

January 25, 1963.

THE SIMULIIDOLOGISTS' NEWSLETTER

Editor

B.V. Peterson, P.O. Box 248, Guelph, Ontario  
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Summary of the  
Third Conference on Black Flies (Diptera: Simuliidae)  
held at the  
Wildlife Research Station  
Ontario Department of Lands and Forests  
Algonquin Park, Ontario,  
Canada

September 14-16, 1962

Members

Dr. J.R. Anderson, Univ. California, Berkeley, Calif.  
Dr. A.P. Arnason, Canada Agriculture, Ottawa, Ont.  
Dr. G.F. Bennett, Ont. Research Foundation, Toronto, Ont.  
Dr. P.S. Corbet, Canada Agriculture, Ottawa, Ont.  
Dr. D.M. Davies, McMaster Univ., Hamilton, Ont.  
Dr. G.R. DeFoliart, Univ. Wisconsin, Madison, Wisc.  
Mr. J.A. Downes, Canada Agriculture, Ottawa, Ont.  
Mr. R.W. Dunbar, Durham University, Durham, England.  
Dr. A.M. Fallis, Ont. Research Foundation, Toronto, Ont.  
Mr. F.J.H. Fredeen, Canada Agriculture, Saskatoon, Sask.  
Mrs. H. Gyorkis, McMaster Univ., Hamilton, Ont.  
Dr. F.P. Ide, Univ. Toronto, Toronto, Ont.  
Dr. H.A. Jamnback, N.Y. State Science Service, Albany, N.Y.  
Miss I.F. Kamitakahara, Univ. Toronto, Toronto, Ont.  
Mr. R.L. Le Berre, Research Station, Bobo Dioulasso, Haute Volta.  
Dr. D.J. Lewis, Medical Research Council, London, England.  
Mr. J.D.M. Marr, W.H.O., (Edinburgh, Scotland).  
Dr. D.R. Oliver, Canada Agriculture, Ottawa, Ont.  
Dr. M. Ovazza, Research Station, Bobo Dioulasso, Haute Volta.  
Dr. D.H. Pengelly, Ont. Agric. College, Guelph, Ont.  
Dr. B.V. Peterson, Canada Agriculture, Guelph, Ont.  
Mr. D.G. Peterson, Canada Agriculture, Guelph, Ont.  
Mr. R. Pilfrey, Ont. Agric. College, Guelph, Ont.  
Mr. M. Rao, Univ. Wisconsin, Madison, Wisc.  
Dr. K.H. Rothfels, Univ. Toronto, Toronto, Ont.  
Mr. G.E. Shewell, Canada Agriculture, Ottawa, Ont.

Mr. S. Smith, McMaster Univ., Hamilton, Ont.  
Dr. K.M. Sommerman, Arctic Health Centre, Anchorage, Alaska.  
Dr. A. Stone, U.S.D.A., U.S. National Mus., Washington, D.C.  
Dr. H.E. Welch, Canada Agriculture, Belleville, Ont.  
Dr. A.S. West, Queen's Univ., Kingston, Ont.  
Mr. D.M. Wood, McMaster Univ., Hamilton, Ont.

Systematics Session : Dr. A. Stone, Moderator

Dr. Stone reported that he had completed the Simuliidae section for the Diptera of Connecticut series. He had also completed an annotated check list of the genus group names for the Simuliidae. He reviewed this list in some detail.

Mr. Shewell followed with a discussion of a translation of Rubtzov's work on the zoogeographical distribution and classification of the different genera of Simuliidae from Linder's "Die Fliegen der Palaearktischen Region," and pointed out certain statements that appear rather doubtful. At the same time, he suggested that we should be a bit more careful about trying to use all stages in arriving at a classification of the Simuliidae. He thought that it might be better to base the classification on the adults.

Dumbleton's work on the primitive types that resemble Gymnopaia and Twinnia was then discussed. It was pointed out that these forms are probably not primitive but that they represent cases of parallelism (specialization) and are probably derivative of what was a primitive stock. Dr. Ovazza suggested that perhaps the primitive things were the more specialized and the less primitive things were not so specialized. Dr. Corbet suggested that the first-instar larva would be a good stage in which to determine whether the thing was primitive or not. All agreed with that, except for the difficulty in finding the first-instar larva.

