

Storage
Forestry

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VOL. IX.

APRIL, 1912

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AND

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief we like and sometimes it is indispensable for us to see the insect suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed at 3rd class rates. When specimens are not accompanied by letter *always* write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent.

THE HAWAIIAN FORESTER AGRICULTURIST

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THE NEW PRESIDENT.

Mr. W. M. Giffard, the new president of the board of agriculture and forestry, was the first member to receive a commission when the board was organized under the act creating it. For some years he was out of the board, having resigned on account of pressure of business while manager of the late corporation of W. G. Irwin & Co., Ltd. It was during his former membership of the board that Mr. Giffard established the Hawaiian Forester and Agriculturist, being its editor for the first few years of its existence with the present editor as his assistant part of the time. Incidentally to his devotion to domestic arboriculture, which is well-known in Honolulu from the beautiful cultures wherewith he has always had his home surrounded, Mr Giffard has long been an enthusiastic amateur in entomology, so much so that he takes rank among the professional entomologists. When formerly a commissioner of agriculture and forestry, he made a record as chairman of the committee on the division of entomology. A few months ago Mr. Giffard was induced to take the direction of the fruitfly control work, as an honorary member of the same committee. His management of the campaign thus far is familiar to the Forester's readers, who will find his latest report thereon in the present number.

RECORDS OF AYRSHIRES.

A report of the annual meeting of the Ayrshire Breeders' Association, held in January at the Manhattan Hotel, New York, has been received. The following data will be of interest to Hawaiian cattle raisers and dairymen:

"The report for the past year showed an addition of 91 new members, and a largely increased addition to the number of registered animals.

"In the mature class, Netherhall Brownie 9th, owned by Mr. J. W. Clise, Redmond, Wash., gave a record of 18,110 lbs. of

milk, 820.91 lbs. of fat, equal to 958 lbs. of butter, with 4.69 per cent. fat.

"In the three-year-old class McAlister's Betty, owned by Mr. Percival Roberts Jr., Narberth, Pa., gave a record of 14,208 lbs. of milk, 581.41 lbs. of fat, equal to 678 lbs. of butter, with an average of 4.19 per cent. fat.

"The average result of the advanced registry work during the past year was, 68 two-year-olds averaged 7610 lbs. of milk, 306.52 lbs. of fat, equal to 353 lbs. of butter, with an average of 4.04 per cent. fat.

"Thirty-six three-year-olds averaged 9318 lbs. of milk, 374.41 lbs. of fat, equal to 432 lbs. of butter, with an average of 4.14 per cent. fat.

"Twenty-four four-year-olds averaged 8723 lbs. of milk, 349.93 lbs. of fat, equal to 408 lbs. of butter, with an average of 4.12 per cent. fat.

"Ninety-seven mature cows averaged 9923 lbs. of milk, 332.03 lbs. of fat, equal to 442 lbs. of butter, with an average of 3.875 per cent. fat.

"The average of the whole, cows and heifers, is 8850 lbs. of milk, 351.21 lbs. of fat, equal to 408 lbs. of butter, with an average of 4.04 per cent. fat.

"The exhibit at the National Dairy Show was particularly fine, with five full herds shown by J. F. Converse, Woodville, N. Y., W. P. Schanck, Avon, N. Y., Ryanogue Farms, Brewster, N. Y., Branford Farms, Groton, Conn., and Willowmoor Farms, Redmond, Washington. The exhibit as a whole was of high quality and type, and attracted a great deal of attention.

"Perhaps the most conspicuous animals in the ring were Beuchan Peter Pan, imported and owned by Mr. J. W. Clise, of Willowmoor Farms, a bull that had never been beaten in the show ring, either in Scotland or America.

"The most sensational exhibit in the ring was the champion cow Oldhall Ladysmith 4th, owned by Mr. P. Ryan of Ryanogue Farms, Brewster, N. Y., who was not only champion and grand champion in her class, but also the winner of the \$500 silver trophy offered by Mr. John R. Valentine, President of the Ayrshire Breeders' Association, for the cow representing the most perfect type of her breed shown."

ARBOR DAY REMINISCENCES.

Someone has sent the Forester a clipping from the Sunday Advertiser's collection of events of twenty-five years ago, containing the following item:

"A meeting of the Royal Hawaiian Agricultural Society was held last evening. The date for the Stock Fair and Horticultural Show was fixed for next May. The desirability of establishing an 'Arbor Day' here was discussed at some length and it was arranged to communicate at once with the president of the board of education on the subject with the view of having a general holiday for school children established for this excellent purpose."

If recollection serves truly, the present editor of the *Forester* was one who agitated the institution of "Arbor Day" in Hawaii, if not the first one, having in the East before coming here taken an active part in "Arbor Day" exercises. As a representative of a press organization he assisted in planting a "press tree" on Montreal city hall square, upon an "Arbor Day" about thirty years ago.

TEACHING OF ENGLISH.

Professor M. M. Scott, principal of McKinley High School, delivered an address before the teachers' meeting, at that institution recently, on "Essential Points to be Emphasized in the Teaching of English."

After a few preliminary remarks on China and Japan and a comparison of the Chinese and Japanese languages with the English language, Professor Scott showed that these people failed to grasp the English language by not mastering the tenses of verbs, the plural of nouns, the sounding of the aspirate "th," final "t" and final "ed." He said that the problem in this country was the English problem and that if anything was to be accomplished in this mixed nationality the teachers must exert themselves to make the pupils speak good English and write good English. He suggested that the foundation be drilled into the pupils in the third and fourth grades of the primary; emphasized more in the fifth and sixth grades of the grammar and then smoothed off in the seventh and eighth grades so that when they entered the high school, the English language would be "jack-planed" for the high school teachers. "Teach them at the beginning when they get a little vocabulary to write and talk correctly. Children should not be taught from books alone. Have them write a sentence every day and then a paragraph. Mark the errors and put them on the board. First, pronunciation; second, tenses. Have them think what they wish to say and then speak it or write it."

Prof. Scott said that the teachers in the lower grades should insist on these points and the student would improve and then these difficulties would not be met with to so great an extent in the high school. The deficiency of so many of the students entering the high school this last year necessitated having a special

class in English every Wednesday afternoon in which they received such drill as should have been received in the lower grades. Prof. Scott remarked that even high school seniors continued to make these common errors, already mentioned, and the only solution to the problem was to constantly drill them in good English and insist on their using it in speaking and writing. He said the Chinese made the most mistakes, and second the Hawaiians and part-Hawaiians, who spoke Hawaiian at home. He asked that the primary and grammar grades do their part in preparing the students for the high school and then the high school teachers would do the rest.

Apropos of tree planting by sugar plantation companies, the suggestion made by Mr. James Gibb, manager of Honolulu Plantation, Oahu, at the annual meeting of the Hawaiian Sugar Planters' Association, is of interest as indicating the trend of opinion among plantation men. Mr. Gibb recommended that each plantation company set out one tree for every ton of sugar produced during the past year. As the total output for the Territory for 1911 was 566,821 tons, this would make a very creditable showing.

FRUITFLY CONTROL.

Honolulu, February 26, 1912.

To the President and Commissioners of the Board of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—As previously advised, the Mediterranean fruit-fly made its appearance in the North Kohala district on the Island of Hawaii during the latter part of January. In consequence of this and in order to prevent, if possible, its introduction into other districts of that Island, your director suggested that he and the superintendent of entomology visit Hawaii for the purpose of hastening the organization of committees to take charge of such campaign as might be found necessary. With the permission of the president of the board, I requested that Mr. Ehrhorn be sent direct to Kohala to investigate that district and to, if possible, secure data as to the limits of infestation. He was also requested to secure the organization of a special committee to handle conditions in such manner as any subsequent regulations of your board might make necessary. Mr. Ehrhorn's visit to Kohala and the result of his work and investigation are given in detail in his report to me under date of Feb. 20, a copy of which I beg to submit herewith. His report is self-explanatory.

