PROCEEDINGS

of the Eighth Annual

WESTERN FOREST INSECT WORK CONFERENCE

Calgary, Alberta
March 27-29, 1957

(For Information of Conference Members Only,
Not for Publication)

Prepared in

Department of Entomology and Parasitology
University of California
Berkeley 4, California
June 18, 1957

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EXECUTIVE COMMITTEE

M. G. Thomson, Victoria	--	Chairman (1956)
R. L. Furniss, Portland	--	Immediate Past Chairman
A. D. Moore, Berkeley	--	Secretary-Treasurer (1956)
C. B. Eaton, Berkeley	--	Retiring Councilor (1954)
R. W. Stark, Calgary	--	Councilor (1955)
D. E. Parker, Ogden	--	Councilor (1956)
C. L. Massey, Albuquerque	--	Councilor Elect (1957)

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WESTERN FOREST INSECT WORK CONFERENCE*

Calgary, Alberta

March 27, 1957

March 27, 9:30 - 10:15

Initial Business Meeting

The chairman, G. M. Thomson, called the meeting to order at 9:30 a.m. in the Forest Pathology Laboratory at Calgary.

The chairman introduced the following new members:

Mr. J. W. Wagg, Oregon State Board of Forestry, Salem Ore.
Miss M. Cumming, Forest Biology Laboratory, Calgary, Alb.
Mr. N. E. Johnson, Weyerhaeuser Timber Co., Centralia, Wash.

and welcomed H. A. Richmond, returning member.

The remaining participants then introduced themselves in turn.

G. R. Hopping moved adoption of the minutes of the 1955 Conference as presented in the proceedings of the meeting. The motion was seconded by G. C. Trostle and passed.

The secretary-treasurer read the secretary's Report and the Financial Statement for the period since the last meeting. Adoption of these reports was moved by J. A. Rudinsky and seconded by G. C. Trostle. Motion passed.

The secretary gave a brief review of the executive committee meeting of March 26.

The chairman called for discussion on the place of the next meeting. R. W. Stark moved that the Ninth Conference be held in the Portland area. The motion was seconded by R. R. Lejeune and passed. J. A. Rudinsky extended an invitation to hold the meeting at Corvalis, Ore.

The chairman presented the question of the frequency and time of meetings, pointing out that the majority of members had indicated a preference for a spring meeting. It was moved by R. W. Stark and seconded by G. R. Hopping to hold annual meetings between Feb. 15 and March 15. The motion was passed following a brief discussion from the floor of the advantages of a spring meeting.

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* Prepared by the Secretary-Treasurer, A. D. Moore, from summaries submitted by the Discussion Leaders named under each session.

The chairman presented a recommendation by the executive committee that the current program committee, the executive committee, and representatives from the next meeting area meet during the later part of the conference to develop guiding policies for improvement of the next meeting. It was felt that it would be better not to leave the program too much to chance. A program planning meeting was called for Thursday evening.

The chairman pointed out that a change in meeting dates conflicted with the Constitution and appointed

G. R. Struble
R. R. Lejeune
A. D. Moore, chairman

to serve on the constitution committee to review this matter.

The chairman reviewed a proposal made at the 1955 meeting on the preparation of lists for distribution to Conference members of unpublished research reports at the various stations. It was pointed out that this was not intended to violate the confidential nature of some of these reports, and that the station leader would reserve the right to restrict release of the reports as he saw fit. Following the recommendation of the 1955 executive the secretary contacted the various station leaders for their reaction to this proposal. While most felt it was a worthwhile endeavor there was some question as to the practicability of preparing such lists. The current executive committee recommended that the chairman appoint a committee of senior officers from the various stations under G. R. Hopping, chairman to further explore the matter.

The chairman appointed the following committee for this purpose:

H. R. Dodge
R. I. Washburn
F. B. Knight
F. M. Yasinski
C. B. Eaton
W. K. Coulter
G. T. Silver
D. A. Ross
G. L. Downing
G. R. Hopping, chairman

With regrets, the chairman informed the conference that F. P. Keen had asked to be relieved of his duties as chairman of the common names committee. R. L. Furniss was appointed to replace Mr. Keen as chairman of the committee. D. A. Ross was appointed as acting chairman for the Calgary meeting, and W. K. Coulter, R. I. Washburn, F. B. Knight, and E. C. Clark as acting members for R. L. Furniss, D. E. Parker, N. D. Wygant, and W. F. Barr.

The chairman appointed a nominating committee composed of

E. C. Clark
H. A. Richmond
D. A. Ross

F. M. Yasinski
C. B. Eaton, chairman

to consider candidates for the offices of secretary-treasurer and 1957-1959 counselor.

The program chairman, G. R. Hopping, reminded the conference members of the banquet on Thursday evening and announced that field trips were being planned to the Kananaskis and Eisenhower forest insect field stations for those members staying over Friday night.

The chairman reminded the moderators on the program that the proceedings of the conference would be distributed to those in attendance and that they should plan to submit summaries of their sessions to the secretary.

The chairman pointed out the new gavel in his possession, compliments of J. W. Whiteside, Portland, Ore.

Meeting adjourned 10:15 a.m.

March 27, 10:30 - 12:00 a.m. C. E. Brown

Review of Current Forest Insect Conditions in Western United States, Canada and Alaska

This review of the Forest Insect infestations in the region covered by this conference has been compiled with the idea of presenting only the insects which are important over a large part of the region or are interesting because of some special circumstance.

Spruce budworm

The insect which is most widely distributed throughout the area is the Spruce budworm. It occurs from southern New Mexico to the Arctic Circle in the Northwest Territories. The expected populations of this insect in 1957 vary greatly from region to region. Portland, Victoria (one year cycle) and Albuquerque expect lower populations while Ogden, Fort Collins and B.C. (two year cycle) expect larger populations in 1957. Calgary expects the population of both the two year cycle budworm in the Parks and the one year cycle budworm in the Northwest Territories to remain much the same as last year.

For Arizona and New Mexico budworm defoliation decreased sharply throughout the region. Approximately 11,500 acres of mixed conifer stands were moderately infested on the Mescatero Indian Reserve.

In southern Colorado the spruce budworm is increasing in the Rio Grande and San Juan national forests. It has not caused tree mortality to date but is potentially dangerous.

In the area serviced by the Ogden Experiment Station the total acreage infested was 4,181,600 acres. Of this total 3,531,600 acres were in Forest Region 1 and 650,000 acres in Forest Region 4. Large scale spraying operations were carried out in both of these areas in 1956; in Forest Region 1, 855,000 acres were sprayed and in Region 4, 476,000 acres. The spruce budworm remained a serious threat to the forests in both these areas.

