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EDEN RECLAIMED. "Deep Spring" in the Background

RECLAIMING EDEN

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It is believed that man originated and dwelt for aeons in the tropics before venturing into the colder regions of the earth. Did they migrate because of over population, or were they driven out by the advent of the disease bearing mosquito? According to the late Surgeon General Gorgas, it was more probably the latter.

Fleeing the mosquito, man came to colder places where vegetation grew only at certain seasons of the year—there the cold of winter made him live in caves, wear clothing, and keep near the constantly burning fire. Unable to hunt profitably at this time of the year, he gradually learned to capture and to keep alive in his cave certain herbivorous animals for his winter's meat. They required food. Their descendants, born in captivity, were the forbears of our domestic animals. Nuts and grasses were propagated for them as close by as possible. In times of meat scarcity these were eaten by man. Thus the beginnings of agriculture. Controlled fire has given us machines, cement, electricity. But all this depended on the brain-developing process we call reason. Community life beginning around the home fire probably did more to foster this than any other one thing. Thus, according to this interesting speculation of Dr. Gorgas, the mosquito was responsible for our civilization.

Whether or not it was thus responsible, the mosquito's occupancy up to this time of the choicest land on earth may well be made a direct cause of an indefinite retarding of our progress. Man's crying need is for rich land on which cheap food can be produced with an ample return to the farmer. The "malaria land" of the South capable of producing crop after crop practically the whole year round is such land. Quantity production and continuous profitable productive occupation is of as great value to the farmer as it is to the manufacturer.

The shaded map of U. S. Public Health Reports ("Distribution of Malaria in the United States as indicated by Mortality Reports", by Assistant Surgeon Kenneth F. Maxey, U.S.P.H.S.), shows the tremendous amount of such land in this country, all of which can be redeemed.

Dr. Henry R. Carter, Assistant Surgeon General of the U. S. Public Health Service, the man who with Gorgas made possible the building of the Panama Canal, says "The loss of efficiency caused by malaria in the country of the malarious section of the South is beyond comparison greater than that caused by any other disease, or even by any two or three diseases combined, including typhoid fever and tuberculosis."

The land is here, the removal of malaria will make the native labor efficient and attract ample outside capital and labor to make this part of our country capable of producing enough food stuffs to make war for conquest on the part of this country totally unnecessary. Properly divided, there is enough similar land elsewhere to more than satisfy all nations. Best of all, the land could *now* be easily apportioned because it is cheap and only potentially desirable. Civilization can hardly survive another general war for "a place in the sun". If we, instead of fighting one another for land already fully occupied by mankind, will only fight the pestilence carrying mosquito, and till the lands from which she now excludes us, there need not only be no more wars of conquest, but there will be no necessity for birth control or for plagues to keep down the numbers of overcrowded and underfed.

There are millions of acres of such land right here in our own country. This land has not been reclaimed, among other reasons because of the hitherto prohibitively large cash outlay necessary. The purpose of this article is to show how this can be done at a cost of practically nothing over and above the amount that always has to be spent in clearing land to make it fit for farming. Here is how it actually was done on our farm in Florida. The land in question is a typical specimen of malarial land in the southeastern part of this country. The methods successfully used here will, with but little modification, answer anywhere in the South.

We have a beautiful spring nearly two hundred feet deep, covering about three acres, with an outlet creek about four feet deep and thirty wide. On the south of the spring is a six foot bank with high land behind it. On the other sides of the spring, and along both banks of the stream, is a strip of cut over cypress swamp and marshland averaging about fifty feet in width. Beyond the marsh the land gradually rises to about twelve feet above lake level. The creek was choked with water lettuce and other aquatic plants and there was a border about fifteen feet wide of the same material all around the spring.

