

PRELIMINARY DATA ON AMPHIBIANS AND REPTILES IN BAHÍA HONDA AND CANALES DE TIERRA ISLAND (VERAGUAS, PANAMÁ)

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Abstract

From recently conducted research, we deduce that amphibian and reptile fauna in Bahía Honda and Canales de Tierra island area, includes at least 46 species comprising 37 genera and 20 families. Of the *Anura* (frogs and toads), there are 19 species -five of which are regionally endemic (S of Central America)- corresponding to 13 genera and five families, of the eight known to exist in Panama. Although we did not collect members of the *Caudata* order (salamanders and newts), we suspect that more in-depth research will yield positive results.

Amongst reptiles, the fauna is varied; *Sauria* are represented by five families, six genera and nine species: *Basiliscus basiliscus* (*Corytophanidae* family); *Gonatodes albogularis*, *Hemidactylus frenatus* and *Sphaerodactylus lineolatus* (*Gekkonidae*); *Iguana iguana* (*Iguanidae*), which is protected by national legislation; *Anolis* (*Norops*) *biporcatus*, *A. (N.) limifrons* and *A. (N.) polylepis* (*Polychrotidae*) and *Ameiva ameiva* (*Teiidae*). The suborder *Serpentes* (snakes) is represented by four families, nine genera and 10 species: *Boa constrictor*, protected by national legislation and *Corallus enydris* (*Boidae* family); *Imantodes cenchoa*, *Leptophis ahaetulla*, *Oxybelis aeneus*, *Oxybelis*

fulgidus, *Pseustes poecilonotus* and *Sibon nebulatus* (Colubridae); *Pelamis platurus* (Elapidae, sub-fam. Hydrophiinae), poisonous sea snake; and *Bothrops asper* (Viperidae, subfam. Crotalinae).

This study has revealed for the first time the presence of two frogs (*Hyla rosenbergi* and *Scinax staufferi*) and three reptiles (*Anolis polylepsis*, *Corallus enydris* and *Oxybelis fulgidus*) in the Veraguas province, Panama Republic.

Since we have also accepted the presence of 1 family, 2 genera and 2 species of *Crocodylia* (caimans and crocodiles); and 4 families, 6 genera and 6 species of *Testudinata* (tortoises and turtles), we conclude that the total herpetofauna in the Bahía Honda region corresponds to 46 species

Introduction

There are approximately 171 species of amphibians and 228 species of reptiles in the Republic of Panama. The former are divided into three orders and 10 families; the latter into four orders and 29 families. Endangered species represent approximately 47% of amphibians 31% of reptiles; species in imminent danger of extinction include 24% of the amphibians and 10% of the reptiles.

Factors that lead to a reduction in populations include loss of habitat and environmental pollution (Young & *al.*, 1999). The same source indicates that despite the existence of a "National System of Protected Areas" there are endangered species that have no forms of protection, and the authors therefore recommend that these areas be reinforced and a more in-depth study made of the distribution of the endangered species.

Since the relative geological and tectonic stabilisation of the Panamanian isthmus, it has been used as a "geographical bridge" by natural populations of different groups of animals migrating S-N and N-S. Some have remained in the area while others, adapting to the habitat, evolved to produce local endemisms, only some of which we know today.

Veraguas province does not belong to the area of greatest international trade and consequently has not enjoyed a high level of economic and social development. As a result, it has not been favoured like other regions (Panamá,

Darién, Chiriquí and Bocas del Toro) by research that would help determine its biological diversity. Nonetheless, we know of some publications which include information about the herpetofauna of Veraguas, such as Troschel (1848), Günter (1872), Cope (1875), Amaral (1924), Barbour & Amaral (1928), Tanner (1962) and Taylor (1969), that describe some species which are new to science. Aside from these publications, it is very difficult to find any other contributions to our knowledge of the herpetofauna, and information on the amphibians and reptiles in the area could only be found in general reports to which access is not readily available.

Methodology and sampling sites

In our field work we used the following equipment: hand-held and head-mounted torches (flashlights), transparent plastic bags and cloth bags in a range of sizes, hooks for trapping snakes and sauria, wide-mouthed jars with lids, pincers, scissors, trays, syringes and hypodermic needles, labels, cameras, pencils, ball-point pens, white paper, indelible ink, note-books, height gauge, tanks with sealed lids, formalin and ethyl alcohol. Field information was obtained in the area around Canales de Tierra island, Playa Limón, Playa del Sol, Río Limón -including the rivulet that flows into it- and El Edén.

Trapped animals were placed in the plastic or cloth bags and where necessary, vegetation (leaves and moss) and some water were added to keep them alive and in good health. Most of the specimens were later released at the sites where they had been collected. However, those selected for reference, were killed using the following procedure: amphibians were anaesthetized with cold (refrigerated) and then injected with a fixing agent (formalin 5, 8, 10%, depending on size); some reptiles (sauria and snakes) could be anaesthetized and fixed like the amphibians, but those which died on site (as was also the case with some amphibians) were fixed on site, on trays. The herpetofauna that was transferred to the laboratory was processed for fixing, labelling and preservation. The preserved samples, with all the corresponding information, were placed in jars and tanks depending on the size and body shape. They will

be housed in the Vertebrates Museum in Biology School, Faculty of Exact Natural Sciences and Technology, University of Panama.

Habitat

According to the "Mapa Físico de Panamá" published by the Instituto Cartográfico "Tommy Guardia" (1988), the area of study is located in the district of Soná, jurisdiction of Bahía Honda, Veraguas province.

The sites where we took the samples were in an area of wet tropical forest (Wtf), characterised by a humid tropical climate (Ami); and the main types of vegetation are currently mixed crops, pastureland with remains of gallery forests associated with water sources (rivulets and small rivers), some patches of secondary vegetation in the section further N of Playa del Sol and wasteland with secondary pioneer vegetation (for further information see the corresponding chapter). As is the case in other geographical areas of the country, some ecological conditions, for example the natural springs with relatively continuous supplies of water, the bio-temperature and average annual rainfall (in the Las Palmas and Azuero massifs) have favoured the existence and survival of groups and species of amphibians and reptiles that are generally very inter-dependent and sensitive to environmental conditions.

Deforestation, which has led to a drastic reduction in habitat, pollution, mainly of water sources and the indiscriminate and excessive use of agricultural chemicals, both in the areas that have been felled -to cut back the undergrowth - and in those used for subsistence crop farming, are the main anthropogenic causes that have a very negative impact on the natural populations of the species of these groups.

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DESCRIPTION OF AMPHIBIAN AND REPTILE SPECIES FOUND IN BAHÍA HONDA AND CANALES DE TIERRA

Class *Amphibia* Linnaeus, 1758

Order *Anura* Rafinesque, 1815 (*Salientia*)

In Panama, toads are represented by the genera *Atelopus*, *Bufo*, *Crepidophryne* and *Rhombophryne*; the former with six species, of which four are nationally endemic (*A. certus*, *A. glyphus*, *A. limosus* and *A. zeteki*); the latter is the well-known golden frog and *Atelopus varius* is most widespread, with specimens found in all provinces except Herrera and Los Santos. The genus *Bufo* is represented by eight species, of which two are regionally endemic. The last two genera cited above have one species each in Panama, which is also regionally endemic. *Crepidophryne epiotica* lives in Bocas del Toro and *Rhombophryne acrolopha* in Darién.

This group is characterised by adults having no tail, the head and trunk fused and the two well-developed pairs of limbs. The fore limbs are better adapted for jumping and swimming (with some degree of webbing). Among other features that distinguish them from frogs, toads have a pair of paratoid glands behind each eye and rough, dry skin; whereas frogs have smooth damp skin, their fore and hind legs are anatomically adapted for a range of activities, including jumping and moving around leaves, branches, bushes and trees. In both groups, barring exceptions, fertilization is external and the egg hatches into a tadpole, which is metamorphosed into the adult; in some groups of frogs [*Hylidae* (genus *Gastrotheca*) and *Leptodactylidae* families] development is direct: the egg hatches into an individual similar to a miniature adult. These groups of amphibians (frogs and toads) feed preferably on insects, which at nightfall are attracted by the light.

Family *Bufo* Gray, 1825

This group of true toads is distinguished from the other Anuran families by its bony cephalic crests and prominent parotid glands behind each eye,

which produce a milky irritating and slightly toxic substance. At the same time, they have a rough and relatively dry skin.

Bufo marinus (Linnaeus, 1758); Giant Toad, Cane Toad - Sapo común. Photo 1

In Central America males attain a length of up to 145 mm and females 90 - 175 mm (amongst the populations of South America and E Australia these values are generally higher). Dorsolaterally the tegument is rough and verrucose with different brown and sometimes yellowish tones; the venter is light in colour with some irregular dark marks. On the head there are conspicuous bony cephalic crests and prominent parotid glands. When the toads is disturbed by dogs, other curious vertebrates or even humans, these glands concentrate and then secrete a caustic substance which is irritating to the touch; it would appear to be relatively lethal for medium-sized vertebrates. In humans, the discomfort can be cured by rinsing well with soap.

