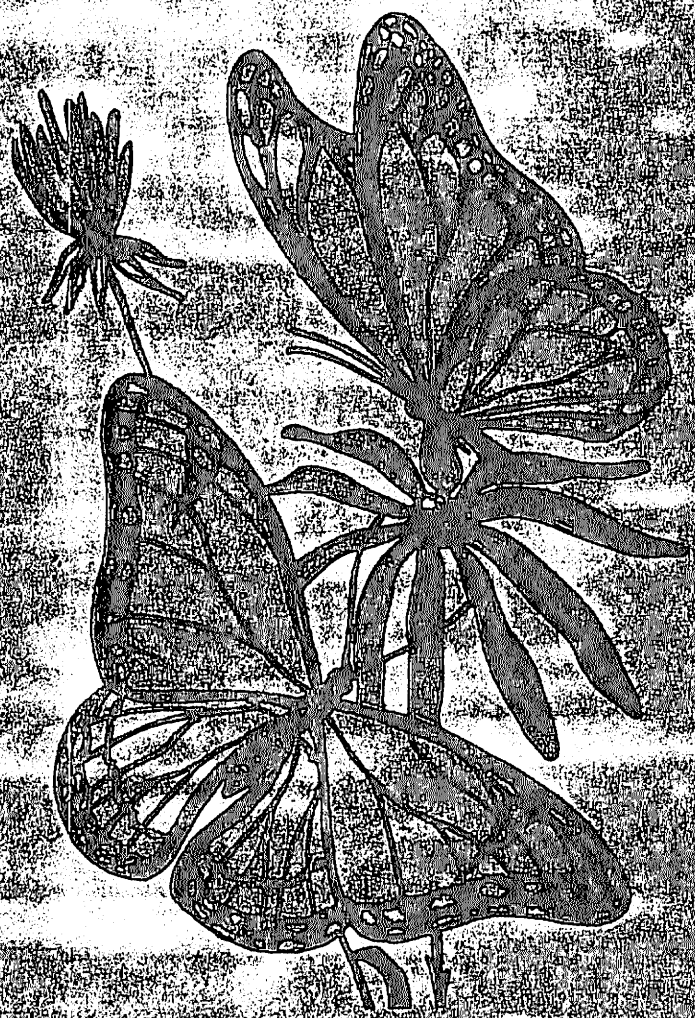
INSECT MIGRATION STUDIES

Volume 28 1991



Annual Report

UNIVERSITY OF TORONTO, SCARBOROUGH CAMPUS

Annual Report to Research Associates

Insect Migration Association

1991

UNIVERSITY OF TORONTO SCARBOROUGH CAMPUS

Scarborough Ontario Canada M1C 1A4

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TO THE ASSOCIATES

Fred and Norah Urquhart

Long Term Resarch Financing: One of the many difficulties scientists experience when working on a project euphemistically referred to as "pure research"(meaning of no direct economic value) is that of obtaining funds.

For many years we submitted applications to the Canadian government for funds sufficient to support our studies of the migration and other biological factors in the life of the monarch butterfly. We filled out lengthy forms that required a considerable amount of abtruse information: The nature of the research in detail; its importance in the field of biological science; the applicant's qualifications; a list of the applicants publications that have appeared in "reputable journals"; the amount requested broken down into a number of categories; stipends for assistants or graduate students; referees familiar with your previous work; etc. etc. etc.

Such request forms were submitted to the government department concerned which department passed it on to an examining committee composed of biologists the members of which may or may not be familiar with the nature of the research or the applicants expertise. Depending upon the amount of money available one might receive a small amount - never as much as requested - or no grant. The amount granted had to be spent within the grant year. Thus, no amount could be carried over for continuing research. In some cases grants were given for more than one year; we were never that fortunate with regards to our request for research on the monarch butterfly. Requests for a continuing grant or sufficent amounts were given better notice to those involved in bird migration because of the interest on the part of hunters and naturalists in this particular group of animals. We were eventually able to overcome these difficulties.

In order to study the annual movements of any migrating animal it is necessary to have a continuous flow of financial assistance. If one receives a grant one year and cancelled the following year the study is completely stymied. This difficulty was solved by our Associates who, in addition to carrying out an alar tagging program and submitting field observations, also donated amounts held in trust by the University of Toronto, Ontario, Canada. Such a continual flow of financial assistance year after year made it possible for a continuing research program.