A large fish-free pond about fifty yards to the west of where our house was to be not only bred mosquitoes, but in wet weather overflowed our proposed garden site. A ditch sixty yards long was dug from the pond through the end of a half acre hummock marsh one hundred feet away, and from there into the spring. The marsh land was grid-ironed with shallow ditches, all connected with the main ditch. The muck from the ditches was piled on the hummocks for banana plants and put into barrels for strawberries. The ditches were dug around the hummocks so that the marsh, instead of a series of puddles, became one body of water all of the year.

When bought, the dry land was a jungle of trees, brush, and thorn filled vines. The swamp and marsh, all of this, plus muck and water. The trees were filled with Spanish moss. In warm weather the whole place swarmed with mosquitoes.

Some fourteen acres to the south and west of the spring were cleared, and ten of it set out for a citrus grove, and one for a vineyard. The rest was used as a site for the necessary buildings, for a pig pen, a chicken run, an orchard, a garden, and a lawn. As far as was practicable, vines, moss, and underbrush were removed from the rest of the place. The larger trees were left and make a beautiful woodland park. A six room white bungalow with two screened porches and sixteen large French windows—the 16 mesh galvanized wire screening attached directly to the outside of the window casings by ½ x 1 inch black wood strips—was built. Our outside buildings, electric and water plant and septic tank sewerage installed, farm implements and stock purchased, we now had a complete farm. A well screened house will remain a necessity until such a large area of land is treated that the home lies beyond the flight range of all mosquitoes.

Having a place to live, I now proceeded with my "anti-mosquito campaign".

In order that the reader may really understand this fight, it is necessary that he first know some few things about the mosquito, its friends, its natural enemies, and its enemies' friends and foes.

The accepted flight range of the malaria carrying mosquito is about a mile. She is only a carrier of malaria, and cannot infect one until she has first bitten a person who has malaria. Five grains of quinine a day will keep one from getting malaria, while he gets rid of his mosquitoes. This usually holds true no matter how often one may be bitten by infected mosquitoes. In order to reproduce, the mosquito must have a blood meal from any warm blooded animal, and water on which to lay her eggs. Tin cans, old automobile casings, faulty rain gutters, water troughs, small puddles, etc., will answer instead of ponds and lakes for some mosquitoes. The malaria carrying mosquito cannot stand sunlight. Wind modifies greatly the flying of all mosquitoes. So dark places and wind breaks of any kind are great aids to the pests in their journey to and from their blood meal. The male mosquito does not need any blood meal, and therefore is not anatomically especially fitted to bite.

The immature malaria mosquito spends its life in water. It can breathe only when at the surface, and stays there nearly all of the time. Water vegetation helps it greatly in its efforts to escape the minnows that pursue it.

Certain plants may, and creosote does, repel the mosquito.

A top swimming minnow, whose favorite food is the immature water dwelling forms of the mosquito, is present in fresh and sometimes in slightly brackish water, from the Gulf of Mexico to New Jersey. The young of this minnow are born alive—as many as two hundred at a time—and ready to eat the smaller water living mosquitoes. When food is scarce, these minnows eat their young. Shallow, weedy waters where they are reasonably safe from larger fish and where young mosquitoes are plentiful, are their favorite natural haunts.

Larger fish, water birds, and at least one water insect prey on this top minnow. Other minnows and some of the larger fish eat the water living forms of the mosquito, but the top minnow is by far our most reliable ally in this respect. Some other insects, insectivorous birds, bats, lizards, and frogs hunt the winged mosquito. In turn, these are hunted, principally by birds, snakes, and large fish.

As direct and indirect aids to the mosquito, we thus have exposed standing water, unscreened sources for her "blood meal", brush, Spanish moss, aquatic plants, hollow trees, unscreened buildings, and other hiding places, for either the immature or the winged mosquito; finally the things which interfere with the multiplication of the mosquito's enemies.

It is obvious that a sufficient number of the mosquito's enemies, plus the removal of enough of its aids, would result in its eventual extermination over an area thus protected.