They feed on invertebrates, mainly insects. The contents of their stomachs have been found to include, *inter alia*, crickets, ants, beetles, *diptera* and their larvae; *myriapoda* and *annelida* (earthworms). During the day they are to be found in hollows, beneath rotting logs, near human dwellings, especially in gardens, and also beneath medicinal grasses, such as "lemon grass" and any other substratum that protects them from the sunlight. Reproductive activity is nocturnal; during the rainy season, the males call from permanent or temporary pools, lagoons and stagnant water, while in the dry season they call from permanent pools and on the banks of rivers and streams; the dark-coloured eggs joined in rows by a transparent cord are laid on the water, where they hatch. Like other vertebrates they contribute mainly to keeping insect populations in check.

The species is found throughout the world except in polar regions. As in the Neotropics, they are widely distributed throughout Panama, but are rare at altitudes of over 1,000 m. In the Americas they are found from Texas (US) in the north to Bolivia in the south; they have been introduced to various Caribbean islands, from SE Asia and the Pacific. There are abundant populations throughout Panama wherever human's settlements exist, including Playa del Sol (Bahía Honda, Veraguas)

Bufo haematiticus Cope, 1862b; Smooth Skinned Toad - Sapo. Photo 2

These toads are relatively small: males rarely exceed 60 mm in length and females 70 mm. No cephalic crests can be distinguished on the head; the parotid glands, which are medium-sized and elongated, become narrower towards the back. From the side, the face can be seen to have a dark background with one or two light coloured marks. The dorsal colouration varies by individual and also by geographical area and habitat, although small black marks and a dark vertebral line can be made out on the back; the relatively smooth dorsal tegument has small tubercles. On the venter the colouration is light; the fore part is smooth and the hind part is granular. Given the area they inhabit, there is no great risk to humans and domestic animals from the secretions from their parotid glands.

The species is found from Honduras to Ecuador. To date, in Panama, there is no record of its presence in the provinces of Herrera and Los Santos. In Bahía Honda adults are found on the banks of rivers and many young are found in the sandy and stony substratum of the rivers. As in other geographical areas in Panama during the rainy season, during the day we found adults on the forest floor (undergrowth) but always near rivers and streams with accumulations of rocks, branches, fallen leaves and logs, and we therefore assume that they feed on small invertebrates and their larvae.

Family *Centrolenidae* Taylor, 1951a

All glass frogs have a transparent vented with some modifications, depending on the position of the white spot, which is generally light in colour; some are rather over 3 mm in length. They are differentiated from the *Hylidae* frogs by having a fused astragalus and calcaneum; the terminal phalanxes, ending in a T-shape, and a medial protuberance in the third metacarpus. The males move from the forest canopy at nightfall to begin their nocturnal calling. They position themselves on leaves, branches and other surfaces along rivers, streams and still water. No danger has been noted from any secretion in the tegument of these frogs.

The family is found from S Mexico to Bolivia and NE Argentina. The following genera have been identified in the Republic of Panama: *Centrolenella* with two species, *Cochranella* with four, and *Hyalinobatrachium* with six. Of these, six are regionally endemic.

Centrolenella prosoblepon (Boettger, 1892a); Emerald Glass Frog - Ranita de cristal. Photo 3

Females and males are generally up to 2.1 - 2.8 mm in length. The smooth dorsal tegument is emerald green in colour, and usually has discreet dark marks; the venter is areolated; the thorax skin is light in colour and the parietal peritoneum is white; the vent skin and those covering the limbs is transparent and the greenish colour of the bones can be seen. One unusual feature, which is well developed among adult males and to a lesser extent among some females, is the presence of a greenish projection on the proximal part of the arm (humeral).

During the day they shelter, for preference in epiphytes and bushy vegetation on the banks of rivers and streams, but they may also hide in any substratum where damp and a lack of sunlight is guaranteed. The males are very territorial and active at nightfall. They pose on leaves, calling throughout the year and particularly in the rainy season.

In general it is accepted that they are distributed in humid forests from Nicaragua to Ecuador; and in Panama on both the Caribbean and the Pacific side, although not in Los Santos and Kuna Yala (San Blas). In the Bahía Honda area we found them by day among the "caña agría" along the banks of the Río Limón. However we did not locate their eggs, which have a dark pigmentation and are presumed to lie among the piles of leaves or the in rocky substratum that protrudes slightly from among the water masses in the river, where they consume small insects, their eggs and larvae.

Cochranella granulosa (Taylor, 1949a); Black-pointed Glass Frog - Ranita de cristal. Photo 4

Features a granular dorsal tegument, with yellowish and occasionally darker granulations on a dark green background. The tegument is areolated in the ventral part, with the digestive tract visible; the area of the parietal

peritoneum is white, as is the pericardium; the green bones are visible. Females can be over 30 mm in length and males up to 29.

Like all *Centrolenidae*, the males are very territorial but they use trees of over 10 metres in height to call, particularly during the night in the rainy season; they feed above all on small insects, their eggs and larvae.

They have been found in Nicaragua and Costa Rica; in Panama they have not been found in Los Santos, Herrera and Kuna Yala (San Blas). In Bahía Honda we found them in the same places as *C. prosoblepon* and we therefore presume that they share the same habitat. This frog is classified as being regionally endemic.

Hyalinobatrachium fleischmanni (Boettger, 1893b); Fleischmann's Glass Frog - Ranita de cristal. Photo 5

This is another Panamanian glass frog. Adult males grow to 19-28 mm and females to 23-32 mm; the dorsal tegument is smooth with small yellow or yellowy-green marks on a lime-green background; the venter is areolated where the pericardium is white, while that of the thorax and venter is translucent. The bones of the limbs can be seen to be light in colour.

They are active on dark evenings and nights in the rainy season during the mating season, when the very territorial males hide amid the foliage and call to attract the females, who withdraw to the surrounding vegetation after the reproductive period. The spawn is deposited on the lower side of leaves of bushes along river-courses with relatively little flow, streams and even relatively permanent pools.

They are found from Guerrero and Veracruz in Mexico to Surinam and W Ecuador; In Panama they have been reported in all areas except Los Santos province, Azuero Peninsula.

Family *Dendrobatidae* Cope, 1865

The following genera have been identified in Panama: *Colostethus* with seven species, six of which are regionally endemic; *Dendrobates* with five species, three of which are nationally endemic and two regionally endemic; *Epipedobates* with one endemic national species; *Myniobates* with one endemic national species and another regional endemic one; and finally *Phylllobates* with

one endemic regional species. The tegumentary system contains glands which concentrate alkaloids. These have been demonstrated to be relatively lethal in vertebrates such as monkeys, and it is therefore recommended that anyone touching the body should immediately wash with soap.

Dendrobates auratus, (Girard, 1855); Green and Black Poison-dart Frog - *Ranita verdinegra*. Photo 6

The adults grow to a length of 25-42 mm. They are characterised by having a striking aposematic dorsal and ventral colouration with a blue greenish-blue, green and greenish-yellow background, with black, brown or bronze stripes or roundels. This diurnal species was found along paths on Canales de Tierra Island. They feed preferably on ants and also small spiders, mosquitoes and flies. They are "poisonous" frogs whose tegument contains glands which produce toxic alkaloids. The males watch over approximately seven eggs after they are laid (this takes 10-13 days). When the eggs are about to hatch, the male stands on the edge of the nest with its back slightly arched and its hind limbs on the frogspawn so that the newly hatched tadpoles can go up its back to be transported, one by one, to the water.

It is found from Nicaragua to Colombia; in Panama it inhabits the undergrowth, including the gallery forest on the sides of rivers and streams where it hides among fallen leaves, hollows in logs and rocks; they have also been found on tree trunks and branches up to a height of 4 m. In Panama they have been found in all provinces from elevations below 850 metres down to sea level; and also on islands such as Taboga.

Family Hylidae Gray, 1825

Frogs with greater activity during rainy nights, mainly climbers and tree-dwellers; the skin is generally smooth but can also be rough. Of the members of the *Anura* order, this is the family with the second greatest variety of genera (40) and species (594). They are mainly insectivores (although they also feed on other arthropods). Among amphibians they have the largest area of distribution, inhabiting Eurasia from W Europe to Vietnam; SW Arabia, N Africa; and in America from Canada to the Pacific coast in Ecuador, the Atlantic coast in Argentina and the Greater Antilles.

The Republic of Panama has representatives of 11 genera (*Agalychnis*, *Anotheca*, *Duellmanohyla*, *Gastrotheca*, *Hemiphractus*, *Hyla*, *Phrynohyas*, *Phyllomedusa*, *Ptychohyla*, *Scinax* and *Smilisca*), of which the one with greatest diversity is *Hyla*, with 25 species; while of the remainder, the next most diverse (*Scinax*) has only five. Altogether there are 47 species, of which the best known are those from the genus *Agalychnis* and in particular *A. Callidryas*. Three species (*Hyla graceae*, *H. thysanota* and *Phyllomedusa venusta*) are nationally endemic. Some genera and species of these frogs also concentrate sticky substances in their tegumentary systems (fore and hind legs and occasionally the back) which may prove allergenic for some human skin types and it is therefore recommended that they should not be handled without gloves.

