

Snakes (Serpentes) of the newly designated comarca of western Panama

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Abstract. With snakebite being a serious concern in Panama and throughout Latin America, it is essential to know what species occur in each political province or comarca. In 2020 the new Naso Tjër Di comarca was formed in the far northwestern corner of Panama. Here we provide a list of snakes found in the Naso Tjër Di comarca and update the list for Bocas del Toro province. We also note the importance of citizen science data in at least some fauna surveys.

Keywords. Bocas del Toro, citizen science, Indigenous, Naso Tjër Di, snakebite

Introduction

When political borders are proposed and eventually designated, they are typically not consistent with habitat boundaries (Dallimer and Strange, 2015; Ray and Ruback, 2015). As a result, there may be a need for new surveys of biological diversity, especially in remote areas. Nowadays, with GIS locations attached to many specimens or digital records, this can be as easy as a computer search. However, when remote areas change leadership or when borders are redefined, it is necessary to understand what flora and fauna are also affected by the changes. When political changes are compounded with habitat loss, the spread of disease, pollution, and other environmental factors negatively affect many species in drastic ways.

Given that snakebite is considered a public health crisis, it is essential to update species lists of snakes for each area. In fact, according to Gutiérrez et al. (2009) “Panama presents the highest incidence of snakebite cases in the Americas (40–65 cases per 100,000 population per year), with an estimated total number of 1300–1800 cases per year.” Although local residents may know which snakes occur in the area, tourists and other visitors will not, thus creating the potential for serious consequences if someone is bitten

by a snake. Furthermore, a better understanding of the diversity of species could lead to better management; in particular reducing the number of intentional killings for nonvenomous snakes. Here, we provide a species list for snakes for the recently formed Naso Tjër Di Comarca and update the snake fauna for Bocas del Toro Province, Republic of Panama.

Materials and Methods

Study area. Bocas del Toro Province, with a total area of 4657 km², is located in the northwestern corner of Panama on the Caribbean Sea and includes the Bocas del Toro archipelago. The province includes two protected areas: Parque Nacional Marino Isla Bastimentos, which includes Isla Bastimentos and neighbouring smaller islands, and Parque Internacional La Amistad, which runs on both sides the length of the Costa Rican-Panamanian border (Fig. 1). The borders of Bocas del Toro were changed in 1997 when the Ngöbe-Buglé Comarca was established and proposed to be changed again in 2020 when the Naso Tjër Di Comarca was formed.

Naso Tjër Di Comarca is the newest Panamanian comarca, or indigenous region with rights to govern their own lands, and was created on 4 December 2020. Naso Tjër Di is located right on the border with Costa Rica in the northwestern portion of Panama. It is 1606 km² large, of which 1469 km² (91%) is protected within Parque Internacional La Amistad and Bosque de Protector Palo Seco (Fig. 1). In 2018, it was within these large expanses of protected lands that the first attempt to become “independent” was vetoed, citing that the Panamanian constitution did not allow for an

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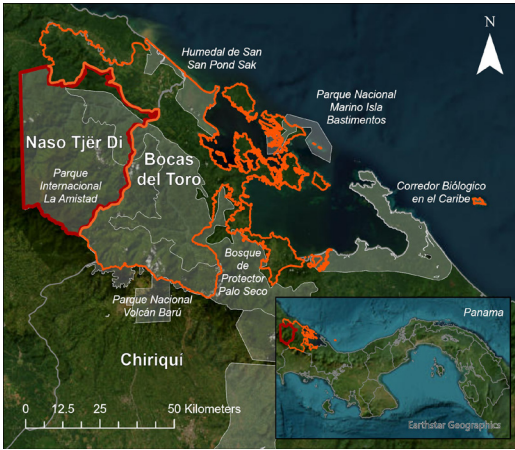


Figure 1. Map of the study area with Bocas del Toro Province highlighted in orange and the Naso Tjër Di Comarca highlighted in red. Protected areas are outlined in grey.

indigenous comarca on protected lands. However, the decision was taken to court and later ruled to not be a violation, thus resulting in the formation of Naso Tjër Di (La Prensa, 2018). The comarca was not included as independent from the Bocas del Toro Province in the most recent 2020 population census, but has an estimated population of 5000, mostly Naso people.

Specimen collection. We utilised our own extensive database of records of Panamanian snakes to conduct this species search. The database includes museum records, personal captures and confirmed data from websites like iNaturalist, Smithsonian Tropical Research Institute and social media. Specimens with questionable identification were checked by JMR and excluded if identification was not confirmed.