The organization of campaign committees in the Hilo, Kau and Kona districts was personally attended to during a recent visit

to Hawaii. In Hilo the matter of organization for that district was handled by the Hilo board of trade at a meeting held on the 7th inst. At that meeting I fully explained the situation in so far as the district of Hilo was concerned and outlined a plan of campaign to prevent, if possible, the introduction of the pest from adjacent districts, as well as from the port of Honolulu or any other infested ports in the Territory, which Hilo was in communication with. The whole matter was thrashed over with the members of the board of trade and they were assured of the coöperation and assistance of the Territorial board of agriculture in any campaign they might efficiently organize. The result of the Hilo meeting was that a committee of five members were appointed to handle the situation there, consisting of A. Lindsay (chairman), H. V. Patten, E. F. Nicolls, D. S. Bowman and Brother Matthias.

From Hilo I proceeded to Kau and Kona and in both of these districts I met the prominent members of local organizations and explained matters to them in the same manner as I had already done in Hilo. In Kau Messrs. W. G. Ogg and C. Wolters promised to handle the campaign, and in Kona three members (Messrs. Macfarlane, Curts and Wallace) of the executive committee of the Kona Improvement Club also assured me that they would keep in line with what was done in the other districts of Hawaii. The Kona coffee growers appeared to be somewhat worried (and rightfully so), because of the possibility that the fruit-fly pest might be brought into their district from Kohala by road conveyances coming from the latter district and were anxious that any regulations formulated by the Board would include the prohibition of all Hawaiian fruit from any section of North and South Kohala, in addition to the seizure and destruction of any which might be landed at any of their ports. I assured them that the object of the board of agriculture was that any regulation passed and having force of law would not only provide for the conditions which already existed in Kohala but also would, as far as was possible, protect the other districts of the island against the introduction of the pest by way of both ports and public highways. The organizations in all the above-mentioned districts have been informed in a like manner.

Before leaving Hawaii I gained the impression that each of the organized committees would endeavor to secure funds either through the county supervisors or by private subscription, or both. The general opinion prevailed, however, that the Territorial government should, if at all possible, assist financially in their campaign and I would therefore suggest that this important question be taken up by your board at an early date.

Since my return from Hawaii I have communicated with the agents of the several plantations located in the Hamakua district and have asked for their assistance and coöperation, in getting the managers together and forming an organization to

manage the campaign in that section and quarantining it against North and South Kohala, in so far as the introduction of Hawaiian fruits are concerned. The ports of Hamakua are to be included in any organization of inspection the same as the ports in other districts are intended to be.

As regards the transportation of any Hawaiian fruit by means of the belt roads leading out of the Kohala district, so far as I could learn from the committees in Kona and Kau more particularly, it was the intention to have gates placed on these at certain points of entry and there hold up and inspect all conveyances and, if necessary, seize and destroy all Hawaiian fruit which may be found in these.

As a result of correspondence with the Maui chamber of commerce, it has been learned that that body has already organized a campaign to prevent the introduction of any Hawaiian fruits at its ports of entry. So far as is at present known, the Mediterranean fruitfly is not yet established on Maui, but it will not be long before we hear of its establishment there unless the most rigid precautions are taken against the entry of any Hawaiian fruits at its ports. In addition to its weekly importations of freight and passengers from Honolulu, it has the further disadvantage of having almost daily intercourse with its neighbor, Molokai, by means of sampans and other small craft. Any new regulations passed by your board should, therefore, make it prohibitive for Hawaiian fruits to be shipped or taken on any inter-island carrier when said carrier is plying from any infested to a clean port of entry.

Immediately upon my return from Hawaii, I took up the matter of the necessary regulations with your president and the attorney general and the latter is now formulating such as I trust will not only meet with your approval but will also meet present requirements on the islands of Hawaii and Maui. As soon as you have adopted these regulations and have given them the force of law by the Governor's approval, I would respectfully suggest that the necessary authority be given to issue commissions to all the members of the organized committees on the islands of Maui and Hawaii, as well as to the inspectors which the said committees may officially appoint.

In conclusion, I desire to say that whilst a *rigid, efficient and continuous* method of inspection, seizure and destruction of all Hawaiian fruits, vegetables, etc., at any ports of entry, and, where necessary, along any belt roads on any island or in any district not at present infested with the Mediterranean fruitfly pest may prolong the period of immunity, it is my candid opinion that there will always be an element of danger of infestation because of the failure of inspectors to appreciate the grave danger in allowing or accidentally passing a single Hawaiian grown fruit of any kind whatsoever in the belongings of any passenger or in freight packages. Again the possibility, at some future time, of the

fruitfly migrating from one district to another by means of a continuous forest belt as prevails in some districts on Hawaii is not to be ignored. It is well known to entomologists that much of the Hawaiian or indigenous flora in the mountain regions on these Islands produce fleshy fruits which are just as liable to infestation as those of the kamani, which flourish on the lower elevations. The fruit of the kamani has but little fleshy material in it, yet we know it to be very badly infested in sections where the fruitfly has become established. The same may be said of the pulp of the coffee berry. The guava in a wild state, as is known to exist at even very high altitudes, is the greatest menace we have on all the islands in the Territory because of its well known adaptability for the reproduction of fruitfly. Like Oahu, there are districts on Hawaii and Maui where, because of the large areas of wild guava, it would be next to impossible to either eradicate or use any practical methods of culture were the pest once established in that region. Kohala on Hawaii I believe has to some extent the conditions I speak of and it will be the sheerest luck if its committee succeeds in exterminating the fruitfly, notwithstanding that it is said to be established as yet in only a comparatively small area. Hamakua, Hilo and Kona have similar conditions on the mountain slopes up to a fairly high elevation, whilst Kau, I believe, is somewhat more fortunate in the above respect.

Preventive natural conditions are certainly almost ideal in the districts of Kona and Kau, in so far as the introduction of the fruitfly from other adjacent sections, as there, there are either extensive aa flows or sand deserts which are practically, if not altogether, bare of vegetation, and which, as barriers, should naturally protect these districts. The infestation in Kau and Kona, therefore, will almost altogether be made possible only by the introduction of Hawaiian fruitfly by means of the various ports of entry in these districts or by means of transportation (autos or wagons) along the belt road leading from Kohala on the one side or Hilo on the other.

Respectfully submitted,

W. M. GIFFARD,
 Director, Fruitfly Control, Board of Agriculture and Forestry,
 Honolulu, T. H.

FOURTH MONTHLY REPORT.

Honolulu, March 4, 1912.

To the President and Commissioners, Board of Agriculture and Forestry, Honolulu, T. H.

Honolulu Fruitfly Control.

GENTLEMEN:—I beg to submit you a report of the work of

this department for the month ending February 29, 1912, viz:

Inspection. Since the beginning of February there have been eight inspectors employed to cover all the districts and precincts within the quarantined area extending from the western boundary of Waiālae to the eastern side of Mōanalua, but excluding the "heights" and valleys back of Honolulu. These latter sections will from now on receive as much attention as prevailing conditions and the small working force will allow.