It remained for actual experiment to show that this condition could be brought about in a reasonable length of time and for a very moderate cost.

The cleaning done for agricultural purposes removed a large proportion of its day hiding places. This was continued in the parking done at a cost of about five dollars an acre. The land parked could have been profitably cleared for agriculture.

High grass, weeds, ets., were mowed. The cost of doing this comes properly under the head of common orderliness on any farm. Hollow trees, unscreened buildings, wooden steps, etc., were painted inside with creosote paint, at a cost of twenty dollars.

Finding the aquatic plants, especially water lettuce, excellent food for chickens and stock, and also of great value as fertilizer, they contained small water animals making its phosphorus value high, the cost of keeping this down was not estimated. It would not be fair to charge stock food and fertilizer to the mosquito.

From the nature of things, the removal of hiding places for the mosquito, especially weeds, is not a job that is finished and done with, it is one of any farmer's constant tasks anywhere.

This day after day job keeps down materially the number of the places where the mosquito can hide and be more or less safe.

The potential breeding places of the pest were destroyed where possible (tin cans, very small puddles, etc.). Wells and mud puddles were stocked with the hardy cat fish. Larger isolated ponds were stocked with the top minnow. One large pond and many isolated marsh puddles were connected with one another and the lake by ditches, too shallow for the large fish that eat the top minnows to negotiate, and denied to the young predaceous fish by one half inch hardware cloth. These ditches make excellent breeding places for the top minnow, and from them are obtained not only stock for outlaying ponds, but the constant migration, due to over population of minnows, into the spring and stream, keeps them filled with sufficient minnows to satisfy the larger fish and still leaves a margin sufficient to cope with the mosquitoes hatched there; this in spite of the large amount of water plants present. Another fish preferred to the top minnow by the larger fish and much sought after for bait was protected from the fisherman, and multiplied rapidly. Fishing birds were shot when caught near these breeding places. Other ponds within a radius of a mile were stocked with top minnows. Breeding sanctuaries (smaller models of the hummock marsh ditches) for the top minnow were built for the nearer and larger of these.

Our top minnows cost us nothing. The ditching cost less than fifty dollars. In this way the breeding places were made very unsafe for the young mosquito. The number of top minnows in a fish filled pond is usually small, and they are to be found only in the shallow places and hiding among the plants. Naturally quite a few mosquitoes escape and reach the flying stage. My plan, however, results differently. Not only is there a constantly arriving fresh supply of top minnows, but the larger fish are furnished a supply of small fish ("Shiners") preferred by them, as a food, to the top minnows. Many forms of aquatic animals subsist on the water plants left, and help greatly in keeping our minnow eating fish away from the top minnow.

The top minnow being too numerous to obtain sufficient food near the shore, and being but little bothered by the larger fish, spreads over the surface, and naturally eats many more young mosquitoes.

Notwithstanding the tremendous superiority of this over the older methods, relatively small numbers of mosquitoes reach the final or winged stage of life. These then attempt to perpetuate their species. As said before, they must have a blood meal and protection from light and wind. These we have done our best to place beyond their reach. However, trees, grass, wild and domestic animals, will always be here. So we have tried to make his hiding places not only scarce but disagreeable, and even dangerous. Frogs and toads search out and eat mosquqitoes, on the banks of ponds, streams, and in inland grass. Protected from man, owls, hawks, and snakes, they have multiplied so that one has to watch one's step. The hornless chameleon has the same enemies and performs the same function in bushes, trees, under uneven logs, etc. Spiders are encouraged in dark corners, hollow trees, etc. We soon had as many of all of these as we needed without resorting to breeding. The small tree frog, however, not only hunts mosquitoes, but is very useful in fruit and citrus trees as a destroyer of certain insect pests. It was found that a small box of hardware cloth placed over these tadpoles in a puddle allowed an unusual number of them to reach maturity. Hunted even by chickens, small tin tobacco boxes attached to trees make them excellent citadels.

