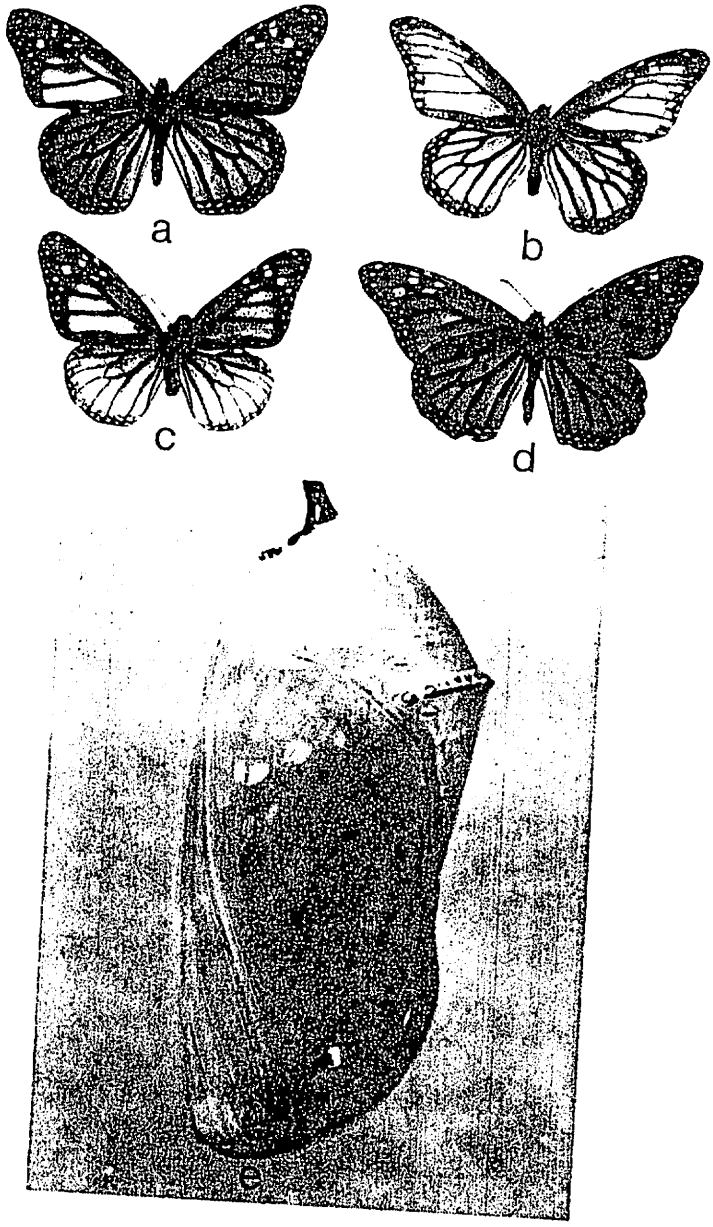
insect migration studies

VOLUME 13, 1976



Effect on wing colour as the result of cauterizing the "gold spots". Publication available.

TABLE OF CONTENTS

THIS NEWSLETTER HAS BEEN PRODUCED IN ORDER TO INFORM OUR ASSOCIATES OF WHAT HAS BEEN DONE AND MUST NOT BE USED FOR SCIENTIFIC PUBLICATION. ANYONE WISHING SCIENTIFIC DATA SHOULD CONTACT PROFESSOR F.A. URQUHART AT SCARBOROUGH COLLEGE, WEST HILL, ONTARIO, CANADA, M1C 1A4.

TO OUR ASSOCIATES

FROM

PROFESSOR AND MRS. URQUHART

In our Newsletter of last year we informed you of the fact that we had discovered the overwintering site of the monarch butterfly in Mexico. We also informed you that there would be an article published in the National Geographic Magazine dealing with this discovery and how, after many years effort, we finally located it with your assistance. In view of this forthcoming article, which will be accompanied by on-the-spot photographs, we shall not dwell on it at this time. We have been informed by the Assistant Editor of the National Geographic Magazine that the article will appear in the August 1976 issue. We sincerely trust that you will be able to obtain a copy of it either by becoming a member of the National Geographic Society or by obtaining a copy from your local library or from one of your friends who is a member of the Society.

We hope that we shall be able to return to the site in Mexico again. We were there in January along with the photographer from the National Geographic Magazine. However, there are certain difficulties involved. In the first place, the volcanic mountains where the butterflies are located is in a remote part of Mexico and in most difficult terrain. Thus, it is expensive to get there, since it is imperative to hire guides. Also, the monarchs are not located in the same mountains or in the same area of a particular mountain from one year to the next. It is therefore necessary to have a field party working in the area in the late autumn when the monarchs arrive in order to assess the situation. The area we visited this past winter was located twenty miles from the mountain where they chose to remain the previous year, and was discovered after two weeks of intensive searching by the advance field party. One can only hope that we are able to locate the site in any one particular year, and having done so that the site is one which can be reached without too much difficulty.

We are hoping that over the next few years we shall be able to visit the Mexican site and that we shall be able to find more tagged specimens which our associates have tagged in various parts of the North American Continent. Then, by tagging on the site, we hope to add to our knowledge of the spring migration. Therefore, we shall intensify our tagging program and to this end we are going to devote more of our time, particularly now that our Univer lecture commitments will be lessened.

Although we have concentrated on the migrations of the monarch butterfly - one of the most important aspects of our research, - we are also interested in all matters pertaining to the life and habit of this amazing little butterfly. May we tell you a little about this broader aspect which might be termed the Ecology of the Monarc Butterfly, and in which you may become involved:

We know that the monarch butterfly exhibits wide fluctuations in population density over periods of years - being very abundant in some years and scarce in others. We have concluded that such fluctuations are caused by virus mutations - a copy of our publi- cation is listed and available to you on request. However, contrar to our first conclusions, the fluctuations are far from cyclical. Indeed, when we forecasted years of scarcity the monarchs proved to be most abundant. By observations over the continent on the part of our associates, we may eventually be able to explain the cause and to forecast the cycles of the population more accurately. Therefore, you should be on the alert for signs of virus infections which are quite obvious when you find or rear larvae which turn black and finally contain a malodorous inky fluid.

We are interested in the kinds of parasites that attack the monarch in various stages of its development. We are familiar with the tachinids (Parasitic flies) and, as mentioned in the book, "The Monarch Butterfly", we have recorded at least one species of ichneumon fly. Just recently we received a science publication, released in 1953, informing us of a minute parasite, Trichogramma minutum, that attacks the eggs. The name "minutum" is well chosen since as many as six of these small parasites will emerge from one monarch egg. We have never witnessed this in our many years of study; we bring it to your attention just in case you may be fortunate enough to obtain this species. We would be most grateful to receive such parasites for our collection.

We carried out some preliminary experiments on the possible functions of the "gold spots" on the pupa. We were delighted to learn that one of our most brilliant young associates, Richard Ebright, of Reading, Pennsylvania, has taken up this fascinating study and has carried it beyond our introductory efforts. We are looking forward to some fine research work from Richard in the years ahead.

One of our Associates raised the question, "Will female monarch butterflies lay eggs on the leaf of a milkweed plant that has aphids on it"? We have noticed in our large patch of milkweed that in late summer the underside of the leaves may be crowded with aphids causing the leaves to turn a rather sickly brown. Perhaps you would like to experiment with this question. It would be quite simple to place cages over plants some of which had aphids on the leaves and some without. By introducing an ovipositing female into the cage you might find that eggs were found only on those leaves without aphids. One has to bear in mind that we are dealing with a caged butterfly and hence some eggs may be deposited on infested leaves due to the cramped quarters and the lack of freedom of choice.