In the Washington-Oregon area infestations were centered around the Blue Mountains-Oregon area. The budworm population in this area is the lowest since 1947, except in the Umatilla, Malheur and Wollowa-Whitman National forests where the population trend is still upward.

In British Columbia the one year cycle budworm outbreak near Lillooet decreased in intensity although heavy feeding was present in some areas. In the older infested areas the trees are showing remarkable recovery and the estimate of tree mortality reported last year has been halved.

The two year cycle budworm in the Babine Lake Area caused heavy damage, in many areas all of the 1956 foliage and some of the 1955 and 1954 foliage was eaten. In other areas medium to light feeding occurred.

In the Northwest Territories a patchy infestation occurred in the Mackenzie River Valley, patches of heavy defoliation were interspersed with areas where little or no feeding occurred.

Douglas-fir beetle

The Douglas-fir beetle was also widely distributed in 1956. Over the region as a whole this insect was less distinctive than in 1955. Downward trends were reported from all the regions infested except Arizona, New Mexico, Colorado, and southern Utah. Chemical control operations involving 1,300 trees are scheduled for the Pike National Forest.

Needle miners on pine

In the California infestations in Yosemite National Park and Sequoia-Kings Canyon National Park many trees are being killed by the needle miner and others which have been weakened by needle miner are being killed by mountain pine beetle.

In Alberta the needle miner populations have dropped to a low level in a few areas -- 5 insects per tip were found. This places them in the lower end of the light classification established by Stark.

In Arizona and New Mexico a needle miner (Recurvaria spp) has infested from 35 - 50 per cent of the 1955 needles of Ponderosa pine. This insect was identified to genus only.

Mountain pine beetle

The mountain pine beetle continued to be a serious pest and appeared to be on the increase although many of those reporting on this insect were reluctant to indicate a trend. Portland reported an increase in acreage from 175,000 acres in 1955 to 260,000 in 1956 with heaviest losses in the western white pine stands in Washington. Fort Collins reports that this insect is the most serious threat to the forests of northwest Wyoming and have scheduled a 1957 chemical control program in which they intend to treat 8,000 trees along the North Fork of the Shoshone River.

Ogden reports two small infestations in Glacier National Park and losses in excess of 100,000 trees in northern Utah. Chemical control in the Teton National Forest in 1956 caused a reduction of over 90 per cent.

Berkeley reported very heavy losses to lodgepole in Yosemite National Park and the Modoc National Forest, and to ponderosa pine near Lake Tahoe.

B.C. reports infestation of this insect to be static or declining. Fewer attacks were reported from the Baline-Morrison Lake area while the Takla infestation remained active.

Blackheaded budworm

Several localized but very severe infestations of what has been tentatively identified as the blackheaded budworm were reported from northwestern Montana and northern Idaho. These spot infestations totalled about 18,000 acres.

Another infestation on about 19,000 acres in the Yellowstone National Park subsided when the larvae were about half grown. A polyhedral virus was believed responsible.

On the northern half of Vancouver Island a large and severe outbreak of the blackheaded budworm occurred in 1956. Reproduction, pole sized, mature and over mature trees were all heavily defoliated.

The egg population decreased 63 per cent from that of 1955 and parasitism killed 67 per cent of the population in some areas. It is not known if the peak of the outbreak has been passed but egg populations are still high enough to cause considerable defoliation in 1957. A chemical control experiment showed that good control of all the instars from the 2nd instar to the last instar could be obtained with 10% DDT in fuel oil applied at a gallon per acre.

Great Basin Tent Caterpillar

The great Basin Tent Caterpillar increased sharply in southern Utah in 1956, showed a gradual to abrupt decrease in southern Colorado except in one small area in the San Isabel National Forest (where a spray program is planned in 1957) and remained unchanged in Arizona and New Mexico except on the Carson National Forest where a noticeable decline was attributed to virus diseases, one of which occurred naturally and one which was introduced.

Black Hills beetle

Increased losses from this beetle were reported from Albuquerque and Ogden. Fort Collins reports that except for a few hot spots this beetle is at an endemic level.

Most important outbreaks occurred on the Navajo Indian Reservation in Arizona, the Carson National Forest in New Mexico, the Dixie National Forest in Utah, the Bryce Canyon National Park in Utah, in the Grand Mesa-Uncompahgre National Forest in Colorado, the Pike National Forest in Colorado, the San Isabel National Forest in Colorado and in the Black Hills of South Dakota.

Engelmann spruce beetle

Although the infestation reported in the area serviced by the laboratory at Fort Collins has subsided to a low level the Engelmann spruce beetle remains a threat to the vast overmature spruce stands of the central Rockies.

In the area served by the Ogden Experiment Station the most serious infestation occurred in the Bridger National Forest in Wyoming. Prompt salvage action was undertaken and although the infestation has remained within the boundaries set in 1955, the number of attacked trees has risen sharply.

Unknown Defoliators--Host: Western Larch

Some confusion still exists over the cause of extensive larch defoliation in western Montana, northern Idaho, and northeastern Washington. Species found feeding on western larch include the larch budmoth, Zeiraphera griseana (Hubner), a looper, Semiothisa sexmaculata (Pack.) as well as several species of undetermined sawflies. The total infested area resulting from the activity of these insects is estimated at 100,000 acres. The picture is further confused by the abundance of a larch needlecast fungus, Hypodermella sp.

Oregon pine engraver beetle (Ips oregoni (Eichh.)) - 1956 was an "Ips year".

Some 324 centers of damage, covering 91,980 acres were recorded. Most of this damage occurred in the Blue Mountains in Oregon, especially where logging occurred in fringe-type stands. No control is warranted, but improving slash disposal, and varying the time of felling and thinning procedures should reduce the damage to residual stands.

Balsam wooly aphid (Chermes piceae (Ratz.))

Total acreage of infestation increased from 294,560 in 1955 to 355,990 in 1956. The severity of infestation also increased, especially in the Pacific silver fir stands of the Mount St. Helens area in Washington. Outbreaks in Oregon increased from 35,680 acres in 1955 to 152,210 acres in 1956, with most of the damage occurring in subalpine fir in the Cascade Mountains. An aggressive center in Pacific silver fir in the Coast Mountains of Oregon was discovered. Considerable progress has been made in salvaging dead and dying trees in one of the older centers of infestation southeast of Mount St. Helens.

Spruce Mealybug (Puto sp.)