What few mosquitoes escape all of this and start to fly are confronted by an unusual number of insectivorus birds. Bird houses for their young, the killing of their enemies, and the abolition of the "sport" of killing them has been all that was necessary in this respect.

These frogs, birds, etc., form an excellent outside "screen", far preferable to the old method of placing domestic animals between the house and the pond, in the pious hope that the mosquito would obtain her blood meal from the poor beasts. The object of my screen is to prevent the mosquito getting her "blood meal", not to furnish her one.

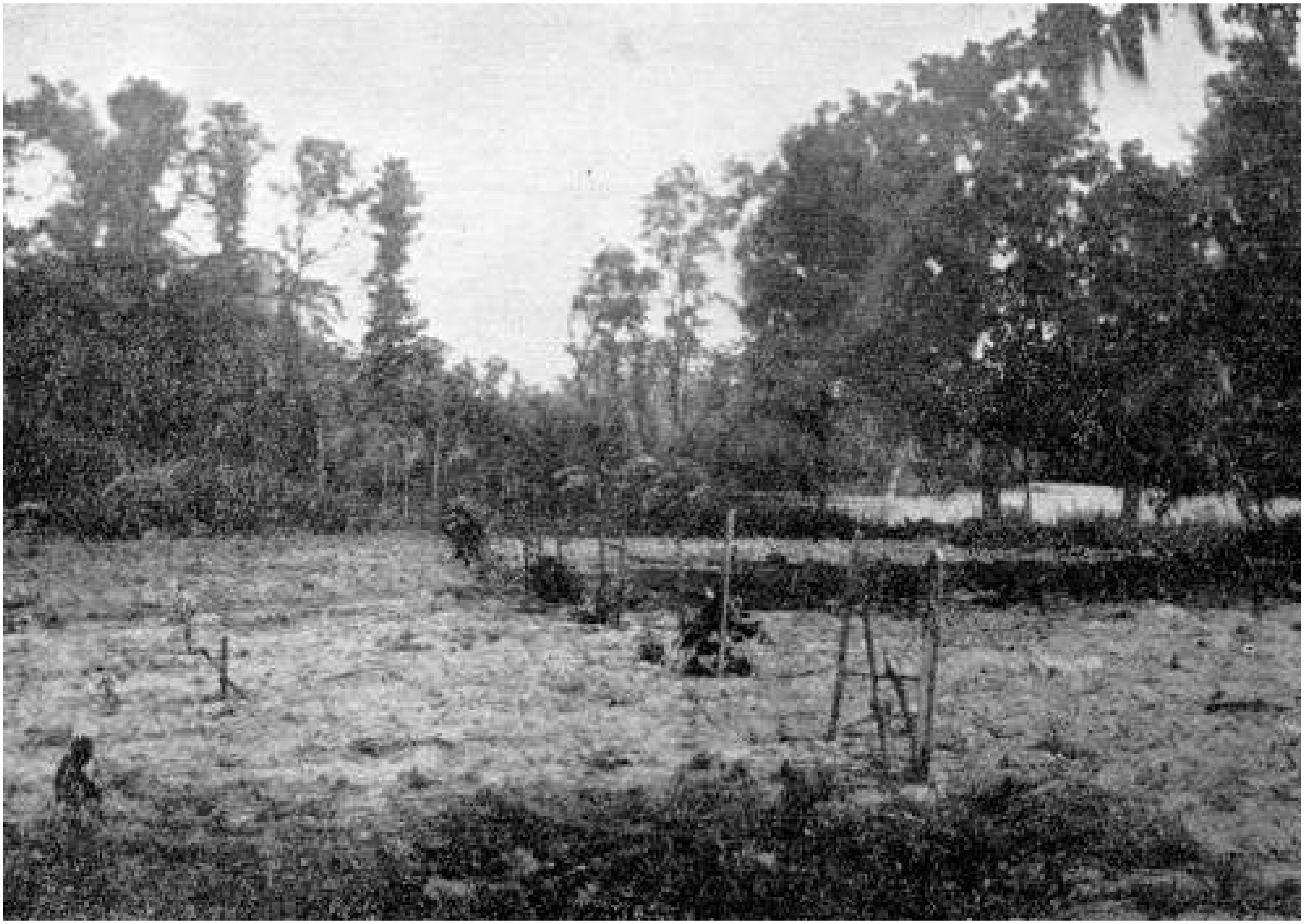
Having ample top minnows to fully stock, when danger threatened, any pond that had previously unexpectedly "gone dry", no necessity arose to use dirty, expensive, soil destroying oil, or for extensive drainage by ditch or by digging through the underlying water-impervious sub soil. A small well dug below permanent water level will leave, in dry weather, a place where some top minnows will survive until the pond fills again. The small amount of work of this kind was done either to beautify the place or for agricultural reasons. Nevertheless, the cost will be included in the anti-mosquito budget.

