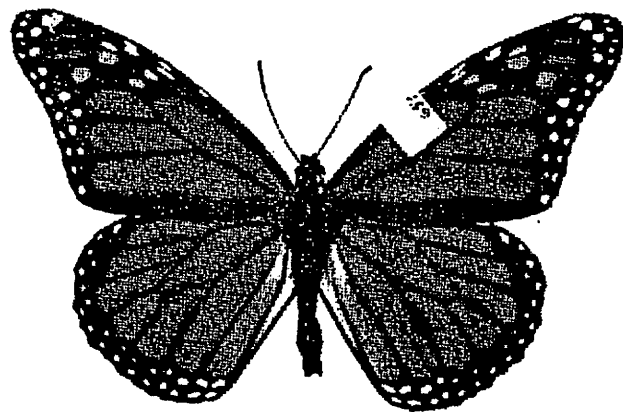


*Insect
Migration
Studies*



*Newsletter
to
Research Associates*

VOL. 8 APRIL 1971

I N S E C T M I G R A T I O N S T U D I E S

NEWSLETTER TO RESEARCH ASSOCIATES

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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 THE EDITOR - MISS AUDREY E. WILSON, R.R. # 5, COBOURG, ONTARIO, CANADA.

* * *

TO OUR ASSOCIATES

FROM

PROFESSOR AND MRS. URQUHART

It seems so short a time since we last addressed our Associates in our annual Newsletter. When one is engaged in such a delightful study as that of following the amazing migrations of a most attractive butterfly time does take on a very rapid flight. But how very pleasant this is compared to being occupied in some boring occupation that causes time to move like molasses on a frosty morning.

Once again we have received many delightful letters from our associates informing us of the very great pleasure they obtain from working on this project. We are, collectively, accumulating information and sharing in the delight of understanding one of nature's most amazing phenomena. We would like to share some of these letters with you, but the cost of producing a more voluminous Newsletter is, at present, prohibitive. Indeed, as you will note, we have had to increase the annual fee so as to take care of the increased printing costs both of the Newsletter and the alar tags. Fortunately, the cost involved for correspondence paper and the like is covered in the budget of Scarborough College.

Today, as we prepare this Newsletter, the sun is shining and, as we left our home to come to the College, the cardinals were singing and our bird-feeding tray was being visited by a flock of goldfinches, and juncoes. The sound of the crows and the cardinals made us think of summer and the pleasure of once again studying the monarch butterfly. We sincerely hope that you too are looking forward to a summer of monarch butterfly studies.

Once again we wish to thank Audrey Wilson, who, incidentally, is one of Canada's foremost Naturalist teachers and a very busy person, for acting as our Editor.

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CORRESPONDENCE FROM OUR ASSOCIATES

Throughout the year we receive many interesting and informative letters from our associates. Of these, some of the most interesting are those that are sent to us from the young members of our research team. We take great delight in reading these letters not only because of the content and the enthusiasm but also we feel that we are doing a little in bringing to the attention of our younger generation the wonders of nature and how we can find out about natural phenomena in a most delightful way. Many of our young associates have won prizes and scholarships and have, as a result of being introduced to this branch of zoological research pursued their studies to the University and some even to the graduate school level.

Here is one of the letters, taken from many similar ones, that will indicate to you the interest enjoyed by one of our youngsters from Illinois.

"Dear Professor Urquhart: This has been the best summer of my life. The biggest reason I feel this way is because I feel that I have been some help in the study of the migration of monarchs and other butterflies and moths. I also feel a deep satisfaction in myself because I reached my goal for the summer. I am looking forward into next spring and summer of 1971 of tagging again. I have found quite a few new good places to go for this coming summer. I have only one sad thing to say and that is this: On Sept. 5, 1970 I had just finished using up all the rest of my tags. The monarchs seemed to be quite frequent so my tagging for the season expired early that day. Well, a little later on that afternoon my friends father ask me to go squirrel hunting out in a farmers woods not to far from my house. So as we walked along I noticed a fairly large number of monarchs feeding on some golden rod weeds along the railroad tracts we were walking on. I didn't seem very concerned at first. We finally got to the woods when my friends father thought he saw a squirrel. So he shot into the tree and all of a sudden the sky turn black and we engulfed in monarchs. There must have been thousands of them. No matter where or which way we turn the monarchs were landing in our mouths and were landing all over us. We called off the squirrel hunt to let the monarchs relax and settle. We did that because we were constantly stepping on them and were just literally blinded by all of the monarchs. I felt fairly heart-broken because I didn't have a single tag left because they were used up earlier that day. This coming summer I am going to save all of my tags till about the 2nd or 3rd week in July. I think I am going to ask for a lot more tags because if there is a lot of monarchs at the woods I want to be prepared. I would also like to tell you that I am in the 9th grade now. The teacher at my school handed out sheets with possible future careers. Two of the three I pick were zoology and land conservation. These are some of the subjects I will be learning about next year in High School. Thank you very much for your time and may I say that I hope yours and my tagging success increases this coming year."