A mealybug on Engelmann spruce has been active for some years in the high spruce country of southern Utah on the Fishlake and Dixie National Forests. It is at a high level on about 60,000 acres of spruce affecting all ages from reproduction to mature trees. Present knowledge of the life history and habits of the mealybug is imperfect. Attempts are being made to determine essential points and to assess the potentials of the species and its importance in this spruce country. Considerable damage is evident in the areas where the pest has been active for several years.

Western balsam bark beetle (Dryocoetes confusus)

This insect has been causing damage in alpine fir in the southwest. Little is known concerning the amount of past loss caused by this beetle. It is estimated that the 1955 kill destroyed 14,185,290 board feet of timber. The estimated epidemic acreage is 121,930 with serious losses occurring on the Santa Fe and Carson National Forests.

Fir engraver beetles (Scolytus spp.)

Infestations were mostly at higher elevations in the Oregon and Washington Cascades and covered 24,880 acres as compared with 50,520 acres in 1955. The extent and severity of the fir engraver beetle infestation in the Sandia Mountains, Arizona, remains unchanged in 1956. Localized areas have suffered 80 percent mortality. The board foot loss for 1955 is estimated at 5,182,400. The loss occurs on 6,880 acres.

Dying hemlock

Western hemlock continued to die in the Pacific Northwest from unknown causes in 1956. The acreage increased from 78,720 acres in 1955 to 125,960 acres in 1956. The damage occurs mostly as scattered dead trees and principally in southwestern Washington. Apparently insects are not primarily responsible for this mortality. Salvage of the dead and dying trees is the only recommendation at this time.

March 27, 1:30 - 5:00 p.m. R. W. Stark, Chairman

Climatic Factors Affecting Insect Abundance

As a basis for discussion, the following paper was presented to the membership by the Chairman:

It is the intention of this session to examine briefly the current knowledge regarding the effects of macro-climate or 'weather' on insect abundance and to review, with a few examples, what is known to apply in our respective regions.

Solomon in 1949, summarized the various theories of natural control from which paper we will discuss only those pertinent to the theme.

(a) Early 'biotic' theories (1914 - 1927) placed the emphasis on biotic factors but some authors recognized that outbreaks may be due to 'unbalance' brought about by weather factors.

(b) Nicholson's papers in the 1930's recognized weather as a 'modifying' factor but placed stress on competition. Other theories in this period acknowledged competition as important but gave greater value to other biotic factors and indicated a greater understanding of the importance of climate.

(c) Parallel work in the 20's and 30's by men such as Bodenheimer, Janisch and Uvarov laid the greatest emphasis on climate. The former held that population density of insects is regulated primarily by effects of weather factors on development and survival. Their chief basis for these theories was mass destruction although long-term effects on fecundity through affecting development were beginning to be recognized.

(d) Perhaps the latest tendencies in the general literature is towards 'comprehensive theories' which may be said to be retreating from the particular to the general. These recognize that all types of factors may be involved and each case may be different. These include such notables as Thompson and Schwerdtfeger. These are summarized as follows: "Each species has its own characteristics including specific needs and limitations. Optimal environmental conditions in which these needs are (best) satisfied are approached at relatively few points. The species multiplies in these favorable places, and the surplus animals so produced are forced out into less favorable places, and so on, so that the increase of the population is first retarded and finally stopped. In general, the control thus exercised is due not only to one or two "controlling factors" which predominate at all times and places but to the whole complex of environmental factors, biotic and physical, of which different factors are predominant in different situations. Density effects also operate against increase in the favorable situations. Furthermore, the environmental conditions are subject to change and so bring about reductions in density from time to time. Control is generally due mainly to physical factors in the environment less favorable to life, where density is low; biotic factors are important chiefly in physically favorable environments where density is high. The diversity and other characteristics of the physical environment are an essential element in competition and other density-dependent processes."

This very sketchily covers the main schools of thought up to 1949. In 1955 Nicholson's paper on population dynamics reviewed in considerable detail an approach which does not disagree essentially from the comprehensive theories but which is perhaps of more value in indicating avenues of effort. He described climate as an "unresponsive requisite" or factors which is one which remains unaltered in spite of any changes in the populations considered. Requisites or factors which are responsive to changes in population density and which will become critical when there is a shortage are density-governing. Non-reactive (to density) factors can never govern population abundance, in the words of Nicholson they can merely be "density-legislative", that is, they can provide the framework within which the density-governing factors act. Density-governing factors may act in both capacities.

This very broad statement embraces a host of theories concerning insect abundance which are not necessarily made obsolete by Nicholson's approach. Thompson in 1956, critically reviews the Nicholson paper. His chief differences in the theory of natural control, related to increasing and decreasing populations appear to me to be based largely on metaphysical and semantic grounds and do not essentially disagree on the fundamental importance of climate.

Glen's (1954) brief summary fitted well into the framework of Nicholson's theory. He states that "physical factors such as climate, weather and space exercise an all-pervading effect:

(1) by determining in the absolute sense, what organisms can exist in a habitat.

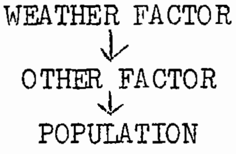
(2) by affecting thresholds of activity and other biological behavior and thus influencing, often decisively, the importance of biotic forces.

Thompson (1929) believes that the variability in population abundance tends to be inversely correlated to the complexity of the 'ecosystem'. There has long been the opinion that insect outbreaks occur more frequently in homogenous than in mixed forests. This may well be applied to the climate of a region as well. Thus the further one proceeds north and towards timberline, the greater will be the effect of climatic changes.

Ullyett (1947) has called climate a 'catastrophic factor' and states that it can be a contributory cause to insect outbreaks. This is based on the assumption, supported by several other authors, that the density-governing (biotic) factors are more adversely affected by such catastrophes than the insect in question and in the absence of these controlling factors the insect may reach destructive densities when the catastrophe is spent. However, the majority of opinion seems to be that this is more apt to be the exception rather than the rule.

Thalenhorst (1956) has presented several European examples of insect outbreaks which have been laid to weather conditions. He shows schematically the various ways (from observational evidence) in which weather may influence the population.

1.



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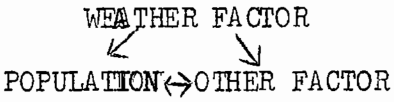

3.

These schematic illustrations can doubtless be juggled and added to but all would show the complex interrelationships and the importance of weather in determining insect population abundance. He summarizes his remarks by saying "So far it can be generally seen that weather factors (whether acting directly or indirectly) may play a decisive role in the origin of mass outbreaks, particularly (and possibly even only) when certain meteorological phenomena are repeated in successive years." The last observation is taken from the work of Wellington by Thalenhorst.