Every species has its natural enemies, and from time to time, as these enemies have triumphed, whole species have disappeared. In the case of the mosquito, these enemies are well known, and, as I have shown, can be readily increased to the point where they will wipe out the mosquito. The cost is negligible. The work here was done on a small tract of land where the mosquito had every advantage nature could supply it. The larger the land area the smaller the cost per acre, and the more nearly perfect the result. The upkeep will diminish with time and the enlargement of the area treated.

Anti-mosquito work requires the active cooperation of every one concerned. That is the reason why we still have malaria. When it is generally known that nature's balance maintaining the mosquito may be altered with a pennyweight sufficiently to put dollars in the pockets of the man doing the work, then we will get this cooperation.

The total outlay required to make our home mosquito free and to keep malaria off the place was less than two hundred and fifty dollars. At the very most, a yearly expenditure of fifty dollars will maintain this condition. Mosquito land is usually fallow muck, and very valuable when malaria is absent. Such land can be bought very cheaply in all of the southern states. Practically unlimited quantities of this land can be purchased, put in condition for planting, and cleared of mosquitoes, for less than one-crop land costs elsewhere. The farmer can raise "money crops" over a large part of the year; twelve months in Florida. This naturally tends to raise land prices, and to remove farming from the list of seasonal occupations.

There is a tremendous lot of this land on every continent. May man occupy it and live in peace and plenty.



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In connection with Dr. Branham's article in this number of the Entomologist we wish to call attention to U. S. Public Health Bulletin No. 114—"Top Minnows in Relation to Malaria Control, with Notes on their Habits and Distribution" by Samuel F. Hildebrand.

DESTRUCTION OF MOLE CRICKETS

In many of the cities of Florida the West Indian mole cricket or "Changa" is getting to be a great nuisance in gardens. In damper soils also the native species are often troublesome. The poisoned bran baits have been found useful in controlling the pests and frequent cultivation and plowing have been recommended. Mr. S. C. Whidden of Jacksonville reports the following method to be highly efficient. He plows the garden and, if dry, wets it thoroly. He then rolls it thoroly and leaves it until the next morning. During the night the mole crickets in the ground throw up little mounds of dirt. In the morning Mr. Whidden goes out with a cane and a bottle of carbon-bisulphide and treats each burrow. Doubtless a solution of sodium cyanide and perhaps a few crystals of calcium cyanide would work as well and be considerably cheaper.

PERSONALS

Dr. E. D. Ball, elected to take charge of the Celery Leaf-tyer investigations of the State Plant Board provided for by the last session of the legislature, has taken up his residence in Sanford. He gave an address on controlling truck crop insects during Farmers' Week at Gainesville. The truckers of Florida are to be congratulated upon securing the services of a man of Dr. Ball's wide experience and ability.