MONARCH BUTTERFLY TAGGING RETURNS FOR 1970

As a result of the marked increase in the population of monarch butterflies in North America this past year, a great many specimens were tagged with the result that there were many returns. Most of those recaptured were for short distances and added but little to our knowledge of the movement of the species. There were, however, a few long-distant recaptures as well as some that added significantly to our plots. It is necessary to bear in mind that the average return on tagged specimens is in the order of two percent. In other words, for every one hundred specimens tagged, only two are recaptured and sent to us. Obviously, the more specimens that are tagged the greater the volume of returns. The following are a few of the recaptures that are of significance in our study. Others, not listed, are of course important as added data for a more accurate survey of the routes travelled:

<u>Tagged by</u>	<u>Tagged at</u>	<u>Recaptured at</u>
Robert Allen	San Juan, Capistrano, Cal.	National City, Cal.
Sara Annon	Oaxaca, Mexico (Jan. 7)	Oaxaca, Mexico (Jan. 16)
Robert Artus	Chicago, Ill.	Acton, Ind.
Lloyd Beamer	Meadford, Ontario	Duncan, S.C.
Lloyd Beamer	Meadford, Ontario	Dalton, Ga.
Paul Bosley	Indianola, Iowa	St. Louis, Mo.
Wm. Casello	Ann Arbor, Michigan	Cincinnati, Ohio
Paul Cherubini (transferred to C. McQueen, Mercedes, Texas)	Castro Valley, Cal. Castro Valley, Cal.	Brownsville, Texas
Boughton Cobb	Falls Village, Conn.	Norfolk, Va.
Wm. Coleman	Santa Cruz, Cal.	San Jose, Cal.
" "	" "	Coalinga, Cal.
Bill Dufour	El Cerrito, Cal.	Richmond, Cal.
Mrs. C. Frickenstein	Seaward, Neb.	Creighton, Neb.
Allen Gehret	Norristown, Pa.	Wildwood Crest, N.J.
Mike Hoffman	Lakewood, Cal.	Long Beach, Cal.
Edward Keith	Point Pelee, Ontario	Oil City, Pa.
" "	" "	Minden, W.Va.
" "	" "	West Haven, Conn.
Mrs. R. Klein	Geneva, Ohio	Anniston, Ala.
Nina Laramore	Greenbelt, Ind.	Lexington, Miss.
Ivy Lemon	Gloucester, Mass.	Montauk Point, N.Y.

<u>Tagged by</u>	<u>Tagged at</u>	<u>Recaptured at</u>
Steve Lewis	Palmetto, Fla.	Bradenton, Fla.
Mrs. H. Marsi	Binghampton, N.Y.	Baltimore, Md.
Mrs. H. Marsi	Binghampton, N.Y.	Miami, Fla.
Ruth McKee	Stockton, Cal.	Lodi, Cal.
Gary Mockli	Lakewood, Cal.	Long Beach, Cal.
Paulette Samuelson	Pleasantville, Iowa	Moberly, Mo.
Mrs. Joan Senghas	Mt. Clemens, Mich.	Summers, W. Va.
Mrs. S. Reuter	Bradenton, Fla.	Kingsville, Texas
Audrey Wilson	Cobourg, Ontario	Staten Is., N.Y.
Mrs. S.A. Wilson	San Jose, Cal.	Aptos, Cal.
Robert Woodley	Bloomington, Ind.	Houston, Texas
Mrs. K. Yeager	Pearsall, Texas	Guadalupe, Mexico.