Data analysis. We retrieved information on the conservation status of inventoried snake species based on available information from Panama (Jaramillo et al., 2010; Johnson et al., 2015). GIS applications were used to overlay the borders of Naso Tjër Di with dot maps of snake records. Museum codes follow Sabaj (2020).

Results

Based on information in our collated database, which includes 13,319 records, just 12 records of nine species and three families have been reported for Naso Tjër Di (Table 1, Fig. 2). Of these nine species, three (33%) are venomous and one of those, *Bothrops asper*, is known to cause the most snakebite deaths in Panama (e.g., Jutzy et al., 1953; Gutiérrez, 2014; Pecchio et al., 2018).

Another species, *Boa imperator*, is considered vulnerable by Jaramillo et al. (2010) and is listed on CITES Appendix II. Also, Jaramillo et al. (2010) ranks three species in the medium category for conservation concern based Environmental Vulnerability Scores (EVS), whilst Johnson et al. (2015) ranks six of the species in that category. Snakes within this category are moderate susceptible to declines because 1) of being specialised for their particular niche, 2) may have a limited range or 3) are experiencing local threats.

With the redrawing of the borders, the Bocas del Toro Province once again shrinks in size. However, only one species of snake, *Tantilla reticulata*, is lost from its faunal list (Ray, 2017; Table 2). This small ground-dwelling snake is elusive and rarely documented. It is considered a medium category for conservation concern based on EVSs (Jaramillo et al., 2010; Johnson et al., 2015). Interestingly, this was the only snake in the Naso Tjër Di list to be represented by a museum specimen (MVUP 1988).

Discussion

According to our comprehensive database, a total of 12 records exist for the newly formed Naso Tjër Di comarca. These records represent nine species in three families and include three venomous species. Of these

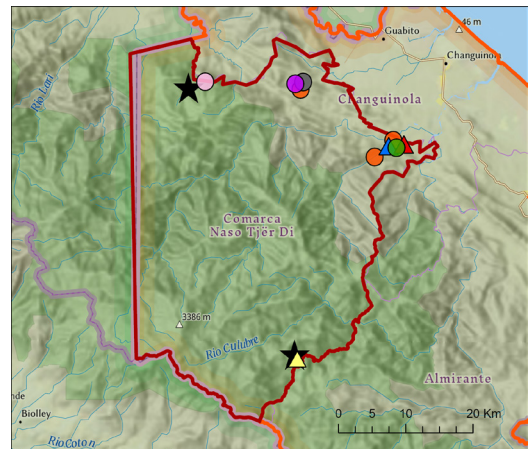


Figure 2. Dot map of snakes found in the Naso Tjër Di Comarca. Symbols: black star: *Boa imperator*, yellow triangle: *Bothriechis nigroadspersus*, red triangle: *Bothrops asper*, blue triangle: *Porthidium nasutum*, purple circle: *Mastigodryas melanolomus*, orange circle: *Phrynonax poecilonotus*, green circle: *Spilotes pullatus*, pink circle: *Tantilla reticulata*, grey circle: *Xenodon rabdocephalus*.

Table 1. Species of snakes documented in Naso Tjër Di Comarca, including number of individuals for each species, source of information and the IUCN and EVS conservation statuses. The IUCN status (A) is from www.iucnredlist.org; 14 December 2023, and (B) from Jaramillo et al. (2010). The Environmental Vulnerability Scores (EVS) (A) is from Johnson et al. (2015), with the vulnerability scores as follows: 3–9 = low, 10–13 = medium, and 14–20 = high; and the EVS (B) is from Jaramillo et al. (2010), with the vulnerability scores as follows: 3–8 = low, 9–11 = medium, and 12–17 = high.

Species	#	Source	IUCN		EVS	
			A	B	A	B
Boidae						
<i>Boa imperator</i>	2	iNaturalist	LC	VU	8	8
Colubridae						
<i>Mastigodryas melanolomus</i>	1	iNaturalist	LC	LC	12	7
<i>Phrynonax poecilonotus</i>	3	iNaturalist	LC	LC	7	8
<i>Spilotes pullatus</i>	1	iNaturalist	LC	LC	6	8
<i>Tantilla reticulata</i>	1	Museum specimen MVUP 1988	LC	DD	13	7
Dipsadidae						
<i>Xenodon rabdocephalus</i>	1	iNaturalist	LC	LC	11	9
Viperidae						
<i>Bothriechis nigroadspersus</i>	1	iNaturalist	LC	LC	11	10
<i>Bothrops asper</i>	1	iNaturalist	LC	LC	10	9
<i>Porthidium nasutum</i>	1	iNaturalist	LC	LC	12	8

records, the presence of *Tantilla reticulata* is confirmed through a museum specimen. However, the other records are from iNaturalist, an online citizen science reporting site for observations all species of flora and fauna (iNaturalist.org). Without the contributions of citizen scientists, we would have no real understanding of the snake fauna of this region of northwestern Panama.

