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ANNUAL

INSECT MIGRATION STUDIES

VOLUME 16, 1979

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NOTE: THIS IS A REPORT TO MEMBERS OF THE IMA - INFORMATION CONTAINED IN THIS REPORT MUST NOT BE USED FOR SCIENTIFIC PUBLICATIONS.

TO OUR ASSOCIATES

FROM

NORAH AND FRED URQUHART

Since funds available for field investigations are very limited we will not be visiting the Mexican Site next year and will use whatever funds are available to continue our investigations of the ecology and migration of the monarch butterfly in other parts of the world. Much of this has been done but a great deal more information is necessary before publication.

On one of our field trips to the Mexican Site we were accompanied by a film team from Survival Anglia, a motion picture company in England that produces nature films for conservation purposes. This film is now being shown in various parts of the world and this past year it was shown in the United States. We hope that you were able to see it and if you did we would be most pleased if you would write and let us know your reactions to it. One of our associates has already done so and was most lavish in her praise of both the film and the commentary since it gave full credit to us for having located it after so many years.

Thanks to the generosity of the Committee on Research and Exploration of the National Geographic Society we were able to investigate the presence of migrant monarchs in Yucatan, Mexico. This field expedition was most successful not only because we were able to obtain the data we needed on the "aberrant migration" but also because of our good fortune in obtaining the services of Sra. Barbara de Montes, a local ornithologist whose interest in the project was such that we covered the entire area needed in the short period of ten days. Sra. de Montes is going to continue working with us and for this we are most grateful.

As mentioned in our last Newsletter to you, we stated that we were reducing the number of our Associates by not adding any new members except those living in strategic areas. This is necessary in view of the high cost of postage, production of labels and printing of instructions.

Since we wish to maintain our research as a pleasurable experience for all those taking part, we attempt to answer all letters received. With a large-number of associates this becomes increasingly difficult both for time and costs involved. We will continue to need more assistance in Florida, Arizona, New Mexico and the mountain states where there are still a few problems to be solved.

In order to fill in the gaps in our knowledge, both with regard to migratory routes and dealing with the result of removing migrants from one route to another, we would like as many as possible to take part in "transfer experiments". For further details see the special note and application sheet in this Newsletter.

We will be discontinuing the sale of slides after this year. Again, this is due to the high cost of obtaining duplicates, glass mounting, and postage. Therefore, if you wish to have any of the slides listed, please inform us as soon as possible.

As announced in our last Newsletter, the Lepidopterists Society published an autobiographical account of how this project got started. See list of reprints available.

We will continue to make milkweed seeds available since the natural plots of this plant are gradually being destroyed as new subdivisions are being erected in farmlands, new roads are being constructed and, what is most alarming, a new herbicide is now available for the control of the milkweed. With the rapid disappearance of virgin fields, the use of herbicides and clearing of roadways, the food plant of the monarch larva is rapidly being diminished. We can do much to overcome this milkweed destruction by growing the plants in our gardens and advising others to do so.

We read a great deal about the need for conserving our wildlife with particular reference to birds and mammals but few conservationists realize the importance of protecting our insect life without which many plants would disappear, not to mention the many species of insectivorous birds. Insects abound in open fields where they feed upon the various grasses and flowering plants. It is such areas that need our attention, in addition to ponds, streams and forests.

We sincerely trust that this past year has been a most pleasant one and that you are looking forward to another exciting summer of studying the monarch butterfly and all its many thousands of neighbours in the world of invertebrates.

RECAPTURE RECORDS FOR MONARCH BUTTERFLIES FOR 1978-79

Tagged By	Tagged At	Date	Recaptured At	Date
Barbara Hagenson	Clinton, Iowa	Sept. 8/77	Overwintering site, Mexico	Jan. 28/78
" "	" "	Sept. 9/78	Wagoner, Oklahoma	Sept. 29/78
Alta Horr	Gretna, Nebraska	Sept. 13/78	Royal, Iowa	Sept. 21/78
James Johnson	Bridgeton, New Jersey	Sept. 21/78	Bay St. Louis, Mississippi	Oct. 9/78
Evelyn Kendrick	Sault Ste. Marie, Ontario	Aug. 7/75	Red Oak, Texas	date unknown (1976)
Ronald Lachelt	Minneapolis, Minnesota	?	Overwintering site, Mexico	winter 78/79
Joseph Moss	Roanoke, Louisiana	Oct. 7/77	Overwintering site, Mexico	Nov. 18/77
Christine Pauly	Brookfield, Wisconsin	Aug. 25/78	Richardson, Texas	Sept. 30/78
Beatrice Ridgeway	North Eastham, Massachusetts	Sept. 15/78	Durham, North Carolina	Sept. 23/78
Faye Sutherland	Boise, Idaho	Sept. 25/78	Brentwood, California	Dec. 13/78
Larry Totton	Granger, Iowa	Sept. 5/78	Overwintering site, Mexico	Feb. 9/79

The above data represent the more interesting records of flights that have come to our attention this past year. We regret that lack of space does not permit us to publish all recapture records. At the time of publishing this Newsletter all associates whose tagged butterflies were recaptured and returned to us have been notified and all captors who sent tagged butterflies to us have been informed of the pertinent data.