General Conditions. These I am pleased to report are much more satisfactory than they have yet been. Considering that up to a month ago only four inspectors were available under the financial conditions then prevailing, it is gratifying to find that the present fruit and pest conditions are so satisfactory. The addition of four extra men in February, made possible through the financial coöperation of California, has helped very materially in cleaning up many infested sections which could not previously be satisfactorily attended to. Continuous daily and systematic inspection of the various precincts and the coöperation of the large majority of householders have very materially assisted in ridding the whole quarantined residential section of infested fruits. These must not, however, include the mango, which is now coming into full bearing. As a whole, I should say that the present infestation is very much less than it was during last summer before the campaign started. In previous reports I mentioned the lack of coöperation on the part of many citizens, who failed to respond when called upon to strip their trees of ripe or overripe and infested fruits. These householders, although comparatively few in numbers, have caused much extra work and have also been the cause of repeated inspections on the part of inspectors. Many have had to be continually reminded of the penalty called for by the regulations. Fortunately the department has been able up to this time to cope with the situation without having recourse to the courts, although it may be that one or two delinquents may shortly make it necessary to bring about such an undesirable proceeding. It is certain that, had it not been for such lack of coöperation, conditions of infestation in some districts would be much better than they are or are likely to be.

Preliminary inspections on the "heights" and valleys back of Honolulu, all of which include the most northerly precincts in the quarantined districts, appear to show that the infestation of wild guava is by no means as great as might have been expected, in view of the conditions which existed in the residential area before the clean culture campaign started. I hope to be able to report to you further as to this as soon as the mango season is over. The full force of inspectors will be required during the next month or two to see that all fallen mangoes are daily cleaned up and thoroughly destroyed. In many cases this labor will be forced on the department, as many of the poorer householders are

without yardmen and have no means of paying for any extra labor arbitrarily thrust on them.

Insular Conditions. In my last report I referred to the condition which had made itself manifest in North Kohala, Island of Hawaii. In consequence of this, I was requested to visit the districts on Hawaii and there organize committees of control, the idea being that each district would handle its own peculiar conditions. The results of my visit and that of Mr. Ehrhorn, the superintendent of entomology, have already been submitted to you by a special report. Since my return from Hawaii your board has adopted a new regulation (Rule XIV), having particular reference to any fruitfly conditions on the island of Hawaii. I am pleased to report that the Governor approved of this regulation the day it was transmitted to him and copies thereof have already been sent by me to the chairman of the committee in each of the districts of Hawaii. The regulation in question will be printed in due course.

In my last report I referred to a questionable case under observation in the laboratory, from Kona, Hawaii. I am now much pleased to say that the breeding of the fruit under suspicion produced melon fly (*Dacus cucurbitas*) and not the Mediterranean fruitfly (*Ceratitis capitata*). We still have other fruits under observation from Hawaii, which may have to be reported on later.

I would also report that the attorney general is at present formulating another regulation suitable to present conditions on Maui and Lanai, where the fruitfly, as yet, has not been found. This rule will give power to local authorities on the above named islands to prevent the introduction of any Hawaiian fruit (excepting bananas and pines) at the landings. Just as soon as this regulation has been drawn it will be submitted to your board for consideration.

General Remarks. In view of the fact that Rule X has not been found to exactly fit conditions as regards fallen fruit, your director has requested the attorney general to formulate an amendment whereby it will be compulsory on the householder to clean up and destroy fallen mangoes and other fruit daily. This amendment will shortly be submitted to your board for adoption or for such other action as may be deemed necessary.

Since my last report the following Honolulu fruits have been found by us to be infected with the Mediterranean fruitfly and should be added to the long list of those already reported on, viz.: Kumquat (*Citrus japonica*), *Murraya exotica* (small red fruit locally known as mock orange), *Eugenia* (species).

I would further report that coffee berries, varieties of orange, loquats, varieties of eugenia, and kamani seeds (species) appear to be among the worst infected fruits so far examined. It is not to be inferred from this, however, that other fruits are not also more or less attacked. Peaches are again coming into season and these will have to be specially watched, as that variety of

fruit is one which always receives the early attention of the fly.

Application has been made by your director to the superintendent of education to have its teachers educate the younger scholars in the public schools as to "clean culture" methods in the fruit garden. This is intended more particularly to secure the assistance of the youngsters in keeping the grounds of their parents free of fallen fruit and the proper disposal of same. The habits of certain classes of school children as to gathering ripe mangoes from trees and throwing the refuse on the sidewalk or thoroughfare, or in undue handling of infested but otherwise fair-looking fruit waiting for the garbage collector, is well known to many of us. It is quite possible that the teacher and scholar can cooperate with and assist this department on the lines suggested.

The superintendent of entomology has now in preparation a circular on the Mediterranean fruitfly, which, as soon as published, will be distributed to householders and to the board of education. This circular will no doubt be desirable as filling a much felt want.

Mr. H. A. Weinland, representing the California horticultural commission, has, among other duties assigned him by that body, continued to cooperate with the work of this department. Mr. Weinland has been paying special attention to the trapping of adult flies, as well as exploiting general conditions in and outside of the quarantined area.

Respectfully submitted,

W. M. GIFFARD,
Director, Fruitfly Control, T. H.

DIVISION OF FORESTRY.

Honolulu, Feb. 29, 1912.

*Hon. Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.*

GENTLEMEN:—I have the honor to submit as follows the routine report of the division of forestry for February, 1912:

Forest Reserve Work.

On February 2, in company with Messrs. L. L. McCandless and H. M. von Holt. I visited the Government land of Kuokala, near Kaena Point, Oahu, to look into the question of fixing a

forest reserve boundary across its upper end. During March it is expected to have this line definitely laid out by a surveyor.

February 5 and 6, I was at Nanakuli with Mr. H. E. Newton of the Territorial government survey, marking out the forest line on the ground. Eight forest reserve monuments were erected at Nanakuli. The other points on the line were marked with small iron pipes.

During the month further progress has been made on several other forest reserve projects, which will be reported on in detail later.

At the board meeting held on February 12, I submitted reports on a plan for starting the reclamation of Kahoolawe and on a proposal from Mr. C. G. Owen to plant with forest trees a portion of the Pupukea forest reserve, Oahu.

Tree Planting Contract.

Mr. Owen's offer was to plant, mainly with eucalypts, an open tract of between 30 and 35 acres, a part of the area formerly known as "Water Reserve C," adjoining the section planted with trees under contract two years ago in return for the privilege of using the area for growing one crop and one ratoon crop of pineapples. The area is a narrow strip lying along the bluff overlooking the Kaleleiki gulch.

Ever since the Pupukea forest reserve was set apart it has been the intention of the board to plant up this area. Only lack of funds prevented its being included when the adjoining area was planted. By the present arrangement the planting is done without any cash outlay by the government, the trees, however, which are to be set out upon the removal of the ratoon crop getting the benefit of the cultivation given the pineapples.

The board having approved the general proposition, carefully worded specifications covering the planting were drawn up and embodied in a contract which was signed on February 23. The faithful performance of the contract is guaranteed by a bond deposited by Mr. Owen with the board.

Tantalus Forest.

On February 12, I published, as chief fire warden, a notice renewing for one year the period during which permits must be obtained before fires for burning brush may be started on Tantalus.

Later in the month an arrangement was effected with Mr. J. W. Caldwell, the new county road supervisor, in regard to completing the cutting of trees along the Tantalus road begun but soon after discontinued last year, under a previous administration. By having our Tantalus forest ranger exercise a general supervision over the Tantalus road cantoniers it is believed that a

good deal more can be accomplished than heretofore in putting the road into shape and keeping it so.

Experiments with New Rubber Trees.

Through the courtesy of Dr. A. Marques, the French consul, there was received in February a small consignment of the seed of *Ficus Schlechterii*, a tree from New Caledonia supposed to be of value as a rubber producer. Samples of this seed were sent to the managers of the several rubber companies and to the sub-nurseries of the board for trial.