An attempt was made to develop a subfamily classification but this made very little progress; there were too many exceptions and too much disagreement as to just where the splits should be made. Mr. Shewell recommended that Stegopterna be removed from Cnephia. Dr. Stone agreed that it was a possible solution for one aspect of the difficult Cnephia problem.

Mr. Wood gave a very interesting classification of a portion of the genus Cnephia, as it is now understood, as well as the related Eusimulium. He showed how they have certain things in common but other things are not in common and that a division could be made between these groups. Mr. Dunbar showed cytological evidence to support Mr. Wood's classification.

Dr. Rothfels gave us a brief statement of progress on cytological studies in his laboratory. He pointed out that there are five S. tuberosum siblings; that S. vittatum, in this country, is all one thing, and that Prosimulium pleurale is probably represented by two siblings.

Dr. Peterson showed us some characters of the furcasternum (metasternum) that he used to separate species in the Prosimulium fuscum-mixtum-fontanum, and in the P. multidentatum-magnum groups. These characters are also useful in separating the difficult Eusimulium latipes-quebecense-pugetense group of species.

Mr. Downes spoke about the bisexual P. ursinum vs P. macropyga species. This was supported, to a certain extent, by Dr. Rothfels studies.

Dr. Lewis gave an interesting account of the cuticular pattern in the Simulium neavei group in Africa, and also suggested that the second sternum in the adults might be a useful character.

Mr. Wood gave us some information on the species E. congareerum.

Finally, in the category of geographic distribution, Mr. Shewell presented a map on which an attempt was made to obtain some idea of various species distribution patterns. Dr. Lewis mentioned the distribution of Simulium damnosum and Simulium griseicolle in Africa.

#### Ecology of Larvae and Pupae : Dr. K.M. Sommerman, Moderator

Dr. Sommerman opened this session with an expression of dissatisfaction with existing systems of stream classification. She believes that it is not correct to refer to a stream or river as a habitat since these are, in fact, a series of habitats. She added that temperature was probably the most important feature of a habitat. The North American workers agreed with her statement on temperature. Dr. Ovazza did not, for, in his opinion, in Africa, the current and the particulate matter in the water were more important than temperature. This led into a discussion of the importance of oxygen content.

The easiest way to classify streams, in Dr. Lewis' opinion, was by their average widths. Dr. Anderson pointed out that most of the species of economic importance develop in large rivers. Dr. Jamnback remarked that S. venustum, a major pest of man, is an exception. This led into a discussion of the apparent relationship between large rivers and the species that attack animals, for example, S. arcticum. Mr. Fredeen pointed out the importance of the fluctuating levels of larval food in large

rivers on the periodic outbreaks by these species.

A discussion of larval and pupal populations began with a debate on sampling techniques. Although the Wolfe and D.G. Peterson cones, as well as the time and space techniques were introduced into the debate, it was initiated by and primarily concerned Dr. Welch's description of an American worker's use of cone nets to examine the biomass production in a stream. An attempt had been made to correlate the net collection with the standing crop in the stream. The technique was criticized by many of the members, but Dr. Welch continued to give it support, providing that it was related to the insect being studied, and to the information one wished to obtain. In his opinion it is a useful tool, eliminating much of the human error inherent in other methods.

Mr. Fredeen described his latest studies on larval nutrition, particularly his success in rearing species through on a diet of bacteria. He found no significant difference in the development of larvae that were fed live or dead bacteria. There was a significant difference in the rate of development with a factor of ten in the number of bacteria available as food. He found no specificity in the black flies that fed on bacteria but had observed, in the field, that streams with a heavy load of bacteria tended to contain a greater number of species of black flies. Mr. Fredeen pointed out this work implicated sewage as a major factor in the production of outbreaks of black flies from certain rivers where there are numerous cities dumping sewage into these rivers.

Turning to respiration in larvae and pupae, Mr. Le Berre stated that, in his opinion, the anal gills of the larvae are not concerned solely with osmoregulation but have a function of respiration. Dr. Davies supported the osmoregulatory viewpoint and, in his view, the entire body surface is probably involved in gas exchange. It was agreed that the function of the anal gills has not been well established. The need for a similar study on the respiratory filaments of the pupa was also agreed upon. Mr. Shewell stated that he is unable to accept the often repeated suggestion that there is a relationship between the number of pupal filaments and the current.

Dr. Peterson raised the question of the number of larval instars, referring to published reports ranging from four to seven instars. Mr. Downes remarked that six had once been the accepted number, and asked if anyone had confirmed this with any species. Dr. Davies said that he had with S. venustum, as determined by the measurement of head capsules. Mr. Le Berre said that there were seven larval instars in all of the species that they had studied in Haute Volta.