Mr. Archie N. Tissot has been elected assistant Entomologist of the Experiment Station in the place of Mr. A. H. Beyer, who has resigned to devote his time to his numerous grove interests. Mr. Tissot received his Master's Degree in June from Ohio State University. He is now teaching in the summer school there, and will take up his duties in Florida on September first.

Mr. W. W. Yothers, of the Bureau of Entomology at Orlando, is travelling in the Pacific Coast states, investigating the use of oil emulsion sprays there.

Dr. H. L. Dozier has resigned his position with the Insular Experiment Station at Rio de Piedras, Porto Rico, to accept a position as entomologist for the Delaware Station at Newark.

Mr. A. C. Brown has resigned from the State Plant Board to take up grove development work at Ft. Lauderdale.

ANOTHER YEAR OF THE CITRUS APHIS

(Continued from page 13.)

Dusting in the open with nicotine sulphate lime dusts is effective *if there is no wind,* but this condition is seldom met during the aphid season. To be highly effective the cloud of dust should hover over the tree a full minute. Much of the dusting done this season has given unsatisfactory results because of wind or poor dust. Some of the dusting done with a power duster on quiet nights has been very effective, an hour's search in the grove the following day failing to yield a single live aphid.

Spraying, too, is effective if thoroly done and done in time, *i. e.,* before the aphids have curled the leaves. It is difficult to get a spray into the curled leaves. The oil emulsions, lime sulphur, and soap sprays are effective, but the kill is much more thoro if nicotine sulphate is added. But to get a satisfactory control by spraying one must do much more thoro work than has session of the legislature, has taken up his residence in Sanford. He gave an address on controlling truck crop insects during Farmers' Week at Gainesville. The truckers of Florida are to be congratulated upon securing the services of a man of Dr. Ball's wide experience and ability.

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(3) *Begin the fight in the fall.* Aphids can be fought most economically during the winter. The first step in preparation for next year's fight (we can see no valid reason on which to base a hope that they will not again appear in destructive numbers next season) is to employ every means consistent with good grove practice to throw the trees into complete dormancy in the late fall, about November in most sections. Then during December and January watch the trees carefully and destroy every aphid found. It would probably be an excellent idea to cut off those occasional sporadic sprouts that start out on young trees. Make every effort to have the groves free of aphids by the first of February. In the spring, as early as is considered reasonably safe from the standpoint of danger from frost, do everything consistent with good grove practice to rush the growth along and get a good crop of new foliage out before the aphids become numerous.

(4) *With the exception of the fungus Empusa, the natural enemies of the aphid are generally incapable of checking an outbreak.* The lady beetles and syrphus fly larvae destroy many aphids, but their multiplication is checked by numerous superparasites. The hymenopterous parasite, which is usually the most effective check on the increase of the melon aphis on citrus, has been repeatedly bred out on the green aphis, but its occurrence on this species in the groves is still so uncommon that the presence of any considerable number of dead, swollen aphids with emergence holes is a sure indication of the presence of the melon aphis.

OTHER HOSTS. In addition to spiraea and citrus the aphid occurs occasionally on a number of hosts. Three of them are quite common in citrus groves and are often quite heavily infested. Perhaps the most dangerous of these is the "Jerusalem oak" *(Chenopodium* sp.). Even more heavily infested is fireweed *(Erechtites hieracifolia* (L) Raf.) but it is not as common in citrus groves, being found mostly on lower more moist land especially when newly cleared. These two plants should be cut down before a grove is dusted or sprayed. Cudweed *(Gnaphalium* sp.) is a very common winter and early spring annual in citrus groves, but the aphids attack only the heads and consequently this plant is not an important host in the early part of the winter when few heads have appeared. In many cases grapefruit has been heavily infested this year. In most cases, however, it was near heavily infested oranges from which the aphids were being driven by the maturing of the foliage.