* * *

TAGGING RETURNS OF SPECIES OF LEPIDOPTERA OTHER THAN THE MONARCH BUTTERFLY

It is possible that many species of butterflies and moths travel over long distances while others move only short ones. Such species as the red admiral, painted lady and peacock butterflies of North America are considered as long-distance migrants, although all records to date are based entirely on observations since no tagging program or similar method of identification has been carried out as has been done with the monarch butterfly. It is important, therefore, in order to add to our knowledge of the movement of various species of Lepidoptera (moths and butterflies) to tag as many species as possible. Although various species tagged may not move over long distances, there is the possibility that they do move in a direction and at a time of the year similar to the monarch butterfly. We suspect that such is the case. In other words, there are certain environmental factors that cause these insects to move in a given direction during a certain time of the year; e.g. northward in early summer and southward in late summer and fall. In any case, whatever data that you, our associates gather re: the movements of these species, will be new to science and should offer an exciting challenge.

It is difficult to tag a small species of butterfly, such as the painted lady or red admiral. The tags used for the monarch butterfly can be cut into two parts and each part fixed to the front wings thus balancing the flight. We have tried this method with good success, admitting that applying such a small label is rather difficult. However, the results could be worthwhile. We are very much pleased at the growing enthusiasm that our associates display for tagging many different species of butterflies and moths. This year 31 species of butterflies and moths were tagged.

The following associates have been responsible for tagging species of Lepidoptera other than the monarch, the results from such activity indicating that various species may travel as far as 32 miles and commonly 5 to 10 miles:

ARAMBURO, Andrew	KELLY, Michelle
ARMSTRONG, Glenn	KROSCHEL, Glenn
BARLOW, Victor	LATHROP, Mrs. Audrey
BERNDT, Larry	LORIMER, John
CARVELL, David	MATZKE, Curtis
CASELLO, William	MILLER, Mrs. Donna
CLEMENTE, Michael	MORGAN, Mrs. Clifford
COLEMAN, William	O'NEILL, John
COOMBS, Brian	PATTY, Brian
CORBETT, Thomas	PARSONS, Larry and Don
DRAPER, Jerome Jr.	PAULO, Becky
FAGLE, David	POGGE, Franz
FITZGIBBON, Mike	RAUB, Mrs. Helen
GEHRET, Alan	RENNER, Robin
GLOVAS, Gregory S.	RUTH, Clayton
GUILLOT, Rebecca D.	SCHUHKNECHT, David
GUNDY, Janice	SENGHAS, Mrs. Joan
HALE, Paul	SMITH, Leslie
HEEKE, Terry	STEPHENS, Jim
HJORT, Richard	THROM, Mrs. Frank
HOFEMAN, Mike	TUTTLE, Brian
INGRAHAM, Debbie	WEBER, Terry
KANEL, Mrs. Tom	WEIS, John
KEITHAHN, Diane	WILSON, Audrey
	WILSON, Wesley

The following species were tagged by the associates listed on the previous page:

Butterflies

Tiger Swallowtail	Silver Spangled Skipper
Mourning Cloak	Painted Lady
Viceroy	Orange Barred Sulphur
Wood Nymph (one species)	Eastern Tiger Swallowtail
Spice-Bush Swallowtail	Zebra
Lorquin's Admiral	White Admiral
Anise Swallowtail	Tawny Emperor
Black Swallowtail	Baird's Swallowtail
Question Mark	Gulf Fritillary
Cabbage Butterfly	Common Yellow Sulphur
Great Spangled Fritillary	Yellow Sulphur
Red Spotted Purple	

Moths

Polyphemus	Cecropia
White Lined Sphinx	Promethea
Tulip Tree Silk Moth	Catocala
Tomato Sphinx	

* * *

REMINDER RE TAGGING REPORTS

We would like to thank all of you who submitted your reports promptly. May we remind you that we would like you to send in your reports as soon as you have completed your tagging for the season as we need to have the reports available when we are compiling data about recaptured specimens. We regret that we were unable to complete some of the data which we would have liked to publish in this Newsletter as some of the reports were not sent in and others were not complete.

PLEASE SEND IN YOUR REPORTS AS SOON AS THEY ARE COMPLETED. If you have already sent in your reports will you check them to see if you have sent in all of the information about your tagging, otherwise we shall not be able to use the data from your tagging when we compile information for a scientific paper.

* * *

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REQUESTS FOR TAGS

If you are asking for 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 renewal fee and renewal sheet (found in the Newsletter).

* * *

LEFTOVER TAGS

If you have tags left over at the end of the tagging season, please keep them and report the numbers on the sheet which will be sent to you in the fall of 1971. The adhesive on the tags should be effective for several years unless you live in a very dry climate.