From Puuwaawaa, Hawaii, Mr. J. F. Rock, consulting botanist, has recently sent in samples of the latex of a native Hawaiian tree, *Euphorbia lorifolia*, that appears to have possibilities as a rubber producer. The Hawaii agricultural experiment station is now making analyses of the latex of this tree. As yet there is nothing tangible to report. Mr. Rock writes that there are several thousand acres covered with this tree in North Kona.

Botanical Exploration.

Mr. Rock is now on Maui, having gone over from Kona on the last steamer. He reports having secured much interesting material from that district. Incidentally, he made an ascent of Mauna Loa from one of the dairy stations on the Greenwell ranch, establishing a new record as to time, in that he started at 4 a. m., reached the summit crater, Mokuaweoweo, and got back to a temporary camp in the edge of the forest the same night; from his account a somewhat strenuous excursion.

Mr. Rock is now collecting on the slopes of Mt. Haleakala. He expects to return to Honolulu about March 20.

Repairs to Office Building.

During the latter part of February the roofs of the main office building at the Government nursery and of the recent addition to the stables were painted with "Elastikote" paint. This ought to add considerably to their durability.

Report of the Forest Nurseryman.

As usual there is transmitted herewith the report of the forest nurseryman, covering the work of the month that comes under his direct charge.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

NURSERYMAN'S REPORT.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—The following report gives the principal work done during the month of February:

Distribution of Plants.

	In seed boxes.	In boxes transplanted.	Pot-grown.	Total.
Sold	400	1,520	1,975	3,895
Gratis	1,500	474	1,974
	<hr/> 400	<hr/> 3,020	<hr/> 2,449	<hr/> 5,869

Collections on account of plants sold amounted to \$45.65.

Plantation Companies and Other Corporations.

No new orders have been received during the month. Tree planting on most of the plantations is practically finished for the season owing to the dry weather coming on and the labor being required for other work. The number of trees distributed under this head during February amounted to 26,200 seedlings. The roof of the potting shed has been extended to cover the soil and sand bins, and a new bench has been made for the workshop and toolshed.

Experiment Garden, Makiki.

The men at this station have been doing routine work, such as potting plants, transplanting and doing other work in connection with replenishing the stock, which was nearly exhausted owing to the numerous demands that we have been receiving during the past few months.

U. S. Experimental Planting, Nuuanu Valley.

The two men are kept busy hoeing and keeping down the grass. During the month of March we expect to plant more trees which are now ready at Makiki.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman

DIVISION OF ANIMAL INDUSTRY.

Honolulu, February 29, 1912.

To the Board of Commissioners, and Hon. W. M. Giffard, President and Executive Officer, Board of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the division of animal industry for the month of February, 1912, as follows:

Animal Quarantine Station.

Pursuant to the instructions from the Board, I have engaged Mr. Albert Davenport, until recently farrier in the 5th U. S. Cavalry, to take charge of the animal quarantine station. Mr. Davenport reported for duty on March 1, and is now in full charge of the station. His compensation is to be \$45 per month, quarters, light, fuel, and feed for one horse.

The construction of the kennels has been considerably delayed on account of inclement and rainy weather, which has practically made it impossible for the concrete work to be finished in time for the carpenters to do the construction of the fences. Provision has been made for the quarantine of twelve dogs in separate kennels, as follows: Four kennels for lap dogs; five for medium sized dogs up to pointers; and three for large dogs as Great Danes, etc. Care has been taken to have the entire construction made as sanitary and modern as possible with the means allowed and even then it has been found that the \$600 allowed for the purpose will barely suffice for the finishing of the kennels, leaving nothing for the provision of quarters for the keeper. It is estimated that an additional \$250 will be required for the extension of the present office so as to provide sleeping room and kitchen and to install the necessary conveniences such as washstand, shower bath and toilet, as well as a cook stove and utensils for the preparation of food for the quarantined animals.

Tuberculin Test of Dairy Cattle in the City and County of Honolulu.

The assistant Territorial veterinarian, together with the milk inspector, detailed by the city and county physician for this purpose, has practically finished the test of all the dairy cattle in the city proper, and will begin testing the cattle belonging to the railroad ranches at the commencement of next week. The test has proved very satisfactory, the percentage of reactors remaining below 5% as compared with 11% at the former test and 27% on the first test. The present percentage will, however, be perceptibly lowered, as it is safe to conclude that but a very small percentage of reactors will be found among the range cattle and the dairy cattle in the outlying districts, which are kept in a stable

only for a short period of each day, or else never come into a stable.

Of the 1600 head of dairy cattle tested in the city, less than 90 have given reaction, and it is a pleasure to state that with very few exceptions the owners of reacting animals have been ready to sacrifice them without question. The further fact that up to this date not a single animal among the reactors has been condemned on post mortem examination as unfit for food, demonstrates the fact that all of the bad cases of tuberculosis have been wiped out during the first two tests and those which are now reacting have been but recently infected, and in most cases as a result of the owners retaining reactors from the former tests on their premises, and thereby continuing the infection in their stables and yards.

Importation of Livestock.

The usual number of steamers have arrived during the past month, and, as will be seen from the report of the assistant Territorial veterinarian, a large number of horses and mules have arrived here, the greater number, however, coming from Seattle, and only two shipments requiring quarantine as coming from or through California. No dogs have arrived so far, but sufficient quarters have been finished to accommodate them should any arrive from this time on.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT FOR FEBRUARY.

Honolulu, February 29, 1912.

Dr. Victor A. Norgaard, Chief of the Division of Animal Industry, Bureau of Agriculture and Forestry.

Sir:—I have the honor to submit herewith a report of the work accomplished during the month of February.

Tuberculosis Control.

The work of testing the dairy herds is progressing rapidly and is meeting with no opposition on the part of owners. Less difficulty is experienced this year in getting owners to dispose of their reacting animals immediately. In fact, they now appear anxious to get rid at once of any source of infection and to have and maintain herds free from tuberculosis. It has taken time, and the experience of heavy loss on the part of some, from one or two reactors being kept in the herd, to bring about this much desired

spirit. Such coöperation on the part of owners makes the task of fighting this disease to a finish much easier.

The following is a list of the different dairies tested up to the present time, giving the total numbers of cows tested; the number passed, and the number condemned:

	T.	P.	C.	Remarks
Wm. Gomes	10	9	1	
J. H. Cummings.....	5	5	0	
D. P. R. Isenberg.....	337	312	25	1 bull
Marshall & Azevedo.....	28	26	2	
P. M. Pond	37	36	1	
M. Gomes	28	28	0	
H. B. Brown.....	13	13	0	
S. J. Grace.....	5	5	0	
Capt. Hartman	3	3	0	
J. E. Faria.....	20	20	0	
R. Compos	12	12	0	
Frank Gouveira	24	24	0	
J. Quintal	2	2	0	
J. M. Whitney.....	10	9	1	
T. F. Farm.....	45	42	3	
Omai Tatsuichi	10	10	0	
F. C. Krauss.....	1	1	0	
K. Inouye	8	8	0	
W. P. Alexander.....	5	5	0	
I. Nagaki	15	15	0	
J. H. Cummings.....	4	4	0	
Mrs. C. M. White.....	10	9	1	
Frank Medeiros	12	12	0	
P. Miyakawa	13	13	0	
J. Allencastro	7	7	0	
K. Yamashita	7	6	1	
S. Hirata	14	14	0	
C. K. Quinn.....	6	6	0	
Chas. Frazier	1	1	0	
College of Hawaii.....	15	13	2	
H. E. Cooper.....	15	15	0	
Frank Andrade	81	80	1	
Kawaihau Seminary	15	15	0	
Mrs. Mary Quintal.....	8	8	0	
S. Tsumoto	9	9	0	
M. Kawamura	6	6	0	
Mrs. W. W. Hall.....	1	1	0	
G. L. P. Robinson.....	5	5	0	
Frank Valph	6	6	0	
Chas. Bellina	138	112	26	
S. de Nobriga.....	13	13	0	