Another study on snake presence was performed in Bosque Protector Palo Seco (Hofer and Bersier, 2001), but the presented GPS coordinates are vague and there are no museum specimens. Through correspondence with the authors we learned that their study area was just east of the new comarca. For this reason, we have excluded these species from our checklist. However, given the proximity of this rainforest, it is not unreasonable to think the snake species reported in Hofer and Bersier (2001) could be found within the newly defined Naso Tjër Di Comarca. If so, this would add 16 species and one family (Elapidae) to the checklist (see Appendix in Hofer and Bersier, 2001). Additionally, among those 16

species there three are venomous species (two vipers, *Bothriechis lateralis* and *Lachesis stenophrys*, and a coralsnake, *Micrurus alleni*), thus bringing the number of venomous species to six (24% of total documented and potential species).

The conservation status of the snakes confirmed within the Naso Tjër Di comarca are listed as Least Concern by the IUCN; however, this considers the entire range of the species. The EVS numbers provided for Panama (Johnson et al., 2015) tell a direr story with most species falling in the medium EVS category. Although neither assessment ranked any of the species at the highest threat level (Jaramillo et al., 2010; Johnson et al., 2015), snakes are regularly persecuted in Panama by human incidental killing, regardless of the species. This action is a precaution towards venomous snakes venturing near family members or livestock. In other indigenous areas visited by JMR, the people were more accepting of snakes as part of the natural environment. It is unknown how the Naso people interact with snakes, but given the large stretches of protected habitat in this comarca, we

Table 2. Snake species reported for Bocas del Toro Province following the designation of the Naso Tjër Di comarca. Includes museum records and verified records from iNaturalist.org. The IUCN status (A) is from www.iucnredlist.org; 14 December 2023, and (B) from Jaramillo et al. (2010). The Environmental Vulnerability Scores (EVS) (A) is from Johnson et al. (2015), with the vulnerability scores as follows: 3–9 = low, 10–13 = medium, and 14–20 = high; and the EVS (B) is from Jaramillo et al. (2010), with the vulnerability scores as follows: 3–8 = low, 9–11 = medium, and 12–17 = high.

Species	IUCN		EVS	
	A	B	A	B
Anomalepidae				
<i>Anomalepis mexicanus</i>	DD	DD	11	7
<i>Liotyphlops albirostris</i>	LC	LC	9	5
Typhlopidae				
<i>Indotyphlops braminus</i>	LC	NA	NA	NA
Boidae				
<i>Boa imperator</i>	LC	VU	8	8
<i>Corallus annulatus</i>	LC	DD	11	7
<i>Ungaliophis panamensis</i>	LC	DD	12	8
Colubridae				
<i>Amastridium veliferum</i>	LC	LC	13	7
<i>Chironius exoletus</i>	LC	LC	12	9
<i>Chironius flavopictus</i>	DD	DD	15	7
<i>Chironius grandisquamis</i>	LC	LC	11	9
<i>Clelia clelia</i>	LC	LC	10	8
<i>Coniophanes bipunctatus</i>	LC			
<i>Coniophanes fissidens</i>	LC	LC	7	9
<i>Dendrophidion apharocybe</i>	NA	LC	16	9
<i>Dendrophidion clarkii</i>	LC	NA	14	NA
<i>Dendrophidion paucicarinatum</i>	LC			
<i>Dendrophidion percarinatum</i>	LC	LC	11	9
<i>Dipsas articulata</i>	LC	LC	15	10
<i>Drymarchon melanurus</i>	LC	DD	6	7
<i>Drymobius margaritiferus</i>	LC	LC	6	8
<i>Enuliophis sclateri</i>	LC	DD	13	7
<i>Erythrolamprus epinephelus</i>	NA	LC	10	8
<i>Geophis cf. brachycephalus</i>	NA	NA	NA	NA
<i>Geophis hoffmanni</i>	LC	DD	12	7

Table 2. Continued.