The dates which are missing have been requested but were not available at this time.

DISCONTINUE TAGGING OF SPECIES OTHER THAN THE MONARCH

Since we now have a great deal of data dealing with the movements of species of butterflies (other than the monarch) and moths, we will be discontinuing this part of the research.

From a cursory examination of the recaptured specimens it seems obvious that there is very little that one can do to add to our present knowledge. The returns on such tagged specimens has been rather meagre and has shown that, unlike the monarch, other species do not engage in long distance movements.

We hope that the data now on hand will show some sort of annual movement even though small.

Therefore, please do not tag species other than the monarch until further notice.

REPRINTS OF PUBLISHED PAPERS AVAILABLE TO ASSOCIATES

____ 1. Fluctuation in the numbers of monarch butterflies.

____ 2. Mechanism of cremaster withdrawal and attachment.

____ 3. A continuous breeding population of monarch butterflies.

____ 4. Autumnal migration routes to the overwintering site in Mexico.

____ 5. Vernal migration from the overwintering site in Mexico.

____ 6. Reprint from News of the Lepidopterists Society - an autobriographical account of monarch migration studies.

Please check which ones you want.

Name: _____

Address: _____

_____

_____

Date requested: _____

Note: The above are available only as long as the present supply lasts.

PUBLICATION OF RESEARCH DATA BY ASSOCIATES

Please note that associates who help to collect data re research on the migration of the monarch butterfly are not permitted to use such data for publication in scientific journals since the data belong exclusively to the Insect Migration Association, Scarborough College, University of Toronto, Toronto, Canada.

ACTIVITIES OF OUR ASSOCIATES

Mrs. Margaret Elliott gave four talks on our tagging program to two schools as well as a Garden Club and a Civic Group; she is also scheduled to give five more talks dealing with the monarch butterfly project.

Barbara Hagenson gave talks and showed slides to 750 school children on the subject of the monarch butterfly. She also addressed five groups of adults on the subject.

Marion Lopina presented a program on the monarch butterfly at one of the sessions devoted to nature work with the handicapped. "Some of the men took my sample larva home (to Woods Hospital) to raise them to maturity".

Mrs. Charles Mallery prepared several cages of monarch larvae showing the life cycle which was exhibited at the annual Roberson Science Center Fair. Mrs. Mallery reports that it is "always one of the most popular exhibits".

Marion Smith gave a talk to the Audubon Club at Auburn, New York about her experiences in the monarch tagging program. They gave Marion the first honorarium she has "ever had the pleasure of receiving". The honorarium was given to the local library to purchase books about butterflies. Marion also gave talks to fifth and sixth grade students at Churchville which was most successful and was followed by an hour of questions.

PRIZES AND AWARDS RECEIVED BY OUR ASSOCIATES

The following associates have written to us about the prizes and awards received as a result of their work on the monarch butterfly:

Russell Siegel receive first prize in the yearly Science Fair in his school for his display on monarchs and other butterflies.

Neil Karrow won first prize in his category and entered in competition in a Science Fair in Guelph, Ontario.

Susie Smith won first place in the 8th grade Biological Science Reporting at a science fair. Susie sent us a colour photograph of her excellent display depicting the migrations of the monarch butterfly.

Nancy Votava won the local Audubon Award of a U.S. Savings Bond for her presentation of the monarch butterfly at the Science Fair held in Stephen Center at Notre Dame University.

Our congratulations to our young scientists - the biologists of the future.

IN MEMORIAM

We regret to report the passing of the husband of Mrs. Beatrice Ridgeway. Mrs. Ridgeway has been actively involved with our research since 1972 and has given us much valuable information and provided us with very helpful contacts. We are sure that Mrs. Ridgeway will miss the co-operation that her husband gave her with this study but we are looking forward to having her continue her keen interest in the monarch migration.

