THE NUMBER OF BROODS OF THE IMPORTED ELM-LEAF BEETLE.

BY C. V. RILEY.

AT the meeting of the Entomological Club of the A.A.A.S. in Washington last autumn, Professor John B. Smith, it will be remembered, gave some interesting observations on this beetle, made at New Brunswick, N.J. As the somewhat astonishing result of his observations, he stated that there was but one annual generation, and that the beetles actually went into hibernating quarters early in August. Professor Smith's statements were so emphatic, and evidently based on such careful observations, that they could not very well be gainsaid, but as they conflicted with my observations on the species in the latitude of Washington, for which I have recorded two generations, and exceptionally a third, I was anxious the present season to go over the ground again, still more carefully than in the past, and, by rearing in confinement the first generation of larvæ from the first eggs hatched, to thus verify, in a manner which could leave no possible doubt, the facts which I had previously recorded.

In this brief note, I desire simply to state that at the present time (June 30) I have eggs laid by the second brood of beetles, i.e., the beetles obtained from larvæ which were feeding during the month of May and early part of June, thus proving, in the most positive manner, that in the latitude of Washington there are at least two broods, and that the second brood of larvæ will be feeding during July.

The following from the Appendix to the second edition of Bulletin 6, Division of Entomology, Department of Agriculture, October, 1891, will bear repeating in this connection:—

"One statement in the life-history of the Imported Elm-Leaf Beetle, as given in the preceding pages, may have to be corrected in the light of the observations of the past six years, and that is in reference to the number of annual generations. Like other leaf-beetles, this insect occupies an extended time in oviposition. The eggs appear to develop slowly in the ovaries, and a single female will deposit a number of the characteristic little yellow batches. This fact, taken in connection with the retardation of certain individuals of a generation, results in an inextricable confusion of broods. Adult beetles, pupæ, larvæ in all stages, and eggs, will be found upon trees at the same time, in Washington, during the months of June, July, August, and even later. From this fact it is almost impossible to estimate the number of annual generations without the most careful breeding-cage experiments. There is no evidence that the facts upon record are based upon such careful experiments. Glover, in the annual report of this department for 1867, page 62, says: 'After becoming pupæ, in a few days the skin of the back splits open and the perfect insect crawls forth, furnished with wings, by means of which it is enabled to fly to other trees and deposit its eggs, thus spreading the nuisance to every elm in the neighborhood; or it may ascend some tree and lay the eggs for a *second generation*, which destroys the second crop of leaves, frequently so enfeebling or exhausting the tree that it is unable to recover and eventually perishes.' Again, in the Annual Report for 1870, page 73, he says: 'The perfect beetles appear in a few days and immediately fly up into the tree to lay their eggs for a *second generation*, which frequently destroys every leaf on the tree.'

"The European records seem strangely silent upon this point. In the articles by Leinweber and Frauenfeld, referred to upon page 6, there is no indication of the number of generations, but it may be inferred that only one, namely, that of June and July, has been under observation. Heeger, however (*loc. cit.*, p. 114), says that 'under favorable circumstances there are three to four generations during the whole summer. Toward the end of August the insect ceases feeding and retires—partly as larvæ and partly as beetles—to winter rest under fallen leaves, in the cracks of bark, holes in the trunks of the trees, and in the ground itself.' This observation was made near Vienna.