The latest observations on the attachment of larvae, their looping movements, and the function of the silk-like thread were described by a number of members. Dr. Lewis described the

attachment of Simulium neavei to crabs in Africa. He questioned the use of the term "phoresy" which is generally used to describe this association. "Commensulism" was mentioned but it was agreed that just "association" might be most acceptable.

Dr. Corbet speculated on the significance of the association. He thought that the main adaptive significance is directed towards the needs of the pupa. The last larval stage is concerned with safeguarding the pupa because it is the last mobile stage that can select a suitable pupation site. Once the selection has been made, the pupa is sessile and at the mercy of the environment. By pupating on an animal, such as a crab or mayfly larva which is adapted to stream life and which adopts a constant orientation to the current, the pupa has gone a long way towards overcoming the danger of disorientation in regard to the current. Dr. Corbet also speculated on the selection of a mayfly or crab that will not let the black fly down by moulting before the adult fly has emerged. The mature larvae probably select large mayfly larvae because they are large enough to accommodate the pupal case. It could also respond to softness of cuticle, choosing a mayfly which has just moulted and thus have the whole of an instar before it. The same would apply to crabs.

Dr. Lewis reported another benefit that the crabs give to the black fly. McMahon found that if, during a control operation, the amount of DDT in the water exceeds 4 ppm, the crabs move out of the water and rest in the forest. He said that it was very necessary to maintain a tranquil crab population during a control program.

Considerable progress on research on mermithid parasites of black flies was reported by Dr. Welch. The most important single piece of work was that of John Phelps who studied three species of mermithids which occur in Simulium vittatum in Wisconsin. Dr. Phelps had confirmed Dr. Welch's and Dr. Peterson's proposal of a mermithid life history which included parasitism in the adult fly, thus taking the worms back upstream and maintaining the parasites in the black fly population. Dr. Welch reported a discontinuous distribution of mermithids in a stream, with high levels in localized areas. An appreciation of the value of mermithids in a biological control program must await further knowledge of the factors limiting mermithid distribution.

Dr. DeFoliart added that Dr. Phelps had obtained almost conclusive evidence that the black-fly larvae ingest the infective worm, and that infection is not by penetration through the cuticle. Dr. Phelps also found that there are two very active feeding stages in the black-fly larvae, one in small larvae, that is, from about the 10th to 14th day, and a second at the end of the last larval instar. There may be a high infection rate in the young larvae and 100% of those infected may die. The nematodes infecting the mature larvae do not affect pupation and emerge from adult flies

that are from four to five days old. Dr. Anderson agreed and admitted his error in reporting that infection in the larvae prevented pupation. Dr. Peterson stated that infected adults are almost always sterile but, although they do not produce eggs, the females go to the oviposition sites. The emergence of the worms at these points probably maintains the mermithid population in the stream.

The microsporidian picture, according to Dr. Welch, is similar to that of the mermithids. Heavy larval infections usually kill the larvae and result in release of spores. These are picked up by maturing black-fly larvae and carried through the pupal stage into adult flies. There are transovarial infections and the infected eggs re-infect the streams.

The final topic of this session was laboratory rearing. Mr. Wood described the trough technique with which he has reared S. venustum, verecundum, E. aureum and S. vittatum from egg to adult. Other species, including P. magnum, P. fuscum, P. gibsoni and E. pugetense have been reared through from small larvae.

#### Ecology of the Adults : Mr. A Downes, Moderator

Dr. Lewis described the relation of adult black flies in Africa to vegetation. Simulium griseicolle moves about freely without hindrance from vegetation. Simulium damnosum, the principal vector of onchocerciasis, can travel long distances in the absence of vegetation but is severely hindered by thick forest. There appears to be a correlation with the incidence of onchocerciasis, since the problem is very great in some of the savannah regions and much less in some of the densely forested parts of Africa. A WHO team is studying this. Simulium neavei is very much associated with forests and has been controlled by the removal of vegetation near a stream.

Dr. Lewis then described the many features that can and should be observed when dissecting black flies. These include wing length, the comparative size of parous and nulliparous flies, the crop or esophageal diverticulum, the fat body, the presence and number of relict eggs in the ovaries, and finally, the follicular relics. Dr. Ovazza stated that one could learn a great deal about the past history of an adult by an examination of the fat body. Its condition can be indicative of the characteristics of the larval habitat. Mr. Marr asked about the function of the fat body. This led to a discussion of its role in the development in the various batches of eggs.