* * *

QUESTIONNAIRE RE SCARCITY and ABUNDANCE OF MONARCH BUTTERFLIES

Thanks to the cooperation of our associates in answering the questionnaire of 1969 we were able to compile data which were published under the title, "Fluctuations in the Numbers of Monarch Butterflies in North America". This paper appeared in "ATLANTA" - a scientific journal devoted to insect migration which is published in Munich, Germany.

We now have more such data as a result of the questionnaire of 1970 which we shall examine with a view to publishing more notes about the cyclical fluctuations of the monarch butterfly.

We are very gratified that our unique group of research associates makes possible surveys of this nature that provide us with so much valuable information.

* * *

ABUNDANCE OF MONARCHS

As forecasted, last summer was a peak year in the abundance of monarch butterflies in North America. There were a few isolated areas in which, for reasons unknown, there was a drop in population density. That this cycle of abundance is correlated with a virus infestation was made obvious in our laboratory populations. This past year we have had as low as 2% die-off as a result of the virus. Obviously, the present abundant population has been able to produce a virus-resistant strain. This coming summer (1971) should see the maximum peak. Then, if the cycle follows the usual trend, 1972 will see a drop in population with a low in 1973 or 1974. Therefore, it is important that you tag as many specimens as possible this summer and make as many observations on flight direction and abundance in your area as time will permit. We would particularly like to have many of our associates rear the monarchs from the egg stage and to record the percentage that die so as to give us some idea of mortality

rate for various parts of the continent. In order that the data you might obtain will be of significance, it would be necessary for you to raise a minimum of 100 specimens. A gravid female (one that is laying eggs) will deposit at least five or six hundred eggs - depending upon the degree of egg depletion when the female is captured. We will send you a paper on rearing methods on request.

So may next summer be the biggest summer we have ever experienced.

* * *

RESEARCH GRANT FROM THE NATIONAL GEOGRAPHIC SOCIETY

In order to carry out a migration study, such as that of the monarch butterfly, many individuals must become involved and the more there are the more data are obtained and in this way a more accurate picture of the migration is obtained. The tremendous success which we have had over the years in this particular study has been due to the number of people who have volunteered to mark individuals of a population in a given area. Thousands of butterflies have, in this manner, been identified along their migratory route with the result that we can now plot with a fair degree of accuracy, the actual routes and times taken.

To accomplish this a great deal of stenographic and clerical work is involved. Many hundreds of letters are answered each month, not only from our associates but from others interested in natural history studies.

Three years ago we had reached the point where we were unable to carry on the clerical work involved and had decided to cut our associate membership back to a number which we could handle comfortably. This, fortunately, we did not have to do since the National Geographic Society came to our assistance and helped finance the extra-clerical work involved.

As a result of the generosity of the National Geographic Society we have been able to extend our studies to southern Mexico, and Central America. At the present time we are building up an associate team in these areas. This marks one of the most important advancements in our studies. It is indeed a remarkable fact that a seemingly frail monarch butterfly can actually travel from the north-eastern United States and Canada to Central America and return, at least, part way.

For this advancement in our studies we owe a debt of gratitude to our sponsor, the National Geographic Society.

Once again we wish to thank those of our associates who have taken the time to write to the National Geographic Society expressing their appreciation of the support given to this project in which we are all mutually involved, which has given us so much pleasure and has introduced so many of our young people to the pleasures of the out-of-doors at the same time contributing facts to a research project.

