NOTES

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Lowland Interior-Forest Stream Habitat of *Galictis vittata* (Carnivora: Mustelidae) on the Las Piedras Tributary, Southeastern Peru.

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Resumen

Los registros de *Galictis vittata* (Huron) de la cuenca del Amazonas son escasos, particularmente en la región de Madre de Dios, donde sólo se han publicado tres registros. Este estudio elabora siete observaciones de *Galictis vittata* dentro y cerca de pequeños arroyos forestales interiores del afluente Las Piedras en Madre de Dios, Perú. Si bien *G. vittata* habita en ambientes terrestres, también se ha observado en asociación con hábitats acuáticos en partes de su área de distribución. Aunque se limitan a siete observaciones, todos los avistamientos documentados de *G. vittata* en la región de Las Piedras se han asociado con ecosistemas de arroyos. Con base en nuestros registros, investigaciones previas de la región y la historia natural conocida de la especie, planteamos la hipótesis de que los arroyos son un hábitat preferido en la selva amazónica. Además, proporcionamos notas de comportamiento asociadas con los encuentros.

Palabras clave: Huron, arroyos, Amazonía, hábitat

Abstract

Records of *Galictis vittata* (Greater Grison) from the Amazon basin are sparse, particularly in the Madre de Dios region, where only three records have been published. This study elaborates on seven observations of *G. vittata* within and near small interior forest streams of the Las Piedras tributary in Madre de Dios, Peru. While *G. vittata* inhabits terrestrial environments, it has also been observed in association with aquatic habitats in parts of its range. Although limited to seven observations, all documented sightings of *G. vittata* in the Las Piedras region have been associated with stream ecosystems. Based on our records, prior research from the region, and known natural history of the species, we hypothesize that streams are a preferred habitat in Amazon rainforests. Additionally, we provide behavioral notes associated with the encounters.

Palabras clave: grison, stream, Amazon, habitat.

Galictis vittata (Greater Grison) (Carnivora: Mustelidae) inhabits a wide range of tropical forest habitats throughout Central and South America from sea level to 2510 m (Bornholdt, 2013, Escobar-Lasso and Guzmán-Hernández 2014, Contreras-Díaz *et al.,* 2020, González-Salgado *et al.,* 2022). Although rarely documented in areas of its range (e.g., Caribbean Colombia in Jiménez-Alvarado et al. 2016), it has been observed in a variety of primary and disturbed environments, including agroforestry systems like coffee bean plantations (Sánchez-Brenes and Monge, 2022). It is frequently observed to inhabit areas near rivers, streams, and wetlands (Leopold 1959, Handley 1976, Jansen and Emmons 1990, Yensen and Tarifa 2003, Hernández-Hernández and Lagunes-Díaz, 2021). Early observations of captive *G. vittata* by Dalquest and Roberts in 1951 and later by Kauffmann and Kauffman in 1965 comment on the species' affinity for water, webbed feet, and its effectiveness at swimming.

Galictis vittata tends to exhibit lower population densities and overall rarity in comparison to other neotropical mustelids, such as *Eira Barbara* (Tayra) (Carnivora: Mustelidae) and *Pteronura brasiliensis* (Giant River Otter) (Carnivora: Mustelidae); In the Amazon rainforest, few direct wild observations and records of *G. vittata* exist (Redford and Fonseca 1986, Timm *et al.,* 1989, Janson and Emmons 1990, Tobler et al., 2008, Hice and Velazco 2012, Payne *et al.,* 2024). Few studies in Madre de Dios describe *G. vittata* occurrence, and some extensive studies have been unable to record them. For example, Tobler *et al.,* (2008), reported 3780 days using forty traps in a grid and did not record the species, Jansen and Emmons (1990) reported it from Manu as rare.

Records from Peru are particularly sparse, with the Global Biodiversity Information Facility dataset, containing 13 records with coordinates (excluding two iNaturalist observations) (gbif.org, accessed on April 29th, 2024). We are only aware of 3 references in literature from the region (Jansen and Emmons, 1990, Payne *et al.*, 2024). Given the limited knowledge regarding *G. vittata* biology, particularly within the Amazon rainforest, we provide descriptions of the habitat associated with observational records previously mentioned in (Payne *et al.,* 2024) from the Las Piedras River, a tributary of the Madre de Dios. Based on our records and evidence from other regional research, we hypothesize that *G. vittata* exhibits a preference for habitats near streams in primary forests.