Solomon in 1957, reviews briefly the advances in population dynamics in the last 10 years, and reiterates the concept that climatic factors do not 'regulate' but are fundamental in setting the limits within which insect numbers fluctuate. Solomon states that Thompson and Andrewartha and Birch hold that the limitation of density is not density-dependent, a view opposed to Nicholson's. This then would allow the view that climate can regulate populations by its effects on biological factors.

Andrewartha and Birch (1954) have attacked the concepts which attempt to show that climatic factors may not control annual variations in the local abundance of insects and give four examples of natural populations in which numbers were determined largely by weather, one of which is Wellington's work on the spruce budworm.

The development of thought concerning weather in relation to insect outbreaks has slowly given more importance to weather as a causal effect. However, Wellington (1954) has pointed out that although the literature is studded with papers dealing with the effects of various meteorological factors on many phases of insect development and behavior, only a few deal with those effects in terms of large scale weather processes and a very few follow through to the logical conclusion: prediction of the biological phenomenon with the aid of modern methods of weather analysis forecasting. Wellington has developed probably the first inclusive theory relating insect abundance and weather. While attempting to avoid detail we will quote verbatim portions of Wellington's papers.

"Weather and climate are often considered simply as the broad framework within which the complicated biotic interactions take place. This viewpoint hastens the process by which numerous instances of the direct effect of meteorological factors are relegated to the limbo of density-independence so that the biological heart of the problem may be pursued without further distraction. Predictive systems lose a number of potentially valuable facts in this way. More important however, this viewpoint leads to total disregard of the indirect effects of meteorological factors on the equilibrum of a population by their action on its habitat, its parasites, its diseases and the supply and quality of its food."

"To assess climatic influences correctly it is necessary to examine climatic variations during the period immediately preceding or coinciding with the beginning of an outbreak of an insect that exhibits violent fluctuations in numbers instead of studying the climate while the outbreak exists. This follows from the concept of climatic release of a small indigenous population. That is, in a region where a species exists in small numbers, and in which biotic conditions already favor population growth no initial increase may occur until seasonal climatic control is relaxed. The important point to keep in mind, however, is that favorable weather may have to recur several years in succession before a major increase in population can develop. Once the enormous potential for increase that such a species possesses is realized, the population grows so rapidly that no combination of adverse physical or biotic factors can halt it immediately. Since it is usually during this period that the outbreak is studied, it is not surprising that effects of the various original governing factors are often obscured."

The application of the theory is best dealt with from concrete examples. Happily we now have three more or less complete and one partial, in Canada.

Thus Wellington et al. (1950) after distinguishing between those weather types favorable and unfavorable to the spruce budworm, related past outbreaks of the spruce budworm in central and eastern Canada to climatic changes. It was shown that outbreaks were preceded by reductions, during three or four consecutive years, in the annual number of cyclonic centers passing through the affected areas and by reductions in June precipitation. By later more refined weather analyses Wellington (1952, 1954) has been able to show definite short-term latitudinal shifts in the movements of pressure centers over North America. Pressure centers are closely associated with known air-mass source regions and may be differentiated into groups depending on where they originate. When the tracks for each center are traced and studied independently, shifts in the principal courses from one period to the next frequently show up. A southward displacement of the tracks of those centers originating in the central States 'Colorado lows' is associated with a corresponding southward displacement of the tracks of pressure centers originating over the polar region. Humid tropical air masses will be mostly barred from the Great Lakes region when such a southward shift of the circulation pattern occurs in the central part of the continent. The majority of air masses that pass over the region will then be of polar origin.

Thus Wellington concluded that in northern Ontario the required physical conditions for spruce budworm increase tend to occur when the annual number of cyclonic passages in the late spring and summer is below average, and the majority of the air masses involved in these passages during these seasons are dry. They are of polar continental or polar maritime origin, because a southward shift of the circulation pattern holds invasions of more southern air masses to a minimum.

In the same study Wellington found that the required physical conditions for forest tent caterpillars population increase begin to occur with increasing frequency as the annual number of passing cyclones rises to a maximum. During this period of increase in cyclones, the number of passages during spring and summer is above average, and the majority of air masses involved are of southwestern origin because there is a northward shift of the circulation pattern which moves the more northern air masses to higher latitudes.

His final conclusion from this study is that his findings place the problem of forecasting population increases of the spruce budworm and the forest tent caterpillar to possible outbreak levels on a meteorological basis that should fit into the techniques for long-range weather forecasting that may be developed in the near future.

Our third example also concerns the spruce budworm but in a different part of Canada - New Brunswick. Greenbank (1956) considered outbreaks of the spruce budworm which occurred in 1912 and 1949 in relation to the theory of climatic release proposed by Wellington. His results were confirmatory. While considering these works it must be pointed out that the basis for the theory was not in the realm of abstract synoptic meteorology but from laboratory and field studies on the effects of meteorological factors on the behavior of the adult, including mating and fecundity, on larval development and behavior and its relationship to eventual fecundity, stand conditions, the effects of climatic factors on the flowering of balsam fir and others, eventually related back to the causal effect of the meteorological factors in operation - the over-all macro-climate of the region.

The final example concerns the lodgepole needle miner which is not yet completed. The groundwork was laid by Henson, Wellington and myself in 1954. The implications of this study are best summarized by Wellington (1954): "There has never been any doubt that low temperatures were responsible for the mortality observed but ordinary meteorological records alone have not always provided a reasonable explanation of the changing distribution of mortality. To interpret observed distributions, it was necessary to make firsthand studies of the effects of the surrounding mountainous terrain on passing frontal systems, and to determine the different frequencies of occurrence of fronts and air masses over the areas during two winters that showed particularly interesting distributional differences.

In the Bow Valley, cold frontal passages at any time produce lower temperatures on the upper slopes than in the valley bottom but, if the invading polar continental air stagnates over the valley, the temperatures at the two levels first approach equality and then reverse. This change in temperature distribution with time is the result of excessive radiant cooling through the clear stagnating air. If the air stagnates for many days, radiant cooling not only lowers the temperatures at all elevations, but also forms an inversion in which temperature increases, instead of decreasing with height. Mortality records of two different winters showed this relationship clearly.

Although this analysis had a strong climatological bias, employment of air-mass and frontal analyses enabled the authors to develop a predictive system for use in future mortality and population studies. For example one of the more interesting implications is that the heaviest persistent infestations should always be centered in the middle range of altitudes in the Bow Valley, because populations above or below this middle zone that might increase during a few favorable years would eventually suffer during the types of winter weather noted above. The predictive system now available will enable investigators to forecast the probable ultimate distribution of mortality before a winter ends, and recognition of the existence of a middle-zone reservoir should influence the course of future control measures (if any). Thus employment of air-mass climatology may permit development of systems of forecasting abundance or mortality on a seasonal basis."