TRANSFER EXPERIMENTS

As mentioned in our last Newsletter, we are most anxious to continue our transfer experiments. Although we now know, thanks to the co-operative effort of over three thousand members of the IMA, past and present, that most of the monarchs of the eastern population migrate to the overwintering site in Mexico. There are still a number of migratory routes for which we have very little data, as mentioned elsewhere in this report. Most of the areas have a very small population of monarchs and also areas where there is a sparse population of people who might recapture a tagged specimen and hence it is necessary to ship migrants from areas where they are abundant to areas where they are not abundant. In this way we are able to fill in the gaps in our knowledge of the migrations of the monarch butterfly for the entire continent of North America.

If you wish to participate in this part of the investigation and you believe you will be able to capture and tag a great many specimens in your area, please write and let us know and we will send you the necessary shipping materials and instructions together with the name and address of the person to whom the specimens should be sent.

TRANSFER EXPERIMENT

If you wish to take part in the transfer experiment, as explained in the note to our Associates, would you remove this form and send it to us with the following pertinent information.

Name _____

Address _____

_____ Postal or Zip Code _____

Telephone number (include area code) _____

Date of returning this form to us _____

At what time would you be able to take part _____

How many specimens do you consider you might be able to tag _____

Where would your tagging take place (nearest town or city) _____

Would you require remuneration for cost of shipment of specimens _____

Signature _____

MORE ASSOCIATES NEEDED IN ARIZONA, FLORIDA, NEW MEXICO, TEXAS AND MEXICO

We have very little data on the movements of the monarch butterfly through Texas although we know that they pass through this state on the way to Mexico. We do not know a great deal about monarch butterflies in Arizona or New Mexico and we are at present in need of more data from Florida in order to add to our present knowledge of the migrations to Yucatan.

We would appreciate receiving names and addresses of anyone you believe would be interested in assisting in this research in these areas.

PUBLICITY RE MONARCH RESEARCH

We are fortunate that the migration of the monarch butterfly generates a great deal of interest on the part of the public, thus making people aware of our study and of the possibility of recapturing a tagged butterfly all of which helps us to obtain data.

This year we are indebted to the Associates who have sent us press clippings and pictures of the research being done and on the general topic of monarch butterflies. We would like to thank the following for their contributions from newspapers and magazines: Ralph Belknap, Gladys Black, Ray Bracher, Kenny Brooks, Mike Clemente, Barbara Hagenson, Mrs. Harvey Houck, Virgil Inman, Christopher Keats, Eva Kendrick, Harold Mahan, Molly Monica, Mary Jane Rabatin, Beatrice Ridgeway, Faye Sutherland, Lesley Wolf, Dorothy Yeager.

MONARCH CONSERVATION

The monarch butterfly is becoming a rare species in some parts of North America. Where once monarchs could be found feeding upon the nectar of flowers along roadways and pasture fields and, in the autumn, thousands would be seen winging their way to the overwintering site, only a few are now ever seen. This rather sad state of affairs is due primarily to the destruction of the milkweed plants as the result of rapid urbanization and the indiscriminate use of herbicides.

Although the milkweed plant can be considered a "pest plant" to farmers, it is not a difficult plant to control in agricultural fields by spring and fall plowing. Even if it grows among the agricultural plants it rarely occurs in such great numbers as to interfere to any degree with the desired species of plants. However, crops that require the removal of seeds cause a certain amount of difficulty because of the milkweed seeds in which the milkweed down will be caught among the seeds.

The answer to this condition is to plant the milkweed in our gardens as a flowering plant. It is a beautiful plant with a most delightful flower and a very fine perfume. In some parts of North America it is grown as a "rare" plant in gardens since it is not indigenous to the area.

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MONARCH CONSERVATION con't.

A project of planting milkweed in vacant lots, along roadways and railway lines would help a great deal in supplying food for the larvae of the monarch butterfly.

If possible, areas should be set aside as a sanctuary for all wild insects without which many of our cross-pollinated plants would become extinct not to mention the effect on insectivorous birds.

By means of radio and television the need for such conservation of fields could be emphasized. It could also be made a school project which would not only preserve this interesting and important part of our wildlife, but would introduce the students to natural history and the importance of preserving the ecology for ourselves and future generations.

Some of our Associates are taking steps to improve this unfortunate situation. Lee Ann Hughes reports that the Army Corps of Engineers decided to deny the New York State Department of Transportation a dumping permit that would have destroyed the wetland park in Palonya. This was done because "the disposal site comprise a unique and productive ecosystem that should be preserved". Congratulations, Lee Ann.

Dick Buegler has been active in trying to prevent a paved road and parking lots being installed in Crookes Point at Great Kills Park. Dick wrote to us asking that we support his efforts, which we did. We trust that Dick's efforts have been successful.

If you are active in attempting to set aside conservation areas for the protection of the monarchs which, incidentally, protects other wildlife, and you wish to have us write to support your efforts, please let us know. Actually we are doing very well - many areas are now being set aside as conservation areas as a result of our efforts on the monarch butterfly. Matters are progressing very favourably for the conservation of the monarch butterfly overwintering areas in Mexico.