Mr. Marr described larval habitats and the behaviour and distribution of black flies, especially Simulium damnosum, in Ghana. He introduced the intriguing riddle of the survival of black flies during the dry season in areas in which the rivers become dry except for scattered pools. The adults disappear at

the end of the rainy season but reappear again shortly before the rivers begin to flow. The flies that mysteriously reappear are parous as well as nulliparous. Mr. Marr suggested that the adults may pass the dry season in an inactive, diapausing condition, or possibly sustain themselves by feeding only on nectar or possibly by feeding on animals other than man. He could find no evidence for survival in the pupal stage and would not support any suggestion that the adults migrate into a region just prior to or as the rivers begin to flow.

Dr. Ovazza did not agree. He presented evidence to show that the adults which appear just as the rains begin in the southern parts of Haute Volta, had migrated from a permanent breeding site, probably in Mr. Marr's Ghana.

The transmission of several species of nematodes, of avian trypanosomes and a number of species of the sporozoon genus Leucocytozoon by black flies to birds in Algonquin Park was described by Dr. Bennett for Dr. Fallis' group at the Ontario Research Foundation. Dr. Bennett described, in detail, an interesting and rewarding experiment on the transmission of Leucocytozoon simondi by Simulium rugglesi. Ducks, with their blood marked by radioactive isotopes, were set out near an isolated larval habitat of S. rugglesi. Subsequent systematic catches of adult S. rugglesi over a comparatively wide area established that the minimum longevity of this species is one month, that the flies returned for a blood meal every five or six days (which probably meant an ovarian cycle in that period), that the adults could move a distance of six miles in one week, and that the females apparently move at random, not being influenced by stream direction and other such factors. Relating this to the transmission of Leucocytozoon to ducks, Dr. Bennett reported that every wild duck returns from its migration to the south in an infected state. Simulium rugglesi feeds only on anseriform birds and quickly picks up Leucocytozoon. The young ducks hatch when S. rugglesi is at its peak of abundance. The ducklings hatch out into a cloud of infective rugglesi.

Host specificity, which was mentioned by Dr. Bennett, was also reported on by Mr. Wood, in regard to E. euryadminiculum feeding on loons. This report was of considerable interest to those concerned with chemical attractants. In brief, a loon was shot and found to have at least 1000 engorging females of E. euryadminiculum on its head and neck. The bird was then skinned and the skin was washed in varsol and then in water and a detergent. The skin was exposed on the lake shore a week or two later and 800 females of E. euryadminiculum were collected from it. Smaller lots of females of the same species were collected off the loon as it was exposed for several weeks after that. No E. euryadminiculum were collected from skins of a grebe and merganser that were exposed at the same place and times. Further, it was



noted that either the varsol or water washing attracted the same species when poured on the ground.

Dr. Peterson described his observations of the flight behaviour of females of E. euryadminiculum. They skim over the surface of the lake with their legs trailing in the water and probably detect the loon hosts through chemoreceptors on the tarsi. It was agreed that this would be an effective host-seeking behaviour.

Mr. Downes reviewed Dr. Lewis Davies' paper on the ecology of Prosimulium mixtum and fuscum to show that as yet undetected and yet quite large physiological and behavioural differences may be characterizing the sibling species that are now being identified. This led to some supporting evidence from observations on S. decorum on the north shore of the St. Lawrence, and on S. vittatum in the Saskatchewan River and in northern Saskatchewan. Dr. Rothfels reacted again to the suggestion of some differences in S. vittatum, by pointing out that one could postulate any number of sibling species for S. vittatum. The evidence of his group, however, made it certain that one and the same species ranges from Newfoundland to Alaska. There has been no cytological evidence for sibling species, however, sibling species are not excluded since sampling had certainly not been complete. Mr. Downes suggested that although the cytologists had found no differences, this didn't strictly show that they are the same species biologically. Dr. Rothfels was of the opinion that this was a difficult argument to uphold unless one postulated that some of the populations are heterogeneous and that certain homozygotes possibly represent a different sibling.

Mr. Downes referred to another paper by Dr. Davies, ready for publication in the Canadian Entomologist. This reports on studies on Simulium venustum near Ottawa. The third piece of work to which Mr. Downes referred was that of Davies, Williams and Downe, on black flies taken in light traps in Scotland. It reports Mr. Downe's development of a technique by which he can identify the source of a blood meal down to the order of bird.

