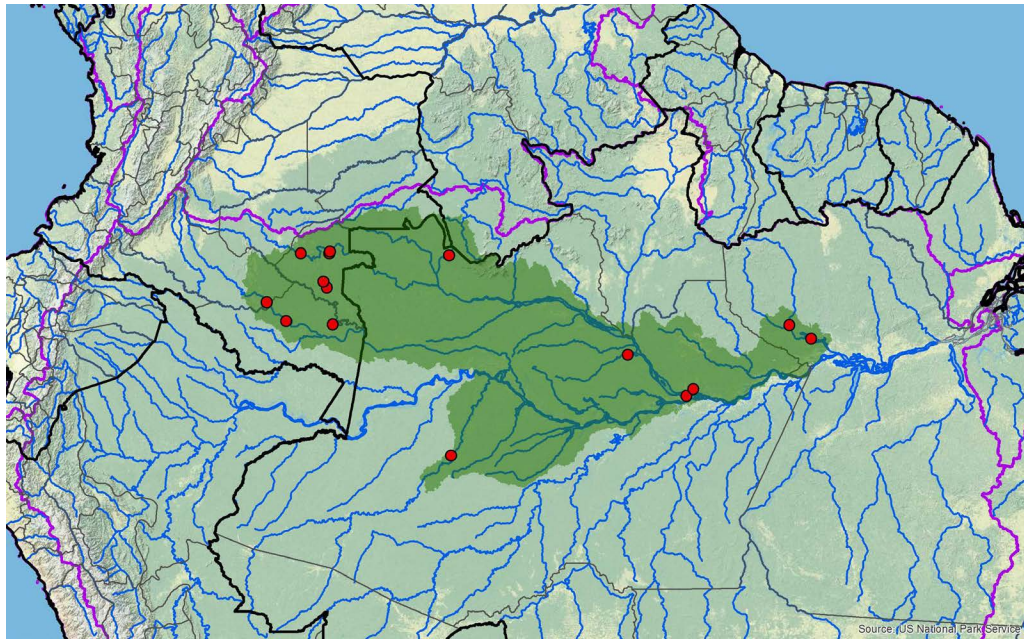


Figure 5. Distribution of *Rhinemys rufipes* in the Amazon Basin of northern South America, including Brazil, Colombia, and possibly Venezuela. Purple lines = boundaries delimiting major watersheds (level 3 hydrologic unit compartments – HUCs); red dots = museum and literature occurrence records of native populations based on Iverson (1992) plus more recent and authors' data; green shading = projected native distribution based on GIS-defined HUCs constructed around verified localities and then adding HUCs that connect known point localities in the same watershed or physiographic region, and similar habitats and elevations as verified HUCs (Buhlmann et al. 2009; TTWG 2014), and adjusted based on authors' subsequent data.

recorded a 240 mm CL female with shelled eggs and the smallest gravid female captured in the Manaus region, Brazil, was 204 mm (Magnusson et al. 1997b). Females near Manaus are mature in 6–10 yrs at about 195 mm CL (Magnusson et al. 1997b, Vogt, unpubl. data), but fast-growing females could possibly reach reproductive maturity at smaller sizes (Magnusson et al. 1997b).

Distribution. — The known distribution of *Rhinemys rufipes* includes the upper Amazon Basin of Brazil and Colombia.

In Colombia it occurs in the Apaporis, Vaupés, Pirá-Paraná, and Papurí river basins (Lamar and Medem 1982, Rueda-Almonacid et al. 2007; Páez et al. 2012). In Brazil, the range extends throughout the Rio Negro Basin from

Tabatinga to Manaus, including tributaries of the Jaú River, Presidente Figueiredo Municipality, and into the state of Pará, where it is known from tributaries of the Trombetas River. An adult female was found in Porto Trombetas and a disarticulated shell obtained from a small tributary of the Rio Trombetas near Cachoeira Porteira (Vogt, unpubl. data).

The species still occurs in remnant forest on the campus of the Universidad Federal de Amazonas within the city limits of Manaus. More intensive studies may show it to occur in most or all of the closed-canopy black-water streams in the Amazon basin. The species occurs in a geographic area of at least 198,440 km² (Santos and Blamires 2009).

Although this species has been hypothesized to possibly occur in Peru, it has not yet been found, and Bill Lamar (pers. comm.) after over 20 years in the field in Peru doubts the species occurs there. We do not include Peru in the distribution of *R. rufipes*.