MILKWEED SEEDS AVAILABLE

In order to increase the available milkweed plants as food for the larvae of the monarch butterfly, we are asking members of the IMA to plant milkweed in their gardens; to ask neighbours to do the same; to make it a school project to plant seeds in vacant lots and along roadways and railway lines. The milkweed plant is a most interesting one because of its unusual method of cross-fertilization which, at times, may trap insects feeding upon the nectar. It is also interesting as a family of plants since it exhibits such a wide range of forms from large plants, five or six feet in heights, to small plants that hug closely to the ground. Some plants look like miniature spruce trees while others are climbers. But, as far as we know, the monarch butterfly larvae can feed on all members of the genus Asclepias and other genera, such as Gonolobus, as well.

We will send milkweed seeds to you on request - the seeds are from Asclepias syriaca, one of the most ubiquitous members in North America and it grows in a variety of habitats, but preferably sandy soil. If you live in a very warm part of North America or in a semi-desert area, then you should find out what species of milkweed is indigenous to the area and plant these seeds. Your high school biology teacher or the University can assist you in locating native species of milkweed.

HOLDING LIVE MONARCHS IN STORAGE

Some of our Associates have had a supply of live butterflies which they wished to keep, awaiting the arrival of more tags. If you wish to do so, do not keep them in a cage since they will damage their wings in the attempt to escape. Place them, wings folded, in a plastic container, the type you buy at the store for sandwiches and the like. Introduce into the plastic container a small piece of cotton or paper towel, about the size of your thumb nail, that is slightly damp so as to maintain the humidity. The sandwich wrapper can be held flat, so as to prevent the monarchs from moving about, by using pins or paper clips. You can keep them alive without harm for a period up to a week or more. We use this method to keep live monarchs during the winter months; the pieces of cotton were treated with a honey solution so as to give humidity and sustenance. Keep the plastic envelopes in a cool place; in your refrigerator if the temperature is not below 40°F, or in a cool part of your basement.

REPORTS OF TAGGING BUTTERFLIES

We would like to thank all of you who sent in your reports of tagging promptly. We would like very much to be able to acknowledge the receipt of tagging reports but unfortunately the pressures of writing scientific papers, the answering of correspondence and the many other activities which are necessary to keep this research going do not permit us sufficient time. We would like to emphasize the importance of receiving your reports as soon as your tagging is done.

PLEASE KEEP DUPLICATES OF ALL YOUR REPORTS SINCE THE ORIGINALS MIGHT BE DAMAGED OR LOST IN THE MAILS.

TAGGING OF SPECIES OTHER THAN THE MONARCH

For the past fifteen years many of our Associates have tagged species of butterflies other than the monarch, as well as a few species of large moths. We now have a good deal of material to report in a science journal as to the movements of such species.

Since very few returns are ever received for the amount of effort involved, we have decided to discontinue this part of the program for the present until we have thoroughly analyzed the data on hand.

Leslie Smith has been most active in this field of tagging other species of butterflies and he reported this year of a tiger swallowtail that flew a distance of 6.5 miles. Most of the other tagged specimens flew less that a mile (0.8 miles).

Except for one record of a mourning cloak that flew over 60 miles, it would appear that most species of butterflies have a limited range. However, further details will come to light as we examine the fifteen years of tagging that has been carried out.

MAIL SERVICE PROBLEMS CONTINUE TO MOLEST US

Problems with the mail service in Canada continue to plague us, due to "slow-downs", strikes and careless work in sorting. Reports that our associates have sent to us have failed to arrive. Some of our mail has failed to reach our Associates and we have had a number of letters and packages returned in a damaged condition. Since this situation is out of our control we would remind you to keep a copy of all reports just in case the originals are lost in the mail. This is a very good scientific practice anyway and one which we adhere to with all correspondence. Documents of importance are always sent as registered mail, which, of course, is very costly but at least you have some way of tracing it if it is lost.

This matter is brought to your attention since we must have your reports in order to complete the data on recaptures as well as having a file on the number of specimens tagged in any one year and in particular areas. Your reports are most important.

IT IS NECESSARY TO LIMIT THE NUMBER OF ASSOCIATES

The study of migrations of the monarch butterfly with particular reference to the problem as to where the eastern population spends the winter months, started as a hobby rather than a research program. From this, the study grew into a research program but, unlike other investigations of this nature, it has been maintained as a group project with a common interest. We have tried to maintain this somewhat family feeling by our interchange of friendly letters and observations.