To summarize by paraphrasing and quoting Wellington: The theory of climatic release explains the time and place of outbreaks and its worth may be measured by its ability to predict outbreaks. It is not a theory to explain the 'regulation' of an insect population at levels of abundance comparable to 'comprehensive theories'. The purpose of the theory is not to postulate regulation of population by climate. Studies on population dynamics in forest entomology during endemic periods are rare, although it is apparent that fluctuations in numbers without loss of balance are common and outbreaks the exception. Within the endemic period increase in population from one year to the next can result from physical conditions becoming favorable to the insect. Readjustment of the population after this increase may come through density-related processes although these may not be entirely effective until physical conditions become favorable again. However, years with unfavorable weather conditions cannot always be expected to follow years with favorable conditions and eventually the favorable weather conditions recur several years in succession. During such a period, as the climatic theory postulates, the endemic population may be released from the controlling influences of both physical and biotic factors.

The relation of the beginning of insect outbreaks and favorable climates has been suggested several times in the past, particularly by German entomologists. However, thorough tests of this relationship for a species have been lacking until Wellington.

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Editorial comments by Wellington were made following this paper (from correspondence). After some advice to philatelists he comments:

"Many of earlier difficulties in assessing the effects of climate on populations ease if we admit that climate is no more stable than weather and that its variations need not be simply random fluctuations about a mean."

Further, "I believe that synoptic concepts are essential if we are to understand climatic fluctuations and their impact on populations, even though we may not always express our results in terms of air masses. As we develop techniques for study at endemic levels and at the chaotic crash point of a population, I believe we will be able to show how climate often is involved in population changes during these periods. I do not believe, however, that there is any more to be gained by insisting that climate does everything than has been gained by insisting that it provides only the outer framework. I think we have demonstrated that the latter view is incorrect, and I am presently involved in studies to protect us from falling into the first error when others become more enthusiastic about the role of climate."

The symposium was then thrown open for discussion. The first comment made brought up an interesting aspect which had not been considered. If the theory of climatic release is tenable in several cases would we not expect over a long period of 'regulation' or non-release, adaptations to develop in the population permitting the insects to overcome the regulatory factor?

While it was admitted that this was certainly a possibility there was little known about the subject and no one was conversant with any work done along these lines. It was pointed out however that an adaptive shift in the genetic makeup to compensate for the regulatory factor could equally well include a genetic change which would be adversely affected by another weather factor. It was also stated that adaptation usually entailed a constant pressure or factor of regular occurrence and weather, even within its regulatory capacity, was so variable that adaptation to any particular factor or degree of a factor was unlikely.

Following this discussion various examples of insect outbreaks were given which could possibly be related to over-all climate.

The first concerned the pine butterfly, Neophasia menapia (F. & F.). Investigations of the dates of past outbreaks showed a surprising coincidence with spruce budworm outbreaks in the Intermountain region. These occurred occasionally simultaneously, or the pine butterfly outbreak followed by a few years. However, the observer cautioned that these observations were based solely on survey records, and detection, or lack of it may have given a spurious impression of correlation.

Observations on the black-headed budworm in British Columbia indicated that budworm populations occasionally suffer extremely high mortality during adverse weather periods and the fecundity of the survivors is apparently affected. Death by starvation owing to the persistence of temperatures below the feeding threshold occurred in 1956. A further comment by another member was that mortality of young larvae from persistent, heavy rain may occur. He had observed young larvae washed from foliage by heavy drops.

An interesting observation on the tent caterpillar in 1955 was given. The outbreak current at that time subsided dramatically. The cause was almost certainly ascribed to early hatching of eggs due to exceptionally warm spring weather followed by two weeks of sub-optimal temperatures. The population suffered mortality between 70 and 85 per cent. That same year extremely hot weather in July caused some form of heat torpor and mortality of the stage present approached 85 per cent.

A further effect of climate was given for the jackpine sawfly. In one particular season the weather during the incubation period of the eggs was so much below normal that their eggs did not hatch until fall. In the same year and area budworm pupae did not complete their normal development.

A particularly interesting example was given for the hemlock looper in British Columbia. A high correlation was found between looper outbreaks and September rainfall. It was believed to be connected with the laboratory established relationship between high humidity and unsuccessful mating. It was found that humidities above 80 per cent profoundly affected the success of mating and hence the succeeding population. The looper outbreaks occurred approximately every eight years and they usually followed a high fire hazard season. On the basis of investigative results one outbreak had been successfully predicted.

A general observation was made that September and October appear to be the critical months, as far as weather is concerned, for the oak looper in Oregon. The thesis of a student at Stanford University was cited wherein he claimed that the success of an oak looper outbreak in California was determined largely by winter temperatures. Outbreaks occurred in northern California only following mild winters and transport of moths by wind. The outbreaks in northern California were usually short-lived even though there was abundant host material. Outbreaks in southern California were severe and frequent and winter temperatures was advanced as the main factor involved.

A few general comments were made on the effects of weather on the range of insects. From survey material the Douglas fir tussock moth seemed to be restricted to areas on the west side of the coastal range and at fairly high elevations. However, it was pointed out that both time and detection could have caused a similar generality to be made about the spruce budworm in the Inland Empire if based on distribution records in 1940 or thereabouts. However, it is common knowledge that the geographic ranges of insects are largely determined by climate and this would entail a symposium of its own.

At this point it was strongly urged that such generalities could lead to completely erroneous conclusions and masking of equally important biotic factors.

The effects of climate on the life cycles of bark beetles was discussed in considerable detail. It was stated that the life cycle of the mountain pine beetle in the Columbia Valley of British Columbia could not be described with any confidence that the same sequence of events would occur the following year. This was due to extreme variability in development caused by climate. This led to the voicing of the opinion that this was generally true throughout our region and many "textbook descriptions" were worthless. This brought comment from several members in opposition. As the discussion was becoming an argument far from the subject of weather the new yew gavel was put to use.

It developed that the comprehensive coverage by the members on the first topic had taken care of much of the discussion in the second section. One member neatly disposed of the first part of the second section by stating that it was a fallacy to argue about any "main" factor in regulation when our factual evidence concerning regulation is so slight. However, no one objected when temperature was placed at the top of the list. No attempt was made to classify the temperature effect. The second section was similarly disposed of in a general reluctance on the part of the membership (and the chairman) to define micro-climate. However, macro-climate or climate was advanced as the principal mechanism behind regulation and drew no opposing comments.

