planned; and in view of the importance of maintaining friendly contact among the geneticists of all countries through regular international congresses it urges that the International Committee arrange for holding the Seventh International Congress at the earliest practicable time."

DISCUSSION

THE SAN DIEGAN ALLIGATOR LIZARD AND THE BLACK WIDOW SPIDER

TOWARD the end of 1935, or early in 1936, local newspapers carried several accounts of a contemplated introduction of *Bufo marinus* to California, to act as a biological control of the black widow spider, *Latrodectus mactans*. That such an attempt might actually be made seems possible, owing to the scare notices which periodically appear in California, claiming that this dangerous spider is on the increase.

While considering the feasibility of introducing this toad and the dangers attendant upon such a procedure, it seems proper to visualize it and its manners of attacking a spider. To one knowing something of the habits of the black widow, such a contemplation conjures up a picture of a robust toad squeezing into cracks under boards and stones, crawling up the studding in garages and homes, clambering into dense shrubs and hedges, leaping nimbly into the air to pick the spiders from the center of their webs, and in other ways behaving in a manner not at all compatible with bufonid temperaments and capabilities. The few spiders found wandering about on the grounds and accessible to the toads would be so small in number as to form only an inconsiderable percentage of the whole population.

After giving some study to the problem of a possible native predator it appeared highly probable that the habits of the San Diegan alligator lizard, *Gerrhonotus multicarinatus webbii*, in southern California, and other subspecies elsewhere in the state, would bring this reptile into close contact with the spiders. This lizard, on close study, also appeared to be the only animal with a habitat approximating that of the black widow.

It was hoped that a study of stomach content might furnish evidence in support of the theory that the lizard is an important predator on the spiders, but it is obvious that only by very remote chance would one find even the chelicerae in the digestive tract of the lizard. Adult spiders, in spite of all the alarms, are too scarce to form an important element in the diet of *Gerrhonotus*.

Although studies in food habits carried on with captive specimens are, or should be, considered subject to serious questioning (as witness our desert tortoise, *Gopherus agassizii*, eating cheese, apples, bananas and lettuce in captivity), in this case, the method appeared our only hope of obtaining any light on the problems under scrutiny.

Although more work on this problem will be undertaken during the coming year, it is not believed that anything but confirmation of our initial results will be forthcoming. In the early attempts, it was found that the female spiders of any size were eagerly consumed by *Gerrhonotus*, and that all healthy and active specimens fed readily. This, in itself, might not be significant, but in view of the repeatedly observed response of the lizard to the egg sacs of the spider, it is believed that this lizard may be the chief vertebrate enemy of the black widow. Every egg sac, whether containing eggs or young, when placed in the lizard's cage, was consumed. The lizard often showed an almost immediate response to the presence of such an inanimate object and would swallow the entire sac as well as the contents. Such behavior is particularly significant to any one who is familiar with these lizards, since they will be aware that this species is ordinarily responsive only to moving objects and that this feeding habit is therefore particularly significant. After conducting the feeding experiments with *Gerrhonotus*, a specimen of *Sceloporus occidentalis biseriatus* was given an opportunity to feed, and the spider was taken with great readiness. It is probable that many other species of lizards would likewise do so, but it is highly improbable that any of them would be as important an enemy of the spider as *Gerrhonotus*, owing to the fact that none of them fits as neatly into the requisite habitat. It is only a remote chance that our other species of lizards would figure as controls of the black widow.

As has been previously stated, it is commonly reported that the black widow spider is on the increase in southern California, and there has been much informal discussion of the subject. That there has been a total increase is entirely probable, since every new building, at least those erected in open country, should furnish more sanctuary than would the same area without a house. Most of the claimants for the increasing abundance theory seem to believe that there has been not only a general increase, but an actual increase in the density of the population within the habitat as well as in total numbers.

Since there are no population counts compiled at any time in the past, there can be no satisfactory method of comparing conditions of ten or twenty years ago with the present; therefore, there can be no solution to this phase of the problem. Theoretically, however, any decrease in the number of parasites and predators would result in an increase in the density of population, irrespective of increase in available areas. If there has been no decrease in parasite effectiveness, but if there has been a reduction in the number of effective predators, we would expect that there might be an actual temporary increase in the density of the spider population, which would continue until the additional food supply made available to the parasite would act on the population of these organisms, accelerating their rate of increase to meet the newly created opportunity for multiplication. That we may be in a stage where there are more spiders available and where the parasites have not yet increased to their maximum numbers seems entirely possible.