Species	IUCN		EVS	
	A	B	A	B
<i>Geophis tectus</i>	LC	DD	13	10
<i>Hydromorphus concolor</i>	LC	LC	12	7
<i>Imantodes cenchoa</i>	LC	LC	6	6
<i>Imantodes gemmistratus</i>	LC	LC	6	7
<i>Imantodes inornatus</i>	LC	LC	12	7
<i>Lampropeltis micropholis</i>	NA	LC	10	8
<i>Leptodeira</i> aff. <i>ornata</i>	Not assessed			
<i>Leptodeira rhombifera</i>	LC			
<i>Leptophis occidentalis</i>	LC	LC	10	8
<i>Leptophis depressirostris</i>	LC	LC	14	9
<i>Leptophis nebulosus</i>	LC	DD	14	12
<i>Mastigodryas melanolus</i>	LC	LC	12	7
<i>Ninia celata</i>	NT			
<i>Ninia maculata</i>	LC	LC	12	7
<i>Ninia sebae</i>	LC			
<i>Ninia</i> sp.	NA	NA	NA	NA
<i>Nothopsis rugosus</i>	LC	LC	10	7
<i>Oxybelis brevirostris</i>	LC	LC	12	9
<i>Oxybelis fulgidus</i>	LC	LC	7	8
<i>Oxybelis vittatus</i>	Not assessed			
<i>Oxyrhopus petolaris</i>	LC	LC	12	9
<i>Phrynonax poecilonotus</i>	LC	LC	7	8
<i>Pliocercus euryzonus</i>	LC	LC	12	9
<i>Rhadinaea calligaster</i>	LC			
<i>Rhadinaea decorata</i>	LC	LC	9	7
<i>Rhadinaea pulveriventris</i>	DD			
<i>Rhinobothryum bovallii</i>	LC	LC	16	9
<i>Scaphiodontophis venustissimus</i>	LC	DD	13	9
<i>Sibon annulatus</i>	LC	LC	14	9
<i>Sibon lamari</i>	EN			
<i>Sibon longifrenis</i>	LC	DD	14	10
<i>Sibon cf. nebulatus</i>	LC	LC	5	8
<i>Siphlophis cervinus</i>	LC	DD	16	10
<i>Spilotes pullatus</i>	LC	LC	6	8

Table 2. Continued.

Species	IUCN		EVS	
	A	B	A	B
<i>Tantilla schistosa</i>	LC	LC	7	8
<i>Tretanorhinus nigroluteus</i>	LC	DD	9	8
<i>Trimetopon pliolepis</i>	LC			
<i>Urotheca decipiens</i>	LC			
<i>Urotheca guentheri</i>	LC	DD	12	7
<i>Urotheca pachyura</i>	LC			
<i>Xenodon rabdocephalus</i>	LC	LC	11	9
Elapidae				
<i>Micrurus alleni</i>	LC			
<i>Micrurus mipartitus</i>	LC	LC	15	12
<i>Micrurus mosquitensis</i>	LC			
<i>Micrurus multifasciatus</i>	LC	LC	15	10
<i>Micrurus nigrocinctus</i>	LC	LC	10	8
Viperidae				
<i>Bothriechis nigroadspersus</i>	LC	LC	11	10
<i>Bothrops asper</i>	LC	LC	10	9
<i>Cerrophidion sasai</i>	Not assessed			
<i>Lachesis stenophrys</i>	NT	NT	17	10
<i>Porthidium lansbergii</i>	LC	NT	15	8
<i>Porthidium nasutum</i>	LC	LC	12	8

expect the snakes will have a better chance of survival than in many regions. A recent article published on Mongabay.com talks about the struggle of the Naso people to define and defend their borders within the forest (Radwin, 2023). In correspondence with the author, he stated, “I didn’t see any snakes while in the Naso Comarca but our guides did mention them several times as we were hiking.” It is also interesting to note that Gupta et al. (2005), while studying ethnobotany practices in the Teribe Amerindians (indigenous people from Bocas del Toro Archipelago), noted five different plants were documented to be used for snakebite. Obviously, snakebite was something that needed treatment in this area.

The records in our database are able to provide a baseline list for the species of snakes found in Naso Tjër Di Comarca. It is shocking that so few records exist for this region of Panama. However, it is very mountainous

and remote, and few studies have been conducted here, despite so much of the land being protected. Future studies should be planned to better understand which snake occur in this region. This will better prepare residents and visitors for snakebite potential, as well as hopefully lead to management plans in the protected areas that include the conservation of snakes and venom research.

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