LIST OF DONORS TO INSECT MIGRATION RESEARCH FUND

Mrs. Fred Armstrong, Little Silver, N.J.
Mr. Brent Beam, Hamilton, Ontario.
Mrs. Gladys Black, Pleasantville, Iowa.
Professor Paul Bosley, Highland Park, Illinois
Dr. Donald Burk, Worthington, Ohio.
Mr. Fairbank Carpenter, Far Hills, N.J.
Mr. Boughton Cobb, Falls Village, Connecticut.
Mr. Jerome C. Draper Jr., San Francisco, California.
Miss Jessie P. Draper, San Rafael, California.
Mr. and Mrs. E.F. Fergus, Lawrence, Kansas.
Mr. Paul Hale, Jeffersonville, Pa.
Mr. Fred Hough, Accord, N.Y.
Mrs. Gertrude Juengel, Hampton, Iowa.
Mr. Matt Limburg, Salt Lake City, Utah.
Mrs. Shirley Kafehl, Cedarburg, Wisconsin.
Mr. Ronald Kaiser, Garnavillo, Iowa.
Mr. Edward Keith, Windsor, Ontario.
Mrs. Richard P. Klein, Geneva, Ohio.
Mr. Steve Lewis, Bradenton, Florida.
Dr. and Mrs. Lester Luxenberg, Tonopah, Arizona.
Mrs. Harriet Marsi, Binghamton, N.Y.
Mr. Roland R. Matson, Minneapolis, Minn.
Mr. Phillip McArdle, Williamsville, N.Y.
Mr. David R. Miner, Barre, Mass.
Mr. Vince Nystrom, Vienna, Va.
Mr. Franz L. Pogge, Morgantown, W. Va.
Mrs. Helen V. Raub, Chatham, N.J.
Mr. Thomas P. Ronan, Fishkill, N.Y.
Mr. and Mrs. John C. Schmid, Greenwich, Conn.
Mrs. Joan Senghas, Mount Clemens, Michigan.
Mr. Prentice K. Stout, Far Hills, N.J.
Mrs. Arthur Welden, New Orleans, La.
Mrs. Maryanne West, Gibson's, B.C.
Mrs. Sterling White, Whitney, Texas.
Mrs. Marie Wren, Fillmore, California.
Mr. David Yurmanovic, Dearborn, Michigan.

TRIBUTE TO MR. COLEMAN

We would like to express our appreciation to Mr. Wm. Coleman, Ranger at Natural Bridges State Park, Santa Cruz, California, for the excellent work he has been doing for the past two years in our program. Mr. Coleman is fortunate to be in an area where monarch butterflies are extremely abundant at certain times of the year, and he has been able to take advantage of this situation because of his remarkable energy and enthusiasm for this research. To date we have sent him approximately 7,000 tags, most of which he has already used, and in addition to this activity, Mr. Coleman has sent us voluminous reports on his tagging and on his observations of monarch butterflies in his area. We now have a great quantity of data as a result of this tagging and some recapture records which are quite unusual. We look forward to analysing these data for a proposed scientific paper about the monarch in the Santa Cruz area.

* * *

PUBLICITY RE TAGGING PROGRAM

Robert Allan of San Juan Capistrano, California and his work with our project was the subject of an article in the "Daily Pilot" August 14, 1970 and of an illustrated article in "The Register" October 25, 1970.

Mrs. Leila Brislin, Tacoma, Washington, sent us a clipping about the recapture of a tagged monarch butterfly from the "Tacoma News Tribune".

A monarch butterfly tagged by David Fagle of Marshalltown, Iowa and recaptured at the local police station was the subject of an illustrated article in the "Marshalltown Times-Republican", September 11, 1970.

David Falk of Wilmington, Delaware, and his family and their tagging at Cape May, N.J. were written up in the "Evening Bulletin" (Philadelphia, Pa.) November 5, 1970.

The names of Mike Hoffman and Gary Mockli of Lakewood, California appeared in a column "Beach Combing" in the "Indiana Press Telegram" in September 1970. The boys are encouraged in their tagging by Gary's father who is a teacher at Downey, California.

An illustrated article about Leone Kessler and her pupil Dawn Conley both of Storm Lake, Iowa, and their butterfly tagging club was published in an Iowa newspaper. The club, organized by Leone has Dawn as its president.

Mrs. Harriet Marsi of Binghamton, N.Y. told us of plans for a monarch exhibit at the local museum - Roberson Center for Art and Sciences in the fall of 1970.

"Action Express" column of the "Chicago Tribune" July 26, 1970 carried an article about a Tiger Swallowtail that was tagged by Robin Renner of Chicago, Illinois.

Dr. and Mrs. Ray Reuter of Bradenton, Florida and their intensive tagging of monarchs in Florida appeared in a column in the "Sarasota Herald-Tribune", in the fall of 1970.

The "Des Moines Sunday Register" carried a profusely illustrated article about the monarch butterfly research done by Paulette Samuelson and her sisters, Shelley and Brenda all of Pleasantville, Iowa. The girls have been greatly encouraged in their work by Mrs. Gladys Black.

"The Cobourg Sentinel-Star", Cobourg, Ontario, of November 25, 1970 carried a story of a monarch butterfly tagged by Audrey Wilson of Cobourg, (our Newsletter Editor) which was taken to Mexico on a jet airplane since its chances of survival were nil in the cold weather.