Many years ago an entomologist by the name of Bates formulated a hypothesis, now known as Batesian Mimicry, that postulated that certain butterflies are distasteful to birds while others, that resemble these distasteful species, are delectable: but the delectable ones look so much like the distasteful ones that the birds presumably learn not to eat either of them. In North America one of the examples that is mentioned most frequently is the Viceroy and the Monarch which resemble each other to the eye of man. One of our Associates placed pieces of monarch butterfly on his bird feeding station and found, much to his surprise, that the birds were very fond of this presumably nasty-tasting butterfly. Unfortunately, experimental work has been carried out using caged birds and caged butterflies which, of course, leads to erroneous conclusions. Perhaps you would like to experiment with this so-called distasteful aspect of the monarch butterfly - in nature, not in a cage. In this connection we would pose the question: "Have you ever seen a bird chase a live monarch butterfly, or any other butterfly, catch it and proceed to try to eat it?" After nearly fifty years of studying butterflies I (Prof. Urquhart) have never seen such action. We would be most interested in your observations and, we hope, experiments.

Many of our young associates have become interested in various research problems using the monarch butterfly as their experimental animal and as a result have been successful in obtaining prizes at science fairs. We are always so very much pleased to hear from our young enthusiasts and to watch their progress through High School, then to University and then to the Graduate School. Many of our young associates, as a result of working with us, have gone on to biological studies at Universities and some of them now occupy positions in Universities and research institutions.

One of our Associates raised the question, "Will female monarch butterflies lay eggs on the leaf of a milkweek plant that had aphids on it"? We have noticed in our large patch of milkweed that by late summer the underside of the leaves may be crowded with aphids causing the leaves to turn a rather sickly brown. Perhaps you would like to experiment with this question. It would be quite simple to place cages over plants some of which had aphids on the leaves and some without. By introducing an ovipositing female into the cage you might find that eggs were found only on those leaves without aphids. One has to bear in mind that we are dealing with a caged butterfly and hence some eggs may be deposited on infested leaves due to the cramped quarters and the lack of freedom of choice.

Many years ago an entomologist by the name of Bates formulated a hypothesis, now known as Batesian Mimicry, that postulated that certain butterflies are distasteful to birds while others, that resemble these distasteful species, are delectable: but the delectable ones look so much like the distasteful ones that the birds presumably learn not to eat either of them. In North America one of the examples that is mentioned most frequently is the Viceroy and the Monarch which resemble each other to the eye of man. One of our Associates placed pieces of monarch butterfly on his bird feeding station and found, much to his surprise, that the birds were very fond of this presumably nasty-tasting butterfly. Unfortunately, experimental work has been carried out using caged birds and caged butterflies which, of course, leads to erroneous conclusions. Perhaps you would like to experiment with this so-called distasteful aspect of the monarch butterfly - in nature, not in a cage. In this connection we would pose the question: "Have you ever seen a bird chase a live monarch butterfly, or any other butterfly, catch it and proceed to try to eat it?" After nearly fifty years of studying butterflies I (Prof. Urquhart) have never seen such action. We would be most interested in your observations and, we hope, experiments.

Many of our young associates have become interested in various research problems using the monarch butterfly as their experimental animal and as a result have been successful in obtaining prizes at science fairs. We are always so very much pleased to hear from our young enthusiasts and to watch their progress through High School, then to University and then to the Graduate School. Many of our young associates, as a result of working with us, have gone on to biological studies at Universities and some of them now occupy positions in Universities and research institutions.

If you have any ideas of a research problem you would like to carry out, please write to us and we shall give any advice and assistance that we can. If you are a Junior or Senior in High School and are concerned about careers in Biology, we should be most interested in sharing our many years of University experience with you.

We feel that we are not only an Association interested in the Ecology of the Monarch butterfly, but, unlike other associations, we are like a very large family with a most interesting and exciting common interest. We trust that you share this attitude!

RECAPTURE RECORDS FOR MONARCH BUTTERFLIES FOR 1975

This year many thousands of monarch butterflies were tagged in a continuing effort to trace the exact migratory route and, we hope, some day to obtain tagged specimens in the spring that had been tagged the previous summer. Many of these tagged specimens have been sent to us from individuals who had recaptured them.

Since space does not permit publishing a complete list, we present for your interest the most pertinent ones:

Tag No.	Tagged by	Tagged at	Recaptured at
rt 602	Barry Bishop	Bethesda, Md.	Alexandria, Va.
qg 830	Ray Bracher	Granger, Ind.	Overland Park, Kan.
34-165	Ted Currie	Toronto, Ont.	Barker, N.Y.
** ps 397	Jim Gilbert	Chaska, Minn.	Barranca Honda Michoacan, Mexico
qo 411	Mrs. Franklin Hupp	Hinton, Va.	Gaffney, S.C.

** See special note on "Mexican Recapture."

UNIQUE RECAPTURE OF TAGGED MONARCH IN THE OVERWINTERING SITE IN MEXICO

During our three week stay in Mexico we were fortunate in being able to visit, on four occasions, the overwintering mountain site of the monarch butterfly. It was not possible for us to visit the colony more frequently because of the necessity of acclimatizing to the altitude at 10,000 feet as well as the strenuousness of the trip into the site.

On the morning of January 18, 1976, during one of our visits, we were surprised to notice that a two inch thick branch of one of the Oyamel trees had broken off, caused by the weight of the mass of butterflies clinging to it, and had fallen to the ground. As a result, the surrounding area was covered several inches deep with thousands of monarch butterflies that were unable to fly due to the low temperature of 34°F.

While we were examining the quivering mass of butterflies, much to our amazement we found one bearing a white tag. This was indeed a remarkable coincidence since of over a thousand trees laden with monarchs, this particular branch had one of our associates tagged specimens on it. We eagerly returned to our base and telephoned to the University in Toronto. After considerable difficulty, since making international telephone calls from rural Mexico is complicated, we finally managed to reach our office where the secretary looked up the record. Much to our delight we learned that butterfly ps 397 had been tagged by Jim Gilbert, with the help of Dean Boen and Jim Street, at Chaska, Minnesota at the University of Minnesota's arboretum. Four months had elapsed from the time of tagging to the time of recapture with a point to point distance flight of 1750 miles.

This was indeed the high point of our trip.

Footnote: The Oyamel tree upon which the butterflies were roosting, closely resembles the balsam fir found in many parts of North America. They grow to a height of over one hundred feet. On the site, the entire tree, including the trunk, was covered with monarch butterflies with the exception of a small portion of the crown which was exposed to the cold mountain winds.

TRANSFER OF TAGGED MONARCH BUTTERFLIES IN 1975

In order to increase the chances of tagged monarch butterflies being recaptured in areas where data is scarce, we have encouraged the transfer by air mail of tagged monarch butterflies from one part of the continent to another. These transfers require a great deal of work on the part of the sender who must place each tagged butterfly in an envelope with a moistened piece of cotton, then pack the envelopes in a box with care and send by air mail to the receiver who then feeds each butterfly, notes the condition, records the tag numbers and then releases them.