In order to maintain this unusual friendly relationship we wish to answer, as fully as possible, all letters submitted by our Associates. We wish to continue taking part not only in your interest in the monarch butterfly but also other aspects of your, and our, lives. To do this is impossible with a large number of associates.

We will, of course, add to our associate list those who live in strategic areas, at the same time maintaining a constant number by attrition.

Many individuals join but do not carry on much in the way of tagging or field observations and, over a period of one year, from the time of receiving a copy of the Insect Migration Studies to the issue of the next volume, do not contribute to the research or keep in contact with us. We have made it a practice to remove such individuals from the list of associates thus giving more time to the active and interested associates, as well as making vacancies for those living in areas where there is a need for more data.

A MONARCH CAGE FOR CLASSROOM USE

Nancy Ziebur sent us an outline of how to make a monarch cage from cardboard grocery boxes.

If you would like a copy of Nancy's plan, let us know and we will have a copy xeroxed for you.

SPECIAL DONORS TO THE IMA FUND

Based upon our anticipated expenses in carrying out the tagging program which involves postage, cost of tags, printing, Newsletter, etc., we have "suggested" a certain amount as a possible "donation" since, as a research project, there is no set fee involved. We are most grateful to those of our Associates who have contributed amounts in excess of the suggested donation.

We make special mention of the following with our sincere thanks: Gabriel & Ralph Brown; Richard Buegler; Joan De Wind; P.A. Elliott; G.L. Fairfoul; C.F. Farwell, Jean Craighead George; James R. Gilbert; J. Glynn; Barbara Hagenson; Carol Hillman; Alta L. Horr; Mrs.F.Hupp; Margaret Katz; Christopher Keats; Laura Kennedy; Ron Lachelt; Van Luxenberg; Harold Mahan; J. Malick; R.R. Matson; Ruth Anne McKee, Molly Monica; Steve Powers; Ellen Roush; D. Reichert; Beatrice Ridgeway; George C. Scott; Marion & George Smith; Marjory Tyndall; Roger Wilson.

WHAT ABOUT BATESIAN MIMICRY?

Does the Viceroy obtain protection from bird predation because it looks like the monarch which is distasteful to birds? We don't think so but why don't you do a little investigation on your own.

See how many times you find a bird chasing a monarch butterfly, tasting it and discarding it. Not in a cage, out-of-doors. Most of the so-called scientific investigations that have been carried out have used only two species of birds, the Florida Jay and the Blue Jay, both birds are hardly insectivorous and both are known to swallow grain to be regurgitated later for removing the husk and devouring the kernel. As a result of these experiments, it is concluded that all insectivorous birds find the monarchs distasteful and what is most ludicrous is that every year thousands of young insectivorous birds have to taste the monarch to find out how distasteful it is! Seems like a lot of bird experimentation! But the most important factor to be taken into account is that those who have carried out experiments have never taken into account the action of birds in nature - no field observations. We have watched countless millions of monarchs in nature; trees clustered with them on the overnight roosting sites; throngs of insectivorous birds flying about the clusters - BUT ON NO OCCASION HAVE WE SEEN A BIRD TASTING A MONARCH BUTTERFLY. Only in the overwintering areas does such seem to occur and even under these exceptional circumstances when the monarchs are not free-flying, where the wing motion is upset by low temperatures, there is relatively little bird predation.

Do some field observations. Let us know if you see birds tasting monarchs.

REGARDING REPRINTS OF PUBLISHED SCIENTIFIC PAPERS AND COPIES OF NATIONAL GEOGRAPHIC

We have only a few reprints of published scientific papers now available (see list). However, a few papers are now in the process of being published and these will be listed in our next annual Newsletter.

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REGARDING REPRINTS OF PUBLISHED SCIENTIFIC PAPERS AND COPIES OF NATIONAL GEOGRAPHIC con't.

All copies of the National Geographic Magazine containing the article on the discovery of the overwintering area of the monarch butterfly in Mexico have been distributed. However, if you wish a copy you might write to the National Geographic Society in Washington, D.C. I believe they keep a number of back copies on hand which would be available to you.

HOW WOULD YOU LIKE TO HAVE YOUR NAME RECORDED?

Some married women like to use their husband's name: e.g., Frank Scott; while others like to use the Christian name, e.g., Edith Scott; while still others like to use only the initials, e.g., F.G. Scott. Men choose either their full name, Frank George Scott, or Frank Scott, or just F.G. Scott.

The use of the identification tags of Mrs., Miss or Ms. causes some confusion. Some unmarried women like to use Ms. while others prefer Miss. Whatever you would like as an identification name is what we will use, so please be sure that the name you put on your renewal form is the way you would like to be addressed in the future.

