

instead of three. However, it is really possible to obtain an approximate set of values representing the initial xanthophyll content of these nine samples. These may readily be computed, on the assumption that the weights of the samples within each size-group stood in the same ratios to one another at the beginning of the experiment as they did at the end. Thus the sample lots W 101, 102 and 103 contained, respectively, 32.4%, 33.7% and 33.8% of the total mass (157.8 grams) at the end of the experiment, and the original mass (118.6 grams) may be apportioned in the same ratios. Each of these assumed original values for weight may then be multiplied by our assumed concentration (0.980) as before. Thus proceeding, we have a set of nine values for "absolute amounts of xanthophyll," which may be compared with the nine obtained at the end of the experiment. It is of significance that in every case the later figure exceeded the earlier one, the differences ranging from 4 to 23 per cent.

⁸ Or possibly into other oxidation-products of carotene, indistinguishable from these by our qualitative chemical tests.

⁹ Considerable time was devoted to ascertaining both the amount of this plankton in the piped sea-water, and the amount of its contained carotenoids, but under present circumstances, it does not seem worth while to discuss these.

¹⁰ Confirmed spectroscopically by Dr. J. H. C. Smith and Mr. Harold W. Milner (Sumner and Fox, 1933).

¹¹ Such refined technique as that employed by Schertz (1923, 1925) and others is clearly indicated in the present case. Situations arise in which the identification of these substances by purely chemical technique is inadequate.

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SOME RARE AMPHIBIANS AND REPTILES OF THE UNITED STATES

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In our searches for live representatives of every species of the amphibians and reptiles of these United States, many interesting records of rare, recently described or little known forms have accumulated. Space permits but a few notes on some of the noteworthy species.

Amphibians.—1. *Ambystoma cingulatum* Cope.—This remains one of the rarest salamanders of the southeastern states. This gray-barred form occurs from Grahamville,¹ South Carolina, to Mobile, Alabama (J. Hurter). In recent times since 1914 (Deckert at Jacksonville, Fla.),

we know of no specimens being found. On the east edge of the Okefinokee Swamp, Georgia, we took one in a dry pine woods (June 15, 1922) and another near the edge of a cypress pond (July 23, 1922).

2. *Ambystoma mabeei* Bishop.—In 1928 Dr. S. C. Bishop² on one specimen from low grounds of the Black River near Dunn, N. C., described a new form, *Ambystoma mabeei*. No more have been reported since that time. In the spring of 1934 we took one (Feb. 24, 1934) 14 miles north of Wilmington, N. C., and about twenty-one more (Feb. 25, 1934) four miles east of the Edisto River on Route No. 17, Rantowles, S. C., and west of Charleston. This spring (1935) at this latter locality, Mr. H. G. M. Jopson found more. This new form may explain the former queer distributional records of supposed *Ambystoma texanum* (*microstonum*) east of the Alleghanies and only in North Carolina.

3. *Gyrinophilus porphyriticus duryi* (Weller).—Weller's³ new form of the Purple salamander *Gyrinophilus porphyriticus duryi* (Weller) described in 1930 and known from northeastern Kentucky and southeastern Ohio, also occurs in West Virginia. We secured it at Polecat Run, Sisterville, West Virginia, June 22–27, 1931.

4. *Aenides aeneus* (Cope).—Cope⁴ had one specimen from Nickajack Cave which is near the junction of Georgia, Alabama and Tennessee. Until Dunn's Plethodontidae appeared, no more than a dozen specimens had accumulated since 1881. Pope⁵ July 20–28, 1927, Pine Mountain, Kentucky, made some good observations on this form. In June, 1931, in examining the West Virginia University Museum material, we found one *A. aeneus* labeled "Cheat River about 1920" (Cheat River usually meaning Cooper Rock country to the University staff). In July, 1931, Mr. M. Graham Netting independently sensed it as *A. aeneus*. Later that summer we went to Baileysville, W. Va., but knew not the secret of finding them in drought. At Athens, W. Va., July 21–25, 1931, Mr. P. S. Bibbee took us to Brush Creek Canyon where we accidentally found the cliff cracks their habitat. Later Mr. Netting⁶ visited this locality. Still later he and Mr. N. Richmond began a search of Cooper's Rock where they found several. The first specimen we ever saw was taken June 15–25, 1909, by Professor J. C. Bradley at Tallulah Falls, Georgia. Many years later Oct. 18, 1926, at this place Doctor S. C. Bishop found it on a boulder under some wood. It is no longer uncommon now we know its habitat.

5. *Leptodactylus albilabris* (Günther).—In 1931 near Los Olmos bridge, Rio Grande City, Texas, Doctor E. H. Taylor⁷ and J. S. Wright took one specimen of this species. It occurs from Vera Cruz to Nicaragua; also in Porto Rico and the Virgin Islands. On May 2, 1934, Mr. Stanley Mulaik of Edinburg, Texas, described a frog which sounded like sea lions and he gave me two specimens of this species. They are the second and third specimens of the White-lipped Frog from the United States.

