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It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

SPENCER F. BAIRD,
Secretary of the Smithsonian Institution.

SMITHSONIAN INSTITUTION,
Washington, May, 1880.

ON THE

ZOOLOGICAL POSITION

OF

TEXAS.

BY

EDWARD D. COPE.

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ON THE ZOÖLOGICAL POSITION OF TEXAS.

By E. D. Cope.

The relation of the nearctic and neotropical faunæ at their point of junction is as yet a problem not fully solved. Where there is placed between the two an obstacle to migration of land and fresh water animals, as between the Gulf coast of the United States and the islands of the West Indies, the differential characters of the faunæ are well marked; but where the northern continent gradually passes into the long isthmus of Mexico, the case is far different. Here no barrier obstructs the passage of animals from the one region to the other, and nothing but climatic and meteoric causes can limit the range of the types of either fauna. A careful investigation of this subject must have an important bearing on the whole subject of the influence of environment on animal life.

In general the studies into the zoölogy of Mexico have shown conclusively that the high plateau is populated by an animal life which differs from that of the coastward plains, or Tierra Caliente. The highest land is known as the Tierra Alpina, and the intermediate region is the Tierra Templada. As residents of the land incapable of performing migrations, the *Batrachia* and *Reptilia* offer the most excellent field for the determination of the boundaries of these districts.

From this source we learn that the line of demarkation between the great Northern and Southern realms is the very sinuous and irregular one which separates the Tierra Caliente from the Tierra Alpina. The genera of South America advance northwards along the lower lands of Central America and Mexico, terminating their range at various points, but enough of them remain at Matamoras, at the mouth of Rio Grande, to show that that point is not far from the northern boundary of the neotropical realm. On the other hand, various genera of the southern regions of North America extend their range southward as far as the city of Mexico. This southern extension is not homogeneous in its character, since two very distinct groups of reptilian life are represented on each side of the political boundaries of the two countries. In North

America proper, there are the two regions called respectively the Austroriparian and the Sonoran, which are, climatically considered, of the most diverse character.* The Austroriparian region is humid, abounding in streams, and is covered with forests. Many species of *Batrachia* are found within its limits, some of which represent families unknown to any other region of the earth. Water-tortoises and snakes are numerous in species and genera, while the lizards have but few representatives. The Sonoran region, embracing the elevated countries of New Mexico and Arizona, is dry, with little vegetation, and a small number of springs and rivers. *Batrachia* and water-tortoises are few in species and individuals, while lizards and snakes are numerous in both. This region, if characterized by its climatic and surface characters, has considerable extent. It commences south of the center of Oregon, and, extending southward, embraces Nevada and Utah. Passing the Mexican boundary we find the sage-brush-desert plateau east of the Sierra Madre, the continuation of the Sierra Nevada, covering the greater part of Chihuahua, Coahuila, and Durango, and extending apparently as far to the southward as Guanajuato, or more than half of the entire extent in latitude of the Mexican Republic. At this point are found its characteristic desert *Batrachia*, *Bufo punctatus* B. & G., *B. debilis* Gird., and *Spea hammondi* Bd. On the west coast, genera and species of the same region have been found as far south as Mazatlan, such as *Bufo debilis*, *Sauromalus ater*, *Uta bicarinata*, &c.

On the eastern coast no trace of the Sonoran Fauna has been found. The low country, as already remarked, belongs to the northern extension of the neotropical realm. This is separated from the barren plateau of Coahuila and Durango by a mountainous region whose intermediate elevation gives it the character from which it derives its name, the Tierra Templada. Its width, at first small, increases southward, where it expands so as to include, in all probability, the beautiful valley of Mexico. No corresponding belt of identical faunal character can be determined on the western side of the plateau, since in Mexico as in the continents which she connects, the Cordillera approaches near to the Pacific, and the descent to the coast is rapid and abrupt. The Tierra Templada is a garden region. Elevated above the hot lowlands of the coast, the clouds from the Gulf discharge their burthen of rain on its mountains and valleys, giving life and support to a varied vegetation. The reptilian fauna of this region is in direct contrast with that of the

* See Check-List Batr. Reptil. N. America, 1875, p. 68, Bulletin Natl. Museum No. I.

dry regions to the westward of it. Like the Austroriparian region of North America it abounds in *Batrachia*, including salamanders; turtles also, though less numerous, are well represented; and lizards and snakes abound. The salamanders mostly belong to a genus, *Spelerpes*, which has its headquarters in North America, and several genera of North American snakes and lizards are abundant there, but they are so mixed with forms of the Tierra Caliente that I regard these districts for the present as faunally inseparable.

Having fixed approximately at some points the southern boundaries of the Sonoran and Austroriparian regions of the nearctic realm, the mutual relations of these divisions remain to be considered. And in connection with these we must endeavor to fix the southern limit of the Central region also, whose southern extremity is bordered by both of those above mentioned. It is needless to say that the great State of Texas is the field where these boundaries must be sought for; since, though politically one, its fauna is of a most diversified character.

Geologically, it was shown by Shumard to be divided, like the Eastern States, by northeast and southwest strikes. If a line is drawn through points a little west of the cities of Dallas and Houston, it will correspond nearly with the strike of the eastern border of the marine cretaceous formation, which constitutes so large a part of the surface of Texas. To the eastward of this line a belt of the Laramie formation extends from the northeast and terminates at the south, without continuing immediately to the west, according to Forshey. East of this the formations of the country are altogether tertiary. The marine cretaceous of Northern Texas soon yields on the west to carboniferous beds which rise from beneath them. These again descend, according to the geologists who have reported on the subject, and are followed by an extensive area of overlying rocks of permian and triassic age. But these formations alike disappear to the southward and are replaced by the western extension of the marine cretaceous. This formation covers a great extent of country in Western Texas, reaching from the latitude of San Antonio, far north into the Staked Plains and New Mexico.

Topographically speaking, Eastern Texas is a plain varied by mounds of red sand of late tertiary age, and by ravines and shallow valleys of erosion. Extensive prairies cover the foundation of Laramie and marine cretaceous throughout the eastern middle line of the State. The first line of elevation is formed by a break in the latter formation. An abrupt elevation commences somewhere to the southwest of Fort Worth

and continues southward and westward, passing close to Austin, the State capital, and within twenty miles of the city of San Antonio, extending westward to the valley of the Rio Grande. The portion of the limestone thus elevated is said to be older than that which occupies the adjoining lowlands, being correlated by some geologists with the No. 2 of Meek and Hayden, while the lower part of the formation is said to represent their No. 3. Without criticizing these determinations, it may be observed that the fault which should exist, if this identification be true, has been observed at various points along the line of elevation. I found it crossing the Helotes Creek eighteen miles from San Antonio at a locality pointed out to me by Mr. Gabriel W. Marnock.

This steppe of elevation is from five to eight hundred, and occasionally a thousand feet in height. Its summit is a greatly interrupted plain, which extends northward to near the Concho River, having a width of nearly two degrees of latitude. Here another elevation takes place, followed by a plain which extends away to the next ascent, which forms the southern boundary of the Staked Plains. The eastern and southern border of this plateau is 3,000 feet above the sea level,* and an ascent of another thousand feet is accomplished before the eastern boundary of New Mexico is reached.

The rivers of Texas, from the Trinity westward, take their rise at or near the first, second, and third lines of elevation above mentioned. Much the greater number of important streams originate in the region between the first and second steppes of a thousand feet each. This plateau is therefore cut up by their courses, and by the extensive lateral drainage belonging to each, so as to constitute a most varied and interesting country. The creeks and rivers flow through canyons or wide valleys with precipitous sides; and the upland is divided into mesas or plains as the canyons are more or less numerous and widely excavated. Near the southern and eastern border the erosion has been so extensive as to leave ranges of rounded hills to mark the former extent of the high land. This hill and canyon region abounds in fine scenery, and is the most picturesque section of the State, excepting the mountains of the Pecos, and the Guadalupe range.

Climatically considered, Texas embraces two distinct areas. The portion which lies east of the ninety-seventh meridian, including one-third of the State, receives the rains which the southern winds bring as clouds

* See list of elevations in United States, principally west of Mississippi River, by Henry Gannett, U. S. Geol. Survey Terrs., 1877.

from the Gulf of Mexico. The region lying to the west of that meridian receives winds which are generally depleted of their moisture before reaching it. West winds, of course, lose their rain on the Sierra Madre of Mexico; southwest winds come over the arid plains of the plateau, while south winds come direct from no sea, and have generally left their watery freight on the hills and forests of Eastern Mexico. Hence Western Texas is related to the east, as Colorado is to Missouri, but here in the south, these regions are brought into juxtaposition without a wide interval of plains.

Eastern Texas is, up to the eastern boundary of the Lignitic belt, forest covered. In the wet regions are the usual cypress (*Taxodium*) swamps; in the loamy soils the live-oak and hackberry (*Celtis*) forests, and on the sandy uplands the pine; all more or less draped with the *Tillandsia*, when within reach of the daily breezes from the ocean. Between the western boundary of the forests and the first steppe of limestone is a great tract of plains. From the Red River to Houston and west to Austin one great prairie extends, interrupted here and there by patches of post-oak and black-jack (*Quercus obtusiloba* and *Q. nigra*). Southward it is diversified by swamps, with or without *Taxodiun*, and alive with flocks of water-fowl. Here also, following the trend of the coast on the one hand and the lines of elevation on the other, the prairie region turns to the westward, extending to San Antonio and beyond. This southern portion of it is much interrupted by live-oak forest and mesquite openings along its northern border. This prairie region differs from the great plains of the North in not being covered by the buffalo-grass, but in supporting longer and coarser species. The region of the *first plateau*, as the hill country west and north of the plains may be definitely called, is not forest covered, nor is it naked. The highlands are diversified with numerous patches of dense shrubbery or brush, with growths of open timber of oak, and with grass. The hill-sides support the same vegetation, often of larger size, while the creek, river, and canyon bottoms are filled with dense forest. The principal trees are the pecan (*Carya olivæformis*), buttonwood (*Platanus occidentalis*), hackberry (*Celtis occidentalis*), pin-oak (*Quercus palustris*), and live-oak (*Quercus virens*); an ash (*Fraxinus*), elm (*Ulmus crassifolia*), wild china (*Sapindus marginatus*), and a spinous barberry with three leaflets. The brush includes many species of much interest to the botanist. Especially is the northern observer struck with the great number of leguminous plants on the lower levels, as mesquite (*Algarobia glandulosa*), the *Acacia famesiana*,

and the *Sophora*, with brilliant vermilion-colored seeds, from which Wood has recently obtained a valuable sedative alkaloid which he calls sophorine. The shrubbery of the highlands consists largely of dwarf live-oaks and two small species, *Quercus sansabæ* and *Q. durandii* of Buckley; with the black persimmon *Diospyrus texana*, a five-leaved barberry, and a *Rhus* very much like the *R. cotinus* of the gardens. Occasionally the elegant madroña raises its kid-colored branches (*Arbutus texana* Buckley), and a small ash with very obtuse leaflets is common. Then there is a multitude of berry-bearing shrubs, and all are intertwined with three or four species of *Ampelopsis* and other creepers. The open stretches are clothed with a dense carpet of buffalo-grass (*Buchloë*), from which rise several species of *Cactaceæ* and two or three *Yuccas* and the *Dasylirion*. The lower levels and hill-sides are, however, the home of the cacti. There the large deep-green *Opuntia*, so conspicuous on the arms of Mexico, rears its lines of discs from the short grass, or depends from the cliffs in picturesque festoons; a type among plants of endurance and persistence, of beauty and of repellant hostility.

Having thus glanced at the topography, geology, climate, and vegetation of Texas, I reach the principal object before us, a consideration of the distribution of its vertebrate animals. My remarks will refer chiefly to the *Batrachia* and *Reptilia*, but I commence with what I was able to learn of the distribution of some of the *Mammalia*. In preparing this part of my paper I have made considerable use of Professor Baird's magnificent report on the Vertebrata of the Mexican Boundary.

MAMMALIA.

