1. INTRODUCTION

It is a fact that the serious damage done by Phassus to useful plants such as fruit trees, timber and so on has, in recent years, come to be seen as a problem. However, it is regrettable that there are many vague points in the ecology of Phassus, which leads to a great difficulty in finding countermeasures to control them. Especially, in the south-west district of Japan, temperate area, the serious damage done by Phassus exrcescens Butler and Phassus signifer Walker to deciduous fruit trees is prominent and the damage to useful trees such as Paulownia tomentosa Steudel and Olea europaeica L. is big. There is also information that serious damage to wheat and pea (Pisum sativum L.) has been observed in Nagano-prefecture in recent years, which has become a serious problem. There are not a few cases where the damage done by Phassus exrcescens Butler has been attributed to an unknown harmful insect and have thus been treated irrationally. Therefore, it is considered that investigation on the ecology of Phassus exrcescens Butler is urgent. The authors have been studying the ecology of Phassus exrcescens Butler since 1961 and as a part of this, have, on this occasion, studied the plants damaged by the larvae of Phassus exrcescens Butler. The results will be described below. We hope to supplement imperfection of this research by our later research. Before the text we acknowledge Mr. Yoshikuni Ieoka (a teacher from Nakamura junior High school in Tokushima prefecture), Mr. Masaru Tsubouchi (a teacher from Mokutō junior High school in Tokushima prefecture) and students who are majoring in applied entomology in Kagawa University) for their help.

2. METHOD OF RESEARCH

The research this time is mainly concentrated on the plants damaged by the insect in woods, tobacco fields, orchards and gardens but accidental discovery of damaged plants outside was added to it. The research on the actual condition in orchards was done, according to a sketch map of planting, by two persons per each kind of fruit, so as not to overlook any instances of such plant damage.
3. RESULTS

1) plants damaged by the larvae of phassus excrescens BUTLER

It seems that the plants damaged by larvae of phassus are of a considerably wide range but many of those plants are damaged especially by phassus excrescens BUTLER and phassus signifer WALKER. A review of all the former fragmentary records related to the plants damaged by phassus excrescens BUTLER shows that research on this covers a considerably wide area but it was not satisfactory. Therefore, there was a need for further research on this question. When the plants damaged by the larvae, which the authors observed, are added to the former records they become, as shown in Table 1, 103 kinds in 43 families but some of these plants are at the same time damaged by phassus signifer WALKER. It is not clear when the larvae of phassus excrescens BUTLER enter these plants to eat. However, considering that many young larvae of phassus excrescens BUTLER temporarily enter, for eating, into caules of artesisia indica and of chrysanthemums, and young branches of salix gracilistyla MTQ and so on, which newly grow in spring, from the beginning of May to the end of May, as shown in Fig. 1, and that many young larvae live in a mass of wood splinters at the part damaged by the larvae which do not attain a stage of perfect maturity and have been in for eating from the previous year, it is thought that the larvae after hatching gradually enter such plants to eat and live, and then change hostplants and move to enter various trees to eat. Actually it is apparent that the number of phassus excrescens BUTLER suddenly increases after summer, as shown in Table 2, in poplars and scrophulariaceae which suffer a serious damage by them. Moreover, recently, Kohana, one of the authors, observed that phassus

XX exerescens BUTLER's eggs, oviposited in the autumn of the previous year, hatched all at once at the end of April and the first stage of the larvae grew to eat caules of various grasses. This stage might be the stage preceding the first entering of plants to eat. If one counts those grasses as well as plants damaged by them becomes very large.

2) Environment and kinds of trees which are frequently damaged by the larvae

The areas where there is great damage done by phassus excrescens BUTLER are near mountainous areas and agricultural (e.g. rice, vegetables) districts but also vineyards on sloping ground, lines of poplars, Paulowia tomentosa STENDING, plantations,
Quercus acutissima CARRUTH woods by the wayside, salicaceae beside irrigation canals, hedges of Rhus vernicifera THUNB around dwelling-houses, Diospyros kaki THUNB. plantations, Castanea crenata SIEB. et. Zucc. plantations and Olea europaea L. plantations. However, it depends on districts, sometimes serious damage occurs in Alnus firma SIEB. et. Zucc. woods planted for forestry protection and flood control, and hedges of quercus phillyrceaides A. Gray or Callistemon speciosus D. C. around dwelling-houses. Of course, in these places there are many plants for which Phasus exsurgens BUTLER have a taste. In this situation, there are many occasions when many larvae of Phasus exsurgens BUTLER enter the trunk of one tree to eat and live there.

Some results of investigation which support this are shown in Table 3-6 and in Figure 2. We are convinced that one should not neglect precautions against this kind of extreme damage.