* * *

PRIZES AND AWARDS

We would like to congratulate the following on their achievements:

Charles Lipscomb of San Antonio, Texas entered his butterfly collection in an Optimist Club Hobby Show and won a \$50 gift certificate with which he obtained a telephoto lens for his camera.

Kristin Moyes of Ogden, Utah, received an "A" grade for her report "Tagging and Migration of the Monarch Butterfly" presented at Weber State College Science Fair.

Robin Renner of Chicago, Illinois won second place at her school science fair with her exhibit, "Migration of the Monarch Butterfly".

Lee Sheppard and Mary Sheppard of St. Paul, Minnesota, each received a purple ribbon for their entries on entomology, at the Ramsey County Fair. This was reported in the "St. Paul Pioneer Press".

Jimmie Stephens of Enon, Ohio, entered a science fair project on monarch butterflies and received a "superior" rating at his local school, at the high school competition and county fair, and an "excellent rating" at the district science fair (comprising eleven counties).

* * *

TRANSFER OF LIVE BUTTERFLIES

This year we again encouraged our associates to transfer live monarch butterflies to the southern parts of the United States in order to increase the chances of specimens being recaptured when they are well on their way in the southward migration.

This effort requires a great deal of coordination, involving long distance telephone calls, telegrams and letters in order to get those who have monarch butterflies to send coordinated with those who are prepared to receive them and release them. The timing involved is crucial, as the live butterflies must be carefully packaged and mailed at a certain time, notification must be sent to the receiver who must be available to receive, release and record the transferred butterflies.

We would like to thank the following for their cooperation in the transfer experiments: Lloyd Beamer of Meadford, Ontario to Mr. Carlton McQueen of Mercedes, Texas.

Mrs. Helen Ochs of Columbus, Indiana to Mrs. Sybil Mayberry of Eagle Pass, Texas.

Mr. Franz Pogge of Morgantown, W. Va. to Mrs. Sybil Mayberry of Eagle Pass, Texas.

Mr. Joseph Moss to Mr. Carlton McQueen of Mercedes, Texas.

Mr. Bill DuFour of El Cerrito, California to Mr. C. McQueen of Mercedes, Texas.

* * *

FLORIDA MONARCH

Dr. and Mrs. Reuter of Bradenton, Florida, had written to us on a number of occasions informing us that the monarch butterfly could be found in Florida in all stages of development throughout the winter months. This was a marked contradiction to the reports that had been received previously. As in southern California, we were faced with the possibility of two distinct races of monarchs, one of which migrated and the other did not. However, we had found in our laboratory studies that if the monarchs were reared in the laboratory at room temperature, without having been subjected to low temperatures, they would breed throughout the year. We are now of the opinion that what we are experiencing in Florida is a physiological differentiation in which monarchs, in the larval stage, having been subjected to low temperature will enter an ovarian dormancy period and become migrants while those that have not experienced low temperature will not do so.

We are hoping to analyze the great mass of data that has been accumulated over the years by Dr. and Mrs. Reuter and, if as a result of our study, there does seem to be a real significance, we hope to present the results for publication with due recognition to the fine work that has been carried out by the Reuters.

* * *

IN MEMORIAM

We deeply regret to report the death of our associate Dr. Ray Reuter of Bradenton, Florida. We had the very great pleasure of joining Dr. and Mrs. Reuter in their field studies during the winter of 1969, a trip we shall always remember with tremendous pleasure. As a result of the work which Dr. and Mrs. Reuter have carried out in Florida, we now have a much clearer idea of the populations of monarch butterflies in Florida and, after a second visit, which we are planning for the Fall of 1971, we hope to present a science article for publication. Mrs. Reuter continues her interest in this study and we are looking forward to working with her.

AUSTRALIAN MONARCHS

We have finally received all of the tagging data for Australia. When we have completed two science papers, the data for which are now being analyzed, we hope to commence a study of the Australian monarchs. This should be a most fascinating study because we have a North American species, the Monarch butterfly, which is a migrant, being transferred to a large island, Australia, which lies south of the equator - this posing a bit of a problem to the monarchs as to whether or not they migrate and if they do in what direction will they travel and at what time of the year? We are looking forward to studying these data and will report to you on our findings either in published form or in next year's Newsletter.