This requires time and effort for all concerned. We have, however, derived very important data from these transfer experiments which makes the project worthwhile.

William Coleman of Ventura, California sent specimens to Faye Sutherland of Boise, Idaho.

Woody Keeney of Hudson, New Hampshire sent specimens to Florida, Georgia, South Carolina, Virginia, and Puerto Rico.

Franz Pogge of Morgantown, West Virginia sent specimens to John McClusky of Fredericksburg, Texas and to Carlton McQueen of Mercedes, Texas.

To date we have had returned to our office four specimens which were transferred from California to Idaho. These specimens were recaptured not far from the point of release in Idaho. Although we had hoped for longer flights, nevertheless the recaptures have served a very real purpose bacause they aroused the interest of Idaho residents who, we trust, will join our group and thus assist us in the working out of flight patterns in the mountain areas.

If you know of anyone in the northwestern United States; Colorado, Idaho, Montana, Nevada, Oregon, Utah, or Wyoming who would like to become a Research Associate, please let us know and we shall be please to contact them.

RELEASE OF TAGGED SPECIMENS IN POPULATED AREAS

This year we had an exceptionally large number of tagged specimens recaptured near where they were released. On examining the data, we discovered that invariably these tagged butterflies had been released in populated areas which, of course, greatly increases the chances of their being recaptured before they have moved any significant distance.

Release of Tagged Specimens in Populated Areas, cont.

We would suggest that if you live in a populated area you place each tagged butterfly in a small envelope, so that its wings will not be damaged, and that you then put the envelopes into a box and take it out into the countryside where you can then release the butterflies.

In this way you will have more satisfactory records for your tagged butterflies and avoid the disappointment of local recaptures.

CALIFORNIA - MEXICO

For the past number of years we have been convinced that there was an overwintering site for these monarch butterflies, the breeding grounds of which were east of the Rocky mountains. As a result of the thousands of tagged specimens, thanks to your efforts, that were recaptured we were able to plot the migratory route of this eastern population which led to its location in the overwintering site in Mexico.

In addition to the above, we had known for many years of the overwintering colonies in California. When our research program was in its infancy we thought that the monarchs from eastern North America could possibly pass over the mountains to overwinter in California. With more and more data we came to the conclusion that we were dealing with two different populations of the same species.

The population from eastern North America, east of the Rocky mountains (which we now term the "Eastern Population") overwinter in Mexico. This represents an extremely large population not only because of the large breeding range but also because of the great abundance of certain species of milkweed, such as Asclepias syriaca, that can cover many acres of ground in a particular part of the country.

The population that overwinters in parts of California, which we will now term the "Western Population", has its breeding range in the valleys of the Rocky Mountains, with particular reference to the Great Basin that lies between the Cascades and the Sierra Nevada on the west and the Rocky Mountain range on the east. This area involves the following States: Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming.

California - Mexico, cont.

Although many thousands of butterflies have been tagged, over the past twenty-five years, in various parts of California, very few have been recaptured that indicate any significant migratory routes.

We are therefore most anxious to obtain release-recovery data for the States mentioned above. If you have knowledge of anyone in the above areas, particularly Montana and Nevada, would you please write and let us know so that we may contact them? Also, we would appreciate a list of the available Newspapers in these States so that we might send articles to them or, perhaps, you might wish to do so.

SCIENCE AND POPULAR WRITING

Some of our associates have written popular articles which have appeared in newspapers, magazines and in book form. Such writings deal in a rather informal manner with what the associates have been doing in this study and what she or he has been able to find out. Many newspapers and magazines welcome such articles - from adults writing for adult magazines and newspapers and from our young associates who have written articles for junior publications. Such articles are not difficult to write; all it takes is a bit of time and concentration. Why not try it?

Science articles are much more difficult to write. It is necessary to have a firm grasp of all that has been published on the subject; the data must be presented in scientific language and manner; all data must be presented in tables or graphs; bibliographic references must be as complete as possible; and the article must be written to conform with the editorial standards of the scientific journal to which the article is being sent. If one of our associates should obtain data which we feel could be published, we would write the article, in co-operation with the associate, and it would appear under dual authorship.

ALAR GLAND

As you know, the male monarch may be distinguished from the female because there is a small black spot on each of the hind wings of the male which are lacking in the female. These we have termed "Alar glands"; other entomologists refer to them as "wing pockets". As yet we do not know the function of these glands. We know that they are of a glandular nature because of the types of cells associated with them concerning which we have written

Alar Glands, cont.

a paper which is now in the process of publication and will be made available to you at a later date. In the "Monarch Butterfly" book we stated that it was not glandular but acted as a sort of blotter in picking up the secretion from glands located at the tip of the male abdomen. Later studies showed that this conclusion was erroneous. The wing spots are glandular.

Now that we are assured that the spots are of a glandular nature we wonder what biochemical substances are produced by them. We are hoping that one of our colleagues in the Department of Biochemistry will be taking on this problem and trust that we will have more information in the near future.

In the meantime, if you would like to try a rather simple experiment: remove the spots (cut them out) and see if the removal has any effect on mating, either in a caged condition or in nature. Such an operation does not harm the butterfly, since there are no nerve endings in the wing, and has little effect on flight. If time permits, we might take up this rather interesting little experiment and perhaps we could then compare notes with those of our associates who have been investigating it.

RESULTS OF TAGGING OTHER SPECIES

A number of our associates have been tagging species of butterflies, and moths other than the monarch, with most interesting results.

We have long suspected that many species of butterflies travel over considerable distances, even though they are not migrants like the monarch. During years of abundance a particular moth or butterfly may leave its normal range and immigrate into distant areas. In addition to these two types of movement there are those that travel considerable distances in a nomadic manner.

As a result of the efforts of those involved in tagging species other than the monarch we have accumulated most interesting flight records which, we hope, will be included in a publication in the not too distant future:

Here are some of the more significant results for this past year - the distances travelled presented in brackets.

Viceroy (10); Gulf fritillary (3); Black swallowtail (3); Tiger swallowtail (5), (10), (8).

Results of Tagging Other Species, cont.

We have also noticed from the above recoveries, that the direction of flight is northerly in mid-summer and southerly in late summer. A movement similar to that of the monarch butterfly.

You will notice that the returns are for the larger species only. There is considerable difficulty in attempting to apply our type of labels to smaller species, as outlined in the followin article.

A NOTE ABOUT TAGGING SPECIES OTHER THAN THE MONARCH

The labels we are using are not suitable for species of moths or butterflies that have a wingspread of less than two inches. The reasons are: The membrane of the wing of these small species is very delicate and is readily damaged when one attempts to remove the scales; there is very little area of the wing to which the tag can be properly attached; the scales are more difficult to remove; and being more delicate species, damage is usually done to other wings during the process of tagging.

We therefore advise concentrating your attention on the many species of moths and butterflies of a size in excess of a two inch wingspread. These are as follows:

1. All the large moths such as Saturnids, Sphingids, and large Noctuids.
2. The larger species of butterflies belonging to the following: Papilionidae (swallowtails); Nymphalidae (fritillaries, such as the Viceroys, Queens, Mourning Cloak, Gulf Fritillary).

We suspect that the Red Admiral and the Painted Lady butterflies travel considerable distances and we would advise tagging these species. Although they are rather small, the wing membrane is rather tough and we have found that they can carry a small label without interfering with flight.