The lodgepole needle miner in Banff Park provided an example for the last two sections. The refuge area was mentioned in the Chairman's paper and it was stated that there is evidence to indicate a differential mortality of parasite and host, the former suffering the highest mortality. K. Graham mentioned work by P. Dowden in the Eastern States which showed this has happened in other instances.

March 28, 8:30 a.m. - 3:00 p.m. R. R. Lejeune, Chairman

Techniques in Studying Environmental Factors

After brief opening remarks by the Chairman, M. G. Thomson described several kinds of equipment used for temperature and humidity controlled rooms or cabinets. For close humidity control cabinets should be in a temperature-controlled room at the same temperature or several degrees lower than the test level, and the temperature brought up to the desired level by light bulbs. The use of refrigeration equipment in test rooms or cabinets is undesirable. Some of the shortcomings of humidity-control equipment were mentioned and problems of calibrating hair hygrothermographs were discussed.

J. A. Rudinsky discussed radiation as a factor affecting insect development. The effect of radiation on rate of development has been studied on mosquitoes and some defoliators, but little work has been done on forest insects. Radiation probably influences the development of defoliators more than bark- or wood-infesting insects.

There are two kinds of natural light affecting animal life which differ not only physically but also physiologically as well: direct and diffused light. Each of these rays has its own intensity, quantity during a given period, and spectral composition. While the intensity of direct rays does not vary much with the latitude, altitudinal differences are important. The intensity of diffused radiation, on the other hand, depends not only on latitude and altitude but also on cloudiness. Thus, when white clouds appear, the intensity of radiation may be increased from 25 to 50 percent.

All light absorbed by an insect, no matter what wave length, is changed into radiant energy and affects its metabolism. The spectrum of natural radiation ranges from about 30,000 A° infrared down to 2910 A° ultraviolet. Total energy of radiation, at the zenith position of the sun, is composed of about 60 percent infra-red, about 40 percent visible light, and less than 1 percent ultraviolet rays. It is understandable that the infra-red rays have a considerable effect upon the temperature of irradiated animals and thus upon the rate of their development. Under natural conditions, particularly at higher elevations, the development of irradiated insects may be faster than the development influenced by the air temperature alone.

Beside the air temperature, therefore, the radiation has to be taken into consideration while studying the rate of insect development for control or other purposes.

Infra-red rays were used in some studies to control certain insects (grain and wood product insects) while raising the body temperature by irradiation to the lethal point; little investigation has been done, however, on the effect of infra-red within the limit of favorable developmental temperature.

In response to questions the following points were made:

1. White clouds increase the amount of radiation by diffusion.

2. For studying the effect of infra-red radiation a 250 watt commercial infra-red lamp was used for mosquito investigations. For the visible range use 15 watt fluorescent tubes, and 275 watt lamps in the ultra-violet range.

3. To measure outside illumination use a Weston illumination meter, model 603.

4. Radiation is heat - different rays increase development up to a certain point. The effect of different rays can be studied by holding temperatures constant.

5. Averaged temperatures may be dangerous to work with as maximum and minimum temperatures may be more sensitive.

Radiation has an effect on lodgepole needle miner development. Wind had little effect because the larvae are in mines.

R. R. Lejeune referred to the synoptic approach to studies of insects and climate published by W. G. Wellington in the Annual Review of Entomology, Vol. 2, 1957, pp. 143-162. The technique recommended by Wellington for studying weather in relation to insects is essentially a sampling procedure whereby everything in the atmosphere at a given instant is measured and the process is repeated at selected intervals to observe changes. In this way characteristic weather of the different kinds of air masses is typed and can be related to macro- and micro- environments.

J. W. B. Wagg reported on studies to correlate temperatures expressed in degree days with larval development of the spruce budworm in northeast Oregon. The threshold temperature was taken as 42°F., and development by instars was plotted against the logarithm of accumulated temperatures over 42°F. For pooled data from 24 plots the standard error of predicted development for a plot was ± 1.14 instars. At the third instar there was an accumulation of 310 degree days, at the fourth 430, fifth 600 and sixth 840 degree days. For an individual plot the error was greatly reduced. Once data are established for a forest area the development of the insect for succeeding years may be predicted from observations of temperature from a single station. This method may be useful in determining the timing of spray operations.

R. R. Lejeune described recent studies on individual differences in insects by W. G. Wellington. The insect used was the western tent caterpillar. First-instar larvae were typed according to their capability of independent directed movement towards a light source. Two broad categories were set up, Type I larvae capable of independent movement and Type II larvae incapable of independent movement. These behavior differences persisted through the larval period. Type I larvae generally were responsible for "leading" Type II larvae to food, Type I larvae located food readily, fed less, were more selective, did not soil their food, and developed faster than Type II larvae. Colonies with an abundance of Type I larvae produced characteristically elongated tents whereas colonies with fewer Type I larvae produced compact tents. In the older infestations there was a larger proportion of compact tents. This situation was reversed in newer infestations. The concept of individual differences applies to any insect species and is bound to command considerable attention in future studies of population dynamics.

D. Allen referred to work using radioactive materials to follow bark-beetle development. The use of radioactive tracers in sufficient dosage to follow subcortical insect activities without habitat disturbance and without objectionable modification of natural behavior is not, at present, possible. Experimental evidence shows us that reliable studies of normal fecundity and reproductive capacity are not possible with radioactive materials.

F. Knight pointed out certain precautions required for handling radioactive substances such as working in an isolated area and burying equipment after use, but they are not dangerous to use if handled properly.

G. R. Hopping described plans for an experiment to produce artificial drought in lodgepole pine and test susceptibility to bark beetles. Drought is to be induced by a raised platform with a radius of 8 feet around the trunk of the tree. Soil moisture will be measured by means of gypsum cartridges buried at various depts. Moisture is recorded on a machine with an accuracy of ±5 per cent at 7°C. One treated and one untreated tree will be caged and the beetles introduced into a "tunnel" between the two trees. Replicates will be necessary, of course.

K. Graham explained the use of a gas extraction process (carrier distillation) to collect volatile substances from wood. A. E. Werner, working with him on the problem of wood odors attractive to ambrosia beetles, designed the equipment for the purpose. The principle is the same as one used independently by Ladisch and Mc Que of Pioneering Research Laboratories, Philadelphia for extracting repellents from *Tribolium* (Science 118, No. 3064, Sept. 18, 1953). Extracts from wood known to be susceptible to *Trypodendron* have been shown to induce attack on non attractive wood.