Uncia onca;* the jaguar. This magnificent cat is not rare on the Nueces River, especially in the extensive thickets along the southern part of its course. Its range extends east as far as the Guadalupe River, where specimens have been killed, and it does not usually range north of San Antonio. I was assured, however, by several persons that a pair were killed a few years ago on the Medina River, in Kerr County, at

* I have employed Dr. Gray's name *Uncia* for the genus of true cats with round pupil, which embraces the largest known species—the lion, tiger, etc. (Proceed. Academy Philada., 1879). In the paper cited I remark, "I assume that this name is derived from *uncus*, a hook, which is appropriate to the weapons of these animals." This proceeding has been the subject of remark by two critics, who with remarkable perspicuity, remind us that Dr. Gray's name is probably a latinization of the common name "ounce." Had I not suspected as much, I would not have used the expression quoted, "I *assume*." As Gray was in the habit of giving barbarous names, without giving any etymologies, I esteem it a piece of good fortune to nomenclature when any of them can be rendered classic by assumption or any other lawful process.

about latitude 30°. This must be the northern limit of distribution of the species. I saw numerous skins of jaguars killed on the Nueces for sale in San Antonio, and heard of a pair in confinement on the Lagenillas Creek.

Felis pardalis; the ocelot. This southern species is more abundant than the jaguar, and has a wider range. It extends eastward to the Brazos, and north and east of San Antonio, along the hilly front of the first plateau region. I was informed that it is common near Fredericksburg, but northwest, near the forks of the Llano River, it was unknown to the settlers.

Uncia concolor and *Lynx rufus* are common all over Texas.

Vulpes cinereoargentatus and *Canis lupus* are also abundant.

Canis latrans I saw at several points on the central prairies of the State as far north as Austin; but I did not hear of it in the hill-country. After camping in the first plateau region for nearly two months I had not heard its voice, so familiar to the traveller on the northern plains.

Mephitis mapurito. I saw a skull of this South American skunk, procured by G. W. Marnock on the east side of the Rio Grande, and did not hear of its range extending east of the valley of that river.

Mephitis chinga, the common eastern skunk, is found as far west as the Medina River, at least.

Bassaris astuta, Licht. This interesting animal is chiefly found in the rough country of the first plateau region, ranging from the Rio Grande to the headwaters of the Colorado. It delights in the labyrinthine ravines among the brush-covered limestone cliffs, making its nest in the numerous caves and fissures that penetrate them. I heard of it as especially abundant in Bandera and Llano Counties. It is unknown east of the first steppe.

Procyon lotor extends to the Rio Grande, and *Ursus americanus* is found all over Texas.

Cynomys ludovicianus. The prairie-dog was found by the naturalists of the Mexican Boundary Survey in the Limpia Mountains, west of the Pecos. I did not see it near San Antonio, nor between that place and the Llano, but I observed a village on the plain on the north side of that river. Mr. Buckley, State geologist, gives the Rio San Saba as its southern limit, and states that it has reached this point (which is not far north of the Llano) in continuance of a gradual southern extension of range. Dr. Coues, in his monograph of the *Sciuridæ*,* enumerates one

* Monographs of the Rodentia of North America, U. S. Geol. Surv. Territories, vol. xi.

specimen as from San Antonio, collected by J. H. Clark of the United States and Mexican Boundary Commission. On reference to the report on the zoölogy of this Survey, specimens are reported as collected en route between San Antonio and El Paso, which leaves the locality indefinitely anywhere in Western Texas north of the former city.

Spermophilus grammurus has a range like that of the *Bassaris astuta*, so far as its eastern limit is concerned. All of the specimens which I saw and of which I heard, were black, the light tips of the hairs giving them a hoary appearance. The coloration is different from that which the species exhibits in other regions, and has given rise to the impression that it indicates another species, for which the name of *S. buckleyi* was proposed. The eminent naturalist, J. A. Allen, of Cambridge, is of the opinion that the Texan animal is only a melanistic variety of the *S. grammurus*. The large bushy tail of this species gives it the appearance of a true squirrel. Its habitat is the rocky cliffs of the first plateau region, where it feeds on the nuts and seeds of the brush. It is always seen climbing on the face of the rocks and never ascends trees. It readily escapes from the hunter by slipping round angles of the precipice or hiding in the numerous fissures and caves where it finds secure retreats. I thus lost all the specimens I saw on the upper waters of the Guadalupe and Llano Rivers.

Dasypus peba; the armadillo. This species I did not see, but I am told by Mr. Marnock, of Helotes, that it extends east as far as the Nueces River, and has been killed near Frio City, in latitude 29° north.

Dicotyles torquatus; the peccary. This is a common animal throughout the first plateau region, and in the lowlands to the south of it as far east as the Colorado. Northward it keeps to the hills and plains of the first plateau, ranging, according to Mr. Boll, an accomplished naturalist of Dallas, as far as the Red River. As in South America, it goes in herds, sometimes large ones, and is particularly common in the chaparral of the Nueces. It is abundant in the hills of the headwaters of the various southward-flowing streams, preferring high ground to the deep ravines. It there hides in brush and thickets, feeding on the acorns of the species of oak, and on the various fruits and roots with which these localities abound. When roused by enemies it does not immediately take to flight, but, when it does so, seeks refuge in the caves of the limestone cliffs. I met a herd in a dry but brushy ravine of the high land near the head of one of the southern tributaries of the Llano. This plain is without water, and crossing its twenty-five miles under a southern sun my thirst became rather urgent. I had no guide

nor trail, and since a failure to strike the narrow sources of the creeks I sought, might involve another twenty miles of waterless prairie, I eagerly directed my way towards the first larger vegetation that suggested springs. The ravine above mentioned contained numerous large hackberry and pecan trees, and a dense undergrowth of shrubs. It had evidently contained several pools in the spring, but now everything was dry. A pair of large owls ruled the darker shades, while the scored condition of the naked and dusty ground indicated terrestrial animals of some strength. I suddenly came on the herd of peccaries. Those not directly in sight fled into the thicket, but there was no retreat in the actions of the half dozen that I met fairly. They stood in a row looking down their noses, which were pointed to the earth, the long black and white mottled bristles of their backs rising and falling. I stood in front quietly watching them, and one by one they trotted off in a leisurely manner, the last to remain being an old boar larger than the rest.

Cariacus leucurus, the white-tailed deer. This is the common deer of Western Texas, and I saw it repeatedly, both wild and captive, and inpected a large collection of its horns in San Antonio. In thirty or forty pairs of horns I found six or eight specimens in which the inferior or first posterior antler was enlarged and more or less extensively forked, as in the *C. macrotis*. It is rarely forked to the same extent as in that species, but I saw two or three specimens which I could not have distinguished from those of the *C. macrotis*. I was assured by the gentleman who shot the deer that they differed in no respect from those which bore the ordinary form of horn.

Cariacus macrotis, the black-tailed deer. This species I did not see, and I was informed by various persons that it did not range south of the Concho River, or the line of the second steppe or plateau.

Antilocapra americana, antelope. This ruminant is found on the plains of the dry region at all elevations, extending its range southward to Fort Inge, and even to Laredo, in latitude 27° 30′. Eastward it is found in the north as far as Fort Worth, but I did not hear of it on the plains east of the first plateau.

Bos americanus, bison. The buffalo herd comes into Northwestern Texas in winter to the eastward of the Staked Plains, on the second and first plateaus. It does not range south of the two-thousand-foot steppe in the west, passing but a short distance below the Concho River.

AVES.

Observations on birds in Texas have been so numerous and so carefully conducted that I devoted little attention to this department. A few species attract the attention of the stranger by their striking character, and I will mention two or three of them.

The scissor-tail, *Milvulus forficatus*, is an important diagnostic species of the Texan zoölogical district. It occurs in all the parts of Texas I visited excepting the eastern or forest regions.

The "Mexican eagle," *Polyborus chiriway*, I only saw near San Antonio. Like the *Uncia onca* it is probably a species of the western portion of the lands below the first limestone steppe.

The chaparral cock (*Geococcyx viaticus*) is another diagnostic bird of much interest. Its habits have often been described, but will bear further mention. It is very abundant in Western Texas throughout the first plateau region as well as in the lowlands, but I did not see it in the wet region east of the ninety-seventh meridian. I found it in the mesquite plain, on the north side of the Llano, in latitude 30° 40′. It appears to be restricted in its range by the occurrence of its food, which consists chiefly of lizards. It is an inquisitive bird and not at all cowardly. It emerges from the brush with its long neck and tail in one line, and then stops and raises both in the air as it gazes curiously around. The head is inclined at various angles, with the feathers ruffled, and the tail slowly rises and falls. If it be alarmed it levels its head and tail again, and with the gait of an excited cock runs straight away from the intruder, without turning to the right or left, for some distance. It evidently relies on its speed, and with good reason, for it is with difficulty overtaken by a good horse. Its bottom is, however, not enduring, and it may soon be run down. In pursuit of lizards it follows them up rocks and tree trunks. It runs up the nearly vertical surfaces with its claws, aided by its wings, and in a most undignified hurry. When it reaches the smaller limbs the lizard's revolutions round the branches become more rapid, and the motions of the bird correspondingly absurd. At such times it looks more like a confused bundle of loose feathers gyrating round the tree—a truly laughable spectacle. It, however, generally gets the lizard, and then may often be seen standing on a naked limb at the summit of the tree with open mouth and dilated breast, considering the further proceedings of its prey, which are now restricted to very close quarters.

REPTILIA.

CROCODILIA.

Alligator mississippiensis. The western limit of the range of this species has never been fixed, and I used my opportunities to acquire information respecting it in Texas. It is common in the waters of the Guadalupe drainage, and is occasionally seen in the San Antonio River within the limits of the city of San Antonio. According to Mr. G. W. Marnock it is found in the Nueces, to its sources, and a skull in his possession belonged to an alligator which was killed between that river and the Rio Grande. In his report on the Herpetology of the United States and Mexican Boundary, Professor Baird records a specimen from Brownsville, on the Rio Grande.

TESTUDINATA.

Testudo berlandieri Agass. I obtained a specimen of this land tortoise, collected by Mr. Marnock in the southwestern part of the State, where, according to that gentleman, it is common. He has also found it near San Antonio. I did not meet with it on the first plateau.

Cistudo ornata Agass. From near Dallas, Boll.

Pseudemys mobilensis Holbr. This species, remarkable for the long tooth-like processes of its alveolar surfaces, is not rare in the drainage area of the Guadalupe River.

Pseudemys elegans Wied. This water-turtle is stated by Agassiz to range over the entire State of Texas. I found it at remote points, *i. e.*, the Upper Trinity River near Fort Worth, and the Helotes Creek, near San Antonio.

Kinosternum henrici Leconte. Found by Mr. Marnock on the tributaries of the Medina, in the region of San Antonio. I did not see it on the plateau.

Kinosternum pennsylvanicum L. A pair of this species was sent me from near Dallas by Mr. Boll. The male was very active and fierce in confinement, and devoured flesh greedily.

Aspidoncetes emoryi Agass. Obtained by Mr. Boll, near Dallas, in Northern Texas, and by Mr. Marnock in Helotes Creek, near San Antonio. I repeatedly saw soft-shell tortoises (*Trionychidæ*) in the tributaries of the Brazos and Guadalupe, in the lowlands and first plateau.

LACERTILIA.

Coleonyx variegatus Baird. This very pretty lizard is the only species of the *Geeconidæ* thus far found in Texas. Only two other species of

that family enter the extreme limits of the United States at other points, *i. e.*, Arizona and Florida. I found it rather abundantly in the rocky hills of the first plateau northwest of San Antonio, but did not observe it in that region north of that point either on the Guadalupe or Llano. It is found in holes under stones, towards evening, and generally in pairs, a peculiarity I have not observed in any other lizard. Its manners are also peculiar. It carries its thick tail coiled vertically on one side of its back like the spitz dog. Its movements are quick but feeble, and its short legs forbid the speed of other lizards. *Coleonyx* is one of the few genera of *Gecconidæ* which have eyelids, and as these are thick, and their movement in winking is slower than in other lizards, the physiognomy is quite peculiar. When handled, this species chirrups and squeals feebly like a singing mouse. One specimen which I took was about to shed its skin, so I placed it in a jar to observe the process. This took place in the night, for next morning it was so clean and its color so bright, that it looked as though gotten up for some special occasion. As no trace of the skin could be found, I suppose that it ate it, after the manner of the *Batrachia*. In life, the colors are very elegant; the pale cross-bands are citron yellow, and the brown ones bright chestnut. The inferior surfaces and all parts of the limbs are flesh or rose color.

Anolis principalis L. This is a species of the low country, and I did not observe it in the hills of the plateau region. Mr. Boll has found it near Dallas, and I took it on the Brazos, in Washington County. Mr. Marnock informs me that it is abundant in the region south of San Antonio.