Mr. Marr continued the description of light-trap studies by reporting his use of such traps in Ghana. Mr. Fredeen described his use of them for a comparison with his visual attraction trap. Dr. Anderson described the use of a portable vacuum machine trap in California.

Dr. Peterson described the biological and entomological aspects of his trip to Iceland in 1962 to collect and study Simulium vittatum. He found that, as in Canada but contrary to previous reports from Iceland, S. vittatum does not bite man. It is the most prevalent species and is often present in such numbers to be annoying. He collected some specimens of S. vittatum that on further study may be a new or different species from that in Canada.



Dr. Peterson made further observations, while in Iceland, on the strange three-dimensional dance of the males of S. vittatum within the mating swarm.

Using black flies for his examples, Mr. Downes spoke on his concept of Arctic insects. He selected ten Arctic species of black flies and pointed out that autogeny was extremely prevalent in the group, and this implies a single ovarian cycle in these non-bloodsucking species. A very early egg ripening was also extremely prevalent, in some cases the eggs are ripe on emergence. In no case was a swarm or mating in flight known. All these factors are processes that eliminate the main problems that the adults of a normal biting fly must face in searching for food or mates. These problems are usually dangerous ones in the northern environment. Mr. Downes looks upon these factors as reductions in the adult stage into a virtually functionless condition. Its essential function of egg-laying can be achieved very rapidly after emergence with the minimum of complications.

He also pointed out that these Arctic species are scattered throughout the genera, and all are surrounded by normal species. The reduced form appears to be polyphyletic and rather easily and quickly evolved as an adaptive form. It is also evident that, although all these species are closely related to functionally normal species, there are big alterations in structure, physiology and behaviour. As one example, Mr. Downes described some interesting phenomenon in ovarian development. In some species a large fraction of the oocytes die and are resorbed. In Eusimulium baffinense, the female lays part of its batch of oocytes as ripe eggs and the remainder are only compressed rudiments that, for nutritional reasons, can go no further. It seems to be a wasteful species. These may be processes of regulation of the number of oocytes the animal is attempting to mature, in relation to the material it has been able to store during the larval stage.

Finally, there is not only one ovarian cycle in these species, but the number of eggs laid is very low as compared to temperate forms.

To conclude this session on the adult, Dr. Anderson reported on the economic importance of the black flies that attack livestock. Last May, he investigated a black-fly problem reported by dairy farmers in central California. The species involved was Simulium trivittatum. The reduction in milk production was 12.5% in one dairy herd at the peak of the attack, that is, a drop of 30 gallons per day. On another occasion, sheep were attacked by the same species, and chicken poults were killed by attacks of another species, E. canonicolum.

Control : Dr. H.A. Jamnback, Moderator

Dr. Jamnback reviewed the research and experimentation on

the control of black flies to the present time. He pointed out that such studies had almost ceased in the early 1950's and that, with minor modifications to formulations and techniques, fairly standard procedures for the use of DDT to control larvae and adults have been followed.

Dr. Jamnback then reported that some lake trout caught by anglers last spring were analyzed for DDT. These fish were caught in lakes into which drain streams that have been treated with DDT for about ten years for the control of black-fly larvae. As much as 40 ppm of DDT was found in the fat. Fish taken from lakes in the section in which forest spraying has been active, contained as much as 400 ppm of DDT.

These findings together with other pressures, e.g., Rachel Carson's book, "The Silent Spring," caused them to initiate a screening program with the newer insecticides for the control of black-fly larvae. They eliminated the chlorinated hydrocarbons because of the persistence, as well as all insecticides that had a mammalian toxicity of less than 150 mg/kg. They tested twenty compounds, mostly organophosphates. Four chemicals were more effective than DDT. Baytex was the most promising, being 5-6 times as effective as DDT. Dr. Jamnback's group developed a technique for the screening program, which will be most useful for many other workers in this field.

Mr. Marr described his experiments in Ghana with various larvicides, all containing DDT. Mr. Le Berre stated that the control program in Haute Volta has not yet been initiated.

Dr. West reviewed the progress and problems of the large scale control programs that are now perennial events along the north shore of the St. Lawrence River.