RECAPTURE RECORDS FOR BUTTERFLIES OTHER THAN THE MONARCH FOR 1975

Species	Tag No.	Tagged by	Tagged at	Recaptured at	Distance & Direction
Viceroy	xr3 404	Kernan Hosea	Lafayette, La.	Duson, La.	10 W
Gulf Fritillary	0221	Eric Brunneman	San Antonio, Tex.	San Antonio, Tex.	3 1/10 NE
Black Swallowtail	u5 828	Cliff Lee	Englewood, Colo.	Denver, Colo.	2 1/2 NE
Black Swallowtail	p4 969	Julie Movall	Storm Lake, Iowa	Storm Lake, Iowa	3 NW
Black Swallowtail	75 842	Cliff Lee	Englewood, Colo.	Englewood, Colo.	3 SW
Tiger Swallowtail	3 165	Molly Monica	Bernardsville, N.J.	Vernon, N.J.	5 NE
Tiger Swallowtail	F 253	Steve Powers	Oley, Pa.	Outside of Oley, Pa.	10 SW
Tiger Swallowtail	F 260	Steve Powers	Oley, Pa.	Outside of Oley, Pa.	8 SW

APHID HONEY DEW

You may have noticed that, at times, the undersides of the leaves of the milkweed plants may be covered with small, wingless, pale green insects. These milkweed aphids (the life cycle unknown) feed upon the juices of the milkweed plant. One of the waste products produced by the aphids is a secretion that has a high sugar content. This sticky secretion will cling to the underside of the milkweed leaf giving it the stickiness which you may have observed. You will also notice that the ants tend to be attracted to the milkweed plant at such times to collect the honey dew upon which they feed themselves and their underground brood. When the leaves are heavily infested, they turn a dark greenish-brown. The aphids do not seem to harm the plant to any great extent; the next summer milkweed plants are just as abundant as before and are quite healthy, at least for the first part of the summer when the aphids are absent. We often wonder where the aphids go in the winter time? Perhaps you could find out?

MILKWEED IN YOUR GARDEN

Many of our associates are now growing milkweed plants in their gardens. We have hundreds of plants in our garden because the flower is beautiful, has a most delightful aroma and attracts many different kinds of insects; it also attracts the female monarchs which lay eggs and thus we can study the larvae. Then in the winter, when the seeds have departed, the seed pod remains on the upright stem, there to collect little caps of snow, thus continuing a winter garden. You can also collect the seed pods, colour them and add them to your winter flower arrangement.

If you do not have milkweed plants in your garden, may we suggest that you do so. If you wish help in obtaining seeds, please let us know.

THE SPOTTED MILKWEED BEETLE

The attractive little beetle, red with black spots, is commonly referred to as the "longhorn milkweed beetle". Longhorn because it has long antennae and belongs to the Family of beetles known as "longhorn beetles" of the Family Cerambycidae.

The larvae feed on the roots of the plant. The adults emerge to mate, deposit the eggs and die. As in the case of many species of longhorns, they emit a peculiar squeaking sound when handled. We like to term it "singing". If you wish to listen to the longhorn song, simply pick one up, squeeze it gently, and hold it to your ear. A rather musical note, we think.

DO BIRDS EAT BUTTERFLIES?

Have you ever seen a bird capture and devour a live butterfly? In nature? We have never seen this happen and we have been watching and collecting butterflies for many, many years. We have seen birds attack crippled butterflies. We have seen male monarch butterflies chasing chipping sparrows and songsparrows, but not the reverse because male monarchs during the reproductive period tend to patrol a certain area and chase moving objects, such as a leaf blown by the wind or a passing chipping sparrow or songsparrow. But birds chasing, catching and eating a butterfly we have never seen. Have you? Some of the smaller hawks, the sparrow hawk for example, have been reported as catching butterflies - perhaps they thought it was a bird. When monarchs are at rest on the overwintering site, such as the one in Mexico, birds may eat them. We have examined the stomach contents of a bird in Mexico and found monarch remains in the stomach, showing that under certain conditions and for certain species of birds the monarch does not seem to be distasteful. But a butterfly in free flight seems to be immune from attack. Could it be that butterflies have evolved a type of flight that does not attract birds as an item of food? This is something for you, particulary our young scientists who have minds uncluttered with false notions, to think about.

We would be pleased to have your ideas and observations. Be sure to identify the bird and the conditions under which the observations were made - in nature, not in a cage.

NAME _____

ADDRESS _____

_____

_____

Please make cheques or money orders payable to Invertebrate Migration Research Fund, University of Toronto.

Date required: _____

Send your request and payment to:

Professor Fred A. Urquhart
Scarborough College
University of Toronto
West Hill, Ontario
Canada, M1C 1A4

A set of 40 colour slides are available to our associates only. The slides deal with the following subjects:

a) life history (egg, larva, pupa and adult)

b) tagging method

c) overnight clusters of monarch butterflies and method of collecting from these clusters

d) overwintering clusters of monarch butterflies

e) monarch butterflies shown in various faunal zones of North America

f) map showing migration lines

These slides are accompanied by a description of the subject matter with information suitable for classroom discussion or lectures.

We suggest a donation to the research fund of $3.50 for rental and $30.00 if you wish to keep the complete set. This allows for costs involved in obtaining duplicates and replacing lost and/or broken slides.

If you wish to keep the set, you will receive, at a future date, extra slides, so as to keep your set up to date with better photographs or more unusual ones, such as photographs of the large overwintering colony in Mexico.

NAME _____

ADDRESS _____

_____

_____

Please make cheques or money orders payable to Invertebrate Migration Research Fund, University of Toronto.

Date required: _____

Send your request and payment to: Professor Fred A. Urquhart
Scarborough College
University of Toronto
West Hill, Ontario
Canada, M1C 1A4

REARING MONARCHS FOR MIGRATION STUDIES

If you are rearing monarchs and eventually tagging them, be sure to raise them outdoors. If you raise them in a lighted building they will not go into the migratory phase. The larvae respond, in some manner as yet unknown, to changes in daylight period. Thus, as the days get shorter there comes a critical period which acts upon the insect's hormonal system such that the reproductive organs do not develop. These butterflies emerging from such larvae are then migrants. If, however, you rear the larvae in a building with electric lights, then the daylight period is prolonged and the butterflies will emerge as non-migratory.

"SCIENTIFIC AMERICAN"

The question has been raised: Why has the "Scientific American" magazine not produced an article on such a popular subject as the Migrations of the Monarch Butterfly? The answer is simply that we have not been asked to submit such an article, but we would be most pleased to do so if such a request were received.

If you would like to see such an article in "Scientific American", the proceeds from which would go to our research fund, we would suggest that you write to the Editor of the magazine suggesting such a topic. The Editorial staff of magazines are always interested in requests from their readers. A few months ago suggestions for future articles in Scientific American were requested by the Editor.

If you do write in such a request, we would be pleased to be so informed.

GOLD SPOTS ON THE PUPA

We have enclosed a colour print of what happens to the colour pattern on the wing of a monarch butterfly when you destroy the cells associated with the gold spots, which we have termed "pigmented maculae" (pm for short). There are a few copies of this series of experiments on hand. In our introductory note we have mentioned the fine experimental studies being carried out by Richard Ebright.

ASSOCIATES NEEDED IN MEXICO

As mentioned in our Newsletter last year, we are anxious to locate interested persons in Mexico and Central America to help us with our studies of the monarch migrations and resident populations in these areas. Please send us any names and addresses of those with whom you are in contact or who you feel would be interested in our research.