Crotaphytus collaris Say. I found this species common in the rocks and open woods of the plateau country from near San Antonio to Mason County, north of Llano River, or as far as my observation extended. In the northern part of the State, according to Boll, it first begins to be abundant near Weatherford, longitude 97° 50′, and extends westward. This gentleman has never seen it in the cretaceous region of Fort Worth and Dallas. It runs very swiftly, carrying the tail over its back, like *Holbrookia texana* and various other iguanian lizards.

Holbrookia propinqua Baird. Professor Baird has well distinguished the species of *Holbrookia* by the form of the tail, the length of the hind foot, and the coloration. I give short diagnoses of the four species I met with in Texas, adding some characters derived from the scuta.

I. Tail flattened, longer than head and body.
Hind foot one-half length of body; tail with black spots below; male with black crescents on the sides ..... *H. texana.*

II. Tail cylindric, longer than head and body.
Hind foot three-fifths length of body; no spots on under surface of tail; sides with oblique black spots; scales minute ..... *H. propinqua.*
III. Tail cylindric, shorter than head and body.
Hind foot two-fifths length of body; under surface of tail black spotted; no black spots on sides; a few larger supraorbital scales ..... *H. lacerata.*
Hind foot two-fifths length of body; no black spots on tail; two small ones on each side; a few larger supraorbitals ..... *H. maculata.*
Hind foot one-half length of body; no lateral or caudal spots; numerous larger supraorbital scales ..... *H. elegans.**

Holbrookia propinqua is easily distinguished from other species of the genus. The tail is slender, cylindric, and longer than the head and body; the hind foot is elongate, being two-fifths the length of the head and body. Ten or more supraorbital scuta; plates of muzzle flat; labials exceedingly narrow, five in number, followed by a flat one. Femoral pores 16–18. A pair of blue spots on the side; none under the tail.

I did not observe the *H. propinqua* in any part of Texas visited by myself. Mr. Marnock finds it abundant near Helotes, and Professor Baird's types came from south of San Antonio. It is doubtless a southwestern species.

Holbrookia maculata, Girard.† I did not observe this species in the parts of Texas I examined, but a variety of it with a longer tail than the usual form was obtained from Mr. Boll, who probably took it near Dallas. Its characters are: Tail slender, cylindric a little longer than body; hind foot less than one-third head and body. Eight or ten supraorbital scuta; scales of muzzle tubercular; labials very narrow, five; femoral pores 13. A pair of blue spots on the side; none under the tail. West of Dallas Messrs. Boll and Isaac obtained this species from Weathford to Fort Concho, and Mr. Isaac sent it from the Wichita country. Professor Baird records it as found between San Antonio and El Paso.

Holbrookia lacerata Cope, sp. nov. Tail cylindric, slender, a little longer than body; hind foot short, less than one-third of head and body; six or eight supraorbital scuta surrounded by minute tubercles; scales of muzzle tubercular. Labials less elongate, 5 oblique, 1 flat; femoral pores 12–13; no blue spots on the sides; transverse blue spots on the inferior side of the tail. Color light brown, with six pairs of transverse dark brown bars between the scapular region and groin, which extend downwards and backwards on the abdomen. Their posterior border is serrate or digitate, and edged with yellowish, producing a

* Bocourt; Mazatlan.

† The *H. approximans*, Bd., is from Northern Mexico, and scarcely differs from *H. maculata* even as a subspecies.

variegated pattern. The inner part of the spots is frequently cut entirely off. The spots are continued on the upper side of the tail, and there are six irregular longitudinal brown bars on the neck A brown band across supraorbital regions, and spot on upper surface of muzzle. Limbs brown cross-banded. A pale band on inferior part of side, which is crossed by the ends of the lateral spots. Below this are five or six small dark spots, sometimes obsolete. Total length, .099; to collar, .015; to vent, .056. This is a short legged species allied to the *H. maculata*, but with longer tail and very different coloration. As compared with the variety of *H. maculata*, above described, the labial scuta are shorter and less oblique, resembling more nearly those of *H. texana*. In coloration it differs from the *H. maculata* in a point not above mentioned. The dorsal ground color is everywhere the same, a rich yellowish brown. In the *H. maculata* the median dorsal region is paler, and the sides of the back are of a dark shade, which connects the spots as by a wide band.

The most northern locality for the *Holbrookia lacera* with which I am acquainted is in Erath County, west of the Upper Brazos. Mr. Boll found it rather abundantly there and in Comanche County. Southward it has been found by Mr. Marnock on the Guadalupe River in Kendall or Comal County. It thus belongs to the first plateau fauna, and is not widely distributed.

Holbrookia texana Troschel. Tail depressed, wide, and rather short; hind foot short, less than one-third head and body. Seven rather short supralabial scuta; supraorbitals 15–20; scales of muzzle flat. Femoral pores 13. Two blue crescents on the posterior part of each side in male, and transverse black spots on the lower side of the tail in both sexes. The largest species. This lizard is the characteristically abundant form of Western Texas. I found it in the first plateau country to the heads of the Medina and Upper Llano. Mr. Boll states that it does not range east of Fort Worth, in Northern Texas. I did not observe it in the low country of Washington County. It evidently belongs to the plateau fauna. It runs with great rapidity, with its tail generally curved upward, displaying the black spots on the lower side. It prefers rocky ground, and does not ascend trees under ordinary circumstances.

Uta symmetrica Baird. A single pair of this species was seen and taken while running up the logs of a small ranch at one of the heads of the Medina River by Mr. Marnock. It had not been previously found in Texas.

Sceloporus consobrinus B. & G. This lizard is found all over Texas and is very variable in its characters. It always has about 28 transverse, series of keeled unimucronate scales between the interscapula and interfemoral regions, and the lateral scales are not larger than the ventral. The head scales are smooth. There may be three or two rows of supraorbitals between the internal and superciliary scales. The colors are often brilliant, especially in specimens from near San Antonio, where the sides of the neck and head are often of a bright rufous, and the tail reddish and yellowish brown at the base. It is very abundant from Dallas west to Fort Concho, and southwest to San Antonio, and in the first plateau region to the head of the Medina River. It is found on the ground, but always takes refuge in trees, running on and around the limbs with great agility.

Sceloporus scalaris Wiegm. This small and elegant species is abundant in the region southwest of San Antonio, according to Mr. Marnock, from whom I obtained specimens. I did not see it on the first plateau or eastward.

Sceloporus spinosus Wiegm., is abundant in Southwestern and Western Texas, as far north as the heads of the Medina and Guadalupe. I did not see it on the Llano. There are specimens in Mr. Boll's Dallas collections, but this gentleman informs me that it is very rare so far east. It ranges in North Texas chiefly west of Fort Worth. This lizard is especially arboreal, always ascending the trunks of trees when pursued. In this situation its somber colors afford it concealment. These are of different shades of brown without the brilliant blue and other colors of the two species of the genus already named.

Sceloporus poinsettii Bd. and Grd. The largest of its genus found in Texas, this species has nearly the range of the *S. spinosus*. I found it very abundant in the first plateau region as far as the upper waters of the Guadalupe. It differs in its habits from the *S. spinosus*, being exclusively a dweller in rocks. It may be seen at any time running over the limestone cliffs of the plateau region, to which its light colors present but little contrast. The relation between its color and habitat is quite as striking as in the *S. spinosus*.

Phrynosoma cornutum Harl. The "horned toad" of Texas is found throughout the cretaceous region, commencing at Dallas, and extending, via Austin, to San Antonio. It is abundant at and between these points, on the first plateau region, to the neighborhood of Fort Concho. Its range, according to Baird, extends west to the Rio Grande, and south to

Indianola. I agree with Messrs. Henshaw and Yarrow that the *P. planiceps*, Hallow., is not distinct.

Gerrhonotus infernalis Baird. This lizard occurs throughout the first plateau country, from the Rio Grande to the Red River. It has been found on the Helotes Creek by Mr. Marnock, and in Wichita County by Mr. Boll. I did not see it living; it is rather rare, and is said to inhabit rocky places.

Opheosaurus ventralis Linn. I did not observe this species in Southwestern Texas, but obtained it from near Dallas. The specimens are of the western variety, with only fourteen rows of dorsal scuta, or the subspecies *attenuatus* of Baird. A specimen from the same locality is similar in the characters named, but is remarkable for the strong carination of its superior scales. The carinæ are elevated on the ten median rows, so as to leave sulci between them. On the posterior part of the body the keels extend to the lateral rows, and on the tail even to the inferior surface. There are only ten superior labial scuta, and no postparietals. The infracanthal row extends over the eye, giving three rows between the latter and the frontal plate. I am not sure that these characters are constant, so I note this form under the varietal name of *sulcatus*. It is described from a half-grown animal.

Cnemidophorus sexlineatus Linn. The "swift" is common in Texas. To the northwest I saw it as far as the upper waters of the Guadalupe, and it is common at Fort Concho, and east to Dallas and Fort Worth. It doubtless extends farther in this direction. It is entirely terrestrial in its habits, and moves with greater rapidity than any other lizard.

Eumeces fasciatus Linn. Professor Baird has shown that the *Scincus erythrocephalus*, *quinquelineatus*, and *fasciatus* are forms of the same species; the first name having been given to old males. It is common near Dallas and eastward, but I do not know it from Western Texas.

Eumeces obsoletus Bd., Grd. Mr. Marnock obtained this species near Helotes, where it is rare. I saw, but did not succeed in capturing a lizard, which I suppose to belong to this species, near the head waters of the Medina River. It was of dark tints, with light spots on the sides of the head, like the younger stages described by Professor Baird. It was concealed beneath the bark of a log, and evading for a considerable time my attempts to take it, finally escaped.

Eumeces brevilineatus sp. nov. No postnasal plate; anterior loreal not elevated, reaching interfrontonasal, its posterior border striking the middle of the second labial; second loreal longer than high; two preoculars, between fourth and fifth superior labials. One large pentago-

nal postsymphyseal. Scales in twenty-six longitudinal rows. Hind leg 2.5 times in length of head and body, and meeting the fore limbs when both are appressed on the side.

Color plumbeous above, light olive below. A light band extends along the upper lip to a short distance behind the axilla, and another from the end of the muzzle over the eye to the corresponding point on the side, separated by two longitudinal rows of scales. The total length is m. 170; from muzzle to vent .059; do. from muzzle to ear .012.

This plainly colored scinc is intermediate in characters between the *E. anthracinus* and the *E. tetragrammus* of Professor Baird. It has the single postmental plate of that species, but the prefrenal is not high; there are twenty-six rows of scales, and there are no lateral bands on the body. The superior pair of pale lines are not dark-edged above, and are separated by six rows of scales as in *E. tetragrammus*. It was discovered by G. W. Marnock near Helotes Creek, on the front line of hills, twenty miles northwest of San Antonio, and was afterwards obtained by Mr. Boll from near Fort Concho.

Eumeces pachyurus sp. nov. No postnasal plate; anterior loreal elevated, reaching the transverse interfrontonasal plate. Postloreal as high as or higher than long; two preoculars between fourth and fifth superior labials; one postsymphyseal; twenty-six rows of scales; tail large, nearly as stout as the body at the base, subtetragonal; legs, small, separated by the length of the anterior limb when appressed; the hind leg a little more than one-fourth the length of the head and body.*

* *Eumeces pluvialis* sp. nov., *Eumeces anthracinus* var. Cope, Proceed. Amer. Philos. Soc., 1877, p. 63. This is a *Eumeces* of the group of the *E. anthracinus*. It has therefore five supraorbital plates, and no postnasal. Its loreals are like those of that species and *E. pachyurus*, of a rather elevated form, the prenasal reaching the transverse interfrontonasal. The two preoculars are wedged between the fourth and fifth superior labials, of which the fifth is elongate and beneath the orbit. The scales are in twenty-six rows and the limbs well developed; when laid along the side they overlap, the fore claws reaching the end of the second toe. Postsymphyseal undivided. Color above, blackish olive; below, malachite green. Two narrow green lateral bands separated from each other by a black band two and a half scales wide, the upper ones of opposite sides separated by a width of six scales. There is a faint trace in the typical specimen of a pale vertebral line with a dark border on each side, and there is a black border above the upper lateral line and another below the inferior lateral line. These lines extend to the orbit and ear respectively. The superior labials are green, black bordered; the other head plates brown with black borders.