As a result of the increased amount of alar tagging on the part of the Associates more recaptured specimens were submitted. This allowed the plotting of tentative migratory routes on our large wall map. It was obvious that field expeditions were necessary following these tentative migratory routes. But the cost of such field expedittions was beyond the amounts donated by the Associates. The first expeditions were financed out of our personal income. However, further expeditions over longer distances and for longer periods of time were necessary at considerable cost.

Norah and I have often speculated on what might have happened had not a youg lad, one of our early Associates, come to our assistance. His name was Steven Auburn. He lived in Rochester, New York. He took it upon himself to write to the National Geographic Society describing the monarch project and asking them to become involved. As a result, we received a letter from the Secretary of the Committee on Research and Exploration of the National Geographic Society expressing their interest in the project. An application form was enclosed. In due course we received a cheque, payable to the University of Toronto, for the entire amount requested. This was repeated for a number of years covering all our field expenses. We also received an amount to cover the expenses, with the addition of a stipend, for our field assistant, Keneth Bruger and later also his wife, Cathy. The generosity of the National Geographic Society finally made it possible for us to locate the overwintering site in Mexico at Angangueo. We wrote an article about this momentous discovery which was published in the 1976 August issue of the National Geographic Magazine.

In addition to following the movements of the monarch butterfly, with considerable accuracy thanks to the combined efforts of the members of the IMA,the Associates have also been involved in related efforts: Students in primary and secondary schools study the monarch butterfly as part of their science courses as well as taking part in the tagging program; numerous articles have appeared in magazines and newspapers - our files contain over 4000 such articles; the Associates have appeared on television programs; many Associates have given lectures to schools and lay audiences. This has brought the monarch butterfly to the attention of the public thus assuring the protection of this amazine little insect. Its popularity, thanks to our combined efforts, has lead to its now being considered as the United States National Insect.

There are still many unknowns in the migration pattern,as described in another article. We still do not know the relationship of the areas where breeding took place and the distribution of the overwintering clusters in the various loci. We still look forward to an alar tagged monarch returning in the spring to the area where it spent its larval existence - we have indications that they do so as explained in the "Monarch Butterfly-International Traveller".Our combined efforts will, I am certain, eventually answersuch questions.

RECAPTURE RECORDS FOR 1990

During the season of 1990 we received many interesting letters letting us know the numbers on the tags of recaptured monarch butterflies. In many cases the numbers on the tags were noted and relayed to us and the butterfly was able to continue its flight.

This past year for the first time we have noted a sharp increase in the number of reports that we received by long distance telephone. We had calls from several different states and the callers' voices had an interesting variety of accents.

We cannot accept as valid tagged butterflies that are reported as being stuck to the grill of a car or truck since we have no idea of the location where the butterfly was picked up. Therefore regretfully, we cannot publish some reports which are interesting but cannot be verified.

In the case of the observation of a tagged butterfly that arrives by letter, we send the associate who tagged it a photocopy of the letter. In the case of a telephoned report a form letter has to suffice.

Listed below are all of the recapture records that could be verified.

ASSOCIATE	TAGGED AT	RECAPTURED AT
Cheryl Bandal	Andover,Mn.	Acambaro,Guanjuato, Mexico
Dale Clark	Dallas,Tx.	Dallas,Tx.
" "	Mesquite,Tx.	Tyler,Tx.
" "	Dallas,Tx.	El Rosario,Michoacan,Mexico
" "	Mesquite,Tx.	" " " "
Kevin DenBoer	Grandville,Mich.	Jefferson City,Mo.
Mary Henshall	Nampa,Id.	Nampa,Id.
Marion Hill	Lyndhurst,N.J.	Lyndhurst,N.J.
Lorett Hogg	Mayfield Hts.,Oh.	Mayfield Hts.,Oh.
Alta Horr	Dunbar,Ne.	El Campario, Michoacan,Mexico
" "	" "	Sierra Chincua, " "
Lorraine&Harvey Houck	Decorah, Ia.	Sedalia, Mo.
Donna Kessler	Iowa City,Ia.	Iowa City,Ia.
James Kupcho	Linden,N.J.	Linden,N.J.
KirkLarsen	Wooster,Oh.	Sierra Chincua,Michoacan,Mexico
Fran Ludwig	Lexington,Ma.	Somerville,Ma.
Monarca A.C.	El Rosario,Mich,Mex.	Ocampo, Michoacan,Mexico
" "	" " "	" " "
Earle Post	W.Milford,N.J.	Ringwood,N.J.
Doris Stifel	Maumee Bay St.Pk.,Oh.	Chana,Ill.