I would like to suggest the following person or persons who might be able to help you make contacts in Mexico or Central America:

Name: _____

Address: _____

_____

_____

Occupation: _____

(so that we may be able to write to this person on the proper level)

Correspondence should be in English _____ Spanish _____

Suggested by Research Associate:

Name: _____

Address: _____

_____

_____

Date suggestion was submitted _____

Please return to: Professor F.A. Urquhart
Scarborough College
University of Toronto
West Hill, Ontario
Canada, M1C 1A4

PUBLICATIONS NOW IN PRESS

In addition to our regular duties at the University and personally handling many hundreds of letters from our associates and many other interested persons, we do get a few spare hours to devote to preparing scientific papers that deal with what we have discovered about the various aspects of Monarch Ecology.

During this past year we were able to submit four short papers to various science journals. One deals with our many years of work on the Florida monarchs. Another is concerned with the cellular structure of the alar gland that is found on the hind wing of the male monarch. A short paper reports on monarch migrants found off the Atlantic coast near Bermuda. And the fourth paper deals with migrant butterflies found along the Gulf of Mexico in the Panhandle area of Florida.

These papers will be listed for you in our next Newsletter.

REQUESTS FOR TAGS

If you are asking for a supply of tags, please mark on the outside of the envelope "Urgent Tags" if your request is made during the tagging season in your part of the country. We shall send them as quickly as we can. Otherwise please request tags (any number you believe you will be able to use) when you send in your donations and renewal sheet (found in the Newsletter).

LEFTOVER TAGS

If you have tags left over from last season, please keep them for use in 1976, and report the numbers which you have kept on the renewal sheet in this Newsletter.

The adhesive on the tags will keep for several years if the tags are kept tightly wrapped in order to preserve the moisture.

NET FOR COLLECTING INSECTS

From time to time our associates write to ask directions about the making of an insect net. The following instructions are to help you make an insect net from materials which should be readily available.

Net for Collecting Insects, cont.

The first necessity is insect netting. This may be simply a piece of mosquito netting, or nylon netting, draped around a metal frame, the latter firmly fixed to a small pole. An iron hoop or a stout piece of iron wire, such as a coat-hanger, whic has been bent to the proper shape and approximately fourteen inc in diameter will prove very satisfactory. The iron hoop may be through with a hack saw and the free ends bent so that they may placed along the side of the wooden pole and then tied into plac with a piece of stout cord. If you wish to dismantle the net, the free ends of the iron hoop, or bent wire, can be made so tha they fit into the grooves, one on each side of the pole. A meta sleeve can then be thrust over the free ends thus holding them in place.

Although mosquito netting is used by many amateur collectors for making their insect nets, it is not the best material. Wet mosquito netting tends to fray and form large holes which permit the specimens to escape. Nylon netting, on the other hand, is a fabric which will not fray when wet. An old white curtain will prove far superior to mosquito netting for the insect net.

In making the bag of the insect net, be sure that it is at least twice as long as the diameter of the supporting frame and that it does not taper to a point at the bottom. If it is not long enough you will be unable to imprison the specimen when caught. A flick of the wrist should cause the net to overlap the mouth and still leave enough room for the captured specimen. If the net is tapered to a point, butterflies and moths will work their way into the folds and thus become damaged.

RENEWAL OF MEMBERSHIP

If you wish to renew your membership as a research associate please note that the term of your membership extends from the dat on which you joined our group as a research associate until the date of the publication of the Newsletter following that date.

Therefore you should renew your membership upon receipt of the Newsletter by sending in the renewal form and your donation.

PUBLICITY

One important factor that has been responsible for our success in tracing the migration of the monarch butterfly has been its popular appeal with the result that the various newspapers and magazines have published numerous articles about our research over the past twenty-five years.

Listed below is a summary of the various press releases sent to us by our associates during the past year. We are grateful to you for bringing them to our attention.

"The Des Moines County News" (Iowa, Jan. 15, '76) announced the naming of the Monarch Butterfly as the official State Insect of Illinois. This action was taken as the result of an Illinois school teacher and her pupils attending three sessions of the State Legislature before final action was taken. We sent an autographed copy of the "Monarch Butterfly" book to the State in honour of the occasion.

"The Clearwater Sun" (Oct. 26, '75) published a front page article heralding the arrival of autumn and the associated migration of the monarch butterfly. However, the picture illustrated a Black Swallowtail. This error was brought to their attention and corrected by Kenny Brooks of Colora, Md.

Bill Coleman of Ventura, Cal. sent in a copy of "Today in Ventura" - a brochure publicizing the area. The article described the over-wintering site of monarchs in Ventura and encouraged visitors to attend lectures given by Bill on the subject of monarchs and their migration.

Mike Clemente of Atlantic City, N.J. sent a column from the "Atlantic City Press" (Aug. 31, '75) which described the migration and suggested the many hazards that the monarchs have to cope with during their long flight.

Philip Del Vecchio of Paterson, N.J. sent us a copy of his column in the "Paterson News" (Sept. 30, '75). He announced the finding of the overwintering site in Mexico. This article was copied by the "Seattle Post Intelligence" (Oct. 1 '75).

"The Times" (Reading, Pa.) and the "Oklahoma Times" announced the winning of two cash awards by Richard Ebright, a note concerning which is included under "Awards".

"The Nevada Daily Mail" (Nevada, Mo., March 26, '75) carried a picture of Mrs. Calvin Emery of Nevada, Mo., and an announcement of the recapture of one of Mrs. Emery's tagged monarchs at the overwintering site in Mexico last year.

Publicity, cont.

The "Hopkins-Minnesota Eden Prairie Sun" (Oct. 29, '75) published an article about Jim Gilbert of Waconia, Minnesota and the work carried out by his students in the study of the monarch butterfly. On Feb. 18, '76 the same paper described the remarkable recapture at the overwintering site in Mexico of the monarch butterfly, #ps 397, tagged at Chaska, Minnesota by Jim Gilbert and his students.

Gregory Glovas of Bethelehm, Pa., sent clippings from: "The Science Digest" (N.Y., June 1, '75) and the "Bethlehem Globe-Times" (April 18, '75) pointing out that some species of butterflies are already extinct and others are threatened with extinction. Also, from the "Bethlehem Globe-Times" (Oct. 14, '75) an article referring to the migrations of the monarch. "The Washington Post" (1975) described the seasonal nature of the autumn and spring migrations of the monarch. An illustrated article appeared in the "Sunday Call Chronicle" (Allentown, Pa.) describing the tagging method used.

Mrs. Barbara Hagenson of Clinton, Iowa sent in a clipping from the "Herald" (Sept. 1, '75) describing the excitement of a local family upon recapturing a tagged monarch butterfly.

Elisabeth Lytle of Detroit, Michigan sent a quotation from the "Detroit Free Press" mentioning the cyclical fluctuations in monarch populations.

Ruth Anne McKee of Stockton, California forwarded an illustrated article from the "Stockton Record" (Aug. 14, '75) showing a tagged monarch recaptured by a child.

James Malick of Stevens Point, Wisconsin sent a UPI summary from the "Milwaukee Journal" of the article that appeared in the "Paterson News" (N.J.) describing the discovery of the overwintering site in Mexico.