The elevated form of the loreals and undivided postsymphyseal plate ally this species to the *E. anthracinus*. The more numerous scales and labial plates, the wide interfrontonasal and different coloration distinguish it. From *E. pachyurus* its well-developed limbs separate it. In *E. brevilineatus* the loreal plates are differently formed and the coloration is totally different. The size is rather small. But one specimen of this species is known. It was taken near Mobile, Ala., by Dr. Joseph Corson, U. S. A., well known by his important additions to Eocene vertebrate paleontology.

Above, light brown; below, pale greenish; anteriorly, straw colored; a light narrow band from the superciliary border continued along the body and tail, separated from that of the opposite side by six scales, and with a strong black border above. Below it, a deep brown or black band one and two half scales wide, which is bounded below by another light line; this is in turn bordered by a narrow brown line below, which does not extend like the other bands on the tail. The head and lips are pale brown, and the only head bands are posterior to the orbits. Length of head and body, .078; to ear from muzzle, .013; of fore limb, .015; of hind limb, .019.

This elegant species belongs to the same group as the last, and differs from the *E. anthracinus* and *E. tetragrammus* in the same characters. It differs from the *E. brevilineatus* in the higher loreal plates, the much smaller limbs, and totally in the coloration. One specimen only is in my collection; it was procured near Dallas by Mr. Boll. In size, it is above the average in the genus.

Oligosoma laterale Say. This species is abundant in many different regions of Texas, as at Dallas, Washington, Helotes, San Geronimo Creek, and the Upper Medina.

OPHIDIA.

Stenostoma dulce B. & G. Found not unfrequently by Mr. Marnock under stones near Helotes, Bexar County, also from Erath County from Mr. Boll.

Tantilla gracilis B. & G. Not rare at Helotes.

Tantilla nigriceps Kenn. I procured one specimen, which was taken near San Antonio by Mr. Kallteyer. A second was found by Mr. Boll somewhere between the upper waters of the Brazos and the Colorado Rivers.

Haldea striatula Linn. Two specimens were taken near Dallas by J. Boll, and one by Mr. Schmit, near Houston.

Virginia elegans Kenn. From Dallas and Helotes. The *V. valeriæ* Bd. and Gird. is the *Carphophis harperti* of Duméril and Bibron, described a short time previously.

Contia episcopa Kenn. This is a characteristic species of Western Texas. It is common west of Fort Worth to Fort Concho and about Helotes in the south. It exhibits a great range of color-variation, so that it is now evident that the *C. isozona* must be reckoned as one of its varieties. Thus its range extends to Utah and Arizona.

The general characters of the species are as follows: Scales in fifteen

rows, all smooth; superior labials, seven; the orbit bounded by the third and more largely by the fourth; loreal, small, quadrangular, longer than high; oculars, 1–2 anterior short, covered above by superciliary; postoculars resting on fourth labial; fifth and sixth labials equal, as high as long; parietals, large, long; frontal, longer than wide; prefrontals, transverse. Internasals partly separated by rostral, which is not very prominent. Inferior labials six; first pair meeting; fourth largest. Postgenials extremely short. Temporals little larger than body-scales, 1–2. Muzzle obtuse; head scarcely distinct; eye small. Gastrosteges 163; anal 1–1; urosteges varying in Texan specimens from 35 to 45.

There are three well-marked color varieties, which pass into each other. They are as follows:

Subspecies I, *episcopa*. Ground color ashen to rosy, with the scales broadly tipped with brown. A few only of the median rows of dorsal scales may be red; and the top of the head may or may not be brown.

Subspecies II, *torquata*. Ground color light yellow tinged with brown above; three median dorsal rows orange. Top of head, from anterior border of frontal to near end of occipitals, black. A transverse black spot commencing on the fourth scale behind the occipitals, two scales long and including the fourth row of scales from the gastrosteges on each side. In one specimen the third and fourth rows of scales black at their bases, forming a double lateral stripe, extending from the end of the half collar to beyond the middle of the body. In a second specimen these lines are absent. Lips and below, immaculate. Gastrosteges 183; anal divided; urosteges 38.

I have but two specimens of this variety, of which one is known to be from Northwestern Texas, and the other of uncertain locality, but probably from the same region. In the smaller, the third superior labial is almost excluded from the orbit; in the latter it has the usual share. In the latter also the top of the head is brown, as is often the case in the usual variety.

Subspecies III, *isozona*. There are four specimens of this form in the collection; in two of them the ground color is ashy, in two red. The back is traversed by from nineteen to twenty-one black cross-bands of three and a half scales in length; there are six on the tail. Belly uniform. In two specimens the top of the head is black; in another it is like the general ground color. In the same specimen the dorsal bars are very faint. This is *Contia isozona* Cope (1866), Wheeler Survey, Zoology, Pl. XVIII.

It is evident that these varieties pass into each other completely.

Tropidoclonium lineatum Hallow. Obtained near Dallas by Mr. Boll.

Storeria dekayi Holbr. From Dallas, Houston, and Helotes.

Tropidonotus clarki Baird and Girard. From Dallas and Houston.

Tropidonotus rhombifer Hallow. From Dallas and Helotes. This large species, heretofore only known from the Lower Mississippi, may now be regarded as a resident of the entire low country of Texas. I did not see it in the plateau region.

Tropidonotus sipedon woodhousei B. & G. From Fort Worth west to Fort Mason, and to Helotes. A specimen from the first locality has the abdomen uniform light yellow. In the young the spots are much more distinct than in the adult.

Tropidonotus fasciatus L. From Mr. Boll's collection made near Dallas.

Eutænia marciana B. & G. Abundant near Helotes and San Antonio, but not procured by Mr. Boll near Dallas.

Eutænia cyrtopsis, subsp. *ocellata*. Scales in nineteen longitudinal rows, the inferior smooth anteriorly but keeled posteriorly. Eight superior labials; loreal higher than long; temporals 1–2–3, the anterior large. The lateral band on the second and third rows of scales cream colored; dorsal band, extending to the end of the tail, orange-red. The usual alternating square black spots between the two bands; the scales in the light interspaces black or deep brown. Anteriorly the lateral black spots unite into a single series of subquadrate spots. The lower borders of the lower series of spots invade the lateral band, sometimes cutting it entirely off into sections of regular length. Below the middle of each section, and therefore alternating with the inferior lateral spots, is another black spot, relating to the arched light bar above it, as pupil to eyebrow. The superior lateral spots in like manner invade the median dorsal band, either cutting it off entirely or giving it a laterally undulatory course. Its width is alternately one and one and a half rows of scales. A dark gray shade connects the lateral inferior spots. Inferior surfaces olive-lead colored; the gastrosteges with blackish bases at the extremities. A large black spot behind the occipital plates, extending to below the angles of the mouth, which is deeply notched behind by the dorsal band. No occipital spots. Labial plates yellow, all equally black-edged. No yellow crescents on the side of the head or neck. Total length, m. .600; length of rictus oris, .020; of tail, .035. This handsome subspecies of the genus was discovered near Helotes,

Tex., by Mr. Gabriel W. Marnock. I did not see it elsewhere, and it does not appear to be common.

Eutænia eyrtopsis Kenn. may be defined as *E. sirtalis*, with eight superior labials, a red dorsal band, and the black lateral and nuchal spots very distinct. It belongs to the Sonoran district, and occurs as far south as Guanajuato, accompanying the *E. sirtalis*. The form *ocellata* is characterized by the anterior interruption of the dorsal and lateral bands by the enlarged black spots, producing the color-pattern above described.

Eutænia sirtalis L. var. *obscura* Cope. Found by Mr. Boll near Dallas. I did not meet with the species in Western Texas.

Eutænia faireyi B. & G. From Dallas, but not seen in Western Texas. The scutellation of the only specimen obtained is very near that of *E. proxima*, viz, 167–1–105.

Eutænia proxima Say. The common species of Western Texas, and, like the *E. saurita*, aquatic in its habits. From Helotes and the heads of the Medina and Colorado. Baird and Girard report it from Indianola and the Red River. It does not occur in the Dallas collections. The dorsal band is a lively red in life.

Diadophis punctatus stictogenys Cope. From Helotes; not rare.

Ophibolus getulus sayi Holbrook. A variety of this multiform species was taken near Dallas by Mr. Boll, in which the black ground color is varied by narrow oblique yellowish lines which extend along one and rarely two scales.

Ophibolus getulus getulus L. The form with yellow cross-bands instead of white, from Helotes.

Rhinochilus lecontei Bd. and Gird. From Helotes; G. W. Marnock. The most eastern locality known for this species, which is also found in California.

Phimothyra grahamiæ Bd. & Gird. Another species of the Sonoran fauna found by Mr. Marnock near Helotes, marking its most eastern known range.

Cyclophis æstivus L. Common in Western and probably Eastern Texas.

Coluber emoryi Bd. & Gird. Abundant near Dallas, at Helotes, and west of the Upper Brazos River.

Coluber lindheimeri B. & G. Found near Helotes.

Pityophis sayi mexicanus D. & B. From Helotes; also from near the Wichita River, in Archer County, near the northern boundary. Mr.

Boll states that he saw a specimen nearly twelve feet long from near Fort Belknap.

Bascanium flagelliforme testaceum Say. I obtained specimens from near Dallas, Houston, Brenham, Helotes, and the upper waters of the Guadalupe and the Llano Rivers. Those from Dallas, Brenham, and Houston, which are in the rainy region of Texas, have the greater part of the length a blackish brown. Those from Helotes, the Guadalupe, and the Llano are entirely pale clay-color. This relation of color to moisture is similar to that observed by Dr. J. A. Allen to prevail among the Rodent *Mammalia*. It is not, however, without exceptions, for I saw a specimen taken near Helotes which resembles the dark-colored subspecies of *B. tæniatum ornatum* B. & G.; and the subspecies of the *B. tæniatum*, which I have called *B. piceum*, is found in the dry region of Arizona, near Camp Grant. The form of *B. constrictor*, which is found on the dry plains (*Coryphodon flaviventris* Hallow.), is, on the other hand, of much lighter colors than the variety from the more humid east. I did not meet with this species in Texas.

Elaps fulvius Linn. Abundant near Helotes.

Ancistrodon piscivorus Latr. Abundant at Dallas and Helotes.

Ancistrodon contortrix Linn. Common from Dallas to San Antonio. I caught a specimen on the head waters of the Medina.

Caudisona miliaria Linn. From Dallas, but not obtained in Western Texas. An eastern species.

Crotalus adamanteus atrox B. & G. I observed this species of rattlesnake to be more abundant in the mesquite prairie, near San Antonio, than elsewhere. I obtained it from Helotes and the plateau country in Bandera County. Mr. Boll has not procured it near Dallas, but sends it from Brown County, in the plateau country north of the Colorado.

Crotalus confluentus Say. I have only seen this species from Texas from Haskell County, which is between the head forks of the Brazos. Baird and Girard record it from Bexar County in the south, showing that it has an extensive range in the western part of the State.

BATRACHIA.

Rana halecina berlandieri Bd. Common at Dallas and on the first plateau; also in the low country near Washington on the Brazos. It is the only species of the genus I saw in Texas, but Professor Baird reports *R. catesbyana* from San Antonio.

Engystoma carolinense Fitz. Abundant at Dallas, Houston, San An-

ton, Helotes, and Fort Concho. I heard it in the streets of Houston and San Antonio. In the former city it was abundant in copulâ, in the ditches that border some of the streets, in September. The cry is loud for the size of the animal, and is similar to that of the *Bufo americanus*, except in being higher pitched, and more nasal (in the vulgar sense). The animals are extremely shy, and become silent on the approach of human footsteps; and as only the tip of their nose projects above the water-level, they disappear beneath it without leaving a ripple.

Lithodytes latrans Cope, American Naturalist, 1878, p. 186. Size rather large; frontoparietal region flat, its width equal to the vertical diameter of the *membranum tympani*. Skin smooth, that of the abdomen thrown into a disc by a circular fold. Digital dilatations small on all the feet. The toes have no dermal free margins; those of the hand are long, while those of the foot are rather short. The fourth finger is as large as the forearm and exceeds the thumb, which in turn is considerably longer than the second finger. There are two strong palmar tubercles, and the entocuneiform is prominent and obtuse. The muzzle marks a point beyond the middle of the tarsus of the extended hind limb. The tarsus to the entocuneiform is just half as long as the remainder of the foot. There are prominent tubercles on the inferior side of the digits of both extremities. The head is wide and flat, and the loreal region oblique. The nasal region is flat and gently decurved, and the lip projects a little beyond the muzzle. The long diameter of the eye equals the length from its border to the external nostril, which is very near the end of the muzzle, and exceeds the long or vertical diameter of the *membranum tympani* by one-half of the latter. The width of the tympanic membrane is five-sixths of its height. The tongue is subround. The *ostia pharyngea* are large, but smaller than the choanæ. The vomerine teeth are in two short, nearly transverse patches, on elevated bases, their apices nearly in line with the posterior border of the choanæ. In younger individuals the choanæ are obliquely longitudinal.