Oahu College	12	12	0	
Manuel Abreu	3	3	0	
John Rezants	13	13	0	
C. J. Day.....	5	5	0	
Geo. Wond	18	18	0	
Antone Pires	8	8	0	
Geo. Holt	37	35	2	1 bull
Kamehameha Schools	44	42	2	
W. E. Miles.....	17	16	1	
Frank Correa	13	12	1	
Mrs. Mary Riedell.....	10	9	1	
Victorino Souza	35	33	2	
Alexander Young Dairy..	46	46	0	
Desidero Tello	2	2	0	
John P. Mendonca.....	10	10	0	
L. C. Fernandez.....	8	8	0	
J. G. Silva.....	4	4	0	
A. Wilder	2	1	1	
Richard Kapena	2	1	1	
A. Tavash	3	3	0	
Mrs. E. Johnson.....	2	2	0	
S. M. Damon.....	148	143	5	
Galt & Carter	13	13	0	
M. Ota	1	1	0	
Chas. Bellina	28	28	0	
Chas. Lucas	90	80	10	2 bulls
	<hr/>	<hr/>	<hr/>	<hr/>
Total	1,578	1,488	90	4 bulls
In 1911 S. M. Damon ranch	185	181	4	

The following is a list of the importations of livestock at Honolulu since the date of the last meeting, February 9, 1912:

S. S. Lurline, Feb. 14, 7 crates poultry; S. S. Mexican, Feb. 16, 48 mules, Q. M. Dept., 3 horses; S. S. Sierra, Feb. 19, 3 crates Japanese games; S. S. Korea, Feb. 26, 3 dogs; S. S. Honolulan, Feb. 28, 2 bulls (shorthorn), S. M. Damon, 1 bull (shorthorn), 1 dog, 7 crates hogs, 2 crates poultry; S. S. Hyades, Feb. 28, 43 mules, Schuman Car. Co., 11 horses, E. E. Paxton.

Respectfully submitted,

L. N. CASE,

Asst. Territorial Veterinarian.

QUARANTINE KENNELS.

Itemized Statement of Expenditures to date in construction of kennels at Quarantine Station, Honolulu.

Concrete work, contract price 27c per square foot, 560

square feet in 13 separate squares (O. Oss).....\$151.20

Wire fence, 60 in. high at 250 ft. at 40c (Axtell).....	100.00
Wire fence, 42 in. high at 270 ft. at 38c (Axtell).....	110.60
Wire fence, 36 in. high at 150 ft. at 25c (Axtell).....	37.50
Lumber, staples, hinges, nails (Allen & Robinson).....	126.37
Sewer pipe, strainer, lead pipe (Hon. Iron Wks.).....	11.00
Labor, supervision to March 9, incl. (O. Oss).....	122.00
	\$658.67

With an additional bill for labor, not exceeding \$40, the kennels proper will be finished, all the required material being on hand.

In regard to the keeper's quarters, the contract estimates that the same can be made habitable for approximately \$200 to \$250. As the room which is now used as office and laboratory must be continued as such and at the same time be made into a living room for the keeper, it will be necessary to build an addition or lean-to in which he can prepare his meals, sleep and dress. A kitchen sink will act as wash basin also and a shower bath and water closet at a slight distance can be constructed cheaply.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, February 29, 1912.

Hon. Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work of the division of entomology for the month of February as follows:

During this month we boarded 40 vessels and found vegetable matter on 24 of them. Careful inspection of all shipments was made with the following result:

<i>Disposal with principal causes:</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	771	21,622
Fumigated	14	410
Burned	16	38
	801	22,070

Rice Shipments.

Twenty-five thousand four hundred and twenty-four bags of

rice arrived during the month, and being found free from insect pests was permitted to enter the Territory.

Pests Intercepted.

Thirty-eight parcels of fruit and vegetables were taken from immigrants at the U. S. immigrant station, and several lots of plants were destroyed on account of blights and scale-insect infestations.

Beneficial Insects.

One lot of Japanese beetle fungus was sent to Wailuku, Maui.
Hilo Inspection.

Brother M. Newell reports the arrival of five vessels at the port, finding three carrying vegetable matter, consisting of 83 lots and 1606 parcels, all passed as free from pests.

Inter-Island Inspection.

During the month of February 60 steamers were attended to, and the following shipments were passed on: 158 bags taro, 53 cases plants, 14 bags taro tops, 2 cases sugar cane, 1 case cabbage. Total, 228 packages.

The following packages were refused shipment: 24 packages fruits, 11 packages vegetables, 3 lots of plants, 1 box of sugar cane. Total, 39 packages.

At the suggestion of the director of fruitfly control, the president of the board of agriculture and forestry requested me to visit the Kohala district, where the fruitfly has made its appearance. I left Honolulu on February 13, remaining in the Kohala district until February 16, on which day I took a return passage for Honolulu. I have handed the director of the fruitfly control a report on the findings of my visit there.

Respectfully submitted,

EDW. M. EHRHORN,

Superintendent of Entomology.

A copy of the Sugar Industrial World, "devoted to the research of sugar industry and tropical agriculture," as a note to the Forster says, has been received. It is published in Tokio and in itself the periodical is an evidence of the agricultural progress of Japan at home and in her colonies.

STREET TREE PLANTING.

A paper read before The Outdoor Circle, Kilohana Art League, by Ralph S. Hosmer, Superintendent of Forestry, January 30, 1912.

Of the means of civic beautification that lie within the reach

of every community there is nothing that so adds distinction to a town or city as well grown trees along its streets. Whether planted for shade or for ornament, tree lined streets give an air of character and individuality that can be secured in no other way, and not only does street tree planting satisfy merely esthetic ends. It is, if properly done, translatable directly into terms of cash value, for it needs no argument to convince even the most thorough going materialist that a home surrounded by trees and approached through tree lined streets, will, other things being equal, fetch a higher price than a house standing alone in the open.

The following paper deals with certain of the principles that underlie street tree planting and their application. In general these principles are simple and for the most part the reason for applying them is self evident. The planting and proper care of trees are not in themselves difficult tasks. Good common sense and perseverance are the most needed requirements. But it is essential that the several steps in the program be systematically and faithfully carried out if real success is to be attained.

The planting of street trees differs essentially in its purpose from other forms of tree planting: In forest planting, for example, the object is the production of wood or timber or the protection of a water shed. In orcharding, to make the grove yield the most and the best fruit, while along the street the object of the planting is to add to the attractiveness of the street by securing shade or by adorning it with trees beautiful in color or in form.

To be adapted for street planting a tree must have a fairly erect habit, or at least be amenable to being brought into shape through pruning. It must be hardy enough to stand more or less neglect, and it should be of a species that is not continually dropping its leaves, twigs or fruit. Further, and especially here in Honolulu, where within an incredibly short distance natural conditions are decidedly unlike, it is essential that the tree be adapted to the soil and local climate of the immediate locality where it is to be planted.

But before coming to the choice of species there are other considerations that have first to be taken into account. Street tree planting is essentially a matter of coöperation. The first step is to work out a general plan, which, when adopted, shall have behind it interest and support sufficient to see it through. It is obvious that on certain streets trees would be out of place; that on others the requirements are already met by vegetation now growing along the way, within private grounds. Other things being equal street tree planting should begin on residential streets, and, again obviously, it is better to do a little well than to attempt so elaborate a program that the whole thing falls of its own weight.

Practically all the authorities are agreed that in street tree planting the best results both as to effect and as to management are

to be had by using a single species within a given unit of street length. Usually, this unit should include several blocks, both sides of the street. Here again is emphasized the necessity for coöperation.