recapture records cont'd

RECAPTURES cont'd

Doris Stifel	Maumee Bay St.Pk.,Oh.	Toledo,Oh.
" "	" " " " "	" "
" "	" " " " "	Oregon,Oh.
Faye Sutherland	Boise,Id.	Boise,Id.
" "	" "	" "
" "	" "	10 miles S/W of Boise,Id.
Bill Thomas	Springfield,Mo.	Clarksville,Ark.
Larry Totton	Granger,Ia.	Underwood,Ia.
" "	" "	Sierra Chincua,Michoacan,Mexico
Larry Wade	Chanhassen,Mn.	Minneapolis,Mn.

CHILDREN HELP WITH COLLECTING MONARCHS

Since Marion Smith could find few monarchs at her farm in Lyndonville,N.Y. she writes that she enlisted the help of local children. "One eager nine year old" girl caught some monarchs which Marion tagged. Then she and her young friends searched surrounding fields and found over 50 eggs and small larvae. At the suggestion of the children's science teacher, they visited Marion's arboretum where she demonstrated how the tagging is done.

FAYE SUTHERLAND"S STUDENT WINS JEFFERSON AWARD

Jenny Bell, a student of Faye Sutherland in Boise,Idaho was given the newly established Jefferson Award for elementary school students for her efforts in writing letters to authorities and friends of the monarch in Pacific Grove, California in order to influence them to raise a public levy to purchase a piece of land where monarch butterfly roosting trees are located.

The award consisted of an all expenses paid trip to Washington,D.C. for Jenny and her two companions where she will receive the award.

Since Faye has worked very hard to help save the roosting trees for the monarch butterflies in Pacific Grove, we feel that she,too,should be congratulated for her efforts.

SIGHTING OF SPRING MIGRANTS

We are fortunate this year to have many reports from associates who have been on the alert for the sight of the first monarch butterfly of the season. Always a welcome sight after a long hard winter, it is a pleasure to be able to identify a flicker of orange wings that heralds the beginning of another season for studying this intriguing insect.

Cheryl Bandal	Brownsville,Tx.	March 13/90
Dale Clark	Dallas,Tx.	March 17/90
*Steve Lee	Phoenix, Ar.	April 12/90
Bill Thomas	Springfield, Mo.	April 14/90
Darlene Bamman	Jacksonville,Mo.	April 26/90
Steve Lee,	Waynesville,Oh.	April 26/90
Doris Stifel	Crane Creek, Oh.	April 29/90
Alta Horr	Dunbar, Ne.	May 6/90
Pearl Eslinger	Terre Haute, In.	May 18/90
*Paul Foster	Idaho Falls,Id.	May 21/90
Cele Burnett	Story County, Ia.	May 22/90
Margaret Elliott	Muskegon,Mich.	May 24/90
Debbie Knutson	Fence Wi.	June 8/90
Dick Nikolai	Appleton,Wi.	June 12/90
Jean Doughty	Clarion,Pa.	July 8/90
Dorothy Hoskins	W.Dennis,Ma.	July 11/90
Joan Senghas	New Baltimore, Mich.	August 1/90

*Western population of monarch butterflies.