* * *

MONARCHS IN MEXICO AND CENTRAL AMERICA

Based on observations and returns of tagged specimens from Central Mexico we now believe that the monarch butterfly in its annual migrations fly as far as southern Mexico and Central America. However, so far we have no definitive data upon which to write an accurate scientific report and our conclusions are therefore purely conjectural. Further evidence to substantiate our conclusions is the presence of the monarch butterfly (*D. plexippus*) in southern Mexico and Central America during the period when they are absent in the northern parts of North America and vice versa. But we need to have members of the population in Mexico and Central America tagged so that we can say with a good deal of certainty that they do move from one area to the other. It is necessary, in this study, to bear in mind that there are populations of monarchs, such as those in the southern parts of California and Florida, that breed throughout the winter months and do not seem to take part in long migratory flights. Perhaps this is the case in Mexico and Central America. To add to the complications, there is a South American sub-species, *Danaus plexippus megalippe* that may be present in these areas and perhaps inter-breeds with the North American *plexippus*. We do not know if *Danaus p. megalippe* migrates or not since there have been no studies of this sub-species carried out.

With the assistance of the Smithsonian Institution in Washington, D.C. we have been able to make a number of excellent contacts in parts of Mexico and Central America and we are looking forward to considerable activity in these areas in the years ahead. Somewhere in Mexico and Central America there must be many millions of monarch butterflies over-wintering since we now know that they leave the United States and Canada and travel in this direction and from personal observations through Mexico we are convinced that they are absent from most parts of Mexico during the winter season.

We have written a semi-popular article on the migrations of the monarch butterfly which, thanks to the kindness of Mr. Jorge A. Ibarra, Director of the Museo Nacional De Historia Natural in Guatemala, will be published in the magazine "Historia Natural Y Pro Natura". Mr. Ibarra's sons are taking part in the tagging program. We are hoping that as a result of this article we will be able to add many more associates in this area.

Sara Annon and Mrs. Olivia Annon of Oaxaca, Mexico, and other members of the Annon family, have been most active in studying the monarch butterflies in their area and tagging them. With such enthusiastic assistance it will not take us long to add to our knowledge of the monarch butterflies in their over-wintering grounds and to fit this piece into the mass of data we have now accumulated.

The following are now assisting us in various ways with our initial studies of the monarch butterfly in Mexico and Central America:

Dr. Arthur E. Dammann, Virgin Islands Ecological Research Station,
Lameshore Bay.

Jorge A. Ibarra, Museo Nacional de Historia Natural, Guatamala.

Eugene S. Merton, Smithsonian Tropical Research Institute, Balboa,
Canal Zone.

Professor Gladys Leon Quant, Universidad Nacional Autonoma de Nicaragua,
Leon, Nicaragua.

Professor G.F. De Stefano, Universidad Nacional Autonoma de Nicaragua,
Leon, Nicaragua.

Ing. Juan J. Rodriquez B., Centre Experimental Agropecuario, Managua,
Nicaragua.

J. G. Viramone, Ministerio de Economia Industria Y Commercio, Managua,
Nicaragua.

Carlos Valerio, Limon, Costa Rica.

* * *

CONTACTS NEEDED

We hope that from this nucleus of associates that we will eventually build up a strong and active associate group in Mexico and Central America as well as the off-shore islands. If you know of anyone in Mexico or Central America we may contact, either to join our research group or to advise us on possible contacts, please write and give us the names and addresses. We would be pleased to send you carbon copies and xerox of replies if you so desire.

* * *

LABORATORY INVESTIGATIONS

Our laboratory experiments have been most successful. No doubt you have often wondered whether or not the "gold spots" on the pupa of the monarch butterfly were purely ornamental or whether they performed a real function. At one time we thought that they were photoreceptors, recording the amount and intensity of light, and that perhaps this factor had something to do with the emergence of the adult butterfly. This is what was stated in "The Monarch Butterfly" book. Much to our surprise we have found that these attractive gold spots control the size and colour of the scales on the wings and body of the adult. We have written up the results and submitted our paper for publication

in "The Journal of Research on the Lepidoptera". When this paper is printed, there will be only a limited supply due to the fact that the colour plates cannot be xeroxed.

We have also concluded our study of the cell structure of the gold spots and we hope to submit our findings, including electron photographs, to the Journal in the near future.

We have completed our study of the wing gland and it is now a matter of arranging the data for submission to a Journal.

In all it has been a most successful year in so far as learning more about the many interesting facets in the life of the monarch butterfly, an interest in which we all share the final results.