Because of the many details that have to be attended to in tree planting, many of them requiring some technical skill to carry out, far better results will be got if the work is entrusted to some one body, such as a committee of the local improvement association, rather than if it is left to individuals. In Honolulu we are prone to over-organization. In this matter there is already in existence plenty of machinery. The proper organization to do the active work of street tree planting is the improvement club, backed by the Central Improvement Association, when questions arise that involve territory covered by more than one local club. What is needed now is to bring pressure to bear on the local clubs to have them take up and carry through this class of work. How such influence can best be exerted we need not here discuss, though personally I think that much more would be accomplished by the local improvement clubs, not only in this but in other ways as well, if there were more women members.

Having decided that a given section of a certain street should be planted with trees, the next step is to determine the location of trees, whether in the "parking" between curb and side walk, or within the boundaries of the lots. Much depends on the width of the street, and into the consideration comes, too, the question of where there is likely to be the least interference with the poles and wires of electric companies. We must, of course, recognize that until that happy day comes when all the wires go underground, it is only just that the electric companies have the right to keep their lines clear. But there is a great difference in the way the necessary pruning is done. Some of the foremen exercise care as it is now. Others, unfortunately, do not do so. Under the law the superintendent of public works has the power and authority to grant the right to set poles and to plant trees on the streets, and to make regulations governing the same. The question of how this control can be more strictly enforced is now receiving the attention of the Territorial authorities. But so far as possible it would be well to avoid friction by choosing for street planting those species which will keep below the wires, or by so placing the trees that they will not interfere with them.

Mention has already been made of the desirability in street planting of using trees of upright habit. It is extremely annoying to have low hanging branches extend over the sidewalk, and it is unnecessary, for only those trees should be used that will naturally, or that can be made to assume a proper shape.

Incidentally it may be said that in general the pruning of trees, while not a difficult matter, is one that should receive a larger share of personal attention from the householder than it now does. Every kind of tree has its individual habit. The object of prun-

ing is to assist nature by cutting out interfering branches and encouraging symmetrical development. If a clean cut is made as close as possible to the limb from which the branch is severed, if the work is carefully done so as not to tear down the bark, and finally if the wound is coated with a dressing to keep out fungi and insects,—and for this, ordinary green stain, carbolineum, is as good as anything—a great gain will be made over the senseless “topping” that now goes on in many local grounds regardless of age or kind of tree. In this connection attention may be called to the fact that the staff of the Territorial Division of Forestry, with headquarters at the government nursery, is always glad to give advice as to pruning and other tree work, either there or on the ground, as may best meet the needs of the applicant.

Of the kinds of trees that have successfully been used for street planting in Honolulu, the following deserve special mention: For ornamental effect: Golden Shower, Pink and White Shower, Royal Poinciana, Pepper and Rosewood or Jacaranda. For shade: Monkey pod, Siris tree, Silk Oak, Ironwood and several species of Eucalyptus. Some of the Palms are highly effective but because of their slow growth and need of attention are not so well adapted for street use as for private grounds. This list by no means exhausts the trees that have been and can well be used for street planting in Honolulu. But it will serve for the purpose of this paper.

Seedlings of suitable size for planting of most of the kinds named, except Palms, are kept constantly on hand at the government nursery and are furnished free for street planting. Upon due notice other species will be got ready if it is so desired.

In the planting out of trees the members of the Division of Forestry will be glad to give advice as to details. These are matters that need not be gone into now beyond the general observation that obviously those trees will grow best that receive the most care and attention at the start in the way of preparation of the soil, watering and subsequent protection.

Indeed it is the care given street trees subsequent to planting that determines largely if the result be marked by success or failure. It is easy enough to get people worked up with enthusiasm for an Arbor Day, but it is quite another matter to be sure that there will be some one on the job six months later to see that proper care is being given to the little trees until they become established, and later still to prune them properly, to place and replace stakes, and to give them water in dry times. Because all this is necessary is the reason why street tree planting can be done better by a permanent organization than by an individual or a temporarily appointed committee.

Some few years ago Honolulu was swept by a wave of interest in Civic Improvement which resulted among other things in the setting out of trees on several residential streets in the Makiki district. The start was a good one, but it was not followed up, and

today, in consequence, the streets planted stand more as a reproach and reminder of things left undone, than as they might well have been, avenues of brilliant color that would have been one of the features of the city. It is with no spirit of blame for any individual that this criticism is made, but rather with the hope that the experience so gained may be an incentive to more systematic efforts in the future.

Returning to a matter of detail in street tree planting, one of the most important points to be observed is the proper protection of the little tree by suitable guards. Especially is this true here in Honolulu where small sized seedlings are so generally used, and where on many of our streets it is not uncommon for the street trees to be exposed to cows on their way to and from their pastures.

Taken by and large there is certainly a great opportunity for street tree planting in Honolulu. There is enthusiasm among those who, if they will go about it right, can accomplish wonders. The machinery is already at hand in the local improvement clubs, in the Central Improvement Association and in the special committees of other organizations that can help by bringing the matter to a head in any one locality. There is expert advice to be had for the asking on all technical points and there are free trees waiting to be called for. Everybody is ready for the individual or group of citizens who can start the ball rolling and keep it under way. The result of their labors will be to make Honolulu a pleasanter place to live in, a better as well as a more beautiful city.

REVIEW OF CURRENT LITERATURE.

VAUGHAN MACCAUGHEY.

Principles of Rural Economics, by Dr. Thomas Nixon Carver, Professor of Political Economy in Harvard University. Ginn & Co., Boston. 1911. 386 pp. 5½x8 ins.

This is an authoritative and well-written text. It consists of six large chapters—General Principles; Historical Sketch of Modern Agriculture; The Factors of Agricultural Development; Management in Agricultural Production; The Distribution of the Agricultural Income, and Problems of Rural Social Life. There is no specific mention of Hawaii in this book, but the point-of-view and concise style of the author should engage the attention of any one seriously interested in the welfare of Hawaii's agricultural enterprises. The sketch of modern agriculture is particularly illuminating in its exemplification of the significant economic interpretation of history. The work is true to its title, in that it elucidates the fundamental principles of the subject. The mate-

rial is well classified and ably presented. The book contains an excellent bibliography.

Fundamentals of Agriculture, edited by James Edward Halligan, Chemist in charge, Louisiana State Experiment Station. D. C. Heath & Co., Boston. 1911. 492 pp. $5\frac{3}{4} \times 8\frac{1}{4}$ ins.

A well illustrated text-book on general agriculture, of the type now largely used by secondary schools offering agricultural instruction. There is a brief introduction by Pres. Butterfield, of Mass. The chapters are: The Soil; Plant Life; Manures and Fertilizing Materials; Farm Crops; Trees and the Garden; Plant Diseases; Insects and Birds; Live Stock and Dairying; Feeds and Feeding; Miscellaneous. A unique feature is that "every subject in this book is written by an expert in his line. This idea was carried out in order to furnish the student with the best information that could be obtained." The section on sugar cane, for example, is written by Prof. H. P. Agee, then of the Louisiana Sugar Experiment Station, now of the H. S. P. A. Station. The book is distinctly southern in its point-of-view, and is thus of interest to Hawaii. The accounts of cotton, rice, sugar cane and tobacco, are explicit and well written. Each chapter contains a good set of references for collateral reading. The illustrations are of good quality throughout. The appendix contains a number of useful tables, and suggestions for an agricultural school library. Teachers in Hawaii's rural schools could make good use of this book.

Cultivation of Tobacco in the Philippine Islands, by B. E. Brewer. Philippine Bureau of Agriculture, Farmers' Bulletin 16. 1910. Pp. 23, plates 3, figs. 3.