FIRST EGGS OF MONARCHS OBSERVED

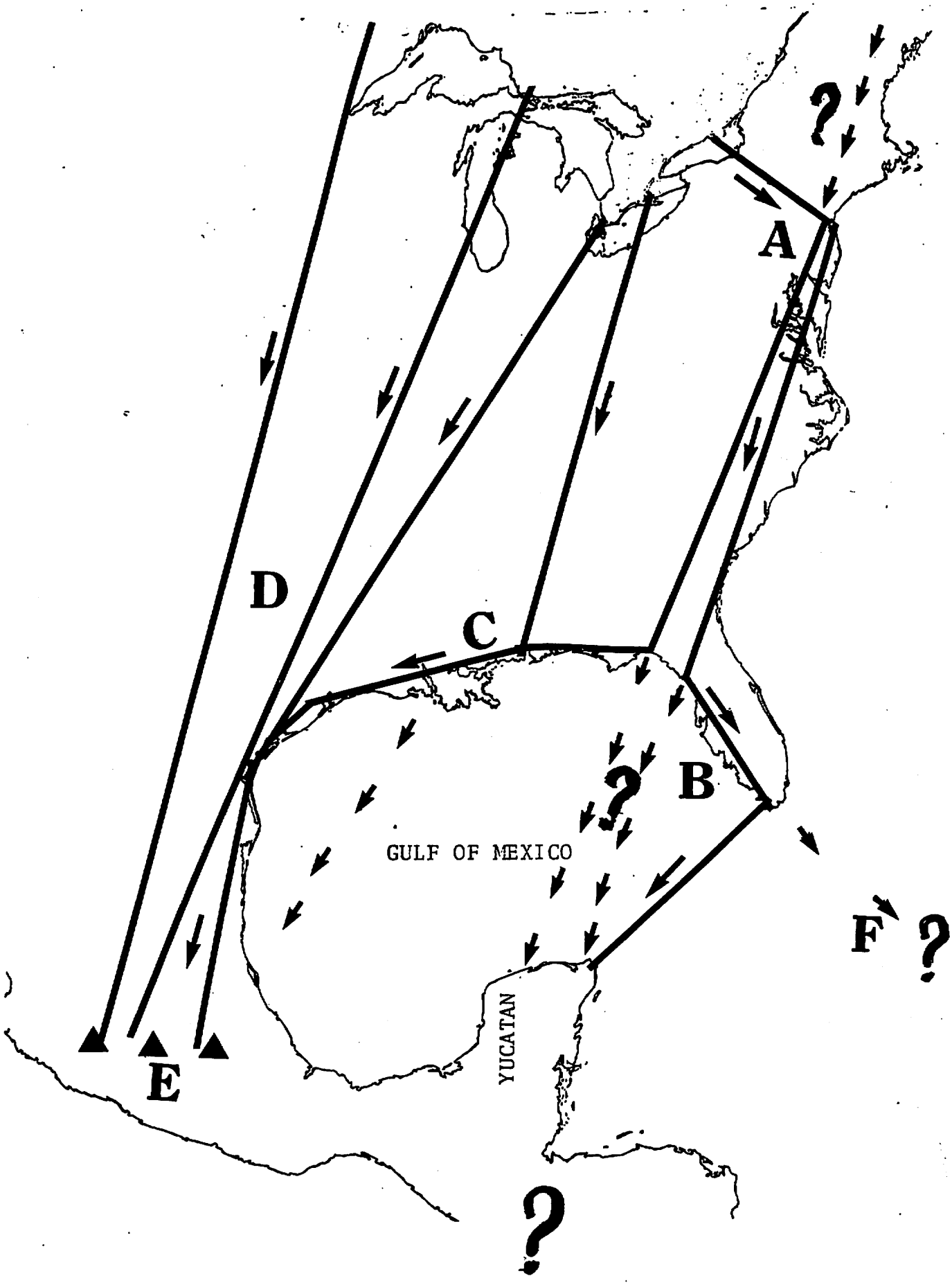
Dale Clark	Dallas,Tx.	March 22/90
Pearl Eslinger	Terre Haute,In.	May 24/90
Greg&Kari Keller	St.Paul,Mn.	June 11/90

FIRST LARVAE OF MONARCHS OBSERVED

Pearl Eslinger	Terre Haute, In.	May 27/90
Greg&Kari Keller	St.Paul,Mn.	June 17/90
Jean Doughty	Clarion,Pa.	July 8/90
Marion Smith	Lyndonville,N.Y.	first week of August/90

FIRST CHRYSALIS OF MONARCHS OBSERVED

Pearl Eslinger	Terre Haute,In,	June 15/90


A
B
C
D
E
F
?
?
?
?
GULF OF MEXICO
YUCATAN

MIGRATION QUESTIONS STILL TO BE ANSWERED

Refer to the accompanying diagram: Although the migration routes to the mountains in Mexico (E) from the western parts of the United States and,to a lesser extent Canada (D), are well documented by recaptured specimens, migratory routes from other parts of the continent are not. Migrations from the Great Lakes region and central-eastern United States appear to move southward to the Gulf of Mexico, thence along the shore (C).There is a possibility that many migrants move across the western end of the Gulf although we have no records of this-either sight or recaptures.