Length of head and body, m. .076; length of head to line of posterior borders of tympanum, axially .024; width at latter point, .031; length of posterior leg, .107.

Color of superior surfaces brownish gray marked with a few large brown spots with pale centers. The largest of these is on each scapular region; a smaller pair is one over the extremity of each sacral transverse process. There are several on the coccygeal region, and above the groin; one on each eyelid, and one or two on the middle of the nasal

region. Another covers the tympanum, and a brown band connects the orbits around the end of the muzzle. There are two large brown spots on the lip, one below the eye, and one in front of it. The segments of the limbs have broad cross-bands, excepting the humerus. Below pale, immaculate.

This species is one of the larger forms of the genus. The nasal bones are in contact for most of their length, but diverge a little posteriorly, displaying a small portion of the ethmoid. This is not typical in *Lithodytes*, but approaches the state of things in *Epirhexis*. It is the second species of the genus found within the limits of the United States, the other being the *L. ricordi*, a Cuban form, found in Southern Florida.

This frog inhabits the cliffs of the cretaceous limestone which are found in every direction along the borders and river valleys of the first plateau region. My friend G. W. Marnock, who dicovered it, informs me that after rains it is very noisy, making the rocks resound with its cry, which is somewhat like a dog's bark. It hides in fissures, and is so difficult to find, as to be generally unknown to the country people, who suppose that the voice proceeds from a lizard. According to Mr. Marnock the eggs are hatched in winter, and the tadpoles pass their existence in temporary pools of rain-water which collects in holes in the rocks and at a distance from the creeks.

Syrrhophus marnochii Cope, American Naturalist, 1878, p. 253.

CHAR. GEN.—Family *Cystignathidæ*, group *Hylodinæ*. Xiphisternum a cartilaginous plate, notched; digits free; vomerine teeth none; ear well developed; nasal bones in contact, forming a solid roof over the ethmoid cartilage. Pupil horizontal.

This genus is simply *Phyllobates* with the nasal bones of *Hylodes*. In the former genus the nasals and ethmoid have the structure seen in *Elosia*. It is probable that *Phyllobates cystignathoides* m. from Vera Cruz belongs to this genus, as small and probably immature specimens have large and closely approximated nasal bones. A third species, *S. leprus* Cope, has been found at Tehuantepec by Sumichrast.

CHAR. SPECIF.—The typical specimen is as large as *Hyla versicolor*, but has a large flat head and remarkably short hind legs. The muzzle is flat and slightly depressed above, and projects a little beyond the edge of the lip. The nostril is a little behind the apex and as far in front of the orbit as the long diameter of the latter. Tympanic membrane round, its diameter about half that of eye. Choanæ lateral, equal in size to the *ostia pharyngea*. Tongue longer than wide, full, entire. Integuments

everywhere smooth; on the abdomen a faint discoidal fold. Digits short, moderately expanded and truncate at the extremity. Prominent tubercles at the proximal ends of the phalanges below. First and second anterior toes equal and shorter than fourth. The heel of the appressed hind limb reaches the middle of the tympanum, and the extremity of the tarsus a little anterior to the orbit. The fore limb is relatively longer, the wrist extending beyond the extremity of the muzzle. The tarsus is two-fifths the entire length of the posterior foot. The interorbital space is flat and wide, and is but a trifle narrower than the expanse of the sacral diapophyses.

The color of the upper surfaces is a light purplish brown, closely spotted with rather small closely placed and broadly defined, dark brown spots. The spots are less distinct on the head. Inferior surfaces light yellowish, immaculate, this tint commencing as small spots on the pale ground of the sides. Limbs above brown, broadly cross-banded with yellowish; femora behind, light brown with a few light points.

This frog was found by Mr. G. W. Marnock near Helotes, Bexar County, Texas, and I dedicate it to him with much pleasure.

Measurements.

	M.
Total length	.032
Length to line of posterior edge of tympanum	.012
Width of head at same point	.015
Length of hind leg	.043
Length of hind foot	.018
Interorbital width	.005

Chorophilus ocularis Daudin, Cope. This species resembles the eastern *C. ocularis*, but some specimens differ in the tuberculate character of the skin of the superior surfaces, and in the rudimental web of the hind foot. The head is rather short, and the anterior outline is a narrow oval. The extremity of the muzzle projects beyond the mouth, and the lores are slightly oblique and a little concave. The nostril is but little nearer the extremity of the muzzle than the orbit. The vertical diameter of the tympanum a little exceeds the transverse, which is one-half the long diameter of the eye-slit. The pupil, as in the other species of this genus, is horizontal. The tongue is wide, discoid, and entire behind. The *ostia pharyngea* are smaller than the small choanæ. The vomerine patches are short and transverse; they are entirely within the lines of the inner borders of the choanæ and behind the line of the posterior borders of the same.

The tubercles of the superior surfaces are small and rather closely placed; they are largest on sides of the back. There is a faint areolation of the gular region. The limbs are short and stout. The humerus is half or more inclosed in the skin. The palm reaches nearly to the end of the muzzle. The fingers are short and stout, and have neither dilatations nor borders. The first is shorter than the second, which equals the fourth. The palmar tubercles are not distinct. The heel of the appressed hind foot in thin specimens marks the middle of the tympanic disc or posterior border of orbit, and the end of the muzzle the extremity of the tarsus. The hind foot beyond the tarsus is only as long as the tibia. The toes have no dilatations, but possess dermal margins, and a short but distinct basal web. There is but one solar tubercle, a small cuneiform prominence. Total length, m. .035; of head, to line of posterior borders of *membranum tympani*, .011; width of head at the latter, .014; length of hind leg, .045; of femur, .013; of hind foot, .022; of tarsus, .009.

The color above is olive-gray, and below, uniform straw-color. A black band passes from the end of the muzzle on each side, through the eye, and expanding over the ear-drum, terminates in front of the humerus. One or two dark spots above and behind the axilla may unite to form part of a lateral band. There may or may not be blackish spots above the groin and on the coccygeal region and anterior part of the back. The limbs have a few dark-brown cross-bands; the femur is yellowish and unspotted behind.

There is some difference between the Texan specimens and those from Georgia. Specimens from the latter State are very smooth, and the limbs, especially the feet, are slender. The heel reaches to the orbit, or at least to the front of the tympanic membrane, and the end of the tarsus extends to or well beyond the end of the muzzle. The web and digital dermal borders are much less marked. Two specimens were obtained by Mr. Boll near Dallas, and three at Helotes by Mr. Marnock. All the latter have large brown dorsal spots.

Chorophilus triseriatus clarki Bd. From Dallas, Fort Concho, and Helotes.

Acris gryllus crepitans Bd. Common at Dallas, Washington, Helotes, and on the first plateau. Professor Baird adds Indianola, giving this small species a range over all parts of Texas.

Hyla carolinensis semifasciata Hallowell. From Dallas, and very common near Helotes. From Indianola, according to Professor Baird.

Hyla femoralis Daudin. A specimen larger than the largest individuals I have previously seen; differs also in the greater extent of palmation of the fingers, and in the coloration of the concealed surface of the femur. In eastern specimens the posterior face of the femur is brown, with rather small yellow spots; in this form it is yellow, with a blackish, coarse reticulation, which only extends to the lower surface on the proximal half of the thigh. The sides have a double row of small black spots, which inclose a yellow band. This is probably a subspecies, and may be distinguished by the name of *chrysoscelis*. One specimen as large as a large *Hyla versicolor* was taken by Mr. Boll near Dallas.

Smilisca baudini Dum., Bibr. This Mexican species has been found by Mr. Marnock in the low country southwest of San Antonio, commencing with the San Miguel Creek, a tributary of the Medina. This is its most eastern known range, that previously given by Professor Baird being Brownsville (as *Hyla vanvlietii*).

Scaphiopus varius Cope. Not rare in the low country from Atascosa County southwestward, according to Mr. Marnock, to whom I am indebted for specimens. This species is a true *Scaphiopus*.

Bufo debilis Girard. Specimens from Mr. Marnock from west of the Nueces River. Specimens in my collection are stated by that gentleman to have been taken near Fort Concho, and Mr. Isaac sends it from as far east as the Wichita River, thus greatly extending its range. It was originally brought from the valley of Mexico, and the Smithsonian Institution subsequently received it from Mazatlan. Baird reports it from the Lower Rio Grande. It is probably diagnostic of the Sonoran region.

Bufo punctatus Bd., Gird. Found near Helotes by Mr. Marnock, but not known from further east. Boll found it as far north as Fort Concho. Baird gives it from Western Texas, and I have determined it from Cape Saint Lucas, Lower California. It is found as far south as Guanaxuato, from which place I have received it from Dr. Dugés. It is another Sonoran type.

Bufo lentiginosus americanus Lec. From Dallas; Mr. Boll. This form also occurs at New Orleans. The usual form of the Gulf States, the typical *lentiginosus*, has not yet been found in Texas.

Bufo valliceps Wiegm. A Mexican toad found all over Southern Texas. I have it from Washington and Helotes. Professor Baird reports it from the Texan coast of the Gulf. Some specimens were sent to me by Professor King, of Baton Rouge, La., which he believed to have been taken in the neighborhood of that city.

Diemyctylus miniatus Raf., subsp. *meridionalis* Cope. This new name is introduced for a form of this genus which has definite characters and a special geographical range. It has the longer digits and low cranial crests of the *D. miniatus*, and agrees in color with the variety *viridescens*. From both forms it differs in the absence of red spots from the dorsal region, which is instead covered with rather large black spots, which continue on the tail. The ground above is olive; below it is yellow, which is marked with numerous small black spots. A character which appears to be of importance is seen in the fore foot of the only specimen in my possession. The outer toe is more than half as long as the penultimate, while in the varieties *viridescens* and *miniatus* it is less than half as long.

The first specimen of this form which I met with was sent to the Smithsonian Institution from Matamoras, Mexico. G. W. Marnock finds it in the tributaries of the Medina River and southward, and it has not been found east of that region. I did not see it in the plateau region.

I may mention here that the presence of the temporal pits cannot be used as a definition of the genus *Diemyctylus*, since they are as often wanting as present.

Plethodon glutinosus Green. From the first plateau as far south as Helotes.

Amblystoma microstomum Cope. Abundant near Dallas; also from Houston.

Amblystoma opacum Grav. From Wichita County, near the Red River; Jacob Boll.

PISCES.

PERCOMORPHI.

Boleosoma phlox sp. nov. This species has the physiognomy of a *Pœcilichthys*, but the technical characters of *Boleosoma*. The mouth is terminal, and the superior arcade extensively projectile. The soft dorsal is considerably longer on its base than the anal, and the cheeks and opercles are smooth. The lateral line is straight, and does not extend beyond the point below the middle of the second dorsal fin. The second dorsal is elongate and the spines are rather long. Fin radii: D. X–12; A. II–5; V. I–5. The anal spines are well developed, and the first is stouter and a little longer than the second. The dorsal fins are separated by the width of a scale. Scales 5–52–8, present on the belly, rudimental or wanting on the nape and breast. The mucous tubules are strong, extending from the lateral line above the operculum and orbit to

the front of the nares, and sending a branch part way to the middle line of the occiput. The head is compressed and the front gradually descending. The mouth is nearly horizontal, the end of the maxillary bone marking nearly the anterior border of the pupil of the eye. The orbit is large, entering the length of the head four times, and exceeding a little the space between it and the end of the muzzle. The interorbital space is very narrow, and the opercular spine is strong. The head enters the length with the caudal fin 4.75 times, and, including the opercular spine, is as long as the base of the spinous dorsal. The latter is, in turn, shorter than the base of the soft dorsal. The length of the caudal fin is intermediate between the two.

The color of the body is vermilion, with rather indistinct small brown dorsal spots. Opposite to these there is a series of similar blue spots on the lateral line, of which those posterior to the anal fin are continued to the inferior surface. The spinous dorsal has a dark-blue border, and a red shade from the base upwards, which is present in the second dorsal also. This fin, unlike the caudal, is not cross-barred. Inferior and lateral fins immaculate. Ventral and pectoral fins light blue. There is a dark shade on the operculum, and an indistinct one below the eye. Length, with caudal fin, m. .043; interorbital width, m. .0005.