This is a brief handbook of information for the tobacco grower in the Philippines.

Sisal Hemp in Fiji, by C. H. Knowles. Dept. of Agric. of Fiji. Bul. 1, 1911. Pp. 16, plates 2.

Directions for growing and harvesting sisal, and for extracting the fiber; with statement of results obtained at the experiment station.

Australian Timber; Its Strength, Durability and Identification, by J. Mann. Melbourne. 1909. Pp. xvi-148, figs. 19.

A compilation of data, available prior to 1900, relative to the strength and durability of about fifty of the best known engineering and construction timbers of Australia.

The Orange Thrips, by P. R. Jones and J. R. Horton. U. S. Dept. Agric. Bur. Entomol. Bul. 99, part 1, pp. 16, plates 3, figs. 2.

A report of progress for the years 1909, 1910. An important

paper, dealing with an important group of citrus pests. The orange thrips were found, not only on citrus, but also on pomegranates, grape, California pepper tree, dock, pursland, and a wide variety of other plants.

The Unification of Reducing Sugar Methods, (A Correction), by Percy H. Walker, Chief, Contracts Laboratory, U. S. Dept. Agric. Bur. of Chemistry, Circular 82, pp. 6.

Grape Propagation, Pruning, and Training, by George C. Husmann, pomologist in charge of viticultural investigations, U. S. Dept. Agric. Farmers' Bulletin 471, pp. 29, figs. 30.

The Avocado in Hawaii, by J. E. Higgins, C. J. Hunn and V. S. Holt. Hawaii Agric. Expt. Station, Bul. 25, 48 pp., 7 plates, 13 figs. 1911.

This excellent bulletin is heartily welcomed by all in Hawaii who are interested in local horticultural problems. It fills a long-waiting gap in the scant literature of tropical fruit production. The text is well classified and fully illustrated. The main sections are: botany and history of the avocado; natural and cultural requirements; control of insects and diseases; the crop and its marketing; breeding the avocado; the avocado as food; varieties. The sections of particular fulness and interest are those dealing with propagation, marketing, methods of serving, and descriptions of varieties. The blank or form for describing varieties is unusually complete. Of the many Hawaiian varieties, about sixty-five have been described by Mr. C. J. Hunn. Experiments with sprays are now in progress, to control scale (*Psuedococcus*), green caterpillar (*Amorbia*), and fungus (*Gloeosporium*).

The following extract from the introduction illustrates the present market situation, " * * * the growing of this fruit is only an infant industry. For a long time it was impossible to develop it because of the lack of a ready means of rapidly multiplying a good variety and thus establishing the uniformity in product which is necessary in all market fruits. This difficulty has now been removed and development is in progress. There are probably more than 100 acres now planted in orchard in Florida, and inquiries are coming to Hawaii from California for thousands of seeds to start nurseries."

(To be Continued)

RECENT INVESTIGATIONS IN INSECT PARASITISM.

BY OTTO H. SWEZEY

(A paper read before the Agricultural Seminar, College of Hawaii,
February 15, 1912.)

(Concluded)

In the work of introducing parasites from foreign countries, care has always been taken lest hyperparasites be introduced along with them, and thus, if they also became established, lessen the effectiveness of the parasite. It has sometimes been supposed that a parasite thus taken to another country without being accompanied by its native hyperparasites, would be more effective when successfully established in a new place than it was in its native place. The above experience has tended to modify the stand taken on the question of hyperparasites, and it is seen that the benefits to be derived from the exclusion of hyperparasites are not so great as has always been supposed, and the danger from their introduction is much lessened—that is, in cases where there are native hyperparasites which are counterparts of the foreign ones.

With the Tachinid flies that have been introduced, there has been better success. These parasitize the gipsy-moth caterpillars. Nine species have been colonized, some from Europe and some from Japan. Most of these were satisfactorily colonized, and at least two species seem to have become established, while there are good hopes for some of the others.

In the work with the Tachinids, a great deal of new information was gained as to the habits of the different species of this family of parasites. The ordinary method of oviposition for Tachinids has been known for a long time. The adult female deposits her eggs on the surface of the caterpillars; they hatch and the young maggots penetrate the body of the caterpillar to feed upon the fat-bodies, juices, and eventually the vital organs; then, when full-grown, they emerge to pass through the pupal stage in the ground. Among the species studied at the Gipsy Moth Parasite Laboratory, were some that were found to have different habits from that, so a careful study was made of the habits of all of them in so far as possible. Sasaki, a Japanese entomologist, had, about twenty years previously, in studying the parasites of the silkworm, ascertained that a Tachinid deposited its eggs on the leaves. When eaten by a caterpillar feeding on these leaves, they hatched inside the alimentary canal, bored through its walls, and located for a time in ganglia. Later on, they became fixed with the posterior end in close connection with spiracles and feeding on the juices and fat of the caterpillar, eventually killed it.

Among the species studied at the laboratory, this method of oviposition was found, as well as several others. One species was found to deposit living maggots on the surface, another beneath the skin of the host caterpillar; and one deposited living maggots on leaves where they awaited a convenient opportunity to attach themselves to a caterpillar and penetrate its body. There are now known to be these five methods by which young Tachinids gain access to their host caterpillars: host-oviposition; leaf-oviposition; supra-cutaneous host-larviposition; subcutaneous host-larviposition; and leaf-larviposition.

Another matter of great interest was brought out in these investigations—that is, that many Tachinids are physiologically restricted in their host relationships. For instance, if larvae of any Tachinid gained access to a caterpillar in any of the above mentioned ways, conditions might be found such that they might fail to develop, if the conditions, chemically or physiologically, were different from those in their own special host. It is for such reasons probably that many parasites have come to have such intimate correlation with certain hosts that they cannot survive or thrive satisfactorily on any other host. Hence, in the consideration of the introduction of parasites, the most valuable ones would be those that were restricted or closely correlated with the particular host that they are desired for, other circumstances being favorable.

Several Hymenopterous parasites of gipsy-moth pupae have been introduced. One of them (*Monodontomerus*) has become established, and very widely spread throughout the region infested by the Gipsy Moth. Investigations show that it has spread at the rate of ten miles per year. After colonization of this species had begun, it was pronounced a hyperparasite by Dr. Ashmead; colonization was then stopped, even though they were emerging in large numbers from imported parasite material under conditions which pointed toward it being an important primary parasite. Later investigations showed that it was chiefly a primary parasite, even though it was also sometimes a secondary on Tachinids and others. Colonization was again resumed, with the result that it is now the most widely spread of all the parasites that have been introduced. In fact, it has been found spread nearly throughout the infested region. It attacks Brown-tail Moth pupae to a greater extent than it does Gipsy Moth pupae. It has also been found to attack pupae of native moths. As a hyperparasite, it has been bred from Tachinids and from the cocoons of the Braconid, *Apanteles*.

Many of the parasites that I have found so far mentioned, attack both the Gipsy Moth and the Brown-tail Moth. Besides these, other parasites have been investigated and their introduction attempted, which attack the Brown-tail Moth and not the Gipsy Moth. Some of these have been more successful than those on the Gipsy Moth.

It will be seen then that an attempt has been made to secure as many parasites as possible to attack each of the different stages of the moths; and to produce as nearly as possible the same kind of sequence of attack that prevails in the native habitat of these pests—that is, to establish as many as possible of the parasites attacking each of the different stages: egg, larva and pupa.

Summary of parasites introduced or colonized: Egg Parasites, 4 species; 2 species established. Parasites of caterpillar, 20 species; 7 established. Parasites of the pupae, 5 species; 1 established. A total of 29 species, 10 of which have become established.