A further step in the study is the separation of extracts into their constituents by means of gas chromatography. This method has demonstrated the presence of a number of constituents of which the two most abundant ones are alpha- and beta-pinene. These appear to be repellent. They were identified by the position of peaks on chromatograms, by the patterns given in infra-red spectrograms, and nuclear magnetic resonance spectrograms.

The purpose of the study is not merely to identify attractants but to determine methods of treating trees to prevent attractants from forming.

G. T. Silver brought up the problem of determining accurately percentage parasitism of larval populations of defoliators. Most species of insects have a sequence of parasites attacking the larval stage which results in overlapping of parasitism or non-recovery if the host is collected at the wrong time. It was generally agreed after some discussion that a knowledge of the seasonal development of the parasites and proper timing of host collections were necessary to overcome the difficulty.

March 28, 3:15 - 5:00 p.m.
March 29, 9:00 - 11:00 a.m. H. R. Dodge, Chairman

Techniques In Studying Biology and Behavior

The operation of the Forest Insect Survey Center at Vernon, B. C., was explained by D. A. Ross. All samples collected by the survey members throughout British Columbia north to the Yukon are mailed to Vernon in mailing tubes with host material. At the Vernon insectary cultures to be reared are placed in 1-1/4" diameter glass vials stoppered with cork and screen. Vials are placed in 10-hole blocks. Pencil and paper labels within the vials are most satisfactory. Insectary racks are set waist-high. Some light is admitted to all shelves. Fresh foliage is obtained daily from the adjacent arboretum, which includes all native species of trees.

Since glassware has been sterilized, mold is much less troublesome. Hot air, 350°F. for 3-4 hours is used. An alternative is 10 percent NA_2CO_3 and 10 percent "detol" in 95 percent alcohol.

Larvae are handled lightly with blunt forceps or a camel's hair brush, and as little as possible. Pupae are handled with extreme care; they are not dropped but allowed to slide down the sides of the vial. Adults are held two days before killing for museum purposes. Vermiculite is good for pupae because it dries slowly and retards mold.

Overwintering cultures are cold-hardened in the insectary until mid-November, then refrigerated at 36°F for 6 weeks and put into cold storage.

Wood and cone borers are reared on ground bark or cone chips. Fresh strips of inner bark are ground in a blender, 80 grams of bark per 500cc water and 5-7 gr. sodium benzoate. The extra water is squeezed out and it is refrigerated at 30°F in bottles (will keep up to 60 days).

The survey collectors use a 7 x 9' mat, which is spread on the ground under the foliage and then the foliage is beaten with a bamboo pole. Spiders, ants and predatory insects are discarded.

M. G. Thomson spoke of culture methods with the hemlock looper. It is difficult to tell if eggs are fertile, and sometimes a very poor hatch is obtained. The looper must have new foliage, but can be reared in winter on macerated old needles. Cottage cheese boxes are used for rearing--darkness is a factor in feeding. Sterilization is routine. The poorest looking stock is handled last.

Mating pairs of adults are kept in 1 quart cardboard cartons with vials of (1) honey and (2) water attached to the bottom. Crumpled-winged adults usually mate poorly. The honey diet doubles egg-production. Two layers of gauze are secured over the top of the carton and the eggs are laid between the layers. A relative humidity of 85-90 percent is best for the larvae; 50°F and 90 percent humidity for the adults. He described a humidity chamber with 6" walls of concrete and cork in which he can actually make it rain.

He also described a technique for handling up to 2,000 larvae on potted trees in pails with holes in the bottom and an exhause fan to draw air beneath. Water is supplied the trees by a wick, using up to a quart a day each.

Mr. G. R. Struble described rearing techniques with defoliators in California, their species being the lodgepole pine needle miner, fir sawfly, Douglas-fir tussock moth and occasionally the pandora moth. Techniques worked out for the needle miner are as follows: eggs are collected in petri dishes with cotton wads for water; adult mortality is low. Habits of the larvae are studied by tagging tips, removing all extra needles, but results are poor. There is considerable larval migration. By September a larva mines 2-4 needles. Incidence of transfer to new needles is studied by periodic sampling. Parasite incidence is studied by placing polyethylene plastic bags over the tips, by putting tips in petri dishes, or by isolating the puparium in gelatin capsules. Adults are reared by putting 20 tips in an ice cream carton, or other container. Mating and oviposition is effected in cheesecloth cages on twigs. 50-60° temperature and diminishing light are necessary. Mass flight is triggered by diminishing light.

White fir sawfly eggs per female are determined by dissection or by caging on 6" twigs. Incubation of eggs in the laboratory is poor--tagged twigs in the field work better. Parasite data is obtained by putting collected cocoons in petri dishes or shell vials. A special study to obtain pure colonies for cytological studies at the Sault Ste. Marie laboratory was described by Bob Lyon. Females emerging from field-collected cocoons were isolated in 3 quart plastic bags over branch tips. They oviposited well, though there was water condensation in the bags. Larvae were reared the next season in situs.

Regarding the Douglas-fir tussock moth, H. R. Dodge made some remarks about laboratory rearing. Egg masses overwinter well in a refrigerator. They are isolated in gelatin capsules to obtain caterpillars and parasites. Caterpillars did poorly in the laboratory - mortality was great due to disease. The same was true for field-collected larvae.

W. K. Coulter spoke on the 15" twig as a sampling unit for spruce budworm population studies. It has been in use since 1950. Tests show it quite reliable as a sampling unit. 15" twigs are (1) easy to collect, and (2) have a major part of the budworm population. They are being used in the East.

In 1955 V. M. Carolin and Coulter tested the reliability of the 15" twig, selecting 5 points 5 chains apart and tagging 5 Douglas-fir trees at each point, each tree being 10-16" DBH and 60-70' high. Four twigs were cut with a 30' pole pruner from the lower half of the crown at three periods of budworm development, (a) 4-5th instar larvae in buds, (b) mature larvae and (c) pupae. Coulter showed a chart of sampling errors for different population levels, the error varying from ± 9.8 to ± 29.4.

Ron Stark mentioned a differential in parasitism by *Glypta* by tree height.

Pole pruners were discussed at some length. Dodge expressed satisfaction with a 6-foot wooden pole pruner with hook-type cutting head and improvised basket. The base of the handle is whittled down slightly to fit into sections of aluminum extensions.

Tom Silver remarked that *Halisidota argentata* had 7 or 8 larval instars in nature in both sexes, but that larvae reared from second instar in the laboratory all had 8 instars. He also remarked on parasitism of black-headed budworm larvae - larvae collected when in 3rd and 4th instar were 44 percent parasitized; a later sample wherein 4th and 5th instar checked out 23 percent and a still later sample 15 percent parasitism. The average of all three is 25 percent, but he believes the actual parasitism is really 44 percent.