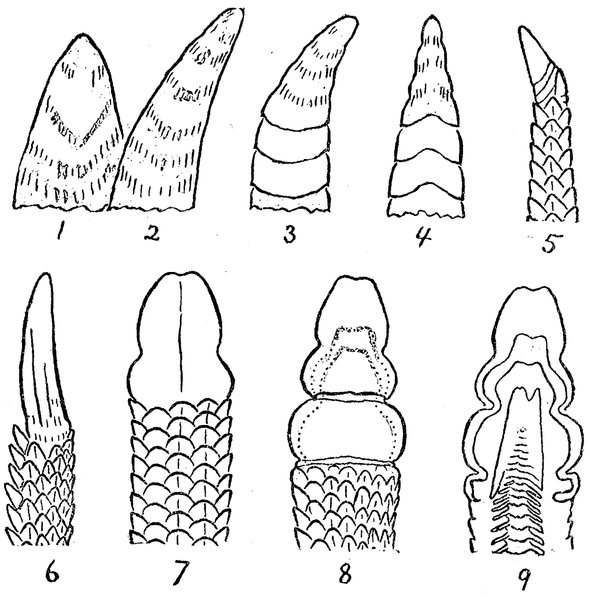
"Our statement upon page 8 was a general one, based upon the observations in August. This state of affairs may probably hold in more northern regions, but in Washington it is safe to say that there are two generations, because, as just stated, newly developed beetles (the progeny of those which hibernate) appear in early June. These lay eggs, and, in fact, egg-laying may continue until the end of September, and larvæ have actually been found by Mr. Pergande in October."

THE REPTILIAN RATTLE.

BY S. GARMAN.

AMONG the specimens secured by Dr. Georg Baur, in his explorations of the Galapagos Islands, there are a number of large lizards of the genera Conolophus and Amblyrhynchus, which exhibit certain peculiarities in the spines of the dorsal crest. Externally each of the spines resembles the rattle of a small rattlesnake. The likeness was evidently brought about by causes similar to those through which the rattle was originated. In a measure, these spines confirm my statement of the evolution of that organ as published in 1888 (Bull. Mus. Comp. Zool., viii., 259). Figures 1–4, herewith, represent a couple of the nuchal spines in a lateral aspect and views, side and front, of one of the dorsal spines of the Galapagos lizard, Conolophus subcristatus. On making a longitudinal section of any of these spines they are seen to be wholly dermal and to contain neither bones nor muscles. Their epiderm is a little thicker than that of the scales on the flanks. It is apparent that for a time, after hatching, growth of the skin was rapid and regular. The spines developed during this period were subpyramidal; they tapered so much, on back as on neck, that the slough came off readily and was lost. A periodic growth was taken on in later stages, and, the spines having become more elongate, a slight constriction was formed around the base, from folding the skin by bending the spine from side to side. Becoming still more elongate, the foldings meanwhile increasing in extent and depth, a stage was finally reached which, mayhap aided by shrinkage, retained the epiderm of the spine in place as a cap after the general slough was cast. Thus one thickness after another was added to the covering of the spine, each of the older being shoved farther up, by growth, so as to expose below it a band of the newer cuticle. The folded lower edge, the collar, of the cap rested in a basal groove or furrow, and prevented displacement. Each cap was closely applied to that beneath it, and the spine as a whole was solid. Outwardly the spines resemble rattles; internally the caps rest one upon another too closely to rattle.

The tip of the tail of the common snake ends in a spine somewhat like that in the crest of the lizard. It differs in containing a bone, the end of the vertebral column. Sloughing is similar in the two cases, a slight variation only being induced on account of the included vertebra. On most snakes the spine tapers greatly, and the cap is carried off in the slough. On a few there are constrictions and ridges around the cap, that recall those on the spines of the lizard. As it happens, those marked in this manner are the nearest living allies of the rattlesnakes. In the paper on the Evolution of the Rattle, above cited, the copperhead, Ancistrodon (Fig. 5), was brought forward as most nearly representing the ancestor of the smaller rattlesnakes, Sistrurus; and the bushmaster, Lachesis (Fig. 6), of northern South America, was suggested as the most likely for the large rattlers, Crotalus. These forms were pointed out as so nearly approximating a condition from which the possession of a rattle was a necessary consequence that we might at any time expect to find individuals on which the caps were mechanically retained. My conclusions in regard to the inception of the rattle seem to be indirectly confirmed by what obtains on the lizards. This will be the more apparent if it is borne in mind that the present development of the rattle (Figs. 7–9) embraces much that is a consequence of its



Figs. 1–2, nuchal spines, and 3–4, a dorsal spine of Conolophus subcristatus; Fig. 5, tail of Ancistrodon contortrix; Fig. 6, tail of Lachesis mutus; Fig. 7, Sistrurus catenatus, at birth; Figs. 8–9, Crotalus confluentus.

possession, much that has been induced by its presence and use. The greater part of the shortening-forward in the extremity of the tail, of the compacting and consolidation of the posterior vertebræ, with the enlargement of the cap to include them, and much of the development of the caudal muscles must be eliminated before one can realize the primary condition of the rattle, a condition which was, no doubt, but a little advanced upon that now existing in Ancistrodon and Lachesis, as sketched in Figs. 5 and 6.