Agalychnis callidryas (Cope, 1862); Red-eyed Leaf Frog - Rana. Photo 7

This is one of the most striking of nocturnal frogs in Panama; the back has a light green to olive background; on the sides it has transverse blue or purple stripes on a yellow or light background; these stripes are edged in red and orange. The hind part of the thigh and fore limb is also blue. Sometimes they have a few (2 to 3) small clear dots on their backs. The venter is orange; at night they appear red. Males can be over 55 mm in length and females 70 mm. This is an abundant and mainly arboreal species, active from dusk, through the night until dawn. They seek protection and concealment among the foliage of trees and bushes, especially along river courses with permanent or temporary water. During the mating season (rainy season) and mainly at dusk and after rainfall and late at night, the males call with a strong "crack, crack, crack" sound from branches, generally near pools, and once they attract a mate, they hold her (amplexo). The female then goes down to the pool to fill her bladder with water; she then climbs onto a leaf which is just above the pool or pond and deposits some dark coloured eggs, enveloped in a clear jelly-like mass. The number of eggs laid varies from 20 to 22 and a female can lay eggs 3-5 times per night. After hatching, the tadpoles fall into the water where they complete their development. Like most frogs, they prefer to feed on insects and their larvae. It is not recommended that they be handled, since the tegument produces toxic composites (peptides) which are not found in other amphibians.

This species is distributed from the humid lowlands of S Mexico to Ecuador; in Panama it has been found in all provinces, now including Bahía Honda (Playa del Sol, to the rear of the main house, in a permanent pool near a stream) and on banana leaves along the banks of Río Limón.

Hyla crepitans (Wied-Neuwied, 1824); Gladiator Green Tree Frog – Rana.

Photo 8

Nocturnally active frogs, with a smooth tegument in variable tones of brown, depending on which marks in a contrasting colour or vertebral line are visible; on the limbs and sides there are dark transverse bars or small dots; the venter is light in colour; males have a thorny projection at the base of the thumb, covered in skin, which they use to defend their territory during the mating season which occurs mainly in the rainy season. They generally inhabit forested areas, although they can also be found in open areas with water and in grassland; in all these habitats they find an abundant quantity of invertebrates, mainly insects, which are their preferred food. Adult males can grow to over 59 mm in length and females 68 mm.

They range from Honduras to Ecuador, Guyana and Brazil; in Panama they appear to be more restricted towards the eastern region (Los Santos, Coclé, Colón, Panamá and Darién) although in Bahía Honda we found them in semi-permanent pools near the laboratory in Playa del Sol, during night time hours.

Hyla rosenbergi Boulenger, 1898; Gladiator Tree Frog - Rana. Photo 9

In these frogs the tegument, which is generally light brown, has darker marks, often with a clear vertebral line. Seen from below the tegument is light yellow but the region of the limbs is pale green. Females and males can be over 90 mm in length; during the mating season, mainly in the rainy season, they are active mainly at night on the branches of bushes and trees along the courses of rivers and streams. They also prefer to feed off insects and their larvae; however they are in turn preyed on, among others, by snakes of the *Leptodeira* genus, bull frogs (*Leptodactylus pentadactylus*) and water bugs.

Distribution includes Costa Rica, Panama, Colombia and Ecuador. In Panama they have been found in Chiriquí, Los Santos, Colón, Panamá, Darién,

and now, for the first time in Veraguas; the specimens we found were sitting on branches of bushes on the banks of the Río Limón. We consider that the ecological conditions in the area of the river where they were found ensure that they can fulfil their reproductive function and thus their survival is assured in the area.

Hyla rufitela Fouquette, 1961; Red Foot Frog - Ranita. Photo 10

Smooth dorsal tegument and greenish background with dark and off-white marks; adult females can be over 46 mm, while males grow to a length of 39-49 mm. The bright red colour of the webbing is particularly striking; the venter is granular and the ventral surface is clear with a greenish hue at the sides and pale yellow towards the middle. They inhabit humid and dry lowland forests and prefer rainy nights (August - October) to mate, after which they lay their eggs on the surface of the water. These rare nocturnal frogs are also found outside the mating season among the dense vegetation close to the water.

As a regionally endemic species they are found in Nicaragua and Costa Rica; in Panama they have been found mainly in the Caribbean although also on the Pacific coast in Coclé and now in Veraguas - a couple of specimens were found in Playa del Sol and Río Limón area.

Phrynohyas venulosa (Laurenti, 1768); Milk Frog - Rana. Photo 11

Females can be over 100 mm in length, while males vary from 70 to 101 mm. The dorsal tegument is glandular (it secretes a sticky substance which irritates the mucus) and, in adults, from smooth to tubercled; generally with a light brown or pale grey, orange or grey background, with dark marks stretching to the end of the trunk. In males, this feature, together with the vocal sacs behind the angle of the jaw, helps to distinguish them from other *Hylidae* and from *Smilisca baudini*, which also has vertical bars on the lips and cream and black marks on the flanks. Seen from below the tegument is cream-coloured and granular. Most specimens are characterised by having a thick postocular fold which extends to the intersection of the forelegs.

These frogs are often found in temporary and permanent pools in the mating season (rainy season) after rain storms and also in the dry season on

bromeliads, hollows or knots in trees, under bark, *Heliconia* leaves and even in banana plants.

They are found from Central America in the sub-humid lowlands of Tamaulipas and Sinaloa (Mexico) to the Atlantic in Nicaragua; Costa Rica and Panama; in South America in humid and sub-humid lowlands from the N of Colombia, Venezuela, Argentina and the E of Brazil; In Panama they have been found in Chiriquí, Coclé, Colón, Panamá, Darién and now on the Río Limón in Playa del Sol (Bahía Honda, Veraguas).

Scinax staufferi (Cope, 1862); Stauffer's Tree Frog - Rana. Photo 12

In Panama the females of these small frogs reach a length of 21-32 mm and the males 21-29 mm; with the tegument tubercled and grey, chestnut brown or greyish in colour, with dark longitudinal marks, the venter is granulated and a dirty white colour. There are no lines or stripes on the visible surface of fore or hind legs. The flanks are cream or off-white in colour; and on the visible part of the hind leg one or two dark strips can be made out. These semi-terrestrial frogs can be found in the rainy season and also in the dry season, not very high up in the axillary area of the herbaceous vegetation. They reproduce in permanent or temporary pools and are often found there after downpours.

They inhabit Central America from Mexico to Panama, where they have been found in the provinces of Chiriquí, Los Santos, Coclé, Panamá and Veraguas.

Smilisca phaeota (Cope, 1862d); Masked Tree Frog - Rana. Photo 13

A small to medium-sized frog. The females are rarely over 70 mm and the males 60 mm; the dorsal tegument is smooth, light brown in colour and occasionally greenish (when they are in the pools). From the side, a dark strip can be seen to run from the preocular and postocular area to the beginning of the fore legs (axillary region). Whitish venter and clear sides with brown radii. During the rainy season they can be heard calling and are found in temporary pools, but also on the branches of bushes on the banks of rivers and streams. They inhabit the humid lowland forests.

They are found from Nicaragua to Ecuador and in Panama they have been found in all provinces except Herrera and Los Santos.

Smilisca sila Duellman & Trueb, 1966; River Tree Frog - Rana. Photo 14

The females are over 60 mm in length and the adult males are rarely over 40 mm, similar to the other species of the genus. The tegument is smooth, and generally grey, orange or chestnut in colour, with occasional dark marks and sometimes also other smaller and more discreet yellowish-green marks. The ventral tegument is creamy; when they stretch out their legs, the characteristic greenish-blue colouration that aids identification can be seen in the groin area. They are arboreal and active at dusk and by night during the year. The mating season starts at the beginning of the dry season when the males pose on herbaceous vegetation, on protruding rocks and on banks of earth accumulated on the banks of streams and rivers, from where they call not only to attract the females but also to confuse predators among which the most important are *Trachops cirrhossus* (bats).

They are distributed in the slopes and lowlands of the Pacific coast of Costa Rica and Panama up to altitudes of 1,300 metres; to the E of Panama and the N part of South America they inhabit the slopes of the Caribbean and the valleys drained by the rivers of the N of Colombia. In Panama they appear to have been reported in all areas except Bocas del Toro.

Family *Leptodactylidae* Werner, 1838

This family has the greatest diversity of genera (54) and species (1980), adapted to live and be active in aquatic, semi-aquatic, arboreal, terrestrial, fossorial and semi-fossorial conditions and they can live among the rocks located on banks and in the water masses of rivers and streams. They are active from dusk and on rainy nights, although in the morning in the rainy season young adults can be found in the undergrowth with fallen leaves and good humidity. They are also insectivores although they prey on other small arthropods. They are distributed from the N of Arizona and Texas to Chile, Argentina and the West Indies.

In Panama, representatives of the genera *Eleutherodactylus* have been found, with 35 species; *Leptodactylus* with 6; and *Physalaemus* and *Pleurodema* each with 1. Of these 43 species, *Eleutherodactylus azueroensis*, *E. emcelae*, *E. jota*, *E. monnichorum* and *E. museosus* are nationally endemic.

Eleutherodactylus fitzingeri (O. Schmidt, 1857); Common Rain Frog - Rana.