Ken Graham spoke on chemical stimuli which attract scolytids to particular host trees. They may fly much before settling down to a log. The problem is to study taxes (non-directional reactions to a stimulus), kinesis (directional reactions to a stimulus), and responses. Ambrosia beetles pursue a zig-zag flight in an odor trail to the source of the stimulus. Graham is studying locomotion responses, which may be hard to differentiate from feeding and mating responses. He finds the arena-type olfactometer much better than the Y-type, which does not allow an insect to correct its error. Experiments are conducted in total darkness. Chapman's flight study method was mentioned.

March 29, 11:00 - 12:00 a.m.

Final Business Meeting

The chairman called the meeting to order at 10:30 a.m. in the Forest Pathology Laboratory.

The secretary read the minutes of the initial business meeting. Adoption of the minutes was moved by C. B. Eaton and seconded by H. A. Richmond. Motion carried.

The chairman then called for committee reports. D. A. Ross presented the report of the common names committee, submitted by F. P. Keen (Appendix A). W. C. McGuffin moved to adopt the report. The motion was seconded by N. E. Johnson and passed.

R. R. Lejeune made a motion that the secretary transmit to F. P. Keen a hearty vote of thanks on behalf of the Conference for his efforts as chairman of the common names committee. The motion was seconded by G. R. Struble and passed.

The report of the research committee was presented by the Chairman, G. R. Hopping (Appendix B). Adoption of the report was moved by R. R. Lejeune and seconded by G. L. Downing. Motion passed.

F. B. Knight summarized the recommendations arising from the program meeting. It was recommended that:

1. -- the next meeting be held in Corvallis, Ore.

2. -- the subject of discussion to be "Insecticides."

3. -- the meeting be lengthened to three days.

G. C. Trostle moved adoption of the recommendations. The motion was seconded by H. A. Richmond and passed.

A discussion followed on the advisability of encouraging representatives for the chemical companies to attend. There was some sentiment in favor of the proposal if it was restricted to research personnel rather than sales personnel.

The secretary presented the changes recommended by the Constitution committee. These were:

1. That the word "years" be changed to "meetings" in the first sentence of Clause 1 in Article IV, and in the second sentence of Clause 4 of Article IV. (Thus, the terms of the present executive committee members will be determined on a meeting basis instead of a yearly basis).

2. That the second paragraph of clause 4 under Article IV be changed to read, "The officers shall be elected at the Annual Meeting. Their periods of office shall begin at the conclusion of the meeting of their election."

3. That the third paragraph of Clause 4 under Article IV be changed to read, "The chairman shall have the power to appoint members to fill vacancies on the Executive Committee occurring between meetings. The appointment to stand until the conclusion of the next general meeting."

F. B. Knight moved adoption of these changes. The motion was seconded by J. A. Rudinsky and passed.

C. B. Eaton presented the recommendations of the nominating committee; that the present secretary-treasurer be confirmed and that Dr. C. L. Massey be nominated as councilor for the 1957-1959 period.

The chairman called for nominations from the floor.

K. Graham moved that the nominations be closed. The motion was seconded by J. A. Rudinsky and passed by the conference.

The chairman instructed the secretary to cast one ballot for each nominee for the position to which he was nominated.

C. B. Eaton moved to reactivate the committee on education in forest entomology in the west which was established at Victoria, B. C. in 1952. The motion was seconded by E. C. Clark. The chairman briefly reviewed the circumstances under which this committee was formed following the 1952 discussions on the training of Forest Entomologists. The objectives of the committee were to aid in developing better students in the field and to maintain closer liason between the schools and industry. Motion carried.

The chairman appointed A. D. Moore to serve as chairman of the committee.

The chairman extended the appreciation of the Conference members to the Calgary Forest Insect and Forest Pathology laboratories for their hospitality and a fine program.

G. R. Hopping suggested that the secretary transcribe a letter to Dr. V. J. Nordin expressing the appreciation of the conference members for the hospitality and cooperation extended by the Forest Pathology Laboratory.

Meeting adjourned 11:30 a.m.

APPENDIX A

Berkeley, Calif.
March 7, 1957

REPORT OF THE COMMON NAMES COMMITTEE, W.F.I.W.C.

Since the last meeting in December 1955, your committee has considered one list of 24 proposed common names of western forest insects and approved 9 of these. When these were passed along to the conference members for review, 4 names were objected to. So 5 new names were submitted to the ESA for their consideration as a result of our 1956 deliberations.

Since this committee started to function on December 4, 1954, common names have been approved by the conference for 57 species of western forest insects and passed along to the ESA committee for consideration. So far, none of these names has been officially adopted by the ESA, as they were submitted too late to be included in the ESA Bulletin of December 1955, which brought the official list of approved common names up to date.

In spite of the small accomplishment in 1956 approved names, your committee has had to undertake voluminous correspondence to consider the many questions of nomenclature and rules of procedure. We have had to feel our way, and while questions of procedure are far from settled, we have gone on the theory that there had to be practical unanimity of consent before any name was passed along for adoption. Since it is practically impossible to get a unanimous vote on names of some of our most important insects, some arbitrary rules may yet be needed to break the log jam, if we hope to see names adopted for these insects. So far this hasn't been necessary.

Recently the work of the Committee has been brought up to date by the issuance of three revised lists of common names of western forest insects. These lists should now be in your hands. They include the following:

List 1. Currently approved names passed by the ESA.

List 2. Names approved by the W.F.I.W.C. and passed along to the ESA for consideration.

List 3. A list of tentative common names, not yet approved by W.F.I.W.C. Of these, 39 are important enough to deserve consideration.

Thus while progress has been made, there is still much work left to do in proposing and adopting suitable common names for many important western forest insects. There is no need to rush this endeavor. It takes time for a common name to jell, and there is still no need to attach common names to many insects which are not abundant nor common enough to need them.

At the rate of progress of this past year, there is little danger that we will over do the naming of common western forest insects in the near future.

Committee on Common Names

F. P. Keen, Chairman
W. F. Barr
R. L. Furniss
W. C. McGuffin
D. E. Parker
D. A. Ross
N. D. Wygant
M. G. Thomson, Ex. Off.

MEMBERSHIP ROSTER

WESTERN FOREST INSECT WORK CONFERENCE

Note: Active members registered at the conference in Calgary, Alberta, March 27-29, 1957, are indicated by an asterisk (*)

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