We have used the name that appeared in your renewal form in this report and in your mailing address.

QUESTIONS MOST FREQUENTLY ASKED

Why is the monarch butterfly called "monarch"?

It was named after King William of Orange, because of its colour. Hence "monarch" and "King Billy".

How long does a monarch live?

Migrants can live up to 11 months; non-migrants live for approximately 30 days, the females dying after laying their full complement of eggs. There may be two or more generations of non-migrants thus increasing the population of the final migrants.

How are migrants produced?

In late summer owing to lowering temperatures and decreased amount of daylight, the reproductive organs do not develop in the larval stage - the effect is on the larvae, not the adults. This gives rise to the migrating phase which is inherent in the genetic complex of this species that has evolved over the past millenium of its existence.

How fast can a monarch fly?

A cruising flight of 12 miles per hour; a rapid flight of 20 miles per hour. With a strong tail wind the effect of the wind can double or triple this speed.

How many miles can a monarch fly in one day?

We have an authentic record of a recaptured alar tagged specimen that flew 80 miles in one day. As with maximum flight speed, plus a strong tail wind the monarchs undoubtedly can fly a much further distance than this one record would indicate.

Do monarchs fly in flocks like birds?

Monarchs travel individually, not in flocks. The many records we have received and our own numerous observations of many hundreds apparently flying together, is due to the sudden departure from an overnight roosting location where they do appear in great numbers on roosting trees.

Why do the migrants cluster on overnight roosting trees?

When the temperature falls below 50°F, the monarchs are unable to fly. As the sun sets and temperature begins to fall, they cluster on the trees, on the leeward side, there to remain until warmer temperatures makes flight possible; also, monarchs, as well as other species of butterflies, do not fly during these periods of darkness - they are strictly diurnal.

How long does it take a monarch to develop?

The egg hatches in three to five days; the larva reaches maturity in 13-21 days; the adult hatches from the pupa in 11-17 days. The difference in times is due to rates of development at high and low temperatures.

What good is a monarch butterfly?

What good is anything? A Van Gogh painting is only good to the beholder or the value placed upon it. A beautiful sunset or sunrise is also of value to those who can appreciate them. The monarch is a beautiful creature and, because of its remarkable migrations, a most amazing butterfly. Aside from this esthetic value, there are other attributes: it is used for teaching the life cycle and habits of insects in most schools in North America; it is used for experimental purposes in studying cellular physiology and insect behaviour in at least eleven Universities; as the result of our studies, much more is now known about the habits of migrating insects in other parts of the world.

Why study the migrations of the monarch; what value is it?

As scientists we are interested in scientific investigations. It is a case of "knowledge for knowledge sake". This is sometimes referred to as "pure science" since it does not involve the results being used for economic purposes, such as manufacturing a new type of motor car or a new refrigerator. However, from pure science comes the ecomonic value. Were it not for the pure science investigators of the past, there would be no X-ray, no antibiotics, no methods of controlling bacterial growth, etc. etc. etc. It is quite likely that as a result of our interest in the habits and biology of the monarch butterfly, some very important discoveries will be made of which, at the present time, we have not the least conception. KNOWLEDGE FOR KNOWLEDGE SAKE! That is what is most important.

What diseases affect the monarch?

A virulent polyhedrosis virus can greatly reduce the monarch population giving rise to their fluctuations in numbers. There are at least 50 strains of bacteria that affect the larval and pupal stages. Tachinid flies, of at least five species, lay their eggs on the larvae which hatch into small, white grubs that devour the internal organs. There are a few parasitic wasps that lay their eggs on the larvae, some of these are about the size of a small house fly while others are not much larger than the head of a pin. There are many predators such as various species of Hemiptera (true bugs), praying mantids, spiders (monarchs caught in the webs of the larger species). Birds, with the possible exception of the black-billed cuckoo and some of the smaller hawks (sparrow hawk), do not attack butterflies. It has been suggested that the reason birds do not attack the monarch butterfly is because of its "unpalatability". This is quite an erroneous hypothesis because birds do not attempt to eat any species of butterflies except under exceptional circumstances (see further note).

If the scales are removed from the wing of the monarch, will this hamper their flight?

We have removed nearly all the scales from the wings of experimental monarchs and found that they could fly quite well without their scales, so long as the wing membrane had not been damaged.

Are monarchs found in other places besides North America?

Being such remarkable travellers, the monarchs are found in many parts of the earth; throughout many of the islands of the Pacific, the Caribbean, the Atlantic and in South America and Central America. Those found in the last two areas are presenting a bit of a taxonomic problem which we are presently investigating.

Do monarchs leave a scent on the overnight roosting trees?