D.G. Peterson  
B.V. Peterson

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### Summary of Business Meeting - September 16

Chairman: D.M. Davies

#### I. Future Meetings

##### a) International Black-fly Meeting in England in 1964

Dr. David Lewis spoke on behalf of Dr. L. Davies (University of Durham) regarding a Black-fly Tour in England after the 12th International Congress of Entomology in London in July 1964. Dr. Lewis considered that a symposium, or even a discussion group, during the Congress was quite unsatisfactory. There was a

possibility of the black-fly workers all joining a post-Congress tour into northern England and Scotland. However, this would be somewhat unsuitable, as these tours are mainly sightseeing.

A special meeting of black-fly workers after the Congress seems preferable. This could be 1-2 days of informal discussions followed by a tour for observing habitats and collecting black flies. It was reported that Dr. Smart might like one session devoted to taxonomy and that other discussions would be more ecological. The early discussions could be held in London or Durham. Most members favoured Durham, because of better, more economical accommodation (less favourable accommodation in London due to the Congress, and availability of Durham student residences during summer holidays), and also because Durham is a better location from which to begin the tour conducted by Lewis Davies.

Ten to twelve members indicated (by a show of hands) expectation of attending the black-fly meeting in Durham in 1964, and black-fly workers from other parts of the world at the Congress of Entomology will also add to the number.

Dr. Lewis was pleased with the response and will carry the views of the members back to Dr. Lewis Davies.

#### b) Regular Meeting in Canada

At an earlier meeting it was decided to hold meetings every two years. Some members were in favour of this plan, while others thought that meetings should be held every three or four years. Further discussion on increasing the time between meetings was postponed to a future meeting.

It was decided to hold a regular black-fly meeting in Ontario in 1964, after the International gathering of black-fly workers in Durham. In this way those who were unable to go to England would be brought up-to-date on discussions held there. In relation to this second meeting in 1964, Dr. West indicated that we were welcome to come back to the Queen's University Biological Station at Lake Opinicon (near Kingston) at any time. It was agreed that we plan for this meeting and that if we find in a canvass of the members through the Newsletter, or in some other way, that there is too little interest, the meeting can be cancelled.

## II. Newsletter

### a) Editor

Bob Peterson was praised by the chairman and applauded by the members for his excellent work as editor of "The Simuliid-ologists' Newsletter". He indicated that it had been a rewarding experience, but hastened to say "not financially, however."

Guy Shewell moved that Bob Peterson be re-elected as editor by acclamation. Applause indicated the ready acceptance of this suggestion and Bob agreed to continue. He expressed a desire for more contributions and not just promise. The members considered that the Newsletter should not be developed into a journal, but remain informal and not a true publication. Any suggestions regarding the scope and contents of the Newsletter would be welcomed by the editor. Contributions would be particularly welcome from those unable to attend our meetings.

b) Title

Some had expressed disapproval of the title of the Newsletter but no one could think of a better one. Members could send suggestions to the editor.

III. Proceedings of Conferences

a) Preparation of 1962 Proceedings

Chairman apologized for taping the discussions of the Conference without asking the approval of the members. He asked if anyone wished to have his remarks deleted from the printed Proceedings which would be circulated later. None did.

Dr. Ovazza expressed the feelings of most of the members in wishing to have at least a summary of the Conference distributed.

It seemed that the best plan would be to print the entire discussion but to edit it carefully. Preparing a summary would be much more difficult. Moderators and contributors of longer talks will be asked to revise and edit their sections (leaving the original draft complete). The final decision about deletions and changes will be left with the editor or editors. One person suggested that there was too much repetition of work already covered at the 1960 meeting. Bob Peterson did not consider that we had been too repetitious. He said that all new work is based on previous work and that to make ideas logical we must recapitulate somewhat. It was decided that certain repetitions or fragmentary information could be deleted providing that it did not interfere with the overall logical sequence. Bob Peterson suggested that charts, tables or illustrations on the blackboard should be prepared for inclusion in the Proceedings.

Monty Wood indicated that some changes in the text would be necessary to clarify the reference to such tables and figures.

Doug Peterson offered to supervise the preparation of the Proceedings.

b) Circulation of 1962 Proceedings

The Proceedings of the 1962 meetings will be distributed

to the 30 or more members present and to a few other active or extremely interested black-fly workers.

c) Circulation of 1960 Proceedings

Doug Peterson indicated that the previous plan had been to restrict the distribution of the Proceedings to members in attendance at the meeting. However, ten additional copies were prepared and are still on hand. Bob Peterson complimented Doug Peterson on paying for the cover and binding of the 1960 Proceedings out of his own pocket.