Its distribution does include upper Amazonian watersheds in Brazil that extend into southern Venezuela, and it most likely occurs there, with an unconfirmed record noted by Barrio-Amorós and Narbaiza (2008).

Habitat and Ecology. — *Rhinemys rufipes* occurs in small, closed-canopy rainforest streams in both Colombia (Lamar and Medem 1982) and the Manaus region of Brazil (Magnusson et al. 1997a). It is unlikely that it occurs commonly in larger rivers, as these are relatively well studied and no records have been forthcoming. Lamar and Medem (1982) did not record other turtles in the same habitat as *R.*



Figure 6. Hatchling *Rhinemys rufipes* from Reserva Ducke, Amazonas, Brazil. Photo by Richard C. Vogt.



Figure 7. Small shallow relatively cool black-water closed-canopy forest stream in Reserva Ducke, Amazonas, Brazil, typical habitat for *Rhinemys rufipes*. Photo by Richard C. Vogt.

rufipes, although other species occurred in the larger open-canopy streams in the same region.

In the Manaus area, the only other aquatic chelonian that occurs in closed-canopy forest is *Platemys platycephala*. That species occurs in small streamside ponds. As it rarely enters running water, it probably has little chance of interaction with *R. rufipes*. The habitat requirements of *R. rufipes* appear to be very similar to those of the Smooth-fronted Caiman (*Paleosuchus trigonatus*) (Magnusson and Lima 1991), and this larger species may be a useful indicator for discovery of new populations of *R. rufipes*.

Rhinemys rufipes is primarily nocturnal, although individuals may be seen moving on the bottoms of pools at dusk. Individuals do not normally bask, even in captivity. Captive individuals may hide among dried vegetation in the enclosure, but extensive radiotelemetry studies in the Manaus area have indicated that the species rarely if ever leaves the water in the wild (Magnusson et al. 1997b). A temperature datalogger (Onset Tidbit™) attached to an adult female for 2 years indicated that she rarely if ever left the water and maintained a temperature close to that of the stream.

Individuals are primarily nocturnal, foraging away from hiding places in the overhanging banks or among the fallen leaves and trunks in the stream bed from 1900 to 2400 hrs. The home ranges are small, extending only 1–2 km along a stream (0.4–0.8 ha) (Magnusson et al. 1997a), where the turtles forage for most of their lives. Often 4–6 turtles are captured together; this could be the result of attraction to a fresh food source or of reproductive activities. It is possible that these turtles communicate vocally underwater as does the similar Australian species, *Chelodina oblonga*, and when they find food sources, communicate to others. Densities of 17–18 individuals per km of stream have been recorded near Manaus (Magnusson et al. 1997a, Sanchez 2008).

In Colombia, *R. rufipes* has been observed to frequently suffer from a chronic bacterial infection which causes lesions beneath the scutes on the carapace, plastron, and on parts of the head and body (Lamar and Medem 1982). Postmortem analysis of one specimen indicated that the causal pathogen was *Proteus morganii* (= *Morganella morganii*, a gram-negative bacteria).

No such infections have been seen in animals from the Manaus area and one captive specimen survived several months in a rather unclean pool together with caimans. Despite regularly receiving bites to the shell when it attempted to pull mice from the caiman's jaws, it never developed superficial infections.

Hugh-Jones (cited by Lamar and Medem 1982) reported that a specimen had leeches clinging to the soft parts around the base of the limbs. These may have been *Temnocephala*, (flatworms) which occur on all specimens at Reserva Ducke outside Manaus. The egg capsules form mats on the under surface of the carapace and upper surface of the plastron. The adults occur on the soft skin in areas protected by the shell and, when out of water, have the appearance of small leeches.

Individuals accept a range of foods in captivity and they are readily trapped with fresh chicken as bait. Colombian Indians capture the species with a variety of baits (Lamar and Medem 1982). However, in the wild, palm fruits appear to be a frequently consumed food of turtles large enough to swallow them (Lamar and Medem 1982; Lima et al. 1997). In both Colombia and the Manaus region, the most commonly consumed palm fruits are from species of *Euterpe* and *Iriartea*. Individuals of all sizes also consume insects and crustaceans. Activity of these turtles is stimulated by local downpours of rain that raise the water level of the stream rapidly, perhaps because more fruits and seeds

are washed into the river at this time, enhancing foraging success.