I took this species in the Trinity River, near Fort Worth.

Percina caprodes carbonaria Girard. From near Dallas (Trinity River) and the Llano, Kimble County.

Micropterus floridanus Les., Goode; *Cichla floridana* Les., 1822; *Huro nigricans* Cuv., Val., 1828; *Micropterus nigricans* Cope. Numerous specimens, probably referable to this species, were taken in the Trinity, Llano, Guadalupe, and Medina Rivers. Several of them, however, differ materially from Professor Gill's description* in his comparative diagnoses of this species and the *M. salmoides*. I select, in illustration, an adult specimen which I caught in the Johnson's Fork of the Llano River, in Kimble County. It agrees with the description cited in the following points: First, the number of scales 7½ or 8, 63; second, those of nape equal; sixth, scales at base of second dorsal forming a low sheath; eighth, mouth large; ninth, maxillary bone extending to line of posterior edge of orbit; tenth, soft dorsal rays I–11, anals III–10.

The characters in which the specimen differs from Professor Gill's description are the following: Third, scales of cheeks minute, seventeen in an oblique and nine in a horizontal series; fourth, scales of

* Proceed. Amer. Ass. Adv. Sci., 1873, pp. 56–71.

interoperculum covering only half that bone; fifth, scales of preopercular limb none; seventh, scales ascending high between rays of anal fin; eleventh, spinous dorsal depressed, the ninth spine half as long as the longest, and two-thirds as long as the tenth. These points of difference are those given by Professor Gill as characters of the *M. salmoides*, excepting the last. The form of the spinous dorsal fin is nearly that of the *M. floridanus*, but the proportions of the spines are those assigned by Gill to the *M. salmoides*.

The differences in the size of the cheek scales, with the characters of the nakedness of the preopercle, and half nakedness of the interopercle, would indicate a valid third species of the genus, were the characters assigned by Professor Gill permanent in the species to which he assigns them. Such supposed species would not be the *Dioplites nuecensis* of Girard, because this author expressly states that the scales of the cheeks and opercula are of equal size. I have, however, examined some *M. floridanus*, from Florida, in my collection, and find these also to differ from parts of Professor Gill's description. I find the cheek scales large, as stated by Gill, and different from the Texan specimens, but the interopercle is only half covered by its scales. The spinous dorsal presents almost exactly the characters of the Texan specimen, and the soft dorsal has the rays I–13, the number assigned by Gill to the *M. salmoides*. The second dorsal and anal fins are naked, as Gill describes.

It appears, then, that the only important character which distinguishes the Texan form from the Floridan is the much smaller size of the cheek scales. I do not know how constant this character will prove. Perhaps some of the names recently given to Mexican forms may be applicable to a variety so defined.

The Llano fish is rather light colored, and there is a dusky line along the middle of each row of scales, which are especially distinct below the lateral line.

I may add here that it seems that the name and characters of the genus *Micropterus* were based on a monstrous or mutilated specimen. The characters thus derived were false and absurd. Under ordinary circumstances this name should be relegated to the limbo of undeterminable myths. The next name in order is *Calliurus* Raf., which is only applicable to young fishes of this genus, and was almost as badly characterized as *Micropterus*. This name should, however, be adopted, as its characters were drawn from normal objects. As, however, *Micropterus* has obtained some currency, and as the name *Calliurus* is peculiarly false in significance, I retain the former provisionally.

Apomotis cyanellus Raf.; *Calliurus formosus* Girard; *Bryttus mincopas* Cope. From Dallas and Fort Worth, from the Trinity River. I have also noted this species from Minnesota to Virginia, in the Mississippi Valley.

Apomotis sp. This species agrees nearly with Girard's description of *Bryttus humilis* Girard, but Professor Jordan informs me that it is not that fish. The form is rather elongate and compressed, and the head is elongate-conic, with a large eye, one-fourth its length. The palatine teeth are present, and the maxillary bone extends to the line of the anterior margin of the pupil. Radii: D. X–10; A. III–8. The ventral fins originate a little in advance of the line of the first dorsal. Every scale has a yellow centre, and the larger specimens are dusted over with black dots. From the Llano River.

Lepomis speciosus Gird. (?); *Pomotis* Gird. This is my *Lepomis longispinis*, a species which ranges north as far as Nebraska and Indiana. Girard's description applies well to it, but his figure (U. S. Mex. Bound. Surv., pl. iv, figs. 5–8) represents it very badly, so much so as to lead me to question the applicability of Girard's name. Numerous specimens from the Llano River. Radial formula: D. X–11; A. III–11. Scales 7–40–14.

Lepomis anagallinus Cope var. I took a sunfish in the Trinity River at Fort Worth which apparently forms a geographical race of this species. The only peculiarities which I observe are the absence of a soft ray from the dorsal fin, and addition of one to the anal, and the shade of the color. The spots and shades which are red in the northern form are yellow here; this color is especially to be noted in the anal and ventral fins. There are no black spots on the dorsal fins. Radii: D. IX–10; A. III–9. Scales 5–36–11. In three specimens out of seven there are only nine dorsal spines.

Xenotis megalotis Raf.; *Lepomis* Cope (Journal Academy Nat. Sci. Phila., 1866, 220); *Pomotis nitidus* Kirtland. The most abundant fresh-water fish in Texas, including two varieties; the one possessing a black spot on the second dorsal, the other lacking it. I have the former from the Trinity at Fort Worth, the Helotes Creek, and the Upper Medina; and the unspotted form from the Trinity at Dallas and Fort Worth, and Johnson's Fork of the Llano, in Kimble County.

HAPLOMI.

Fundulus diaphanus Les. Abundant with *Campostoma* in a pool in the otherwise dry bed of Comanche Creek, Mason County.

Zygoncetes notatus Raf.; *Fundulus olivaceus* Stor. The Trinity River, at Fort Worth.

Zygoncetes brachypterus sp. nov. Base of first dorsal ray behind the vertical line equally dividing the base of the anal; radii, few, D. 7, A. 8; ventrals not reaching base of anal. Scales large, in nine longitudinal and thirty transverse rows. Head wide, with overhanging supercilia; interorbital width twice the diameter of the orbit, which enters the length of the head 2.5 times. Head entering length, with caudal fin, 5.5 times, and equalling the length of the caudal fin. Color uniform olivaceous; the scales with brown edges; cheeks silvery; no spots on the head. Length m. .049. This plain species, distinguished by the small number of its fin rays and its robust form, was taken in the Trinity River at Fort Worth.

NEMATOGNATHI.

Ichthælurus cœrulescens Rafinesque, Gill, Coues. From the Trinity at Fort Worth and Dallas and the Little Wichita. The name first adopted by Gill from Rafinesque, and frequently used by later writers, is very appropriate to this fish, and should not, it seems to me, give way to the *Silurus punctatus* Raf., a very inappropriate name, unless it be absolutely necessary. In view of the frequent uncertainty of the identification of Rafinesque's names, I have in this instance followed the next succeeding author who has used such name, and believe that it will be to the advantage of the subject to allow such use to remain as authoritative in all cases. The reopening of the subject in doubtful cases is, from all points of view, unprofitable.

Amiurus lupus Girard. A compressed and rather slender species, with the caudal fin emarginate for about one-fifth of its length. Head short, moderately elevated behind, about one-fourth the length less the caudal fin. Eye entering length of head 5.5 times, and interorbital width 4 times, over convexity. Depth at front of anal fin a little less than length of head. Radii: D. I–6; A. 22; P. I–9–10. The spines are rather long and irregularly grooved. Those of both dorsal and pectoral fins have a remote serration on their anterior faces; and while the pectoral exhibits low teeth on its posterior face, that part of the dorsal spine is smooth. The postclavicular process is acute and grooved. The maxillary barbels extend to the middle of the pectoral spines, and the nasal barbel reaches to above the middle of the preopercular border. The median mental barbels extend to the bases of the branchiostegal rays, and the external ones to beyond their extremi-

ties. Mouth terminal. Color lead-color, darker on the head; below silvery. Length m. .100.

This species of catfish was obtained by Mr. Marnock from one of the tributaries of the river Medina. He states that during the dry season it buries itself in the mud in the bottoms of the creek channels, and may be found there by digging. I find no peculiarity of the branchial apparatus or swim-bladder indicative of such a habit.

Amiurus brachyacanthus sp. nov. This is a robust species of rather small size, which is distinguished, among other characters, by the shortness of the spinous radii. Radial formula: D. I–6; A. 22; P. I–6. The body is rather deep; depth at front of anal fin 4.4 times in the length exclusive of the caudal fin; the head enters the same 3.6 times. The (external) eyes quite small, entering the length of the head seven times, and the interorbital width four times. The head is not depressed, and rises gradually posteriorly. The maxillary barbels extend to the middle of the pectoral spine, and the nasals to above the middle of the operculum. Both pairs of mentals extend beyond the extremities of the branchiostegal rays behind them. The dorsal and pectoral spines are small and acute and are not concealed in the skin, but have a rough surface. The former is not serrate before or behind, and the latter is weakly serrate behind only. The lengths of both are nearly equal, and are less than one-third the length from the end of the muzzle to the base of the dorsal spine, and 1^{mm} less than the interorbital width. The lips are equal. Caudal fin.?? The adipose fin extends anteriorly along the back to above the middle of the pectorals (?). The color above is blackish, and below yellowish. Length, with caudal fin, m. .080.

I took two specimens of this species in Wallace Creek, one of the heads of the Medina, in Bandera County.

Amiurus catus Linn.; Jordan Siluridæ, p. 90. Little Witchita River; J. Boll.

Amiurus bolli sp. nov. Represented by two specimens in my collection. They are nearest to the *A. natalis* Les., but differ in several features from all of the numerous varieties of that species recorded by Jordan. They differ very much from the typical *A. natalis cupreus*, and appear to come nearest the *A. n. analis* Jordan. They agree with *A. natalis* in having a rounded caudal fin, and twenty-five anal radii, and subequal jaws. The body is more slender than in any of the varieties, its depth entering the length minus the caudal fin, 5 and $5\frac{1}{2}$ times. In *A. natalis* these proportions are as 1 to 4 and $4\frac{1}{2}$. The form of the caudal fin

differs from that of most other species in having the superior distal angle somewhat produced, while the corresponding lower angle is obliquely truncate. The intermediate border is scarcely emarginate when spread out. Other characters are as follows: Head flat, one-fifth longer than wide; greatest gape of mouth equal half length of head from dorsal spine, omitting soft upper lip. Length of head $3\frac{2}{3}$ times in total, minus caudal fin; length of base of anal fin the same. Pectoral spine finely serrate posteriorly, more than half as long as head; dorsal spine long, smooth, a little shorter than pectoral, its base a little nearer end of muzzle than origin of adipose fin. It is separated by a wide space from the supra-occipital crest. Longest anal rays one-half as long as head. Branchiostegal rays 9.

Color light or dark olivaceous above; below, with mental barbels, yellow or white in spirits. Length of specimens 6 inches.

The only species besides the *A. natalis* with which to compare this species is the *A. crebennus* Jordan. From this species it differs in many points.

Little Wichita River, Northern Texas. It is dedicated to the well-known naturalist Jacob Boll, who discovered it.

Pelodichthys olivaris Raf. The Trinity, at Fort Worth and Dallas.

PLECTOSPONDYLI.

Myxostoma macrolepidotum Les. This Texan representative of the "red horse," var. *duquesnei*, was found to be common in the Guadaloupe and Llano Rivers. It may prove to be but a geographical race or subspecies, as I find no other difference between the two than a rather larger number of scales in the Texan form. They number 6–45–5 in the latter; in var. *duquesnei* 5–42–4, a slight difference, but more important in this genus than in many others. Radii: D. I–12; V. 9.

Campostoma anomalum Raf., subspecies or var. *pullum* Ag. I found the small form of this species common at Helotes, on the Upper Medina, and in Comanche Creek, at Mason.