Photo 15

Adult males can be up to 35 mm (generally over 20 mm) and adult females over 50 mm (generally over 30 mm). The dorsal skin is greyish, orange or olive-coloured with small warts and crests of variable colouration; some individuals have a light grey, yellow or orange mid-dorsal strip. Another peculiar feature is the light yellow speckling on the surface behind the thighs, which contrasts with the dark background. They are mainly active at night; they can be seen amongst rocks, fallen leaves, logs, and on the banks of rivers and streams. Their mating season coincides with the rainy season. They feed on insects and other arthropods.

The species is found in Nicaragua, Costa Rica, Panama and Colombia; in Panama they live throughout the country, except in the province of Kuna Yala (San Blas) where none have yet been found. In Bahía Honda we found them in the area near El Edén and on the banks of the Río Limón where the fallen leaves accumulate among the rocks.

Leptodactylus insularum Barbour, 1906; Common Pond Frog - Rana. Photo

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Adult males are over 20 mm in length and can be up to 36 mm, while females range from 25 to over 35 mm in length. They have a sharp snout; the dorsal tegument is smooth with a chestnut background and various dark marks, some of which look like narrow longitudinal stripes. The venter is clear and has a well-defined line on the back of the thigh, which stands out against the speckled background. From the side, a narrow postocular stripe runs to the base of the forelegs, interrupted by the conspicuous tympanum. They inhabit pools and flooded areas in forests and open areas, fields, urban areas and cities provided there are permanent or temporary pools. The males may occasionally call by day, but in the rainy season they mate after heavy rainfall; they are carnivores and prefer to feed on insects and other arthropods.

They are found from Mexico to Colombia and Venezuela; they are common throughout Panama except in Bocas del Toro and Kuna Yala (San Blas), where none have yet been found.

Leptodactylus labialis (Cope, 1877); White Lip Pond frog – Rana. Photo 17

Adult males reach a length ranging from 24 to slightly over 34 mm and adult females range from 25 mm to 38 mm; they are nocturnal and terrestrial, preferring stagnant water; they are characterised by the smooth dorsal tegument with a greyish or chestnut background against which darker marks stand out; they also have a clear longitudinal strip on each side of their backs; the venter is yellowish/greenish in colour; the back of the thighs shows clear segmentation, dark marks and a yellow line; they are nocturnal and are common in open and farmed areas such as fields and stubble where there are small permanent or temporary pools or lagoons and in very wet areas during the rainy season (their mating season). They are very active from dusk on rainy days in the lowland forests, mainly on the Pacific coast. They feed on arthropods and particularly on insects.

They are found from Texas (USA) to Colombia and Venezuela; in Panama they have not been reported in Bocas del Toro and Kuna Yala (San Blas). In Bahía Honda they were found calling amid drenched undergrowth near the laboratory and the shelter in Playa del Sol.

Leptodactylus pentadactylus (Laurenti, 1768); Central American Bullfrog - Rana toro. Photo 18

Adult females are over 115 mm in length and can grow to nearly 190 mm, while males are over 100 mm and can reach 170 mm. The smooth dorsal tegument, can be grey to chestnut or bronze and can be accompanied by contrasting dark bars or marks; at night the eyes appear red; with red marks on the back of the thighs contrasting with the dark background; they also have reddish colouration on the sides where the skin is glandular. They have robust limbs. Their skin secretes a soap-like irritant.

During the reproductive season the males have black horny spines on the chest and thumbs. At night in the rainy season they can be found on the banks of pools, lagoons and ponds, but during the day they tend to hide in spaces beneath piles of fallen logs, in hollows in the bases of trees, on the edge of wet and shady places in lowland forests and in the wet and rainy pre-

mountain forest. In the area studied they were heard calling near the site of the laboratory in El Edén and in the area with busy vegetation in Playa del Sol.

They are found from Honduras to Peru and Brazil; in Panama they are widespread in lowland forest areas up to heights of nearly 1,200 metres. One curious detail was that we observed specimens eating small crabs on the seashore; they also eat invertebrates, frogs and even small vertebrates.

Physalaemus pustulosus (Cope, 1864); Tungara Frog - Túngara, sapito túngara. Photo 19

This is perhaps the most abundant frog in Panama's lowlands; it reaches a length of 25-34 mm in adult males and 26 -35 mm in adult females. The body is rather rough (tubercled) and the dorsal colouration is greyish or bronze-coloured with some brown marks. The elbows and surface of the dorsal urostyle is brick red. The venter is light in colour with quite plentiful small brown or black dots. The throat is greyish with a clear line running the entire length. It has an unmistakable "toon, toon" call and depending on the number of individuals in a pond, there may also be a one or more "garas", resulting in a "toon-gara, toon-gara", hence its common name. Although they are not readily distinguishable, they possess glandular concentrations in the parotid area (behind the eyes) and on the flanks.

In the rainy season (the mating season) the female goes to pools or ponds in grasslands, stubble or areas with succession forest where she approaches the most prominent male caller. He holds her (amplexo) and then the female makes off with the male on her back to a safe place to avoid predators or disturbances from other mateless males. When all calling has ceased, she returns to the site and begins releasing the eggs, which are simultaneously fertilised by the male. During fertilization the male beats the spawn into the foam with his hind legs, which he keeps moist even when the temporary pond dries up. They are unfussy eaters and eat arthropods—mainly insects. For preference they inhabit areas with some stagnant water, areas with undergrowth, grasslands and even open ground; It has been reported that they begin calling with the first rains, which makes them an easy prey for bats (*Trachops cirrhosus*).

They are found from Mexico to Colombia; Venezuela, Trinidad and Tobago. In Panama they live up to an altitude of 1,400 metres and are widely distributed.

Class *Reptilia* Laurenti, 1768

Order *Squamata* Oprel, "1810", 1811 (Scaly)

Suborder *Sauria* Macartney, 1802 (*Lacertilia*) (*Sauria*)

Among other features, they are distinguished by having well-defined fore and hind limbs (tetrapods) and five digits (except for the Amphisbaenids, "suelda con suelda", a group whose body has adapted to life underground); with the head differentiated from the trunk, a tail, a scaly body, eyes with mobile lids, a protractile tongue and a transverse ventral cloaca. Most are active during the day and have a very varied diet.

In Panama representatives of 10 families and 32 genera have been found, containing 81 species. Of these, the greater number of species correspond to the *Polychrotidae* (lizards) family; these are agile little animals which by day generally live in the bottom third of tree trunks and bushes; in the presence of humans they move up to the top; at night they can be found resting on branches and leaves on bushes beside water sources.

Family *Corytophanidae* Fitzinger, 1843

This family is restricted to the Neotropical area and concentrated in Central America, but they are found as far as Mexico, NE Venezuela and W Ecuador. These reptiles lay white or cream-coloured eggs with a flexible shell. In Panama the family is represented by four species of the genus *Basiliscus*; and *Corytophanes cristatus*. Of all of them, *B. plumifrons*, which inhabits Bocas del Toro province and the N land of Chiriquí, is considered to be regionally endemic.

Basiliscus basiliscus (Linnaeus, 1758); Common Basilisk, Jesus Christ Lizard

- Moracho, meracho. Photo 19A,19B,19C

The males are characterised by having a rounded cephalic crest and a sharp dorsal one which runs to the caudal region. Their dorsal colouring is olive

with a dark strip on either side; with a light paired strip on the sides and lips. They also have a fleshy fringe on the outer digits. They may be distinguished from *B. vittatus* by their smooth ventral scales. They are omnivorous semi-aquatic lizards, which also eat insects and other arthropods, small lizards, small snakes, birds and mammals, shrimps and small freshwater fish, flowers and fruit. The males reach a standard length of 130 to 250 mm (occasionally they reach 900 mm), while females range from 130 to over 185 mm. They are diurnal and during the night sleep on the branches of bushes on the banks of rivers, rivulets and streams; thus if they are threatened they can jump into the water to escape. They are preyed on by mammals such as *Philander* and *Chironectes* and by various snakes.

Females mature at 18 months and lay clutches of up to 18 eggs, 5-8 times during the 10 months of the reproductive season, which begins at the end of the dry season. The eggs hatch after the three months. They are vulnerable to floods and the survival rate is estimated at 15%. They are found from Nicaragua to Ecuador.

Family *Gekkonidae* Gray, 1825

In Panama this family is represented by six genera and 12 species of which five are classified as regionally endemic. They can be nocturnal or diurnal, although they prefer to remain hidden in any natural or artificial substratum they can find in forests, inhabited areas in rural zones and even cities. They are insectivores although they prey on other small invertebrates.

Gonatodes albogularis (C. Dumeril & Bibron, 1836); Yellow-headed Gecko, Gecko - Limpia casa. Photo 20

The male of this species is distinguished by its orange or bright yellow head, while the rest of the body is blackish or greyish brown, in the female and young the body is greyish with black speckling. They generally measure over 36 mm in length and very exceptionally can grow to 45 mm; they can be distinguished from other geckos by the round pupil in the large eyes, which is indicative of their typically diurnal activity when they prey on small insects. The tail and skin are very delicate.