The greater part of the mass of stomach contents consists of palm seeds, but much of this may be indigestible and the relative contributions of animal and plant matter to overall nutrition are not known (Caputo and Vogt 2008). Lamar and Medem (1982) reported fish in the stomach contents, but the only vertebrates recorded from fecal samples in the Manaus area have been lizards (Lima et al. 1997). These authors had trouble flushing the stomachs of individuals that had ingested very large numbers of palm fruits; these can be felt through the body wall but are not flushed by Legler's (1977) technique. After one animal died due to a ruptured stomach, they decided to rely on fecal analysis to study the diet of this species. Caputo and Vogt (2008) successfully stomach-flushed all 31 adult *R. rufipes* captured in Reserva Ducke, and collected feces from ten of the flushed turtles. Their results showed that only an integrated approach using both techniques is able to provide a comprehensive picture of the species' diet. Trichopteran larvae were the most consumed item in numeric terms and in frequency of occurrence, but shrimp contributed the greatest volume of invertebrates. The seeds of most species of palm trees common around streams in the area were eaten. Due to the limitations of stomach-flushing technique, palm fruits were underestimated, but they still contributed the highest volume of material flushed from the stomachs and found in the feces. These findings modify the conclusions of the earlier studies of the food habits of *R. rufipes*; it is an omnivorous species that feeds opportunistically on a greater quantity of benthic macroinvertebrates and fish than was evident from earlier studies based on fecal sampling alone.

Colombian Indians have indicated that *R. rufipes* nests from June to August (Tukano), December to January (Karapana), August to September and December to February (Barasana), and a female with shelled eggs was captured in Colombia in August (Lamar and Medem 1982). Females with shelled eggs have been collected from March through July as the rainy season ends in the Manaus region (Vogt, Magnusson, and Lima, unpubl. data), and the size distribution of juveniles indicates that the peak of hatching occurs in June (Magnusson et al. 1997b). Most Indian informants indicate that oviposition occurs in the dry season and that the eggs are laid in streamside sand beaches exposed to the sun (Lamar and Medem 1982), but this has yet to be confirmed. Radiotelemetry studies have never documented this species coming out of the water, and natural nests have never been found. Nesting may take place underground in runways under overhanging riverbanks or locations away from streams, because nests have never been found in sandbanks along the margins of the streams where the species is abundant in the Manaus region. One female was recaptured in Igarape Bolivia in Reserva Ducke in May 2012, with temperature

data logged from 22 June 2008 to 27 March 2010. Mean temperature of the radio fixed to the carapace was $24.9^{\circ}\text{C} \pm 0.47$ (23.3–26.6), $n = 15,445$. Stream water temperatures in Reserva Ducke are generally between about 22 and 26°C (Mendonça et al. 2005). The relatively constant temperature of the radio, with no rapid abrupt changes, suggests that the female rarely if ever left the water during this time (Vogt et al. 2012).

Dimensions of eggs from one near-term clutch of hard-shelled eggs were given by Lamar and Medem (1982). The four eggs ranged from 41 x 37 mm to 42 x 38 mm and weighed 32.5 to 34.5 g. In Colombia clutch size varies from 3 to 12 eggs (Rueda-Almonacid et al. 2007). Clutch size from 7 females at Reserva Ducke in Manaus, Brazil, ranged from 3 to 8 eggs (mean 4) (Vogt 2008). Freshly laid eggs from these clutches had a mass of 24–33 g (mean 30.0 g), length 37–44 mm (mean 40.8), and width 32–36 mm (mean 34.4). In the Manaus region, the carapace of hatchlings varied from 51 to 57 mm (Magnusson et al. 1997b). Eggs of 7 females obtained by oxytocin injection indicate that incubation at ambient temperature (about 26–29°C) takes 5–6 months. Both males and females were produced at controlled incubation temperature of 25°C, and embryos died at constant temperatures above 28°C.

Population Status. — Magnusson et al. (1997a) estimated the number of *R. rufipes* in Reserva Ducke in Manaus to be about 2500 individuals. Since individual turtles show site fidelity and have small home ranges, the large number of turtles in the reserve suggests that the species has a good chance of persisting in the reserve for a long time. Sanchez (2008) conducted a mark and recapture study throughout the Reserve and made a population estimate of less than 50% of what the population was estimated to be 10 years previously (only 420 and 1100 turtles), but the methods used were different and may not be comparable.