Migrants from the northeastern parts of the United States (particularly the New England States) appear to follow the Atlantic coast to the Gulf of Mexico and thence along the west coast of Florida to Cuba (B) and finally to Yucatan. One of our early Associates reported, year after year, trees laden with monarchs on overnight roosting trees in Cuba (B). From Cuba they then travel to Yucatan. Norah and I stood on the northern shore of Yucatan, Mexico, and watched migrants flying in from the Atlantic ocean. We have been unable to obtain any recaptures to validate this migration route. There is the possibility that they cross the Gulf of Mexico (B).

Sight records of a few monarchs would indicate a slight movement from Florida to the eastern parts of Cuba and thence to Jamaica (F). The occasional migrant has been seen and specimens collected and sent to us from Haiti; we believe that this is an aberrant record caused by strong westerly winds.

So far we have not had reported a tagged monarch which has made the complete trip from the place where it spent its larval period, to the overwintering site and back again.We look forward to scuch a record as a real possibiity.

Perhaps continued alar tagging will provide definitive answers to the above unknowns.

WHO FIRST SAW THE OVERWINTERING MONARCHS IN MEXICO?

Norah and I were attending a symposium on insect behaviour held in the city of Montreal,Quebec, Canada. I was one of the speakers. When I had concluded my short address a professor from the university addressed the Chairman: "I am surprised, Mr. Chairman, that no one had previously discovered the overwintering site of the monarch butterflies in Mexico," To which I replied rather succinctly:"So - am I." My curt remark was followed by a ripple of laughter from the audience,

We were not the first to see the masses of monarch butterflies on the trees in Mexico. The natives living in nearby towns and villages knew about them. No doubt the Aztecs knew about them - they thought they were the souls of the deceased. Then what did we accomplish for nearly forty years of research?

When I was a young lad interested in collecting insects I saw the monarch butterflies clustered on the branches of trees in our local park. Then they departed. I said to myself:"Where did they go?"

After graduating from the university, I decided to find the answer to this boyhood question, a question that had baffled the minds of zoologists and naturalists for many years. After considerable experimentation with possible ways of marking the migrant monarchs I eventually arrived at the alar tagging method,a method now so familiar to all our Associates and zoologists. This seemingly small invention was to solve the riddle of the migrations of the monarch butterfly. Where did they go when they left the breeding grounds ?Where did they come from when they arrived in Mexico?

War years intervened. I was attached to the Royal Canadian Airforce for over four years. After the cessation of hostilities with Germany, Norah and I were married. We joined forces to solve the riddle of the migrating monarch butterflies. This was the year 1950. In that same year Norah wrote an article about our research and submitted it to the American Museum of Natural History in New York city. It was published in Nature. The Editor added a footnote requesting volunteers to help alar tagging the monarch butterflies. Twelve individuals responded, some of whom are still actively involved. Thus was established the Insect Migration Association (IMA) composed of volunteers termed Research Associates.

To the professor we can now say: No. We were not the first to see the overwintering monarchs in Mexico. But we, the members of the IMA, were able to tell where they came from.

LIGHT AND TEMPERATURE INITIATE MIGRATION

Two factors cause the monarchs to enter the migratory phase: Lowering temperatures and decrease light period. We have carried out a number of experiments in the past dealing with the factors involved in initiating migration. At first we thought, as did most entomologists, that it was entirely the effect of dereasing light period - shorter days. However, we found that if we kept the temperatures high but decreased the light period most of the experimental monarchs did not enter the migratory phase - the latter is a cessation of the development of the reproductive organs in both males and females. If teachers raise monarchs in the classroom where temperatures remain fairly constant and where light period is interrupted by artificial illumination, the lights being turned on in the evening and at night- then the migratory phase will not take place and specimens tagged will not indicate a movement to the south. In our laboratory we were able to keep our experimental stock of monarchs throughout the winter in the larval, pupa and adult stages by controlling the light period and temperature. Therefore, it is important not to raise monarchs under such artifical conditions if you wish them to migrate, Once the pupa stage has been reached light and temperature have no effect, the environmetal factors imping upon the larvae. By keeping larvae in the classroom in all stages, it is possible to have monarchs throughout the winter. If you wish to do so you need to collect a supply of milkweed leaves in the wummer and keep them in your freezer.A discussion of this is contained in my book.