6. *Rana heckscheri* Wright.—Since we⁸ described this form in 1924 this species has been found sporadically from South Carolina to Biloxi, Mississippi. Several have been found in Florida and, imagine my surprise in finding that E. Ross Allen at Silver Springs, Florida, considers it one of his main local reliances as food for his reptile house.

Reptiles.—7. *Crotaphytus reticulatus* Baird.—From Baird's⁹ first description in 1858 to 1898 only four specimens accumulated for Cope¹² to pronounce it still rare. The Biological Survey of Texas¹⁰ published in 1905, reports that "William Lloyd collected a specimen of this rare and apparently very locally distributed lizard at Rio Grande City, Texas, May 28, 1891." In 1925 (June 12–16) we saw them from Rio Grande City to Roma, Texas, and also in 1934, in which year Mr. Stanley Mulaik of Edinburg, Texas, took specimens.

8. *Sceloporus disparilis* Stejneger.—In 1905 Doctor Stejneger¹⁰ identified "five specimens collected by Mr. William Lloyd at Lomita Ranch, six miles north of Hidalgo, Texas," as *Sceloporus dispar*, Baird and Girard. Later, in 1916, Doctor Stejneger¹¹ described these five and two specimens from Duval County, Texas, and Nuevo Leon, as a new species, *S. disparilis*. So far as we know, no one has recorded it since the three lots were taken. On May 2, 1934, while visiting Mr. Stanley Mulaik's school in Edinburg, Texas, we saw a recently hatched young of this species, and later, June 14, 1934, we received a live adult female. In 1925 at La Lomita we did not find it because of a drought.

9. *Sceloporus torquatus cyanogenys* Cope.—In 1898 Cope¹² writes "S. t. cyanogenys is found so near the boundary that it is not unlikely to be found within our limits. Indeed I am not sure that I did not see this animal on the rocky banks of the Rio Grande at Laredo, Texas, in 1885." In 1925 from June 9–15 we found this form from Zapata to Roma, Texas. At the latter place we took a fine specimen on June 15. In 1934 we found several around Rio Grande City where E. H. Taylor¹³ captured it in 1930. Doctor Taylor was the first to announce its presence in the United States.

10. *Neoseps reynoldsii* Stejneger.—This elongate burrowing skink with one toe on the fore foot and two toes on the hind foot has eluded most collectors since Doctor Stejneger¹⁴ described the unique specimen from Fruitland Park. Thereafter, one man, Mr. Norman Wood, in Auburndale, Florida, collected them in considerable number, while no one else ever found them, or very rarely. In 1934 (March 30) Mr. O. C. Van Hyning at Eustis, Florida, when directing a large group of CCC workers in making an airport, found that in the first time over they went down three inches and found mainly *Eumeces egregius*. The next time, they went down to nine inches and revealed mainly *Rhineura floridana* and *Neoseps reynoldsii*.

11. *Coluber constrictor flaviventris* (Say).—In 1895 Cope¹² described

two new forms of *Zamenis* from the lower Rio Grande valley: one as *Z. stejnegerianus* from one specimen from Cameron County; and another as *Z. conirostris* from one specimen from Matamoras. Brown¹⁵ in 1901 considered the first as synonymous with *Zamenis constrictor flaviventris*. In 1928 Doctor Ortenburger¹⁶ in his monograph on the racers following Brown considers the two forms *Coluber c. flaviventris* but shows in his range map no *Coluber c. flaviventris* below the latitude of Victoria, Texas. In 1934 I saw at Edinburg, Texas, one specimen which more or less fits the composite description of Cope's 1895 forms. Later, in 1934, we received another specimen of the same form from Edinburg. We suspect these two species will become one, *Coluber stejnegerianus*. Eventually it may be considered *C. c. flaviventris*, but I believe more work and material are needed before a conservative accepted determination is possible.

12. *Elaphe bairdii* (Yarrow).—In 1880 Yarrow¹⁷ described *Elaphe bairdii* from Ft. Davis, Texas. Until a few years ago no other specimens were known. Doctor G. S. Myers and Mr. G. M. Kranzthor secured one in the Cherry Canyon, Ft. Davis Mountains, on May 20, 1929. He also found one in the Sul Ross Teachers College collection at Alpine, Texas. In 1917 and 1925 we saw it not, but in the Chisos Mts., May 21, 1934, just as we were breaking camp in Green Gulch, we picked up the fourth specimen known.