As well as having been introduced into Florida, it is found from Mexico to Colombia and Venezuela; in Panama it has been found throughout the country on both coasts, mainly in rural areas, hidden in cracked walls, on the base of tree trunks in the forest and beneath the bark, in gaps and cracks in tree trunks. It appears to favour palm trees. Although they reproduce all year round and with greater success in the rainy season, they are currently feeling the pressure of geckos introduced from the tropical regions of other latitudes.

Hemidactylus frenatus (C. Dumeril & Bibron, 1836); House Gecko - Lagartija

Species accidentally introduced in Panama. Lizards with a greyish brown dorsal colouring with dark broken marks, fringes, or lines; yellow venter with chestnut splashes. The adults measure over 50 mm in length and can grow to slightly over 60 mm; they are characterised by being active at night, when the males in particular can be heard emitting a characteristic “chack, chack, chack” sound, and because at that time of day they hunt insects, which are attracted by the lights of houses in rural areas and mainly in the cities. It is known that the females can retain sperm for various months, which gives them something of a competitive edge over Panama’s true native geckos. During the day, when the colouring remains dark, they remain hidden in cracks in the walls and wooden structures of houses, and when night falls, they can be seen mating or hunting nocturnal insects.

They are found from S India and Sri Lanka; Burma, S China and the Malaysian Peninsula to the Philippines; they were accidentally introduced into New Guinea, the Solomon Islands, N Australia, Samoa, Guam and Hawaii; the islands adjoining S China and the Indian Ocean, Madagascar, E Africa, Cape of Good Hope, St. Helena, the Mediterranean region; in the Americas in Texas and Florida and from SE Mexico to Panama where they now inhabit most provinces and islands and their tropical and sub-tropical habitats.

Sphaerodactylus lineolatus (Lichtenstein, 1856); Spotted Dwarf Gecko - Lagartija. Photo 21A, 21B

Barely exceeds 30 mm in length; it is distinguished by its yellowish greenish head with narrow parallel brown stripes running along the length of the face; the trunk is light in colour, and covered in elongated marks, also brown;

the tail is yellowish and with faint light brown marks. Like other geckos, the skin and tail are delicate and the tail falls off easily when handled. They inhabit the more concealed parts of palm trees and other cracked structures, and it is therefore relatively easy to find them in constructions where branches are used, for example in ranches and places for storing grain, or picnic sites in the forest. They are diurnal and feed of small insects and their larvae. To find these reptiles it is necessary to shake these structures. This genus, in which approximately 90 species have been identified, is the most diverse of the family.

It is found from the W of the Pacific coast in the Republic of Panama to NW Colombia.

Family *Iguanidae* Gray, 1827

Of the eight genera in the family, only *Iguana iguana* (green iguana) and *Ctenosaura similis* (spiny-tailed iguana) are found in Panama; the former inhabits the entire country and the latter inhabits coastal sea areas.

Iguana iguana (Linnaeus, 1758); Green Iguana - Iguana verde. Photo 22

Diurnal and arboreal species. The young are mainly herbivores (they eat leaves, flowers and fruits) and sometimes insects, whereas the adults are mostly herbivores but can eat small animals. They have a compact head, a body covered in small granular scales, and a striking crest with fringes running from the base of the head to the start of the tail, where they look like spines; from the side and beneath the ear aperture a large circular scale can be observed in front of which there is another smaller one. In adult males the trunk may be over 500 mm long and up to 1.5 m if the tail is included. The body is a vivid green in the young becoming greenish grey or bronze-grey as they get older; in the trunk and tail there are dark stripes. This species is protected by national legislation because its eggs and meat are in great demand for human consumption; they are also preyed on by snakes of the genera *Chironius*, *Spilotes*, *Pseustes* and others; boas and birds such as *Ramphastor* (toucans), crocodiles, and mammals of the genera *Felis*, *Nasua* and *Eira*.

They are found from Mexico to Paraguay; in Panama they are live in the whole country, but mostly in the lowlands.

Family *Polychrotidae* Fitzinger, 1843

These are arboreal and semi-arboreal Neotropical lizards which are represented in Panama by 32 species of which one belongs to the genus *Polychrus*, five to *Dactyloa* (distributed from the extreme S of Central America to South America) –three of which are regionally endemic - and 26 are *Norops* (*Anolis*), of which five are nationally endemic and 14 are regionally endemic.

Anolis (Norops) biporcatus (Weigmann, 1834a); Green Tree Short-legged Anole - Lagartija. Photo 23

Bright green in colour, strictly diurnal and arboreal, it can be observed relatively easily on trunks of large diameter and height, of over one metre in the wet and rainy lowland forest, which has mainly been left unspoiled. When it is spotted, or an attempt is made to trap it, it changes with great ease from its natural colour to darker shades and even dark brown; adults grow to a total length of over 70 mm and the total length including the tail can exceed 300 mm. The tail is relatively long compared to other species in its group; the adults feed preferably on a wide variety of arthropods, also on small *Anolis* and they appear to be particularly fond of ants. The young prefer small coleoptera (beetles).

They are found from S Mexico (Chiapas and Veracruz) to N South America (Colombia, Ecuador and N Venezuela).

Anolis (Norops) limifrons Cope, 1862c; Slender Anole - Lagartija. Photo 24A,24B,24C,24D

This lizard is common on the trunks of trees in Playa del Sol and on the banks of Río Limón. The dorsal tegument is chestnut coloured; in females a brown strip edged with a light colour runs from the base of the head following the vertebral line to the first third of the tail; on the tail there may be black transverse ring-like marks on the chestnut background and they are therefore said to be ring-tailed. The venter may be smooth or have slightly keeled scales. On the back and flank there are small granular scales. Most specimens are characterised by having a thick postocular fold which extends to the intersection of their 40 mm in length. They feed on ants, small spiders, dragonflies,

butterflies and crickets. They are found from Belize to Panama, where they have been found in all regions except Los Santos and Kuna Yala (San Blas).

Anolis (Norops) polylepis (Peters, "1873",1874); Sweet Gulf Anole - Lagartija.

Photo 25

The males are characterised by having a large orange dewlap; the dorsal colouring ranges from yellowish to brown or chestnut, with small granular scales; the ventral scales are smooth. Females and males are over 40 mm in length and may grow to slightly over 50 mm. The species has been classified as being endemic to SW Costa Rica (Golfo Dulce); however in Panama it has been reported in Chiriquí and now in Veraguas (Bahía Honda). During the day they are active on branches and the bases of tree trunks and bushes in the forest, as well as in the undergrowth where they move quickly. They are passive (ambushing) predators, waiting at length for their prey to pass; this consists of ants, small spiders, dragonflies, butterflies and crickets. Like *Anolis (Norops) limifrons*, they can be preyed on by spiders of the genera *Nephila* and *Cupiennius*. During the night they are found sitting on the branches of bushes. They are extremely territorial and the males defend their territory with visual displays, extending their dewlap and moving their bodies (tilting their heads). This reproductive activity is apparently related to the rains and, despite the fact that the females lay eggs throughout the year, the proportion of females with eggs in their oviducts is smaller in the dry season. They are preyed on, amongst others, by *Colubridae* such as *Oxybelis*, *Leptophis* and *Sibon*.

Family *Teiidae* Gray, 1827

This family, which is restricted to Latin America, is represented by nine genera and 116 species of animals with well-developed heads and limbs and a differentiated trunk and a ringed tail which can break off; they are diurnal and terrestrial although there are two semi-aquatic South American genera (*Crocodirulus* and *Dracaena*); most are carnivores, although some are insectivores or herbivores. In Panama, there are four species of the genus *Ameiva*, which are quite uniformly distributed as well as the genus *Cnemidophorus* with the species *C. lemniscatus* which is restricted to the E of the province of Panamá and Darién.

Ameiva ameiva (Linnaeus, 1758); Common Whip-tailed Lizard - Borriguero

As well as the characteristics described for the family, these animals have a bluish green or brown background colouring; the adult males also have greenish yellow marks while the females and the young have two lateral lines and two ventrolateral lines in cream colour. Males vary in length from 90 to over 190 mm and females from 80 to slightly over 150 mm. They are diurnal, terrestrial (they inhabit hollows that they dig themselves) and feed mainly on arthropods. They are found from the lowlands of SW Costa Rica, Panama, N and central Colombia, N Venezuela, SE Brazil, Paraguay, N Argentina, Trinidad, Tobago, the southern Lesser Antilles, Swan, San Andrés and Providencia; they have also been introduced into S Florida.

Suborder *Serpentes* Linnaeus, 1758 (*Ophidia*)

The body is also covered in scales; barring exceptions, the head is differentiated from the trunk, with a tail and ventral anus, without limbs, most with normal lidless eyes and a forked, protractile tongue. They are active during the day, and poisonous varieties are active mostly at dusk and at night; they feed mainly on rodents, other small mammals, granivorous birds, amphibians and *Sauria*; they live in trees, fresh and salt water, in caves or pits and even beneath the ground.

In the Panama Republic there are eight families of snakes distributed among 59 genera and 127 species. Of these, the family *Colubridae* has the greatest number of genera (41) and species (95); in second place comes the family *Viperidae* (poisonous) with 7 genera and 12 species. However, in Bahía Honda, Canales de Tierra and neighbouring areas we only found *Bothrops asper* which is the mostly widely distributed in Panama, the most aggressive, with the most lethal poison and the best-adapted to rural areas with livestock and arable farming.