* * *

THE MONARCH BUTTERFLY BOOK

The Monarch Butterfly Book is now available to our Associates at a 10% discount. The book is priced at \$3.95. Cost to our Associates is \$3.50. This book of 360 pages is illustrated in colour and black and white. It is the basis for all of our studies on the monarch butterfly. Since the proceeds from the sale of the book go to our research fund, please make the cheque payable to the University of Toronto, Invertebrate Migration Research Fund.

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MONARCH BUTTERFLY SLIDES FOR RENT OR SALE

Many of our research associates have enjoyed showing the set of 24 kodachrome slides depicting the life history of the monarch butterfly to students and friends.

If you wish to rent a set of these slides, please send \$2.00 and we shall send them to you. If you then wish to purchase any of them, the charge is \$5.00 per slide if they are for your own personal use. If, however, the slides are to be used for commercial purposes, such as in books or articles, the charge is \$25.00 per slide; the proceeds are deposited in our research fund.

These slides are of excellent quality as they were selected from hundreds of slides made by professional nature photographers.

* * *

PUBLICATIONS FREE TO OUR ASSOCIATES

We are a sort of family group of researchers in which we enjoy finding out as much as we can about this amazing little insect and sharing our results and pleasures. One of the ways we share, from the scientific point of view, is in the final publication of the results of our efforts. THESE ARE FREE TO ALL OF OUR ASSOCIATES,

the cost of publications being included in the annual fee. It has been our feeling that since we share in obtaining the data we should share in the results. We do not send our copies of the science papers without a request since some of our associates are not interested in such publications. If you wish copies please write and let us know. The following is a list of the papers now available to you:

AUTUMNAL MOVEMENT

A STUDY OF THE MONARCH POPULATION IN NORTHERN CALIFORNIA

GULF COAST MONARCH MIGRATIONS

A VIRUS EPIZOOTIC (A study of the virus that is responsible for the monarch cycles)

LABORATORY TECHNIQUES IN RAISING MONARCH BUTTERFLIES

MICROCAUTERIZATION (A method now used to study the gold spots on the monarch pupa)

FLUCTUATIONS IN THE NUMBERS OF MONARCH BUTTERFLIES IN NORTH AMERICA

A CONTINUOUSLY BREEDING POPULATION OF MONARCH BUTTERFLIES IN SOUTHERN CALIFORNIA

THE METHOD OF CREMASTER WITHDRAWAL IN THE PUPA OF THE MONARCH BUTTERFLY.

* * *

SPECIAL NOTE RE PUBLICATION

Mr. Francis Munger who is a research associate of Whittier College, Whittier, California, has kindly given permission for us to distribute, on request, his paper "Laboratory Production of the Monarch Butterfly" which was published in "Journal of Research on the Lepidoptera".

If you wish to have a copy of this paper, please send your request to Dr. Urquhart at Scarborough College.

* * *

RENEWAL FEE

Your renewal fee is due each year when you receive your Newsletter for that year. Please fill in the sheet and send it in with your fee and request for tags - if you need a supply.

SPECIAL NOTE: Many of you have already paid your fee for 1971 which we have recorded. If you have, just fill in renewal form - "Fee already paid".

* * *

NOTE RE INCREASED RENEWAL FEE

You will note, on the Renewal Form for 1971 that the renewal fee has been increased to \$3.65. This is due to the fact that last year the costs of printing this Newsletter rose significantly, partly because of the increased size of the Newsletter.

In addition to this our mailing costs have risen due to our correspondence with individuals in Mexico and Central America where postal rates are higher than in Canada and the U.S., and to the rise in the cost of transferring specimens in special containers.

* * *

PAYMENT OF RENEWAL FEES BY CHEQUE

We have been informed by the accountant's office of the University of Toronto that it is no longer necessary to mark your cheques for the renewal fee "Payable in Canadian funds". Henceforth please make your cheques payable in U.S. funds.

Special Note

In some cases associates have discovered that payment of the renewal fee by cheque involves extra expense. Please consult your bank re the charges involved if you are in doubt re the cost of the cheque.

* * *

MEMBERSHIP for 1971

RENEWAL FORM

If you wish to continue as a research associate in the study of insect migration, please fill out the following form and send it to:-

Professor F. Urquhart,
Scarborough College,
University of Toronto,
West Hill, 483, Ontario, Canada.

Please enclose your renewal fee of \$3.65. Make cheques or money orders payable to the University of Toronto, Insect Migration Research.

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