After many years of recording the appearance of roosting monarchs we have concluded that no scent is left - it is a matter of direction of flight, availability of flowering plants, and topography. We are engaged in experimental studies to obtain definitive data on this question.

How many eggs are laid by a female?

We have been able to obtain as many as 700 eggs in our laboratory females. Perhaps in nature the amount might exceed this.

RESEARCH ASSOCIATES 1978-79

Those listed below are research associates who have been actively involved in our research for the year 1978-79.

Please note: If your name does not appear on this list, it is because you joined our group after this issue was submitted for publication.

A.

Allgrove, Valerie. Windsor, Connecticut.
Anderson, Timothy P. Richfield, Minnesota
Antonopolos, Joseph. Fargo, North Dakota
Armstrong, Mrs. Fred. Red Bank, New Jersey

B.

Barry, Jerome J. Bedford, New Hampshire
Beauchaine, Mrs. Willard. Minneapolis, Minnesota
Beich, Kris. Thief River Falls, Minnesota
Belknap, Ralph. Ann Arbor, Michigan
Black, Gladys. Pleasantville, Iowa
Brachen, Ray W. Granger, Indiana
Brady, Wm. S. Brewster, Massachusetts
Breen, Jean. Brookfield, Connecticut
Brooks, Kenneth A. Colora, Maryland
Brown, Gabriel & Ralph. Baltimore, Maryland
Buchanan, Frances B. New Paltz, New York
Buegler, Richard P. Staten Island, New York
Burns, Cathy. Flushing, Michigan

C.

Carlson, Betty N. Lake Oswego, Oregon
Carter, Gray. Winston-Salem, North Carolina
Cieniuch, Gary A. Dearborn Heights, Michigan
Clemente, Michael F. Atlantic City, New Jersey
Clements, Marta. West Paris, Maine
Coleman, Wm. J. Ventura, California
Conner, Timothy A. Loveland, Colorado
Conroy, Philip. Paterson, New Jersey

D.

Davidson, Rowena. Waterloo, Iowa
DeMar, Sharon J. Romeo, Michigan
Dewind, Joan M. Sherman, Connecticut
DeWitt, Erma R. New Paltz, New York
Duncan, Mrs. J.G. Brampton, Ontario

E.

Eid, Troy A. Wheat Ridge, Colorado
Eller, Lillian. Mason City, Iowa
Elliott, Mrs. P.A. Muskegon, Michigan
Emery, Mrs. Calvin C. Nevada, Missouri
Ensman, Patty & Family. Oswego, New York

F.

Fairfoul, G.L. Toronto, Ontario
Farwell, C.F. Bala, Ontario
Finley, Karin & Sonia. Saugerties, New York
Freund, Carol Lynne. McKeesport, Pennsylvania

G.

George, Jean. Chappaqua, New York
Gilbert, James R. Waconia, Minnesota
Glovas, G.S. Bethlehem, Pennsylvania
Glynn, J. Limehouse, Ontario

H.

Hagenson, Barbara. Clinton, Iowa
Halmi, Chris. Erie, Pennsylvania
Hansen, R.E. Staten Island, New York
Haws, Karl W. Welch, Oklahoma
Hays, Lana. Independence, Kentucky
Henshall, Mary S. Nampa, Idaho
Hillman, Carol B. Harrison, New York
Hopf, Alice. New York, New York
Horr, Alta L. Gretna, Nebraska
Hosea, Kerman F. LaFayette, Louisiana
Hoskins, Dorothy M. Weston, Massachusetts
Houck, Harvey & Lorraine. Decorah, Iowa
Hughes, Lee Ann. Palmyra, New York
Hummer, Larry. San Mateo, California
Hunt, Duane R.B. & Lonsberry, John. Perry, New York
Hupp, Mrs. Franklin. Hinton, Virginia

I.

Inman, Virgil. South Bend, Indiana
Irwin, Ann D. Bloomfield Hills, Michigan

J.

Johnson, James Edward. Bridgeton, New Jersey

K.

Karrow, Niel. Waterloo, Ontario
Katz, Margaret. Riverdale, New York
Keats, Christopher. Clearwater, Florida
Keeney, Norwood H. Hudson, New Hampshire
Kendrick, E. Sault Ste. Marie, Ontario
Kennedy, Laura. Islington, Ontario
Kester, Patricia. Appleton, Wisconsin
Keyes, Brian R. Shrewsbury, New Jersey
Klass, Judith. Leonia, New Jersey
Korte, Jeff. St. Cloud, Minnesota
Kough, Ruth. Dysart, Pennsylvania

L.