The activities of Mrs. Molly Monica of Berkeley Heights, N.J. concerning rearing and tagging of many species of butterflies were described at length in an illustrated article in the "New York Times" (July 6, '75). Mrs. Monica sent in a picture of the sign forbidding the molestation of monarch butterflies at Pacific Grove, California, which appeared in the "National Enquirer".

Mrs. Hellen Ochs of Columbus, Indiana, sent in a copy of her column taken from "The Republic" (May 31, '75). The article asked for assistance in observing the spring migration as well as other phases of monarch research.

Publicity, cont.

Rick Plouffe of Baraboo, Wisconsin sent an illustrated article published in the "Wisconsin State Journal" (Oct. 2, '75) concerning the discovery of the overwintering site in Mexico which had been copied from the "Paterson News" (N.J.).

Francisco Sanchez Gonzalez of San Luis Potosi, S.L.P., Mexico, sent in an article illustrated in colour published in "El Sol de San Luis" (Dec. 7, '75) showing the life history of the monarch butterfly, and relating his activities in the tagging program in Central Mexico.

Emily Stobbe of San Jose, California sent a copy of her illustrated article taken from the "Purple Martin News" (Griggsville, Ill., July 30, '75) describing the tagging method and some of the migration lines that have been revealed through our research.

Mrs. Fay Sutherland of Boise, Idaho sent a picture of a tagged butterfly being liberated. This appeared in the "Idaho Statesman" (Boise, Idaho, Oct. 25, '75). Also a picture of a child feeding a monarch butterfly which appeared in the "Statesman-Valley News" (Sept. 26, '75).

Sam Trophia of Rome, N.Y. sent a picture of himself with a tagged monarch which appeared in the "Rome Sentinel" (Sept. 13, '75) along with a description of his part in migration research.

Nancy Votava of Westchester, Illinois, was pictured in "Suburban Life" (Sept. 6, '75) placing a tag on a monarch butterfly prior to releasing it. This picture accompanied an article on the tagging program.

Mrs. Maryanne West of Gibson's Landing, British Columbia, sent a clipping from the "Christian Science Monitor" describing the beauty of an overnight roosting site of monarchs at the same time making a plea for the conservation of butterflies. Mrs. West also sent an article from the "Vancouver Sun" (Jan. 9, '75) copied from the "Los Angeles Times" relating the observations of various authorities about butterflies attacking birds in flight.

Mrs. Dorothy Yeager of Pearsall, Texas, sent an article from the "Corpus Christi Caller" (Sept. 27, '75) calling attention to the monarch migration through Texas and to our research program. Mrs. Yeager also sent quotations from the "Hondo Anvil Herald" (Texas, Oct. 16, '75) and the "Pearsall Leader" (Texas, Oct. 16, '75) concerning her activities in monarch research.

Publicity, cont.

Rick Plouffe of Baraboo, Wisconsin sent an illustrated article published in the "Wisconsin State Journal" (Oct. 2, '75) concerning the discovery of the overwintering site in Mexico which had been copied from the "Paterson News" (N.J.).

Francisco Sanchez Gonzalez of San Luis Potosi, S.L.P., Mexico, sent in an article illustrated in colour published in "El Sol de San Luis" (Dec. 7, '75) showing the life history of the monarch butterfly, and relating his activities in the tagging program in Central Mexico.

Emily Stobbe of San Jose, California sent a copy of her illustrated article taken from the "Purple Martin News" (Griggsville, Ill., July 30, '75) describing the tagging method and some of the migration lines that have been revealed through our research.

Mrs. Fay Sutherland of Boise, Idaho sent a picture of a tagged butterfly being liberated. This appeared in the "Idaho Statesman" (Boise, Idaho, Oct. 25, '75). Also a picture of a child feeding a monarch butterfly which appeared in the "Statesman-Valley News" (Sept. 26, '75).

Sam Trophia of Rome, N.Y. sent a picture of himself with a tagged monarch which appeared in the "Rome Sentinel" (Sept. 13, '75) along with a description of his part in migration research.

Nancy Votava of Westchester, Illinois, was pictured in "Suburban Life" (Sept. 6, '75) placing a tag on a monarch butterfly prior to releasing it. This picture accompanied an article on the tagging program.

Mrs. Maryanne West of Gibson's Landing, British Columbia, sent a clipping from the "Christian Science Monitor" describing the beauty of an overnight roosting site of monarchs at the same time making a plea for the conservation of butterflies. Mrs. West also sent an article from the "Vancouver Sun" (Jan. 9, '75) copied from the "Los Angeles Times" relating the observations of various authorities about butterflies attacking birds in flight.

Mrs. Dorothy Yeager of Pearsall, Texas, sent an article from the "Corpus Christi Caller" (Sept. 27, '75) calling attention to the monarch migration through Texas and to our research program. Mrs. Yeager also sent quotations from the "Hondo Anvil Herald" (Texas, Oct. 16, '75) and the "Pearsall Leader" (Texas, Oct. 16, '75) concerning her activities in monarch research.

NOTES FROM AND ABOUT OUR ASSOCIATES

Although we have a considerable amount of data for the Fall migration, we have very little for the Spring return. Mrs. Charles Mallery of Vestal, N.Y. sent tags to a friend in North Carolina in early May so that her friend could tag some of the returning migrants. Perhaps others could do the same.

Mrs. Hartley of Pensacola, Florida, informed us that the garden plant, Tithonia, with its large sunflower-like heads, is a most effective flower for attracting monarch butterflies.

Anne Weil of South Harpswell, Maine, warns us not to raise monarch larvae in a building where the gaseous poison Shell Vapostrip is present. Many of Anne's reared monarchs were destroye as a result. It makes one think what harm it can be doing to our own health!

Leslie Smith of Citrus Heights, California, has been doing an excellent job of tagging Tiger Swallowtails and Mourning Cloaks. We are hoping that more of our associates will help in tracing the movements of some of our larger species of butterflies.

AWARDS:

One of the most delightful side effects of our interest in the migrations of the monarch and other butterflies has been the activities of our young people across the continent and the awards they have received as a result of this interest.

Richard Ebright, one of our most talented young associates, won cash awards at the 25th Annual International Science and Engineering Fair at Oklahoma City. He repeated a win at the 23rd Annual Reading-Berks Science and Engineering Fair held at Albright College. He won the Eastman Kodak Award as well as the Entomologica Society Award and Certificates from the Army and Navy to allow him t enroll in a summer research project. Richard's awards were for his exhibit on the "Effects of Cauterization of Danaus plexippus." Congratulations from all of us, Richard!!

Francisco Sanchez Gonzalez of San Luis Potosi, won first place in the Biological Division of the National Institute of Mexican Youth contest held in the state of San Luis Potosi - with the theme "Migratory Flights of the Monarch Butterfly". Representing the state of S.L.P., he won fourth place in the national competition for all of Mexico.

Notes from and about our Associates, cont.

LECTURES AND PUBLICITY

Alice P. Woodcock of Tabor, New Jersey, made the monarch butterfly research an item in the summer workshops at the Center for Environmental Studies in Roseland, New Jersey. Mrs. Woodcock writes" "Many mothers who had never taken a good look at that "worm" before, were fascinated and the children brought many of them back as butterflies to be tagged and released."

Hellen Ochs of Columbus, Indiana, averaged at least two lectures each month in Indiana. Hellen writes: "Each time I have used slides of monarchs and told the story of the life cycle. One of my lectures was given to a State Garden club convention in Southern Indiana attended by several hundred women."