Dr. Sommerman suggested that the extra ten copies be given first to overseas members present who wish one and next to any other members at the present meeting.

IV. Expressions of Thanks

Dr. West, on behalf of the assembled gathering, expressed to Mr. Robin Hepburn (Director), Mr. Verne Oakes (Business Manager) and Mr. Jack Pigeon (Chief Cook), as well as to the Chief of the Research Division of the Lands and Forests Department of Ontario, very sincere appreciation for the excellent accommodation. Dr. Fallis suggested that a letter of appreciation be written to Mr. R.N. Johnston, Director of Research, Department of Lands and Forests, and that in this letter we indicate the great success of the meeting.

Dr. Fallis thanked Doug Davies and Bob Peterson for organizing this successful meeting. The chairman paid credit to Doug Peterson for his help, and to the moderators and speakers themselves in making the Conference a success.

Dr. Lewis said "I can speak on behalf of the visitors from other countries. I have long looked forward to coming to this Conference. It has been a great privilege to attend all the sessions and find out about all the new work that is going on in Canada and elsewhere. My wife and I have enjoyed meeting old friends and making new ones, and also in seeing Algonquin Park and the Research Station. I should like to add a very hearty thanks to what Dr. Fallis has said and to thank all our colleagues in Canada for making this meeting so enjoyable and interesting."

On this happy note the formal portion of the Conference closed, and Bob Peterson, Philip Corbet, David Lewis and Harold Welch showed coloured lantern slides of Iceland, Africa, Venezuela, Norway and Germany, indicating the wide scope of black-fly research and control.

D.M. Davies

A few copies of the 1960 Proceedings are available and will be sent on request as long as the supply lasts. The 1962 Proceedings will be ready for distribution about March 15, 1963. Sufficient copies will be prepared to permit distribution to members of the conference, other recipients of the "Newsletter," and some other interested persons. However, copies will be sent to all such persons (excluding Conference members) only on request.

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News a la Carte

Messrs. D.G. Peterson and E.F. Bond of the Guelph laboratory have been seconded to the Canadian External Aid Office for a one year assignment to Ghana. Mr. Peterson heads a team of four which will study resistance in mirids that attack cacao trees.

Dr. H.B. Hynes has temporarily joined the staff of the University of Indiana, Bloomington, Indiana. Dr. Hynes writes, "We here are beginning to work with particulate insecticides against Simulium larvae and the initial results look promising. So far our kill is low, but it does seem to be entirely selective, and to leave all the rest of the fauna undamaged. I feel this could be important in areas where Simulium control has to be fitted in with other interests, and it also, of course, means that Simulium predators such as Plecoptera and Trichoptera survive as a check on recolonisation."

Dr. Pedro Wygodzinsky has now joined the staff at the American Museum of Natural History, New York City, New York.

Mr. J.D.M. Marr has left Ghana and is now in the Sudan on Simulium control for W.H.O.

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Parasimulium furcatum Malloch

Dr. Alan Stone recently reported that he has located 4 more specimens of P. furcatum, bringing the total known specimens to 7, still all males. The seven specimens are from six different localities in Oregon and northern California (U.S.A.). Dr. Stone has one specimen that he believes to be a second species of Parasimulium; it, too, is a male and was collected from Mt. Baker, Washington (U.S.A.).

It will be most interesting if someone can find the female and the immature stages.

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**Blackfly Conference, 1962 – Wildlife Research Station, Algonquin Park, ON, Canada**

*1<sup>st</sup> row (sitting) from left to right:* David Lewis; Douglas. Marr; I.E. Kamitakahara; Helen Györkös; Kathryn Sommerman; Doug Peterson; Guy Shewell; Alan Stone; Dr. Arni Arnason

*2<sup>nd</sup> row (kneeling):* Max Ovazza; René Le Berre; Gene DeFoliart; Mallampalli Rao; Harold Welch; Hugo Jamnback, Al West; Don Oliver; Steve Smith.

*3<sup>rd</sup> row (standing):* Hartley Fredeen; Klaus Rothfels; Doug Davies; Bob Dunbar; John Anderson; Anthony Downes; Murray Fallis; Monty Wood; Phil Corbet; Bob Peterson; Fred Ide; Ron Pilfrey.

Missing from the photograph are: Gordon Bennett; Dave Pengelly; E.F. Bond.