The study area is situated along the central area of the Las Piedras River in the Madre de Dios region of southeastern Peru, several kilometers north of the Lucerna community and within the Tambopata Province. The records were made along a gradient of high-terrace terra firme forests, dominated by Brazil nut trees that transition to lower-elevation floodplain forests. Small tributaries deriving from terra firme ridges divide the floodplain from the high-ground forests and meander through both floodplain and higher terra firme forests. The forest of the study area remains largely intact and with little disturbance (Payne *et al.,* 2024). Four of our observations were made during nocturnal stream surveys on a small interior-forest stream's (Figure 1 B, C). WS is a geomorphologically unique system in the study area. It maintains water throughout the year and features a sandy bottom, although some deeper areas and current cuts reveal exposed rock. The bank width varies ca. 1.5-5 m across. The stream culminates with two waterfalls at its confluence with the Las Piedras River. Notably, the primary branch exhibits remarkably clear water, with visibility extending to depths exceeding one meter. There are two major source areas: one originating from a stream valley with multiple spring sources, offering clear and cold water, and the other emerging from a palm swamp, with tannin-stained black water and following a steep 30 m tierra firme divide. Throughout its course, the stream originates in higher

elevated tierre firme forests and traverses old semi-elevated floodplain forests characterized by dense undergrowth and interspersed with *Dipteryx micrantha* trees. WS displays more relative meandering than all other streams we have mapped on foot in the central Las Piedras area (n=13). The primary branch stretches 5200 m of stream length from the top of the tributary to its confluence, within a total differential distance of 2500 m. We made a fifth observation opportunistically on another distinct stream system, but nearby, ca. 460 m from the confluence of WS with the Las Piedras River. The stream is approximately 745 m in length. At the observed location, the banks of the stream from the main channel to the top are ca. 10 m in height. The depth of the stream was less than 30 cm, and the channel was ca. one m in width. At the source is a mineral lick and the stream's confluence ends with the Las Piedras River (-12.00425, -69.5213). Unlike WS, this smaller tributary dries out completely at the height of the dry season.

TABLE 1. Records of *Galictis vittata* near and within inter-forest streams on the Las Piedras River, Madre de Dios, Peru. Included in the table are two records reported by Payne *et al.,* 2024.

Date	Time	Location and Elevation	Observation
May 25th 2012	2320 h	Waterfall Stream -12.0700, -69.5232, 240 masl	Detected on the bank ca. 5 m away, where it remained for several seconds before it entered the water. It swam upstream with its head above the water slow enough for us to maintain visual while moving upstream. After following for approximately 50 m, the *G. vittata* submerged to traverse a thicket of Lianas from a fallen tree. We were able to continue following the individual for ca. 10 m, before it emerged from the water, ascended the bank (ca. 1 m), and climbed to the upper canopy (20-30 m) on a large tree that was within two meters of the stream bank.
July 6th 2013	2122 h	Waterfall Stream -12.069, -69.5207, 220 masl	Detected in the center of the channel and then swam along the bank and changed direction twice covering a 5-6 m length of the stream before retreating up the bank and into the forest. The observation was over one minute in duration, with five observers.
July 22nd 2013	0047 h	Waterfall Stream -12.0719, -69.5247, 220 masl	Detected on a flooded beach margin positioned with its legs and stomach partially submerged in shallow water. It remained motionless for approximately 30 seconds. It repositioned itself and moved at least two meters downstream behind a thicket of vegetation, however, was still partially visible for several minutes before climbing the bank behind it. It made several short snorting vocalizations while retreating.
August 1st 2013	0515 h	Waterfall Stream -12.0711, -69.5295, 220 masl	The lead observer treaded on the animal while turning around a corner in the stream along a sandy beach. It remained still for several seconds before producing a loud grunt, loud enough to be heard by other observers still moving through the water. It ascended the bank and was observed retreating loudly into the forest. The individual is presumed to be distinct from the other two encounters in 2013 due to noticeably smaller size.

June 8th 2016	1057 h and 1101 h	Loboyoc Stream -12.0728, -69.4922, 235 masl	Reported by Holly O'donnel in Payne et al. (2024). Two records were acquired several minutes apart in floodplain forests, 80 m from the Loboyoc stream and 200 m from the Las Piedras River using a camera trap. It is not known if it is the same individual or two.
June 7th 2017	1300-1400	Seasonal Stream -12.06, -69.52, 250 masl	Detected while crossing a small stream in semi-elevated floodplain forests north of WS. When we ascended over the edge of the bank, we detected G. vittata facing us ca. 5 m away. It retreated from us and onto a trail. As we entered the trail, It continued away from us for another five-ten meters before moving out of sight.