Molly Monica wrote enthusiastically: "The lecture was a huge success and the kids loved your slides. It's amazing how few people in the local school system were aware of your tagging program."

One of our Associates, who unfortunately did not include his or her name, sent a copy of Eco-News Teacher's Guide to us in which there was an appeal to study the habits of butterflies rather than kill them to be used as lifeless bodies in a collection. The article states: "The best way for children to learn about butterflies is to observe them in their progress from egg or caterpillar to the adult stage." With this we concur and we would ask our associates to advise anyone finding one of our tagged butterflies to record the number and then release it. Our associates, of course, are well aware of this procedure.

Dorothy Yeager of Pearsall, Texas, is actively engaged in arousing an interest in the studies of the monarch butterfly through her lectures and articles. Dorothy also writes to various journals asking them to bring the study to the attention of interested persons.

Note: Please let us know of your activities which might be included in next year's Newsletter as well as any suggestions that you might have.

NATIONAL GEOGRAPHIC ARTICLE

As noted in our Newsletter of last year, there will be an article written by us to be published in the August, 1976 issue of the National Geographic Magazine. This article will be accompanied by a number of photographs in colour showing the over-wintering site and the countless thousands of monarchs clinging to every part of the Oyamel trees as well as covering the ground beneath the trees. On the shores of a small pond situated near the base of the mountain, thousands of monarchs congregated to drink the water in preparation for their flight back to the breeding grounds.

Although it is not possible to purchase a copy of this magazine in stores, you can obtain one for $1.25 by writing to the National Geographic Magazine, Washington, D.C. Those who care to join the National Geographic Society for the cost of $10.00 will receive twelve copies, one per month, of the magazine.

TAGGING REPORTS

We appreciate very much your sending in tagging reports for our files. All reports of tagging are retained for future compilations. We regret that, owing to the lack of time and the pressure of other correspondence, we are unable to acknowledge receipt of the reports.

POSTAL STRIKE

Unfortunately, in the fall of 1975 Canada suffered a prolonged and crippling postal strike. We regret the inconvenience suffered by so many of our associates on this account and the fact that your correspondence was returned to you without compensation for postal costs. If such a strike occurs again, and we expect it will, it would be well to check at your local post office before sending mail to Canada if you learn of such a strike.

CORRESPONDENCE WITH ASSOCIATES

One of the real pleasures this research offers is receiving so many friendly letters from our associates and sharing our experiences and interests with you. We would like to be able to answer all such correspondence, but as mentioned in another note, time and the lack of sufficient clerical help makes it quite impossible. Perhaps, when our duties at the University come to an end, which takes place in July, 1977, we shall be able to spend more time with you. For the present, however, may we take this opportunity to thank you for your kind letters and to express our very real appreciation

SPECIAL DONORS TO INSECT MIGRATION RESEARCH FUND

Although we receive financial assistance from outside granting agencies, such as the National Research Council of Canada and the National Geographic Society, it is necessary to have a continuing source of funds to cover expenses in obtaining reprints of publications, cost of publications in some research journals, printing and purchase of alar tags, production of an annual Newsletter, postage, etc., etc. Funds from granting agencies usually cover special expeditions and extra clerical help and field assistants. We are most grateful to those who, during the past year, have donated funds to the University to assist us in carrying out our investigations and also introducing our research project to others.

Brooks, Kenneth Alva. Colora, Maryland
Elliott, P.A. Muskegon, Michigan
Fashingbauer, B.A. St. Paul, Minnesota
Gilbert, James R. Waconia, Minnesota
Hansen, R.E. Staten Island, New York
Kendrick, Mrs. Evelyn. Sault Ste. Marie, Ontario
Lytle, Elisabeth B. Detroit, Michigan
Mallery, Mrs. Charles. Vestal, N.Y.
(Naturalists Club of Broome County)
Matson, R.R. Minneapolis, Minnesota
McClure, O.M. Salem, Oregon
McKee, R.A. Stockton, California
Patty, Diane M. St. Paul, Minnesota
Pogge, F.L. Morgantown, West Virginia
Powers, Steve. Philadelphia, Pennsylvania
Reese, R. Newark Valley, New York
Reichert, D. Hanover, Pennsylvania
Ridgeway, Beatrice. North Tarrytown, New York
Smith, Jean. Cambridge, Massachusetts
Smith, L.V. Citrus Heights, California
Stout, Prentice K. Narragansett, Rhode Island
West, Maryanne. Gibson's Landing, British Columbia
Wright, Maxene. Mountain Brook, Alabama

RESEARCH ASSOCIATES 1975-1976

As a result of special grants-in-aid of our research received from the National Research Council of Canada and the National Geographic Society of the United States, it has been possible for us to add to our present membership. In addition, the University of Toronto allowed us research leave for half of the academic year which made it possible for us to get on with the job of presenting our research data to various scientific journals. Four papers dealing with: The cellular structure of the alar gland; the migration of monarchs down the Florida Pennisula; the migration of butterflies along the Gulf Coast; the presence of migrating monarchs off the Atlantic Coast near the Bahamas. Reprints of these articles will be made available to you after publication and will be listed in next year's Newsletter.

Our special thanks is extended to all those who donated funds above the suggested donation. This has helped immeasurably in obtaining different kinds of alar labels and experimenting with others.

A.

Adams, Barbara. Fanwood, New Jersey
Armstrong, Mrs. Fred. Little Silver, New Jersey
Anderson, Tim. Richfield, Minnesota
Andersen, Mrs. Carolyn. Layton, Utah
Antonopolos, Joseph. Fargo, N. Dakota

B.

Baden, Dave. Shakopee, Minnesota
Baird, James. Pine Bush, New York
Beimborn, Don. St. Paul, Minnesota
Bishop, Barry. Bethesda, Maryland
Black, Mrs. G. Pleasantville, Iowa
Blanchard, Kathleen A. Ithaca, New York
Bracher, Ray W. Granger, Indiana
Brooks, Kenneth. Colora, Maryland
Brouchoud, Mrs. Lynette. Manitowoc, Wisconsin
Brugger, Kenneth and Cathy. Mexico, Mexico.
Brunnemann, Eric. San Antonio, Texas

C.

Campodonico, Kristin. Arroyo Grande, California
Carlson, Keith. Wauwatosa, Wisconsin
Carpenter, Fairbank. Far Hills, New Jersey

C., cont.

Carter, Gray. Winston-Salem, North Carolina
Cherubini, Paul. Castro Valley, California
Clemente, Michael. Atlantic City, New Jersey
Coleman, Wm. J. Ventura, California
Conroy, Philip. Paterson, New Jersey
Cox, Judee. Watonga, Oklahoma
Cripps, Mrs. Fred. Fayetteville, Arkansas.
Currie, E.A. Toronto, Ontario

D.

Davidson, Mrs. Donald. Waterloo, Iowa
Davis, Donald A. Newmarket, Ontario
Day, Ezra R. Hunter, Utah
De Rosier, M.D. Colorado Springs, Colorado
DeWind, Joan M. New York, New York
Drexler, David. Marcellus, New York
Dubois, Mabel. Bannister, Michigan
Duncan, Mrs. Ruth. Brampton, Ontario

E.

Ebright, Richard H. Reading, Pennsylvania
Elliott, Mrs. Paul A. Muskegon, Michigan
Eller, Mrs. Lillian. Mason City, Iowa
Emery, Mrs. Calvin. Nevada, Missouri

F.