Hybognathus flavipinnis sp. nov. This species belongs to the second division of the genus, as defined in my Fresh Water Fishes of North Carolina (Proceed. Amer. Philos. Soc., 1870, p. 466) by the narrow suborbital bones and the inconspicuous speculum of the postfrontal region, the type of which is the *H. argyritis*. The present fish differs from that one in the smaller scales and quite distinct coloration. Formulæ:

D. I–8; A. I–7–8; scales, 7–41–2–4. Eye large, horizontally oval, its length 2.66 times in that of the head, and equal to interorbital width. The muzzle is shortly decurved to the mouth, which is terminal and short. The extremity of the maxillary bone extends half way from the end of the muzzle to the line of the orbit. The length of the head is contained in the total (with caudal fin) five and three-sevenths times, and is 1^{mm} less than the depth of the body at the ventral fin. The origin of the latter is below or a little in advance of the base of the first dorsal ray. The pectoral is short, not nearly reaching the ventral, which in turn falls far short of the vent. The lateral line rises anteriorly. The occipital region is convex and rather wide; the interorbital region nearly flat. Dorsal region dusky; a wide dusky lateral band, separated by a pale band from the dorsal shading. An inconspicuous black dot at the base of the caudal fin. The fins generally pale yellow, and without spots. The bands and shades of the body are continued on the head. Length m. .076.

This fish differs from the *H. siderius** Cope, in its much larger scales. I found it to be abundant in the Johnson's Fork of the Llano, in Kimble County.

Hybognathus nigrotæniata sp. nov. This species nearly resembles the last, but differs in its considerably larger scales, relatively rather shorter body, and longer fins. The formulæ are: D. I–8; A. I–8; scales 5–34–3, or fewer than in the *H. argyritis*. The head is one-fifth the length, including the caudal fin, and about equal to the depth at the ventral fin. The latter originates a little in advance of the line of the first dorsal ray. The diameter of the eye is large, a little less than one-third the length of the head, and a little less than the interorbital width. The ventral fin nearly reaches the vent.

In color and other respects the description of the *H. flavipinnis* is applicable to the present species. I may modify this by the observation that the lateral band is blacker in the present species, and there is no evidence that the fins were yellow. The size is less. Length of the largest specimen m. .066.

This cyprinoid is abundant in the upper waters of Wallace Creek, one of the heads of the Medina.

Cochlognathus biguttata sp. nov. The genus *Cochlognathus* of Baird and Girard was stated by Girard to be related to *Pimephales*, and to have

* This species is a *Hybognathus*. Through some unaccountable oversight it was referred to *Hyborhynchus* in Vol. V, Report Lieutenant Wheeler, p. 670.

the same character of dorsal fin. In the "*Cyprinidæ* of Pennsylvania" I showed that it was much more like *Alburnops* ("Hybopsis") in all respects; that it is of carnivorous habits, with short alimentary canal, and with the short dorsal spine not separated by membrane from the first cartilaginous ray.

The present is the second known species of the genus. It is a fish of rather uniform diameter and deep caudal peduncle. The head is oblong and rather wide above; the muzzle has a decurved profile and terminal mouth. Radial formula: D. I–8; A. I–7. Scales 7–34; number below the lateral line unknown, as they are quite carneous. The orbit is large, entering the length of the head 3.4 times and a little more than once in the length of the muzzle, which is just equal to the interorbital width. The head is wide behind and flat above. The infraorbital bones are narrow, while the preorbital is large, with convex inferior and concave superior border. The extremity of the maxillary bone does not quite reach the line of the anterior border of the orbit.

The ventral fin commences opposite the second or third dorsal ray, and reaches the vent, but not the anal fin; the latter is small in all dimensions. The pectoral fin covers three-fifths the space between its base and that of the ventral. The length of the head is about one-fifth the total, including caudal fin, and is a little greater than the greatest depth of the body.

The color is silvery, without dark markings on the head or body. There is a black spot on the middle of several anterior dorsal rays, and a small but very black one at the origin of the caudal fin on the bases of the rays. Total length m. .063.

As compared with *C. ornatus*, according to Baird and Girard's description and figure, in the United States and Mexican Boundary Survey, the present fish presents various differences. In that species the ventral fins originate below the first dorsal spine, and there are but six anal rays, etc. Its color is also quite distinct, resembling more that of *Pimephales* in the general suffusion of dark color over the dorsal and caudal fins and the absence of the characteristic black spot at the base of the latter.

Abundant in the Trinity River at Fort Worth.

Cyprinella venusta Girard. (United States and Mexican Boundary Survey, II, p. 54 pl. xxxi; figs. 1–4.) I made the above identification provisionally, and Professor Jordan informs me that it is correct. Since Girard omits most of the important characters of this fish in his short description, I give the following diagnosis for future use: Orbit large, contained 3.5 times in length of head and 1.4 times in interorbital

width. Length of head contained 4.12 times in length without caudal fin. Muzzle rather acuminate; maxillary bone not reaching orbit. Radii: D. I–8; A. I–8. Scales 7–37–3. Silvery, without markings, excepting a large black spot at base of caudal fin nearly as large as the orbit. Teeth 1.4–4.1 or 4–4, crenate. My largest specimens exceed those of Girard in proportions, measuring m. .084 in total length.

This species is near the *C. cercostigma* Cope, differing mainly in its larger eye and deficiency in the number of the small teeth of the external row. According to Jordan, the *Cyprinella texana* Gird. is this fish. Abundant in Johnson's Fork of the Llano River.

Moniana jugalis Cope (variety or different species?). The Texan form which I mention under this name agrees nearly with that to which I first applied it, but I find that numerous specimens agree in possessing a smaller number of longitudinal series of scales above the lateral line, and sometimes one less below it. The number is $\frac{6}{2\cdot3}$; in *M. jugalis* from the Missouri $\frac{7}{3}$. Abundant in the Trinity at Fort Worth and Dallas.

Moniana sp. A much more slender species than the last, represented by very small specimens.

SUPPLEMENTARY NOTES.

Conepatus mapurito Gm. Mr. Boll sends me this skunk from the Wichita region, near the Red River.

Eumeces pachyurus Cope. I find on comparison of this species with specimens of *E. septentrionalis* Bd. from Neosho Falls, Kansas, in the Smithsonian Museum, that the differences between the two species are not great, but that they are nevertheless sufficiently distinguished by the following characters:

E. pachyurus.	*E. septentrionalis.*
Postnasal scute reaching interfrontonasal.	Postnasal widely separated from interfrontonasal.
No dark dorsal stripes.	Two black dorsal stripes.
Rows of scales, 26.	Rows of scales, 28.

Two specimens in the Smithsonian Museum (No. 5325) from Savannah, Ga., appear to represent a form of *E. septentrionalis*, differing only in the relatively longer legs. They are, when extended on the side, only separated by a space equal to the length of the forefoot. In the typical form the space is equal to the length of the forearm and forefoot together.

Some exceptional forms of *Eumeces obsoletus* have been sent me from Douglas County, Kansas, by Prof. F. H. Snow, of Lawrence. It is

represented by three large adult individuals of very light colors. They differ remarkably in the scuta of the nose. In one the frontonasals and supranasals are in contact; in the other two they are separated by the prefrenals. In the former there is one prefrenal on both sides, and a postnasal on one side. In No. 2 there is a postnasal on each side, and two prefrenals, one above the other, on one side only. In No. 3 there is no postnasal plate; the prefrenal is in contact above with the interfrontonasal. On one side of the head it is divided by a horizontal fissure into two scuta, one above the other; the other side is undivided. The hinder leg measures one-third the distance from its base to the end of the muzzle. When extended along the side, the fore and hinder limbs just touch the extremities of each other's claws. The second and fifth posterior toes are of equal length. Color pale ashen, with a bluish or greenish tinge. The external edges of the scales of the second row from the median line are brown, forming a longitudinal line on each side. In the same way the edges of the scales of the oblique lateral rows of scales are brown. These oblique brown lines are each six or seven scales long; anteriorly they become more longitudinal, two parallel lines running backwards from above the superior border of the ear. Superior labial plates brown edged. Scales of posterior faces of limbs brown edged. Length to vent, m. .101; length to axilla, .038; length to meatus of ear, .020; length of hind leg, .032.

No. 1 is colored like No. 3, omitting the dorsal lines; No. 2 is like No. 1, except that the lateral brown borders unite into a wide, loose band.

Eumeces epipleurotus sp. nov. Through the kindness of Professor Baird I was able to inspect three specimens of this species which are preserved in the Museum of the Smithsonian Institution. They are from the northern boundary of Texas and from Nebraska, at Fort Kearney.

The species belongs to the group of the *E. fasciatus*, having a small postnasal in front of the base of the usual larger one, and agrees with the *E. leptogrammus* Bd. in having but 24 rows of scales. The postnasal reaches the rather transverse interfrontonasal. The limbs are not very short, being separated when applied to the side by a space less than the length of the forefoot. The coloration is as follows: The median dorsal pale band covers only the adjacent halves of the two median rows of scales. A black band bordering it occupies the remaining half of the row, with the adjacent half of the next row. The remaining half of the next row is occupied by a pale band. A black line passes along the adjacent edge of the next row, whose middle is white. The external

edge of the same row is involved in the superior edge of a wide band, which covers two rows and two half rows. Thus there are three dark bands on each side of the middle line, the inferior being the widest. Altogether they only cover five and a half rows of scales on each side. There are also no lateral light bands as in many species, but the color of the abdomen extends to the lower dark band. Size rather small; length of head and body m. .070. The peculiar distribution of the color bands distinguishes this species from the *P. leptogrammus* of Baird, should the adult form of that species be found to have the paler colors of the present one.

Coluber bairdi Yarrow sp. nov. Dr. H. C. Yarrow sends me the following description of an interesting novelty from the arid region of Western Texas:

Body rather compressed. Head very broad; neck contracted. Vertical plate longer than broad, with a slight notch in anterior border; posterior portion very large, broader than long; supercilium broadest posteriorly; anterior orbital one; postorbitals two, lower largest; nine upper labials, seventh largest; lower border of orbit formed by upper margins of the fourth and fifth upper labials; lower labials twelve, seventh largest. Dorsal rows of scales 27, long and lozenge-shaped; three upper dorsal rows slightly carinated. General color above (alcoholic) warm grayish-ash; beneath yellowish; behind occipitals two converging oblong brown blotches, and posterior to these a series of narrow transverse brown blotches, eighty in number, becoming obsolete near caudal extremity; these blotches are six scales in width. Laterally below, there is a corresponding series of irregular blotches on both sides, almost obsolete. Along upper border of abdominal scutella, on both sides, are strongly marked small black blotches at intervals of 2, sometimes 3 scales. Anterior portion of abdominal scutella black, maculated; on head a black band commences at anterior margin of superciliary and extends nearly across and to nearly the entire width of the postfrontal; upper labials margined with blackish-brown posteriorly, lower labials also; a blotched line of blackish-brown extends from posterior lower angle of orbit to angle of mouth; under surface of jaw yellowish-white.

The specimen described (No. 10403, Nat. Mus. Herp., s. i) was secured near Fort Davis, Tex., by Hospital Steward von Manteuffel. This post is in the Apache Mountains, 50 miles from the Mexican border or Rio Grande, Northwest of Presidio del Norte. The species is dedicated to Prof. S. F. Baird, director Smithsonian Institution.

GENERAL OBSERVATIONS.

Various important features of the fauna of Texas require us to place it within the Nearctic realm; for although it possesses a number of genera which are common to this realm and the Neotropical, there are numerous genera which belong to the former exclusively, and very few that belong to the latter alone. In order to display these relations, I place side by side lists of the genera of vertebrates whose geographical relations are in the three directions mentioned. It is assumed for the present that the faunæ of Mexico and Central America are branches of the Neotropical.

Nearctic genera.	Mixed genera.	Neotropical genera.
Antilocapra.	Cariacus.	Dicotyles.
Ovis.		
Bos.	Uncia.	
Lynx.	Felis.	
Taxidea.	Canis.	
Blarina.	Vulpes.	
	Bassaris.	
Mephitis.		Conepatus.
	Procyon.	
	Ursus.	
Castor.	Sciurus.	
Cynomys.	Spermophilus.	
Geomys.	Reithrodon.	
	Perognathus.	
Thomomys.	Hesperomys.	
Fiber.	Lepus.	
	Didelphys.	Dasypus.
Holbrookia.	Phrynosoma.	
Crotaphytus.	Sceloporus.	
Eumeces.	Anolis.	
	Coleonyx.	
	Gerrhonotus.	
	Oligosoma	
Virginia.	Tantilla.	Stenostoma.
Cyclophis.	Ophibolus.	
Tropidonotus.	Eutænia.	
Pityophis.	Coluber.	
	Spilotes.	
	Bascanium.	
	Elaps.	
	Ancistrodon.	
	Crotalus.	
Scaphiopus.	Rana.	
Acris.		Smilisca.
		Lithodytes.
		Syrrhophus.
Plethodon.	Engystoma.	
Amblystoma.		
Diemyctylus.		
Siren.		
Scaphirhynchops.		
Carpiodes.		
Myxostoma.		
Notropis.		
Cyprinella.		
Etheostominæ.		
Centrarchinæ.	Micropterus.	