Other than the plants mentioned above, Quercus acutissima CARRUTH, Albizzia julibrissin DURAZZ, Amorpha fruticosa L. and Clerodendron trichotomum THUNB are damaged with high frequency. It is thought that Clerodendron trichotomum THUNB, especially, is one of their favorite plants, as well as willows, poplars and paulownias. It has already been mentioned that the damage, especially, in vineyards and orchards on sloping ground is considerable. In this case, patches of high vegetating frequency of Clerodendron trichotomum THUNB are often observed in the surrounding woods of these orchards in the south-west temperate district of Japan. Orchards in this environment are, generally speaking, damaged more by Phasus exsurgens BUTLER (or Phasus signifer WALKER). Great damage to wheat and zea Mays L. has been observed in Inaya district in Nagano prefecture in recent years. This was not known before. It is considered that this damage is, probably, done by the young larvae before they enter trees to eat on a full scale.

In general, however, this period seemed to be the same period as that when the young larvae enter various grasses and Chrysanthemums to eat. The mass damages done by Phasus exsurgens BUTLER in crop fields in Nagano prefecture is a real surprise. There are noteworthy characteristics in the damage done by Phasus exsurgens BUTLER to various trees. The damage done by the insect can be easily distinguished from the damage done by cerambycidae or conidae. As shown in Figure 3-4, wood splinters from the part damaged by Phasus exsurgens BUTLER gather together like a
4.

Gumpling (it looks like a cow-pat), and stick to the entrance of the damaged part. Then the gumpling of wood splinters is, removed from there, one can see the condition of the inner damage, a tunnel, upward or downward (a tunnel is rarely branched). In the case of a fairly small trunk or branch they grow beltlike (see Fig. 5) the bark and the cambium part, and then enter the wood part to eat, or depart from it. This is shown in Figure 5. However, the damage done by the young larvae in Chrysanthemum or other grasses and new branches of willows resembles the damage done by other harmful insects, such as small moths to stalks of various plants, or sesamia inferens WALKER to tea leaves L. Therefore, one is not to fail to recognize the damage done by the larvae of phassus excrescens BUTLER.

4. CONCLUSION

As described above, the kinds of plants damaged by the larvae of phassus excrescens BUTLER are very wide and count 103 kinds in 43 families. The plants damaged greatly by them are poplars, willows, Alnus firma STBB, et. ZOCC, gaslinea crenata STBB, et. ZOCC, quercus serrata THUNB, quercus acutissima CARRUTH, quercus philly raeoides A. Gray, Albizzia julibrissin DURAZZ., Amorpha fruticosa L., Eucalyptus japonica THUNB, vitis vinifera L., Callisteon speciosus D.C., Diospyros kaki THUNB, olive (Olea europaeae L.), Clerodendron trichotomum THUNB, paulownia tomentosa STEUDL and paulownia Kawakami ITO. These plants which they specially have a taste are damaged by a few or up to 10 larvae of phassus excrescens BUTLER per plant. In fruit trees and other useful plants, there is, in addition, damage to branches broken by strong wind, therefore, the damage becomes considerably great. However, observing the movement of the larvae of phassus excrescens BUTLER, there are thought to be two periods for entering plants to eat, one is, for a short period after hatching, mainly for herbaceous plants and the other, after this, for serious eating, in trees. Therefore, for the prevention of their entering to eat, control during the above two periods must of necessity be considered.

We would like to do further research in the future on this question.

Moreover, according to recent reports, the damage done by phassus unexpectedly occurs also on lead covers of cables (including aerial cables). A few such cases have been reported in Japan. (73)
It is well known that the lead covers of cables are damaged by Chalcophora japonica gory and Spondylis buprestoides (Linne) which are harmful insects for a forest and whose larvae eat and damage pines and others. It has to be noted that phassus is likewise an attacker.

5. SUMMARY
The plants damaged by phassus excrecens BUTLER were studied and described. The results are as follows;
1) The plants damaged by phassus excrecens BUTLER count up to 103 kinds in 43 families. Among them the greatest damage is made on poplars, willows, Alnus firma SIEB. et. ZUCC., Caslanca crenata SIEB. et. ZUCC., Quercus serrata THUNB, Quercus acutissima CARRUTH, Quercus phillyraeoides A. Gray, Albizia julibrissin DURAZZ., Amorpha fruticosa L., Erythrina japonica THUNB, vitis vinifera L., Callistemon Speciosus D. C., Diospyros kaki THUNB, Olea europae L., Clerodendron trichotomum THUNB, Paulownia tomentosa STEUDEL and paulownia Kawakami ITO.
2) It is not rare that the young larvae of phassus excrecens BUTLER, before entering various trees to eat, enter Chrysanthemums and herbaceous plants to eat. This has to be taken note of, from the horticultural point of view.
3) Especially on their favorite plants, not only the damage rate is high but also the number of the larvae entering to eat per tree is considerably high. It was often observed that this caused branches to be damaged by being broken by strong wind.