Family *Boidae* Gray, 1825

Three genera and four species have been recognised in Panama; the best known are the common boa and the rainbow boa. They generally feed on small mammals, including domestic cats, dogs, birds and occasionally reptiles

of the sub-order *Sauria* and various species of amphibians from the order *Anura*.

***Boa constrictor* Linnaeus, 1758; Common Boa - Boa común.** Photo 26

The head is clearly differentiated from the trunk and is covered in small smooth (unkeeled) scales, as is the rest of the body except for the ventral area, where the scales are considerably wider; the maxillary and mandibular teeth in the fore region are long, becoming shorter towards the back. They have a robust body, covered in smooth iridescent scales; on the head the scales are small. The males have spurs in the anal region, which they may use during courtship and mating. These structures are typical of primitive snakes. The dorsal colouring consists of oval and square marks on a light dun or grey background; these marks are more vivid at the front and tend to form broad irregular stripes on the back of the body and tail; the pattern is believed to be cryptic (creating confusion). They do not have sensing pits in the labial scales; the subcaudal scales are arranged in simple rows.

They are mainly nocturnal, and are found on bushes and trees and also in the undergrowth, hidden beneath and in hollows in trunks; they feed on birds—including domestic ones—rats, mice, bats, other mammals and sauria. They do not appear to tend to their young. The reproductive season varies geographically, having been reported to be from August to March with births from March to August. Sexual maturity can occur when the individuals reach a length of 1,500-2,000 mm. This is one of the few reptiles protected by national legislation because it is widely captured to make accessories such as handbags, wallets and belts out of the skin.

It is found from Mexico to Argentina; in Panama it is found in all provinces from sea level to over 1,000 m mainly in the dry and wet forests on both sides of the country; and also in grassland and farmed areas.

***Corallus enydris* (Linnaeus, 1758); Garden Boa, Tree Boa – Iguanera,** Cazadora. Photo 27

This snake can grow to a length of up to 2,000 mm; with the trunk slightly compressed at the sides, the head is somewhat triangular in shape and because it is arboreal the tail is long and prehensile. The background colouring

of the body is yellow or chestnut; on the sides there are patterns with dark edges and centres which are lighter than the background colour. The scales at the base of the trunk are mostly light coloured; the tail is darker in colour but the marks are still clear; from the side the head is distinguished by a brown stripe running from behind the eye to the lower jaw. It is distinguished from the *Boa* genus because the supranasals come in contact or are separated by elongated scales and by the fact that it has sensing pits on the labial scales. They feed on birds, small mammals and sauria.

They are found from Costa Rica to Amazonia (Ecuador, Colombia, Peru, Venezuela, Brazil and Guyana); in Panama they have been found in Colón, Darién, Panamá, Herrera, Kuna Yala (San Blas), Chiriquí, and now in Veraguas (Bahía Honda). They do not appear to be very aggressive; the specimen was found on a tree by the shore in Playa del Sol.

Family *Colubridae* Oppel, "1810", 1811

This family has the largest number of genera (approximately 287) and species (approximately 1,800) in the world, except for Australia and the Pacific Islands. They have adapted to live a terrestrial, fossorial, semi-fossorial, arboreal, fresh water and even sea water life. They eat such varied foods as arthropods, earthworms, fish, snails, crustaceans, birds, frogs, lizards and small mammals. Some grow only to a small size, but they can be over 2,000 mm in length. In Panama approximately 41 genera and 95 species have been identified, of which 10 are nationally endemic and 25 regional endemic.

Imantodes cenchoa (Linnaeus, 1758); Brown Blunt-headed Vine Snake - Bejuquilla. Photo 28A,28B

Very short head with highlighted brown lines; they have large eyes for the size of the head, a long, thin tail (between 20 and 34% of the total body) and grow to a length of slightly over 1,000 mm. The body is compressed and has a chestnut colouring with brown marks, which are repeated on either side along the entire length. Common in relatively unspoiled forests and mature forests; they are nocturnal and arboricolous and are not aggressive. They prefer to feed on frogs of the genus *Eleutherodactylus*, eggs of other frogs and small lizards.

They are found from Mexico (Tamaulipas in the Atlantic and Oaxaca in the Pacific) to Paraguay, Bolivia and N Argentina. They have been found in all provinces of the Republic of Panama, mainly at twilight and at night when they are active, hunting geckos, anoles, small frogs and also the eggs of *Centrolenidae*.

Leptophis ahaetulla (Linnaeus, 1758); Parrot Snake - Bejuquilla. Photo 29

The background colouring is uniformly green; the venter is pale green, with an elongated body and long thin tail; large round eyes, with a black postocular stripe (behind the eye) and round pupils. Arboricolous and diurnal, although it is also found in the undergrowth where it preys on lizards (*Anolis*, *Norops*), frogs and birds' eggs; it is oviparous. It is characterised by the fact that when it feels threatened it opens its mouth to intimidate its opponent. Common in open areas, worked forests and mature forests. It is found from SE Mexico to Ecuador. It has been found throughout Panamanian territory.

Oxybelis aeneus (Wagler, 1824); Brown Vine Snake - Bejuquilla. Photo 30

This vine snake is differentiated from the other two species of *Oxybelis* because in most cases the body has a dorsolateral chestnut colouring, although specimens can be found with yellow, greenish, orange and reddish tones; while in other species of *Oxybelis*, green predominates. Some specimens can be over 900 mm in length. The face is long and sharp; the eyes are large and, like the pupil, round; the tail is long, thin and prehensile and nearly always has a yellow or reddish ventrolateral line. They are found from the United States (Arizona) to Peru, Bolivia, Paraguay and N Argentina. They have been found throughout the country, mainly by day, in open areas and areas with secondary vegetation, and also in cultivated areas where they mainly trap lizards and frogs. When they feel threatened, they open their mouths, displaying a dark (violet blue) interior, to intimidate and even attack. We recommend the use of leather gloves for handling them.

Oxybelis fulgidus (Daydin, 1803); Green Vine Snake - Bejuquilla.

This snake is active during the day among low bushes and trees where it generally traps frogs, lizards, birds and even small mammals. As well as having

a vivid green background colour, at the base of either side it can be seen to have a continuous yellowish line running to the tail; the snout is long and sharp, while the venter is yellow, at times with light green tones. They are larger in diameter than other *Oxybelis* and can grow to a length of nearly 2,000 mm. These animals are somewhat aggressive when they feel threatened and humans should take care of the toxic saliva; in forests they are easy to confuse with the foliage.

They are found from Mexico to Surinam, Brazil and Argentina. In Panama they have been found in Chiriquí, Coclé, Los Santos, Panamá, Darién, Colón and now in Veraguas (Bahía Honda).

Pseustes poecilonotus (Günther, 1858a); Rat Snake, Bird-eating Snake - Iguanera, pajarera. Photo 31

Semi-arboreal snake; in adults the dorsal colouring varies between brown, greenish, olive and yellow; and they have several orange or grey marks; with a light (yellowish) lateroventral area; the tail is not as long as the body and adults grow to over 2,000 mm; the head is clearly differentiated from the rest of the body; the eyes are large and, like the pupil, round; they are diurnal and are found looped around the branches of bushes and trees and on the ground in open areas, on the banks of rivers and streams and also in the canopy of high trees from where they hunt small mammals, birds and bird eggs; reptiles and some frogs. The young have a light coffee-coloured body but there are some dark marks on the head; the lateroventral area of the trunk is light and on the supralabial scales there are some dark marks. They are found from the Isthmus of Tehuantepec and Yucatán (Mexico) to Colombia, Venezuela, Guyana, Surinam, French Guyana, Trinidad, Brazil, Ecuador, Peru and Bolivia. In Panama they have been found in all provinces except Los Santos and Kuna Yala (San Blas). Despite their size they are not particularly aggressive, although they try to bite when one attempts to trap them.

Sibon nebulatus (Linnaeus, 1758); Snail-eating Snake - Culebra. Photo 32A,32B

Non-poisonous and non-aggressive snake with a total length of slightly over 80 mm. Arboreal and nocturnal, it mainly eats invertebrates (molluscs)

such as slugs and land snails. The head is large and rounded with slightly protuberant eyes and a vertical pupil. The dorsal colouring pattern is light with irregular black bars on the entire body and as a result it is easily confused with the surrounding vegetation; it can reproduce oviparously or viviparously.

It is found from Mexico to Colombia, Venezuela, Trinidad, Tobago, Ecuador and Brazil. In Panama it has been found in all provinces except Los Santos and Kuna Yala (San Blas).

Family *Elapidae* F. Boie, 1827

All are poisonous snakes (producing neurotoxins) and have a pair of teeth attached to the maxilla; the terrestrial and arboreal forms are similar in shape to other snakes, but the marine genera and species have undergone anatomical modifications to adapt to their habitat. The family comprises 65 genera and 327 species. The current trend is to separate the family into sub-families (4 groups) of which *Elapinae* contains Panama's eight species of coral snakes and *Hydrophiinae* contains *Pelamis platurus* (marine).

Subfamily *Hydrophiinae*

The only species to inhabit the Pacific coast of Panama is the one described below.