It was confidently expected that several others would be found established when the time came for making the necessary investigations. Some of them were so recently colonized, that it is not expected that it can be determined yet whether established or not, though some additional ones may have been found established by the investigations in 1911, of which we have no report at hand.

The situation at present is considered satisfactory, but it is expected that five or six years time may yet be necessary before proof is reached as to whether these two pests can be controlled by the introduced natural enemies. In the meantime, plans are being made to continue the introduction of parasite material.

In the course of all this work, many observations of extreme biological significance have been made, particularly with regard to the interrelation of host, parasite and hyperparasite. Some of these have already been mentioned, as for instance the five different methods by which the different Tachinids attack their hosts.

Another interesting habit is in the case of one of the egg-parasites from Japan (*Schedius*). The egg of this parasite is supplied with a long stalk. It is placed within the body of the unhatched caterpillar within the egg of the host, but usually with the end of the long stalk projecting outside the host egg: "When the parasite egg hatches, it does not entirely leave its shell, but remains with its anal end thrust into it, and the stalk which is hollow, becomes functional and acts like a life-line attached to a submarine diver in supplying a connection with the outer air." As the larva grows through its two first stages it retains this connection with the life-line. This is one of the parasites which also act as hyperparasites; for example, if the host egg had already been parasitized and now contained the full-grown larva of that parasite, it would be the victim of this parasite, which in turn might be destroyed by yet another hyperparasite, according to the conditions in Japan where it came from.

A more particular hyperparasite is one, that, having gained access to the body of the host, wanders about in search of any parasites that might be there, apparently not injuring the host,

and not being able to survive unless it finds a parasite larva in which to live.

Another place where a study of the interrelation of parasite and host are being minutely studied is at the laboratory of the Agricultural School at Portici, Italy. Many new and interesting habits are being brought to light. Dr. Silvestri, at this place, has made some most minute investigations of polyembryony. Polyembryony is that method of development by which a large number of embryos is produced from one egg, as occurs with some of the Chalcididae. Dr. Silvestri investigated this phenomenon with *Litomstix*, a parasite of *Plusia*, and a number of other moths. According to his investigations, the process of development is as follows: the adult female parasite deposits one egg in an egg of the moth. It does not destroy the egg as egg-parasites do. It does not interfere with the embryonal development of the host nor the hatching of the caterpillar, nor does it prevent the latter growing to its full size; on the contrary, a parasitized caterpillar attains a somewhat larger growth than a normal healthy one. Returning to the egg of the parasite, a peculiar nuclear division takes place in its development, which results in a segmentation different from usual, by which, eventually, a large number of minute embryos is formed from this one egg. These embryos then feed and grow in the growing caterpillar, not killing it till after it has become full-grown and spun its cocoon; when they soon finish their growth, having eaten the entire contents of the caterpillar skin which they entirely fill, giving it the appearance of being crammed full and stretched beyond the normal size. These parasite larvae pupate in this position, and in due time the adults emerge to the number of several hundred, even thousands. As high as 3000 has been reported as produced in this way in one caterpillar, and all having originated from a single egg. This method of development is known for a number of parasites. We have in the Hawaiian Islands a parasite on native wasps which probably reproduces in this way, though the details of it have not been worked out for this species.

Some mention should be made of the investigation of parasites in connection with the cotton boll weevil in the Southern States. No parasites have been obtained from foreign countries, but in the study of the native parasites, 26 species have been found attacking the boll weevil. These sometimes have been found killing quite a good percentage of the weevils, and thus becoming one of the important factors in their control, in 1909, producing an average destruction of 16 per cent. A good deal of work has been carried on in distributing the more efficient of these parasites from one place to another in Texas, and also to those places in Louisiana and Mississippi to which the weevil has spread.

Considerable experimenting has also been done in the transfer

of *Aphis* parasites from southern points, into Kansas wheat fields, for the destruction of the spring grain aphid or so-called "green bug," that made such severe outbreaks a few years ago, particularly in 1907. Definite results have been prevented by the occurrence of the parasite throughout the range of the destructive insect, parasitic as it is upon other species of plant lice. It could not always be determined definitely whether the parasites might not have come from this source to the wheat fields and had accomplished as much or more good than those which were brought from a distance.

Recently an egg-parasite has been introduced from Europe for the eggs of the elm leaf-beetle in the Eastern States; and attempts are being made to introduce parasites for the alfalfa weevil in Utah, and the "white fly" in Florida. From the United States parasites are also being sent to other countries, for different pests. I mention these few out of many similar investigations, as evidence of the amount of this kind of work that is being done.

I should not close without dwelling a little upon one of the latest feats in parasitic work here in Hawaii, though you no doubt are mostly already familiar with the facts. I refer to the introduction of the Tachinid fly from New Guinea, by Mr. Muir. This is a parasite on the sugar cane borer, a pest known to exist in these Islands for about half a century. Mr. Muir was engaged in searching for parasites for this weevil for two years before discovering any. After searching such regions as Fiji, Southern China, Malay States, Java and Borneo, he finally discovered this Tachinid at Amboina, one of the islands of the Malay Archipelago, between Boreno and New Guinea. All attempts to transport it from there to Honolulu failed. On further search, the same parasite was found in New Guinea. From there, overcoming many difficulties, it was finally successfully received in 1910 in Honolulu, via Australia and Fiji, in which places colonies were reared to send on the next stage of the journey.

From the time the parasites arrived safely in Honolulu, they have been successfully reared in cages, continually to the present time, and colonies distributed to all sugar cane districts of the Islands. Nearly all of the sugar plantations have already been supplied with them; and on those where first established, they have already become widely spread, in but little more than a year's time. The prospects are very favorable of their becoming a considerable help in checking this very destructive cane pest.

This Tachinid presents still another method of reaching its host, different from the five methods previously mentioned, by which the different species attack caterpillars. Briefly, this borer Tachinid deposits her eggs (and sometimes maggots instead) in the minute openings in the rind of the cane produced by the borer larvae coming close to the rind while eating inside the cane. The tiny maggots wander about in the channels produced by the borers in the cane, on finding a borer larva, pene-

trate it, living inside, feeding on the fat-bodies of the host, finally killing it. The death of the host does not take place usually till it has constructed its cocoon; then the one or more parasite maggots emerge from it and form their puparia within the cocoon of the host, from which the adult parasites emerge in due time. We have here a parasite with habits perfectly correlated with its host. One that will probably not attack any other species of insect, unless perchance a different species of weevil, in sugar cane, should any exist.

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* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.
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Report of the Board of Commissioners of Agriculture and Forestry, for the biennial period ending December 31, 1910; 240 pp.; 45 plates.
"Notice to Importers," by H. E. Cooper; 4 pp.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

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- "Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.
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"The Hawaiian Forester and Agriculturist," a monthly magazine. Vols. I to VII; 1904-1910. To be obtained from the Hawaiian Gazette Co., Honolulu. Price \$1 a year.

DIVISION OF FORESTRY.

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- "Eucalyptus Culture in Hawaii," by Louis Margolin. Bulletin No. 1; 88 pp.; 12 plates; 1911.
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DIVISION ON ENTOMOLOGY.

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- ** "A Catalogue of the Hemipterous Family Aleyrodidae," by G. W. Kirkaldy, and "Aleyrodidae of Hawaii and Fiji with Descriptions of New Species," by Jacob Kotinsky. Bulletin No. 2; 102 pp.; 1 plate; 1907.
- * "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.
- "A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.
- "The Japanese Beetle Fungus," by Jacob Kotinsky and Bro. M. Newell. Circular No. 2; 4 pp., cut; 1905.
- Rule VII: "Concerning the Prevention of Distribution of the Mediterranean Fruit Fly"; unnumbered leaflet; 1910.
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