So far as one may judge, all gardeners, amateur and professional, are 99.9 per cent. antagonistic to all reptiles, and the unfortunately snake-like *Gerrhonotus* is apparently particularly obnoxious to these active outdoor people. Although the above percentage may not be exact, at least one seldom hears of any evidence indicating a friendly attitude on the part of the non-herpetologist to this lizard. Unfortunately, even though the gardeners might be amenable to a herpetological conversion, the clean, cultural methods involved in gardening and cultivation of the ground are both inimical to an increase in the number of lizards. Another factor which may have a bearing on numbers of these useful animals is the predatory skill of our domestic cat. Although our spiders are so much feared and although the lizards may be an important control device, it is not believed that even though this information is disseminated there will be any marked shift in the choice of pets, at least not on the part of those who, at least since Darwin's time, have enjoyed the company of cats. In the writer's own experience, cats are serious enemies of this as well as other species of lizards. Again, in the writer's experience, it appears to be probable that the protection and introduction of *Gerrhonotus* will result in a decreasing population of the black widow spider. Too many uncontrolled factors enter into the present discussion, but it might be mentioned here that five years ago the writer's house was thoroughly popular with black widow spiders. An effort to reduce their numbers made little impression on the population. At the same time, however, an effort was being made to increase the numbers of the San Diegan alligator lizard. Individuals of this species were introduced onto the place; cats were carefully driven away; and clean cultural methods were not employed. As a result, the population of the alligator lizard increased considerably. Five years later, when spiders were needed for the present experiment, it was found that the black widow was extremely scarce; hardly any specimens could be found on the writer's property. That this may have been due to an increase in the number of parasites is recognized; but it may also have been due to the presence of an unusually large number of *Gerrhonotus*. Particularly significant is the fact that in the garage, where spiders were particularly abundant, *Gerrhonotus* was repeatedly found climbing about within the building, even as high as the top of the garage door, approximately eight feet from the ground. Here the lizard would lie in the narrow space between the top of the door and the lintel, where occasionally they were crushed by the closing of the doors. Although the evidence in this case is circumstantial, it appears probable that the friendly protection and encouragement of the San Diegan alligator lizard and, incidentally, the elimination of cats, might be of considerable benefit to the population of southern California.

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NOTES ON THE DISTRIBUTION OF THE BLACK WIDOW SPIDER

IN Donald C. Lowrie's note in SCIENCE for November 13, 1936, "New Localities for the Black Widow Spider," Minnesota, Iowa, Virginia, Delaware, New Jersey, Connecticut, Rhode Island and Vermont are listed as the only states from which this spider has not been officially recorded.

However, it may be noted that this spider must be fairly prevalent all over the state of Virginia, as stated by G. W. Jeffers in SCIENCE for December 11, 1936, and has been recorded by Anderson and Walker,[1] C. R. Willey[2] and W. J. Schoene,[3] as well as noted in the article by C. E. Burt in the *Journal* of the Kansas Entomological Society (8: 4, 117, 1935).

In addition this spider has been recorded from New Jersey by C. H. Headlee[4] in 1935, from Connecticut by W. E. Britton[5] in 1935 and from Rhode Island by A. E. Stene[6] in 1936.

H. L. Bailey informs me that this spider has been collected in Springfield, Vermont, in the fall of 1936 (identification verified by C. R. Crosby, of Cornell

[1] L. D. Anderson and H. G. Walker, *Bulletin*, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Insect Pest Survey, 12: 404, 1932.
[2] C. R. Willey, *ibid.*, 14: 9, 296, 1934.
[3] W. J. Schoene, *ibid.*, 15: 7, 359, 1935.
[4] C. H. Headlee, *ibid.*, 15: 8, 389, 1935.
[5] W. E. Britton, *ibid.*, 15: 6, 318, 1935.
[6] A. E. Stene, *ibid.*, 16: 6, 306, 1936.