Pelamis platurus (Linnaeus, 1766); Yellow-bellied Sea Snake, Pelagic Sea Snake – Culebra de mar.

This sea snake, with neurotoxic poison, has a trunk that is slightly compressed at the sides; the tail is completely compressed; most are over 600 mm in length. Despite the great variation in colour they have dark colouring as far as the mid-lateral region with contrasting light yellow, except on the tail where there are blackish stripes; the eyes are medium-sized and have round pupils.

They are found from the E coast of Africa, the Indian Ocean, the seas of Indo-Australia, the Pacific Ocean, the coast of Central America and from the Gulf of California to the N of Peru and Chile. The literature (Fitch, 1970) reports

that they were seen to be nocturnally active in Bahía Honda (Veraguas) in March (young and adults).

Family *Viperidae* Oppel, "1810", 1811

This family, which comprises 32 genera and approximately 225 species, contains all our vipers, including those that inhabit trees and bushes (bocaracá, lora and verdinegra) and those that are found in the different habitats of the undergrowth (patocos, tobobas de altura, mano de piedra, trozo, verrugoso and equis). The species of the genus *Lachesis* are oviparous while the rest are ovoviviparous; some are small (genera *Cerrophidium* and *Porthidium*), medium-sized (genera *Bothriechis* and *Atropoides*) and some are very long, such as the species in the *Lachesis* and *Bothrops* genera. Their poisons are mostly haemotoxic; most are very aggressive and we therefore recommend that they only be handled by experts. The family is widely distributed with the exception of Australia, Madagascar, New Guinea and adjoining islands, Oceania, Greater Antilles and W Peru and Chile.

According to Savage (2002), the family has been distributed in three sub-families as follows: *Azemiopinae* Liem, Marx and Rabb, 1971; *Viperinae* Oppel, "1810", 1811 and *Crotalinae* Oppel, "1810", 1811. The latter contains all the genera and species that have been found in the Republic of Panama.

Bothrops asper (Garman, "1883", 1884); Velvet-skin, Yellow Beard - Barba amarilla, equis, terciopelo, víbora negra, víbora de gajo, mapaná, rabo amarillo, fer de lance, víbora blanca; también y erróneamente bocaracá. Photo 33A,33B

To quote from the excellent description by Carlos Pérez Santos in his book *Serpientes de Panamá* (1999), "The back may be bronze, brown, grey-olive, greyish brown, pink or nearly black, with 18 to 25 dark lateral triangles edged in a lighter colour with the apices alternating or opposed in the mid-dorsal region; in the interspaces there are dark paravertebral marks. The venter is yellow, green, or whitish-grey, with small dark marks that become larger in the hind region. Dark grey ventrolateral marks on alternating scales. The top of the head has no marks or else ill-defined occipital marks." This is the most widely distributed poisonous snake in the country, living from sea level to above 1,100 metres; the average number of young exceeds 40; they are very

aggressive and highly poisonous. From the side the dark postocular stripe on the head is striking; Newborns are over 180 mm in length and adults can grow to over 200 mm. They feed preferably on rats and mice, other mammals and granivorous birds. They are found from Mexico to N Colombia, N Venezuela, Trinidad and the Pacific coast of Ecuador.

Order *Crocodylia* (Gmelin, "1788", 1789) (*Loricata*)

These are our caimans and crocodiles. Throughout the world three families and eight genera of this group have been identified, containing 23 species, which mostly inhabit the tropics and also the subtropics. They are the only reptiles that possess four digits on their hind limbs, which are webbed; the anal aperture is ventral and longitudinal. In Central America there are two species representing the family *Crocodylidae* and each species has been classified in the subfamilies *Alligatorinae* and *Crocodylinae*.

Subfamily *Alligatorinae* Cuvier, 1807

Caiman crocodilus (Linnaeus, 1758); Spectacled Caiman - Lagarto, babillo o babilla.

This freshwater carnivore is distinguished by having a moderately tall transverse ridge on the snout in front of the eyes; the fourth maxillary tooth is long and the tooth corresponding to the mandible is not visible when the snout is closed; adults can grow to over 2.000 mm and are more active at night when they hunt. Distribution is widespread in lowlands and they are found from Mexico to Argentina; In Panama they have been found in all provinces except Kuna Yala (San Blas) where none have been reported. Local people from the Bahía Honda area and neighbouring areas tell us that the species inhabits rivers, streams with abundant water and some places that are flooded during the rainy season. Because of the constant anthropogenic pressure they suffer as a result of the illegal trade in their skins, they are protected by national legislation and are listed as an endangered species on the UICN list (UICN & WWF, 1999).

Subfamily *Crocodylinae* Cuvier, 1807

Crocodylus acutus (Cuvier, 1807); American Crocodile - Lagarto aguja, caimán aguja, cocodrilo.

This inhabitant of large rivers, streams, mangrove swamps, river mouths - principally those with most water flow - fresh water and salt water marshes and, in our experience, other areas of the country (e.g. Coiba Island and Leones Island in the Gulf of Montijo in the province of Veraguas), also ventures into the sea. It has no transverse ridge in front of the eyes, the fifth maxillary tooth is long; the fourth mandibular tooth is visible when the snout is closed; adults tend to grow to over 2,000 mm with some reaching 4,000 mm. In the Americas they are found from Florida to NE Peru and also on Caribbean islands. As well as being protected by national legislation, they are listed in Appendix I of CITES. Despite protection measures, they are still hunted in Panama, even though the illegal trade in their skin has become more difficult; Panamanian peasants are known to eat the flesh of the tail as a source of protein and, in some areas of the country, they are killed out of fear of attack. Inhabitants of the area report that they are found throughout the S of Veraguas province, including Bahía Honda.

Order *Testudinata* Oppel, 1811. (Chelonia)

Tortoises, turtles, giant tortoises. This diverse group includes Panama's sea turtles from the *Cheloniidae* and *Dermochelyidae* families; and also the fresh and saltwater species from the *Chelydridae* and *Emydidae* families; and the inland varieties of the *Kinosternidae* and *Testudinidae* families. Because there are no geographical differences or ecological barriers between the conditions of marine, marine-coastal, shore and flooded areas in our Pacific area and, based on information obtained from local people, we believe it is reasonable to assume that the species reported for Coiba Island, Leones Island in the Gulf of Montijo and their marine-coastal areas also inhabit Bahía Honda. In Panama there are 15 species from 10 genera and six families.

For the purposes of this research, in addition to our experience in the area, we consulted guides and local people about this group. We only list those species, which, with good grounds and for the reasons stated above, we consider inhabiting the Pacific and the freshwater and landing habitats of the area.

Marine species:

Family *Cheloniidae* Gray, 1825

Caretta caretta (Linnaeus, 1758); Loggerhead Sea Turtle - Caguama.

Eretmochelys imbricata (Linnaeus, 1766); Hawksbill Sea Turtle - Carey.

Lepidochelys olivacea (Eschscholztz, 1929); Olive Ridley Sea Turtle - Lora.

Family *Dermochelyidae* Baur, 1888 (1825)

Dermochelys coriacea (Vandelli, 1761); Leatherback Turtle – Tortuga canal, baula.

Freshwater species:

Family *Emydidae* Schmid, 1819

Trachemys scripta (Schoepff, 1792); Common Slider Turtle - Jicotea, morrocroy.

Family *Kinosternidae* Gray, 1869 (1857)

Kinosternon scorpioides (Linnaeus, 1766); Red-cheeked Mud Turtle - Tortuga candado.

SPECIES WHICH HAVE YET TO BE FOUND

Order *Gymnophiona* 1814 (Apoda), Caecilians or two-headed worms

These have a long, cylindrical body, segmented by grooves (primary and secondary); they have no limbs (apoda), but have anatomical adaptations that allow them to spend most of the time beneath some type of substratum that ensures protection, moisture and a suitable temperature. The anal aperture is ventral. Short tail. The head is rounded, with a compact skull and co-ossified skin. The eyes are lidless, small and covered by skin or bone, all of which suits them admirably for a hypogeous life. They have no branchiae or branchial slits; fertilization is internal by means of the male's protractile organ; they feed for preference on earthworms, termites and the larvae of insects. In Panama the

following genera have been identified: *Caecilia*, *Dermophis*, *Gymnopsis* and *Oscaecilia* (family *Caeciliidae*). The most widely distributed species in Panama are *Dermophis mexicanus*, *D. parviceps* and *Oscaecilia ochrocephala*; the last two are regionally endemic. It is worth noting that we have two nationally endemic species: *Caecilia volcani* and *Oscaecilia elongata*.

We believe it is reasonable to assume that if we were to spend more time in the right seasons (rainy season and transition between dry and rainy seasons) at the different sites and habitats in the region, with greater effort on our part in searching, better logistical support and better tools for field work, we should be able to find at least *Dermophis mexicanus* and *Gymnopsis multiplicata*.