Lachelt, Ron. Minneapolis, Minnesota
Larson, Donald W. Minnetonka, Minnesota
Lefevre, Robert H. Keene, New Hampshire

L. con't.

Lopina, Marion T. Wauwatosa, Wisconsin
Lorimer, John & Family. West Bloomfield, Michigan
Luxenberg, Mrs. Lester. Castle Rock, Colorado

M.

Mahan, Harold. Cleveland, Ohio
Malick, J. Stevens Point, Wisconsin
Mallery, Mr. & Mrs. C. Vestal, New York
Manos, Marilyn, Provincetown, Massachusetts
Marian, Sister Joseph. Lebanon, Kentucky
Masshardt, Mrs. Eugene. Brooklyn, Wisconsin
Masuoka, James. Chardon, Ohio
Mathes, G. Eldred & Marjorie. Pontiac, Michigan
Matson, R.R. Minneapolis, Minnesota
McClusky, J.V. Fredericksburg, Texas
McKee, Ruth Anne. Stockton, California
McLeod, Dave. Hyde Park, Ontario
Meyer, Tim & Sandra. Milwaukee, Wisconsin
Milani, Ruth. Meaford, Ontario
Miller, Donna. Ottawa, Ontario
Monica, Molly. Berkeley Heights, New Jersey
Morgan, Anne W. Montgomery, Alabama
Morris, Alan. Brigham City, Utah
Murray, Sarah M. Tuscola, Illinois

N.

Naturalist Club of Broome County. Vestal, New York
Neale, J.H. Berkeley Heights, New Jersey
Newland, Susan. Kuna, Idaho
Noles, Paul Stephen. Winchester, Tennessee

O.

Onken, Christopher. Central Valley, New York
Ortt, Marilyn & Jennifer. Marietta, Ohio

P.

Patent, Dorothy H. Missoula, Montana
Pauly, Christine M. Brookfield, Wisconsin
Pendleton, Emily V. Montevallo, Alabama
Penn, Linda. Toledo, Ohio
Podnieks, Vizma M. Edina, Minnesota
Powers, Steve. Philadelphia, Pennsylvania
Preston, Mrs. Barry W. Whiteford, Maryland

Q.

Quinn, Joanne M. White Plains, New York

R.

Rabatin, Mary June. Chardon, Ohio
Reese, Randy. Newark Valley, New York
Regula, W.F. Hamilton, Ontario
Reichert, D. Hanover, Pennsylvania
Ridgeway, Beatrice. North Eastham, Massachusetts

R. con't.

Roush, Ellen. Lynchburg, Ohio
Running, M.H. Two Harbors, Minnesota
Rutherford, Kathleen M. St. Catharines, Ontario

S.

Sanders, Mary. Morrison, Missouri
Scott, Mrs. George C. Casper, Wyoming
Senghas, Joan. Mount Clemens, Michigan
Severson, Lu. Middleton, Wisconsin
Siegel, Russell. Danbury, Connecticut
Sieker, W.E. Madison, Wisconsin
Simon, Jim. Burnsville, Minnesota
Sinclair, Ellery W. Falls Village, Connecticut
Skutka, Joan. Rockaway, New Jersey
Smith, Leslie V. Citrus Heights, California
Smith, Marion E. & George. Lyndonville, New York
Smith, Susie. Bountiful, Utah
Smith, Trudy. Groton, Connecticut
Spafford, Michael & Mark. Saunemin, Illinois
Spears, Ian. Toronto, Ontario
Stull, Jean H. Waterford, Pennsylvania
Sturgess, Kelley. Unadilla, New York
Sutherland, Faye. Boise, Idaho
Sutton, Edna M. Richmond Centre, Wisconsin
Swanson, Severin. Omro, Wisconsin

T.

Teed, L.B. Wichita, Kansas
Terry, Mrs. Willie G. Baytown, Texas
Totton, Larry W. Granger, Iowa
Tretter, Mary Ann. Emmaus, Pennsylvania
Tyndall, Marjory A. Millington, New Jersey

U.

Union County Outdoor Education Center. Berkeley Heights, New Jersey

V.

Vishino, Vivian. Otto, Missouri
Votava, Nancy. Westchester, Illinois

W.

Walker, Thomas J. Gainsville, Florida
Wangsgard, Beth. Ogden, Utah
Wardwell, Wayne. Caldwell, Idaho
Weber, Lois. Clearwater, Florida
West, Maryanne. Gibson Landing, British Columbia
Williams, Gary. Glen Ellyn, Illinois
Wilson, Audrey, Cobourg, Ontario
Wilson, Roger L. Moville, Iowa
Wolf, Lesley Ann. Newton, Iowa
Woodcock, Alice P. Upper Montclair, New Jersey

Y.

Yeager, Dorothy. Pearsall, Texas

Z.