In May and June the Experiment Station received from the California Experiment Station two shipments of a lady-beetle *(Leis* sp.) which was originally brought from China. This lady-beetle is much larger than any native species. The adult female is 5/16 of an inch wide and nearly 3/8 inches long. The ground color is red. There are thirteen round black spots on the elatra and a larger one on the thorax. The beetle's appetite for aphids is in proportion to her size. Sometimes as many as two hundred aphids are eaten in a day. But our hopes for this beetle were chiefly that it might be less susceptible to the fungous and bacterial diseases which are such a large factor in checking the multiplication of our native species. Experience in breeding these beetles in the laboratory at Lake Alfred would seem to justify this hope. Altho many have died of diseases, the proportion is distinctly smaller than in the case of the blood red lady-beetle, the most common of our native species in aphid colonies.

The original small number of these beetles brought to Florida has increased until we now have several hundred on hand and have liberated as many more in groves scattered over the state. While some of the early colonies liberated seem to have died out, (due apparently to scarcity of food) others seem to be prospering, and in at least one grove the beetles have completed a full generation in the field, thus demonstrating their ability to live out of doors in Florida, at least during the summer time. From the standpoint of the food supply the summer is the most unfavorable season, as aphids are scarce.

As to the outlook for the future, the aphids are much more numerous in our groves than they were a year ago at this time. Much will depend upon the weather during the next five months. Unless their numbers are greatly diminished by dry or cold weather throwing the trees into complete dormancy during the fall or winter, the prospect is for another heavy infestation next spring.

A NEW Species of Symphyothrips (Thysanoptera) from Argentina

J. R. WATSON

Symphyothrips reticulatus sp. nov.

Whole body including legs uniform chestnut brown; only tarsi and antennal segment 4 a little lighter brown, and antennal segment 3 yellowish brown.

Head about .2 longer than broad. Cheeks straight, converging only slightly posteriorly. Dorsum with anastomosing reticulations forming a network. *Eyes* rather small, dorsal length considerably less than a third of the head; non-protruding; facets large. *Ocelli* large, yellowish, bordered by dark crescents; posterior pair situated opposite the middle of the eyes; anterior directed forward. Post-ocular bristles conspicuous, considerably longer than the eyes, widely dilated at the tip, colorless. A small bristle behind each posterior ocellus, a pair in front of the anterior ocellus, and one at the anterior angle of each eye, and an irregular row of eight across the middle of the dorsum.

Mouth cone large, reaching the mesosternum. Antennae somewhat less than twice as long as the head. Segments 1, 2, and 5-7 concolorous with the head, 3 yellow with apex almost colorless, 4 yellowish brown. 1 cylindrical, considerably wider at the base than at the apex; 2 urn-shaped with a broad pedicel; 3 clavate, 2.6 times as long as broad, scarcely pedicellate; 4-6 barrel-shaped, with a long broad pedicel; 7 spindle-form. Spines and sense cones colorless. Sense cones on segment 4 especially heavy.

Prothorax considerably shorter than the head and, including the coxae, about twice as wide as long. A heavy, colorless spine with a dilated tip on each angle; those on the posterior angles less than half as long as the prothorax (71 microns); the ones on the anterior angles and coxae a little shorter. A pair of conspicuous ones along each lateral margin. Dorsum with a number of smaller bristles; the surface covered with faint anastomosing lines which are more conspicuous along the anterior margin.

Fore femora short and considerably thickened (about half as wide as long). Fore tibiae also short, about five ninths as long as the femora, a short thick tooth on the inside of the apex. Fore tarsus with a heavy, slightly curved spine. Middle and hind legs rather slender. Pterothorax a little wider than prothorax, sides slightly convex.

Abdomen rather short and thick, abruptly rounded posteriorly; bristles rather short, only one pair almost as long as the tube, pointed. Tube .8 as long as the head and about half as wide as long, heavily chitinized, sides roughened with little warts which bear minute spines; terminal bristles considerably shorter than the tube, pointed. (To be continued.)