Orden *Caudata* Oppel, 1811 (*Urodela*), Salamanders, land scorpions

These have a persistent tail. In the trunk, most species have costal grooves and folds, plus two pairs of relatively weak limbs. Because they have no lungs they exchange gases through the damp skin and the throat (buccopharyngeal respiration); they lay their fertilised eggs in damp substrata that ensure direct development (without metamorphic states), and therefore have to live in habitats with suitable humidity and periods with regular rainfall. In Panama there are 14 species of the genus *Bolitoglossa* of which *Bolitoglossa cuna* and *B. taylori* are nationally endemic, but we also have 12 which are regionally endemic; of all these species *B. biseriata* and *B. schizodactyla* are most widely geographically distributed. Of the genus *Oedipina* we have seven species, of which *O. complex* and *O. parviceps* are the most widely distributed; seven of them are regionally endemic. The same remarks we made for the last group regarding new searching and the best season are also applicable to this one.

At least *Bolitoglossa lignicolor*, *B. colonea* and *B. striatula* should be found in Bahía Honda in future surveys.

Remarks on the diversity of Bahía Honda herpetofauna. Comparison to other areas in the south of Veraguas province and Azuero Peninsula

Most of the research on Panamanian amphibians and reptiles has been carried out in forest ecosystems in the mainland area and mainly in the Central mountain ranges (Talamanca and Tabasará). On the contrary, coastal areas and in particular on the islands only a small number of studies have been carried out, such as those in the Archipelago of Las Perlas (Gulf of Panama) by T. Barbour (1906), and Cochran (1946); in Leones Island, Montijo Gulf, Veraguas province by Martínez Cortés & Rodríguez (1999); and for Coiba Island those by De la Riva (1997); and Pérez Santos & Martínez Cortés (1997). Regarding other studies in areas relatively near to the S of Veraguas province, we only have the Rapid Ecological Assessment made at the Cerro Hoya National Park, an area shared between Los Santos and the SE of Veraguas provinces (Alvarado & Hernández, 1999), the study describing the biotic resources in Cerro Quema, Los Santos province (Delgado, 2002), and the recent studies for the Reserva Forestal Montuoso, in Herrera province (Martínez Cortés & Rodríguez, unpublished). We have not mentioned here the exhaustive research carried out in Barro Colorado, because the island is far from our study area.

For the reasons we have stated above, we shall draw pertinent comparisons between our results for Bahía Honda and those for Coiba Island, Leones Island, the Cerro Hoya National Park, Cerro Quema and Reserva Forestal Montuoso ([Table 1](#)).

In the case of the numbers of amphibian families, genera and species in Bahía Honda and comparing with those for Coiba and Leones islands, we can see that the diversity in Bahía Honda is much higher than in both islands. Even when comparing with the forested protected areas of Cerro Hoya, Montuoso and Cerro Quema, their species richness is not much higher than that at Bahía Honda. This relatively high diversity in our study region is something we expected, because this is a continental area (unlike Coiba and Leones) and also there exists well preserved ecosystems, refuge for amphibian species from where they migrate to disturbed and coastal areas. Important refuge areas for amphibian conservation are the forests south of the Soná Fault.

In the case of the reptiles, same as amphibians, their diversity is relatively high in Bahía Honda. The differences regarding numbers of families, genera and species between Bahía Honda and the rest of localities can be explained by several factors. In the first place, the reason for Cerro Quema lower diversity is its lack of the coastal and marine environments, while in Leones we can explain it by it being a small area, submitted to a strong human influence (logging, burning and land use for cattle raising and crops). The slight differences in the diversity of reptiles in Coiba, Montuoso and Cerro Hoya compared to Bahía Honda can be explained by a different intensity of sampling in each area. In Bahía Honda the field work was shorter, while some other factors we should consider are the differences in conservation status of the forests (less preserved in Bahía Honda), the lack of marine environments in Montuoso and the island status (isolation) of Coiba Island.

Table 1. Herpetofaunal comparison by families, genera and species of Bahía Honda (Veraguas); Cerro Hoya National Park (mainland area shared between Veraguas and Los Santos provinces); Coiba Island (Veraguas); Leones Island (Montijo Gulf, Veraguas); Cerro Quema (Los Santos) and Reserva Forestal Montuoso (Herrera).

GROUP AMPHIBIANS	BAHÍA HONDA (VERAGUAS) Martínez Cortés & Rodríguez (2003) This study.	PARQUE NACIONAL CERRO HOYA (LOS SANTOS-VERAGUAS) Martínez Cortés (1999)	ISLA COIBA (VERAGUAS) De la Riva; Pérez – Santos & Martínez Cortés, (1997)	ISLA LEONES (VERAGUAS) Martínez Cortés, Rodríguez & Rodríguez (1999)	CERRO QUEMA (LOS SANTOS) Delgado (1992)	RESERVA FORESTAL MONTUOSO (HERRERA) Martínez Cortés & Rodríguez (2003)
Families	05	06	04	04	04	06
Genera	13	11	05	05	06	11
Species	19	16	06	06	09	23
GROUP REPTILES						
Families	15	14	16	11	09	11
Genera	24	32	30	19	12	27
Species	27	34	32	21	14	33
SPECIES GRAND TOTAL	46	50	38	27	23	56

AMPHIBIAN AND REPTILE SPECIES RECORDED FOR BAHÍA HONDA AND
CANALES DE TIERRA

Class *Amphibia* Linnaeus, 1758

Order *Anura* Rafinesque, 1815 (*Salientia*)

Family *Bufo* Gray, 1825

Bufo marinus (Linnaeus, 1758)

Bufo haematiticus Cope, 1862b

Family *Centrolenidae* Taylor, 1951a

Centrolenella prosoblepon (Boettger, 1892a)

Cochranella granulosa (Taylor, 1949a)

Hyalinobatrachium fleischmanni (Boettger, 1893b)

Family *Dendrobatidae* Cope, 1865

Dendrobates auratus, (Girard, 1855)

Family *Hylidae* Gray, 1825

Agalychnis callidryas (Cope, 1862)

Hyla crepitans (Wied-Neuwied, 1824)

Hyla rosenbergi Boulenger, 1898

Hyla rufitela Fouquette, 1961

Phrynohyas venulosa (Laurenti, 1768)

Scinax staufferi (Cope, 1862)

Smilisca phaeota (Cope, 1862d)

Smilisca sila Duellman & Trueb, 1966

Family *Leptodactylidae* Werner, 1838

Eleutherodactylus fitzingeri (O. Schmidt, 1857)

Leptodactylus insularum Barbour, 1906

Leptodactylus labialis (Cope, 1877)

Leptodactylus pentadactylus (Laurenti, 1768)

Physalaemus pustulosus (Cope, 1864)

Class *Reptilia* Laurenti, 1768.

Order *Squamata* Oppel, "1810", 1811

Suborder *Sauria* Macartney, 1802 (*Lacertilia*)

Family *Corytophanidae* Fitzinger, 1843

Basiliscus basiliscus (Linnaeus, 1758)

Family *Gekkonidae* Gray, 1825

Gonatodes albogularis (C. Dumeril & Bibron, 1836)

Hemidactylus frenatus (C. Dumeril & Bibron, 1836)

Sphaerodactylus lineolatus (Lichtenstein, 1856)

Family *Iguanidae* Gray, 1827

Iguana iguana (Linnaeus, 1758)

Family *Polychrotidae* Fitzinger, 1843

Anolis (Norops) biporcatus (Weigmann, 1834a)

Anolis (Norops) limifrons Cope, 1862c

Anolis (Norops) polylepis (Peters, "1873", 1874)

Family *Teiidae* Gray, 1827

Ameiva ameiva (Linnaeus, 1758)

Suborder *Serpentes* Linnaeus, 1758 (*Ophidia*)

Family *Boidae* Gray, 1825

Boa constrictor Linnaeus, 1758

Corallus enydris (Linnaeus, 1758)

Family *Colubridae* Oppel, "1810", 1811

Imantodes cenchoa (Linnaeus, 1758)

Leptophis ahaetulla (Linnaeus, 1758)

Oxybelis aeneus (Wagler, 1824)

Oxybelis fulgidus (Daudin, 1803)

Pseustes poecilonotus (Günter, 1858a)

Sibon nebulatus (Linnaeus, 1758)

Family *Elapidae* F. Boie, 1827

Subfamily *Hydrophiinae*

Pelamis platurus (Linnaeus, 1766)

Family *Viperidae* Oppel, "1810", 1811

Bothrops asper (Garman, "1883", 1884)

Order *Crocodylia* (Gmelin, "1788", 1789) (*Loricata*)

Family *Crocodylidae* Cuvier, 1807

Subfamily *Alligatorinae* Cuvier, 1807

Caiman crocodilus (Linnaeus, 1758)

Subfamily *Crocodylinae* Cuvier, 1807

Crocodylus acutus (Cuvier, 1807)

Order *Testudinata* Oppel, 1811 (*Chelonia*)

Family *Cheloniidae* Gray, 1825

Caretta caretta (Linnaeus, 1758)

Eretmochelys imbricata (Linnaeus, 1766)

Lepidochelys olivacea (Eschscholztz, 1929)

Family *Dermochelyidae* Baur, 1888 (1825)

Dermochelys coriacea (Vandelli, 1761)

Family *Emydidae* Schmid, 1819

Trachemys scripta (Schoepff, 1792)

Family *Kinosternidae* Gray, 1869 (1857)

Kinosternon scorpioides (Linnaeus, 1766)

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