13. *Elaphe rosacea* (Cope).—In 1888 Cope¹⁸ described this form from one fresh alcoholic specimen taken at Key West, and mentioned four indistinct longitudinal bands. In 1920 Doctor Thomas Barbour¹⁹ reported on a beautiful live *Elaphe rosacea* taken on Big Pine Key. Like Cope, he noted its intermediate position between *E. guttata* and *E. quadrivittata*. In 1933 Mr. Maurice Brady²⁰ reported on the third specimen found and, ostensibly, it came from Little Pine Key. Last spring (March 18, 1934) on our lone day at Matacumbe Key, we went out at night for *Hyla septentrionalis*, and fortunately stumbled on this fourth specimen of *Elaphe rosacea*, but it has no suggestion of four longitudinal stripes. Mr. A. Pflueger, who captured Mr. Brady's specimen, said he had two more which were lost. He saw my specimen in life and considered it the same as Brady's specimen and the two he lost. Is this form moving northward as *Hyla septentrionalis*, *E. ricordii* and others are doing? On March 14, 1935, we received another specimen from Mr. H. G. M. Jopson at Key West.

14. *Elaphe subocularis* (Brown).—E. Meyenburg collected snakes in Ft. Davis Mts., for Mr. Arthur E. Brown²¹ of the Philadelphia Zoo. Among his finds was a new form described in 1901. Until Colonel M. L. Crimmins found a specimen²² at Mt. Franklin, El Paso County, its range was held to be solely Ft. Davis Mts. It is yet held to be a very rare form. After we had left the Big Bend country and Chisos Mt. country, Mr. Thomas

Miller brought me at Alpine a beautiful specimen from San Vicente, Texas, very near the tip of the Big Bend of the Rio Grande River.

15. *Lampropeltis alterna* (Brown).—After A. E. Brown published *Elaphe subocularis* above, he sent a copy of his paper on *E. subocularis* to the collector, E. Meyenburg. This last year Mrs. Ellen Schulz Quillen of San Antonio gave me a number of papers she had bought in San Antonio several hundred miles from Meyenburg's operations. Among them was this separate to Meyenburg. Lo and behold! on the back cover was a photograph from life of Meyenburg's latest find, *Lampropeltis alterna*.²³ Only one specimen was ever found and no photos of it were known when Doctor Blanchard²⁴ published his thesis.

16. *Lampropeltis getulus brooksii* Barbour.—In 1919 Doctor Thomas Barbour²⁵ described this tropical Floridan race wherein no light dorsal crossband appears, as in all other *L. getulus* subspecies. I have had several specimens which closely approached this form but no perfect duplicate of it. At Pinecrest, Florida, in 1934 (March), Mr. M. B. Bishop and his associates from New Haven took three *L. getulus floridanus* and one *Lampropeltis g. brooksii*. We saw the four. As yet, we are at a loss to understand this form. Several live specimens which various collectors have called this subspecies have certainly appeared to be *L. getulus floridanus*.

17. *Stilosoma extenuatum* Brown.—For many years after its description²⁶ until 1925 or 1928 this form was considered very rare. In recent years a few have been found. In 1934 Mr. E. Ross Allen of Silver Springs, Florida, told me he had taken 15–20 of them. They feed on other snakes and constrict them.

18. *Ficimia streckeri* Taylor.—In 1931 Doctor E. H. Taylor²⁷ described a new species of *Ficimia* as *F. streckeri*. He secured it three miles east of Rio Grande City, Texas. I received another specimen of this form from Brownsville, Texas. It, therefore, ranges from Rio Grande City to Brownsville, Texas.

19. *Coniophanes imperialis* (Baird).—In 1898 Cope¹² apparently had just the one alcoholic specimen from Captain Van Vliet's collections. On October 15, 1929, we received one specimen from Brownsville, Texas. On April 25, 1934, Mr. A. J. Kirn of Somerset, Texas, showed me a snake he took near Rebb's Palm Grove, Brownsville, Texas. It proved to be of this species. On May 2, 1934, we visited Mr. and Mrs. Irby Davis of Harlingen to see if a snake they had was alive. That morning Mrs. Davis had tried to etherize it, but did not succeed, and in the afternoon of the same day we saw it—our first one alive. Doubtless this form is not uncommon in the Rio Grande Valley.

20. *Kinosternon bauri palmarum* Stejneger.—On December 4, 1925, Doctor L. Stejneger²⁸ described this translucent mud turtle wherein the dermal carapace sutures show through the shell. We have specimens

of this form from the southern tip of Florida. In 1934, with Mr. and Mrs. H. G. M. Jopson, we saw another specimen at the Miami Aquarium. But the striking discovery was to find that some of the students around Gainesville, Florida, had also taken two or three specimens at that place.

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STUDIES OF PROTECTIVE COLOR CHANGE. III. EXPERIMENTS WITH FISHES BOTH AS PREDATORS AND PREY

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In an earlier issue of these PROCEEDINGS¹ I described some experiments designed to test the protective value of concealing coloration to organisms equipped with the mechanism for adjusting their color-scheme to that of the background. Small fishes (*Gambusia patruelis*) were chosen for this purpose, a fish-eating bird (penguin) being selected as the predator. These