Farmer, Mary A. St. Paul, Minnesota
Fashingbauer, B.A. St. Paul, Minnesota
Fender, Mrs. June, Springfield, Missouri

G.

Galaburri, Richard. New York, New York
Gerardo, Gonzales. Molina, Merida, Mexico
Gerber, Ian. Glenview, Illinois
Gilbert, Jim. Waconia, Minnesota
Girl Scout Council of St. Croix Valley. St. Paul, Minnesota
Gladieux, Rosemary. Fort Wayne, Indiana
Glovas, Gregory. Bethlehem, Pennsylvania
Glynn, Mrs. Jessie. Limehouse, Ontario
Godbout, Sylvia. St. Paul, Minnesota

H.

Hagenson, Mrs. Barbara. Clinton, Iowa
Hague, Margaret J. Sudbury, Ontario

H., cont.

Hansen, Mrs. R.E. Staten Island, New York
Hartley, Mrs. Chas. Pensacola, Florida
Hintz, Roger. Waldo, Wisconsin
Horr, Mrs. Alta. Gretna, Nebraska
Hosea, Kernan. Lafayette, Louisiana
Hoskins, Mrs. D. Weston, Massachusetts
Houck, Mrs. Harvey. Decorah, Iowa
Hughes, Heidi. Chatham, New Jersey
Hummer, Larry. San Mateo, California
Hupp, Mrs. F. Hinton, Virginia
Hurst, Peter. Boothbay Harbor, Maine

K.

Keeney, Norwood H. Hudson, New Hampshire
Kelley, Mrs. Barbara. Laconia, New Hampshire
Kendrick, Mrs. Evelyn. Sault Ste. Marie, Ontario
Kennedy, Mrs. Laura. Islington, Ontario
Kester, Mrs. Patricia. Appleton, Wisconsin
Klipstein, John. Wausau, Wisconsin
Knight, Seth. Doylestown, Pennsylvania
Komarek, E.V. Tallahassee, Florida
Korte, Jeff. St. Cloud, Minnesota
Kough, Ruth. Dysart, Pennsylvania

L.

Larson, Donald W. Minnetonka, Minnesota
Lee, Cliff. Englewood, Colorado
Lefebvre, Robert H. Keene, New Hampshire
Lemon, Ivy. Gloucester, Massachusetts
Lindsay, Targe M. Fair Oaks, California
Lipscomb, Charles. San Antonio, Texas
Lopez Nunez, Francisco. San Luis Potosi, Mexico
Lorimer, Mrs. John. Birmingham, Michigan
Luxenburg, Mrs. Lester. Tonopah, Arizona
Lytle, Elisabeth. Detroit, Michigan

M.

Malick, James. Stevens Point, Wisconsin
Mallery, Mrs. Charles. Vestal, New York
Masshardt, Mrs. E. Brooklyn, Wisconsin
Mathes, Mrs. G. Eldred. Pontiac, Michigan
Matson, Roland R. Minneapolis, Minnesota
Maxwell, J.W.H. Montreal, Quebec
McClure, O.M. Salem, Oregon
McClusky, John. Fredericksburg, Texas
McGee, Kathleen. Falls Village, Connecticut

S.

Sanchez Gonzalez, Francisco. San Luis Potosi, Mexico
Sawyer, Mary. Rockland, Maine
Schippers, John V. Stockton, California
Science Museum of St. Paul, Minnesota
Scott, Mrs. George. Laramie, Wyoming
Senghas, Mrs. Joan. Mount Clemens, Michigan
Severson, Mrs. Lu. Middleton, Wisconsin
Sherman, Daniel. Los Angeles, California
Siegel, Russell. Bronx, New York
Sieker, Wm. E. Madison, Wisconsin
Simonsen, Mrs. R.A. Waterloo, Iowa
Sippola, Calvin. Loomis, California
Smith, Mrs. Jean. Cambridge, Massachusetts
Smith, Leslie. Citrus Heights, California
Smith, George M. Lyndonville, New York
Soltysiak, Godi. Rome, New York
Spack, Kathryn. Salem, Ohio
Stalter, William B. Corpus Christi, Texas
Stern, Ruth W. Yarmouth, Maine
Stotz, Raleigh R. Grand Rapids, Michigan
Stout, Prentice K. Old Dutch Road, Bedminster, New Jersey
Stovall, Brenda. Dallas, Texas
Struble, Buddy L. Lake Hiawatha, New Jersey
Stull, Mrs. Jean H. Waterford, Pennsylvania
Sutherland, Mrs. Faye. Boise, Idaho
Swanson, Jon. Dublin, New Hampshire
Swensen, Robert. Baltimore, Maryland

T.

Tall Timbers Research Station, Tallahassee, Florida
Teed, Mrs. Laneil B. Wichita, Kansas
Thompson, Brent. Lucas, Ohio
Throm, Mrs. Frank. Overland Park, Kansas
Torrey, Mrs. Anne. Scituate, Massachusetts
Trophia, Samuel. Rome, New York
Tuttle, Brian. Claremore, Oklahoma
Tyndall, Marjory A. Millington, New Jersey

V.

Valachovic, Diana. Bellaire, Ohio
Votava, Nancy. Westchester, Illinois

W.

Waggy, Mrs. Paula. Marlinton, West Virginia
Weil, Anne. So. Harpswell, Maine
West, Mrs. Maryanne. Gibson's Landing, British Columbia
Wieser, Barry P. Wayne, New Jersey

W., cont.

Williams, Jim. Dallas, Texas
Williams, Thomas. Hamden, Connecticut
Wilson, A. Cobourg, Ontario
Wilson, Mrs. Ellen K. San Jose, California
Woodard, R. Falconer, New York
Woodcock, Alice P. Tabor, New Jersey
Wright, Mrs. Maxene. Mountain Brook, Alabama

Y.

Yeager, Mrs. K. Pearsall, Texas

PLEASE NOTE: The names of some research associates will not appear on the above list as these people joined our group after the Newsletter was sent to the printer.

SCIENTIFIC PAPERS FREE TO RESEARCH ASSOCIATES

The following scientific papers are now available. If you wish to have copies in order to learn what we have found out about various aspects of the ecology of the monarch butterfly, check the appropriate spaces and fill in your name and address:

( ) 1. A discussion of the use of the word "migration" as it relates to a proposed classification of animal movements.

( ) 2. Laboratory techniques for maintaining cultures of the monarch butterfly.

( ) 3. A study of a continuously breeding population of Danaus p. plexippus (in California).

( ) 4. Fluctuations in the numbers of the monarch butterfly in North America.

( ) 5. Mechanism of cremaster withdrawal and attachment in pendant rhopalocerous pupae (Lepidoptera).

( ) 6. Microcauterization to maxillectomize lepidopterous larvae by fulguration.

( ) 7. The effect of cauterizing the PPM of the pupa of the monarch butterfly.

( ) 8. The effect of cauterizing the MNPPM of the pupa of the monarch butterfly.

( ) 9. The effect of microcauterizing the ALPPM of the pupa of the monarch butterfly.

( ) 10. Epidermal cells of the PPM of the pupa of the monarch butterfly.

( ) 11. Functions of the prismatic pigmented maculae of the pupa of Danaus p. plexippus.

Name _____

Address _____

_____

_____

Date papers were requested _____