In passing, I give the following list of genera which occupy the adjacent regions of the two realms, not extending far into either. Their significance is chiefly to be considered in connection with the minor

divisions, as they have not an extensive range. Those found in Texas are marked with an asterisk:

Chilomeniscus; Gyalopium; Hypsiglena; Phimothyra; Heloderma; Callisaurus; Sauromalus; Uta.**

The middle column of the three above given may be redivided into those which belong to the Mexican district alone, and those which are found both there and in one or more of the South American districts. But this discussion belongs rather to that of the relations of the Mexican fauna.

The consideration of the vertebrate fauna of Texas will be now chiefly limited to the *Mammalia*, *Reptilia*, and *Batrachia*, as the forms which are most fixed in their range and most intimately related to the physical history of the surface of the earth. The distribution of the areas of elevation and of the drainage have been already pointed out in the opening of the article. It was shown that the surface of Texas rises to the northwest, and that the strikes of the strata, as well as of the faults of the formations, have a northeast and southwest direction. It has been pointed out that the climate west of the 98th meridian is characterized by aridity, while the eastern portion of the State is supplied with abundant rains. The annual amount of rainfall on the eastern border of the State is, according to Blodgett,† fifty inches. At the meridian of the western or Mexican coast of the Gulf the amount is reduced to thirty-five inches. From this point westward the amount diminishes rapidly. Thus, in longitude 98° 30′, about the border of the first plateau, the rainfall is twenty-five inches; at Fort Concho it is reduced to twenty inches, and on the high plains of the Pecos to but fifteen inches. Of course change of vegetation accompanies this climatic gradation, and animal life is modified in proportion as it is dependent on plants. Such change affects many birds and arboreal mammals, reptiles, and *Batrachia*. Of tree-livers may be especially mentioned the *Scelopori*, *spinosus* and *consobrinus*, and the *Hylæ*.

We may now place in connection with the facts of geology and climatology the distribution of the *Vertebrata* considered in the previous pages. The species will be taken up in geographical groups. These, which have been already foreshadowed, are four in number. First, those of the extreme southwest; second, those of the plateaus; and third, those of the low country and the east. These will be placed in three columns, so that the common and peculiar species may be com-

† Climatology of the United States; also, Gray's Atlas, p. 26.

pared. Some species which are found throughout the Nearctic realm (*Felis concolor*) are omitted; so, also, some whose range in Texas is insufficiently known.*

Southwestern division.	Plateau division.	Eastern and southeastern division.
Uncia onca.		
Felis pardalis.	Felis pardalis.	
Conepatus mapurito.		
	Bassaris astuta.	
	Spermophilus grammurus.	
Dasypus peba.		
Dicotyles torquatus.	Dicotyles torquatus.	
	Antilocapra americana.	
	Bos americanus.	
Alligator mississippiensis.		Alligator mississippiensis.
Xerobates berlandieri.		
	Coleonyx variegatus.	
	Crotaphytus collaris.	Anolis principalis.
Holbrookia propinqua.	Holbrookia texana.	
	lacerata.	
	maculata.	
	Uta symmetrica.	
Sceloporus scalaris.	Sceloporus consobrinus.	
spinosus.	spinosus.	
	poinsettii.	
	Phrynosoma cornutum.	
	Gerrhonotus infernalis.	Opheosaurus ventralis.
Eumeces tetragrammus.	Eumeces obsoletus.	Eumeces fasciatus.
	brevilineatus.	
Oligosoma laterale.	Oligosoma laterale.	Oligosoma laterale.
	Stenostoma dulce.	
	Tantilla nigriceps.	
Tantilla gracilis.		
	Contia episcopa.	
		Storeria dekayi.
	Rhinochilus lecontei.	
Tropidonotus clarki.		Tropidonotus clarki.
		rhombifer.
		fasciatus.
Eutænia marciana.	Eutænia cyrtopsis.	
	proxima.	Eutænia faireyi.
		Ophibolus getulus.
		sayi.
	Phimothyra grahamiæ.	
Cyclophis æstivus.		Cyclophis æstivus.
Rhadinæa imperialis.		
Sibon annulatus.	Coluber emoryi.	
		Elaps fulvius.
Ancistrodon piscivorus.		Ancistrodon piscivorus.
	Ancistrodon contortrix.	contortrix.
Crotalus adamanteus.	Crotalus adamanteus.	Caudasona miliaria.
	confluentus.	
	Rana halecina.	
	Engystoma carolinense.	Engystoma carolinense.
	Lithodytes latrans.	
	Syrrhophus marnochii.	
	Chorophilus triseriatus.	Chorophilus ocularis.
Hyla carolinensis.		Hyla carolinensis.
Smilisca baudini.	Smilisca baudinii.	
	Scaphiopus varius.	
	Bufo debilis.	
	punctatus.	
Bufo valliceps.	valliceps.	Bufo valliceps.
		americanus.
Diemyctylus meridionalis.		
Siren lacertina.		Amblystoma microstomum.

The following conclusions may be drawn from the inspection of the preceding tables. Of the twenty-two species of the extreme southwest of the State, nine are found in Mexico, and six belong to the Austroriparian district of the Nearctic realm. Eight of the species are also found in the eastern portion of Texas, represented in column three; six only are distributed over the pleateau region. But five species are

* The species of the Plains are considered later.

peculiar to this section, so far as known, but its boundaries on the southwest have not been ascertained.

If now we examine column three, which, though incomplete, gives a general idea of the species of the eastern part of the State, we have a list of the well-known species of the Austroriparian region, with perhaps the single exception of the *Tropidonotus clarki*, whose eastern range is unknown. We derive from this, that Texas, southeast of the first plateau, must be included in that primary region.

Forty species are enumerated as characteristic of the plateau district, and they present affinities in three directions. These are to the Mexican fauna of the Tierra Caliente, to the Sonoran fauna of Mexico and the United States, and to the fauna of the central region or that of the great plains of North America. Some of the species are peculiar to the plateaus, and others are found in all the regions named. I first indicate the relationships of the genera, omitting those which are universally Nearctic.

Mexican genera.	Sonoran genera.	Central genera.
Dicotyles.		Bos.
		Antilocapra.
Bassaris.	Bassaris.	
	Cynomys.	Cynomys.
Coleonyx.	Coleonyx.	
	Crotaphytus.	
	Holbrookia.	Holbrookia.
	Uta.	
Gerrhonotus.	Gerrhonotus.	
Stenostoma.	Stenostoma.	
	Phimothyra.	
	Rhinochilus.	
Syrrhophus.		
Lithodytes.		

From the preceding tables it is evident that the Plateau district owes the character of its fauna chiefly to the predominance of Sonoran genera. There are ten of these, four of which are also Mexican and two Central. There are two Mexican genera of frogs, but it is very uncertain whether they are widely distributed in the Plateau region. A most important difference between this and the Austroriparian region is at once apparent. No genus is peculiar to the Plateau district of Texas.

In considering the corresponding relations of the species, I add to the three already defined, a fourth list, which consists of those peculiar to the Plateau district in Texas, so far as yet imperfectly known.

Mexican.	Peculiar.	Sonoran.	Central.
Felis pardalis.			
Bassaris astuta.		Bassaris astuta.	
		Spermophilus grammurus.	Cynomys ludovicianus.
Dicotyles torquatus.		Antilocapra americana.	Antilocapra americana.
			Bos americanus.
		Coleonyx variegatus.	
		Crotaphytus collaris.	
		Holbrookia texana.	
	Holbrookia lacera.	Holbrookia maculata.	Holbrookia maculata.
	Sceloporus spinosus.	Sceloporus poinsettii.	
		Uta symmetrica.	
		Phrynosoma cornutum.	
	Gerrhonotus infernalis.		
	Eumeces brevilineatus.	Eumeces obsoletus.	Eumeces obsoletus.
	Stenostoma dulce.		
	Tantilla nigriceps.		
		Contia episcopa.	
		Rhinochilus lecontei.	
Eutænia proxima.		Eutænia cyrtopsis.	
		Phimothyra grahamiæ.	
	Coluber emoryi.		
	Coluber bairdi		
	Crotalus adamanteus.	Crotalus confluentus.	Crotalus confluentus.
	Lithodytes latrans.		
	Syrrhophus marnochii.		
			Chorophilus triseriatus.
		Scaphiopus varius.	
Bufo valliceps.		Bufo debilis, punctatus.	

The summary of the above lists of the species of the Plateau district is as follows: Found in the Sonoran region, nineteen species; peculiar, eleven; found in the warm parts of Mexico, five; found in the Central region, seven. The Mexican list is reduced by the fact that one of its species is also Sonoran; and the Central list by the exclusion of four species, which are also Sonoran.

It is now evident that the characteristics of the fauna of the Plateau region of Texas refer it to the Sonora region, of the Nearctic realm, unless the number of its peculiar species is so large as to necessitate the recognition of another primary division. This course is negatived, not only by the fact already shown, that there is no genus peculiar to this district, but by the character of the list of species enumerated as peculiar to it. Of the eleven species of this list, six are rare in collections, and it is quite uncertain what the extent of their range in the district really is; but should the entire number (eleven) prove to be limited to the Plateau district it would only entitle it to be regarded as a subdivision of the great Sonoran region. The addition of *Cynomys ludovicianus*, *Bos americanus*, and *Chorophilus triseriatus* from the Central fauna, which do not occur in the typical Sonoran list, adds some weight to this conclusion. We have now attained to what has heretofore been a desideratum, the eastern limit or boundary of the Sonoran region. This, it appears, is the eastern and southern border of the Plateau district, which extends southwards to within twenty miles of San Antonio, and runs northeastward, crossing the Colorado River not far northwest of Austin, and then passes northwards, crossing the Brazos near Weatherford.

While considering the boundaries of the Sonoran region I allude to its southern limit. A collection made by Edward Wilkinson at Batopilas, in Southern Chihuahua, includes a majority of species of this fauna. These are *Phrynosoma cornutum*, *Uta ornata*, *Sceloporus couchi*, *S. tristichus*, *Eutænia cyrtopsis*, *Phimothyra grahamiæ*, *Elaps euryxanthus*. Accessions from the Mexican faunæ are only *Anolis nebulosus* and *Cyclura acanthura* of general distribution, and *Trimorphodon upsilon* heretofore from the west side of the plateau of Mexico. A peculiar snake is *Procinura æmula*.*

Collections sent by Dr. Alfredo Dugés from Guadalaxara, at the southern extremity of the northern plateau of Mexico, included five distinctive species of the Sonoran region, viz, *Bufo punctatus*, *Hyla arenicolor*, *Spea hammondi*, *Eutænia cyrtopsis*, and *Hypsiglena ochrorhynchus*. Ten other species belong to Nearctic genera, while one only, (*Cystignathus microtis*) belongs to an exclusively Neotropical genus. There are about a dozen species peculiar to the neighborhood.

In the Check List of the Reptilia and Batrachia of North America I attempted to define the Texan district of the Austroriparian region as distinct from the two other divisions of the same, the Louisianian and the Floridian, and gave a list of the genera and species, supposed to characterize it. I remarked (p. 80) that "the high northwestern regions of the State should be assigned to the Sonoran fauna," but not being aware at that time of the distribution of many species, I did not give this region sufficient extent. In accordance with the facts already adduced, it seems necessary to restrict this Texan district to the southwestern part of the State, and regard it as characterized by the list of species already given in the first column on page 44. I select from that list the following species which are, so far as now known, peculiar to it: *Testudo berlandieri*, *Holbrookia propinqua*, *Eumeces tetragrammus* *Rhadinæa imperialis*, *Diemyctylus meridionalis*.

The Texan district will then be distinguished by the presence of these species, and the admixture of the following Mexican species: *Uncia onca*, *Felis pardalis*, *Dasypus peba*, *Dicotyles torquatus*, *Sceloporus scalaris*, *Sibon annulatus*, *Smilisca baudina*, *Bufo valliceps*.

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* Eleventh Contribution to the Herpetology of Tropical America, by E. D. Cope, Proceed. Amer. Philos. Society, June, 1879.

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