Based on these studies, and the relatively large geographic range, this species could potentially be among the most abundant turtle species in South America (Magnusson et al. 1997a, Vogt 2008). From 1984 to 2008, 83 capture-recapture events were recorded in Reserva Ducke, including 53 females (CL 135–242 mm), 30 males (CL 123–225 mm), and one juvenile (Bernardes et al. 2008). Growth constant estimated from the Von Bertalanffy model was 1.7% higher for females ($k = 0.170$) than males ($k = 0.167$), whereas the parameter b was 0.77 for females and 0.75 for males (Magnusson et al. 1997a).

Lamar and Medem (1982) reported that the species is hunted, and perhaps overhunted, by several indigenous tribes in Colombia. However, it is generally not a preferred species and “terra firma” forest far from large rivers in the Amazon generally has low human densities. The apparent rarity of the species (Pritchard 1979) probably only reflects the rarity of chelonian research in closed-canopy Amazonian

rainforest. If the density of the species in Reserva Ducke (Magnusson et al. 1997a) is typical of the densities in the small closed-canopy black-water streams that cover most of the northwestern Amazon basin, *R. rufipes* may be one of the most abundant South American freshwater turtles.

Threats to Survival. — Local populations may be reduced by overhunting by indigenous people in Colombia (Lamar and Medem 1982), but the species is rarely pursued for food in Brazil. In Jaú National Park along the Rio Negro in Brazil the species is considered taboo and not eaten (Pezzuti et al. 2010). Mining may also affect the species in some areas. However, at the present, the species is probably not at significant threat of extinction in most areas within its range. The survival of the species is probably tied to the future of the Amazon forest, which in turn is tied to logging, agriculture, mining, roads, development, forest destruction and degradation, and other presently unpredictable pressures.

Although it is a beautiful species of turtle, it has not been actively collected for the pet trade, because Brazilian law prohibits such activity and it is rarely encountered in Colombia. At this point in time there is no reason to mount particular conservation efforts for this species; it has ample suitable habitat throughout millions of hectares in the northwestern Brazilian Amazon Basin where it is not pursued or in any great danger of habitat destruction. The species is maintaining viable densities close to urbanization and even within the city of Manaus.

Conservation Measures Taken. — The species is totally protected in Brazil, but it is unlikely that there are any effective conservation measures taken. Its presence in Brazilian protected areas has been confirmed in Jaú National Park, Reserva Florestal Adolpho Ducke, and Rio Trombetas Reserve (Vogt, unpubl. data). In Colombia it would likely occur in the Rio Puré, Cahuarí, and Yaigojé Apaporis National Parks.

The species has been assessed as Near Threatened on the IUCN Red List since 1996, but a reassessment by the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group in 2011 recommended that it be downlisted to Least Concern. It is not listed on CITES. In Colombia it is nationally red listed as Vulnerable (Castaño-Mora and Medem 2002, Páez et al. 2012) due to its apparent scarcity there.

Conservation Measures Proposed. — The exact distribution of the species should be determined in relation to possible phylogeographic variation and potential conservation or management units. Research on nesting in the wild would be helpful in terms of understanding its habitat and reproductive needs.

Captive Husbandry. — Medem (1975), Pritchard (1979), and Lamar and Medem (1982) reported difficulty in maintaining animals in captivity because of a bacterial or fungal disease of the shell that the turtles apparently had

when captured from the wild. Turtles from the Manaus region do not appear to suffer from this problem, though there have been no attempts to maintain them in captivity in Manaus for more than a few months. One of the problems people may have trying to maintain this species in captivity is that they are kept at too high a temperature, considering that they are a neotropical species; however, the temperature of this turtle in the wild rarely if ever exceeds 26°C.

Captive turtles readily take most animal flesh, and Medem and Lamar (1982) reported that one turtle died after gorging on seeds of *Euterpe oleracea*. However, since this species is subject to shell diseases it is probably advisable to maintain them in clean, preferably running, water and feed them on fresh crustaceans and palm or other fruits so as to mimic conditions in the wild where the disease does not appear to be fatal. Medem and Lamar (1982) reported that a male attacked a smaller male in captivity, possibly indicating the need to segregate individuals into compatible social groups.

Current Research. — Over 200 individuals have been marked in Reserva Florestal Adolpho Ducke, which lies 25 km from Manaus; Vogt and students continue monitoring the population in one stream there from March to June every year.

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