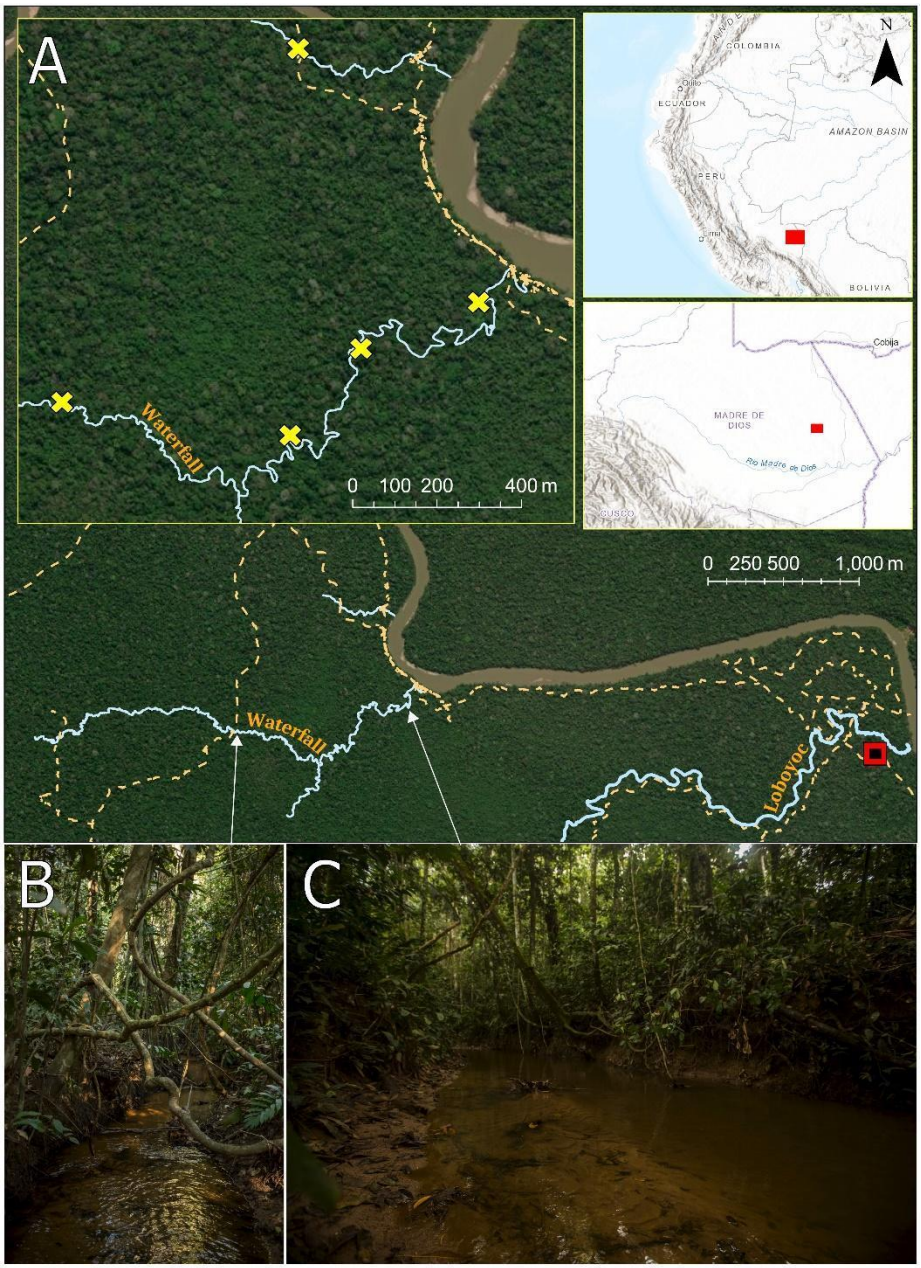

FIGURE 1. A- Records of *Galictis vittata* from three streams on the Las Piedras River of Peru. Yellow crosses depict new records of *G. vittata*. The square is a record reported by (Payne *et al.*, 2024). Blue lines depict inter-forest streams, and dotted lines are trails. B and C- Typical habitat characteristics of the Waterfall Stream (Photographs by Mohsin Kazmi). Maps were produced using ArcGIS Pro (Environmental Systems Research Institute (ESRI), Redlands, California, United States). Departmental and country boundaries as well as imagery were facilitated through ESRI's image and living atlas platforms. Stream tracks were generated from the field using Garmin 64s.

The behavior, natural history, and ecology we observed are consistent with information reported from parts of the species' range. According to Emmons (1999), Wainwright (2002), and Yensen and Tarifa (2003), *G. vittata* exhibits nocturnal activity, can hunt prey in water (such as fish and frogs), and is noted to be a proficient swimmer. *Gallictis vitatta* has an extensive range and occurs in various habitats throughout. For example, in Colombia, *G. vittata* occurred from sea level to elevations as high as 2510 m (González-Salgado *et al.,* 2022), in both forested and disturbed areas (González-Maya *et al.,* 2019). All records of *G. vittata* from the Las Piedras River (n=7) are associated with streams. Grid studies reported in both (Tobler *et al.,* 2008) (Los Amigos River) and (Payne *et al., 2*024) did not record *G. vittata*, suggesting that streams might be a preferred habitat. Although these records are consistent with other literature depicting *G. vittata* as having an affinity for water, our observations may shed further light on how much this species prefers aquatic habitats, specifically stream ecosystems in Amazon forests. Investigation of a *G. vittata* population inhabiting tropical forests of the Osa peninsula in Costa Rica found an association with stream systems (Van Calster Rolin, 2022). Notably, Van Calster Rolin found that burrows of prey items along permanent streams appear important for grison ecology. Given the known affinity of *G. vittata* for aquatic habitats and the lack of records from extensive grid studies regionally, we suggest that *G. vittata* may demonstrate a preference for streams in Amazon rainforests, like those from the Osa Peninsula. This study represents an addition to the limited knowledge available on *G. vittata* in the region. Large-scale camera trap projects with stream coverage within the Amazon basin could further evaluate and validate these observations.

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