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OPPOSITION OF MARS.

BY EDGAR L. LARKIN.

THE coming opposition of Mars will be of interest to astronomers throughout the world; and extensive preparations are being made to observe it. The face of the god of war is sure to be watched, drawn, and photographed with more care than ever before. And the most perfect spectroscopes made will be turned on his ruddy disk. The sun, earth, and Mars will be on the same straight line nearly, on Aug. 3 at 13 h. 13 m., or at 1 h. 13 m. A.M., Aug. 4, 1892. The time of the opposition will be favorable for observation, since the earth passes its aphelion on July 1, while Mars does not pass his perihelion until Sept, 7. That is, the earth will be 34 days only past the time when at its greatest distance from the sun; and Mars but 35 days from its nearest approach. If these dates could coincide — opposition take place when the earth is at a maximum and Mars at a minimum distance from the sun — then would the earth and Mars be at a minimum distance from each other, or 33,864,000 miles; in which computation a solar parallax of 8.8″ and a mean distance of Mars of 141,500,000 miles were employed. However, since the opposition will occur midway between, it is probable that, at the moment of the nearest approach of the two planets, they will be distant about 35,500,000 miles.

The last opposition favorable for close observation was on Sept. 5, 1877; at which approach, Prosessor Asaph Hall discovered two minute moons in revolution around our neighboring world. This important discovery is best given in Professor Hall's own language: "The sweep around the planet was repeated several times on the night of Aug. 11, and at half-past two o'clock I found a faint object on the following side and a little north of the planet, which afterwards proved to be the outer satellite. On Aug. 16 the object was found again on the following side of the planet. On Aug. 17, while watching for the outer satellite, I discovered the inner one." Perhaps this optical discovery reveals the power of modern telescopes in a manner more impressive than any other, thus: "The outer one was seen with the telescope at a distance from the earth of 7,000,000 times its diameter. The proportion would be that of a ball two inches in diameter viewed at a distance equal to that between the cities of Boston and New York" (Newcomb and Holden, "Astronomy," p. 338).

These moons were seen with the 26-inch glass at Washington; but now a 36-inch telescope is in waiting for Mars, and none can predict what will be discovered. The satellites are estimated to be 6 and 7 miles in diameter; and they have a most rapid motion. It is well to note some of the facts about these bodies that served a great purpose, in sweeping away that mythology of astronomy, the nebular hypothesis. Distances from centre of Mars: Deimos, 14,600 miles; Phobos, 5,800 miles. Times of revolution: Deimos, 30 h. 18 m.; Phobos, 7 h. 39 m. But it requires 24 h. 37 m. for Mars to turn on its axis, which divided by 7 h. 39 m. equals 3.22; that is, the inhabitants of Mars have 3.22 months of Phobos every day. This moon rises in the west and passes through a phase in 1 h. 55 m. Deimos is 130 h. 37 m. from rising to rising, or 65 h. 18 m. from rising to setting. Its gain over the rotation of Mars is 3° 24′ per hour, hence it requires 106 hours to gain a whole revolution, which, added to the diurnal rotation of the planet, gives the 130 h. 37 m. But 65 h. 18 m. equals 2.155 months of Deimos; therefore the other satellite passes more than two full sets of phases while above the martial horizon, with plenty of eclipses beside.

The main interest in the next opposition rests in the hope that an accurate map of Mars can be made, or that good photographs can be secured, or that the spectroscope may make further revelations concerning the absorption of solar rays by its atmosphere, or that the lines due to the vapor of water may be seen to better advantage, if possible, than at the last. Professor C. A. Young, "Astronomy," p. 337, says: "The probability is that its density is considerably less than that of our own atmosphere. Dr. Huggins has found with