ACCURATE AND PROMPT SUBMISSION OF REPORTS NECESSARY

A research project must be carried out as accurately as possible. In following the movements of a marked animal the records must clearly and accurately show where and when the animal was so identified by tag or other methods. We keep accurate and permanent records of every tag issued. Before we can accurately record all information about a re-captured specimen we must have the accurate report from the associate.Occasionally an Associate fails to submit a report. In this case we send a follow-up letter asking the Associate to send in his or her report or to inform us if the report has been lost in the mail. If we fail to obtain a report then we question the validity of the recapture and "tentatively" show a release-recapture line. It is most disappointing to have a meaningful recapture and no tagging report. Fortunately this is of rare occurrence.This year we had a few significant recaptures with no tagging report.

Occasionally an associate loses his or her tagging report or it is lost in the mail. When you have spent considerable time tagging and recording your tagged specimens, along with observational notes, it is worth while to make a copy of it keeping one in your files and sending us the original.

It is important for you to add up the total number of monarchs tagged and report that in your report. This helps in making our final count of monarchs tagged which we then report in our annual IMS.

LAST MONARCHS OF THE SEASON SIGHTED

*Paul Foster	Idaho Falls,Id.	August 16/90
Arlene Benham	Cambridge,Ont.	October 21/90
Cheryl Benyi	St.Paul,Mn.	October 5/90
Greg&Kari Keller	St.Paul,Mn.	October 5/90
Elaine Warner	Rochester,N.Y.	October 20/90
Pearl Eslinger	Terre Haute,In.	October 23/90
Don Davis	Toronto,Ont.	October 31/90
Dorothy Yeager	Pearsall, Tx.	December 2/90

Note: the above butterflies at Pearsall, Tx. laid eggs which produced larvae by December 18/90.

*Western population of monarch butterflies.

FALL MIGRATION OBSERVATIONS

Blanche Emerson observed the first fall migrants at Dauphin Island, Alabama, on October 10/90. A sparse population of monarchs was still present on November 13/90. She noted a majority of male monarchs.

Dick Nikolai noted that the fall migration was spread out because of a long fall season. This was noted at Appleton, Wisconsin.

Jean Sinclair of Earlysville, Virginia observed,"They arrived in great numbers on September 22/90,suddenly. I have never seen so many in the past ten years. Five or six hanging on one flower spray at one time. I noted that the females were noticeably smaller that the males in a good many instances.

Larry Wade observed,"At Mound ,Minnesota, huge clouds of (monarch) butterflies on aster and goldenrod- more than 500," noted on September 11/90.

Audrey Wilson,Cobourg, Ontario saw monarchs "really late" in October 1990 while she was picking apples.

MISCELLANEOUS OBSERVATIONS

Cheryl Bandal noted that eggs were much more abundant than in 1989 and she witnessed an increase in the population of monarch butterflies.This was at St.Paul, Minnesota.

Margaret Elliott, Muskegon, Michigan reported that monarchs were scarce in her area all summer.

Blanche Emerson observed at Dauphin Island, Alabama during the last three weeks of March a small population of monarchs that looked pale in colour, some were a bit tattered and many were mating.

When Alta Horr and her daughter discovered a roosting place for the fall migration of monarchs she says,"We were in butterfly heaven". The site was a hay field that is never mowed and is surrounded by timber. She adds,"Next year will be a great year. I may not get anything else done".

miscellaneous observations Cont'd

MISCELLANEOUS OBSERVATIONS cont'd

Alta also reported an unusual number of tiny monarchs."They were the size of Viceroys and some even smaller".

Joan Johnson of Winchester, Virginia noted a marked scarcity of monarch butterflies in her area which suffered from a much wetter summer than usual.

Robert McGrath, Smithtown, N.Y. reported unprecedented numbers of monarchs on October 4/90 many of which he was able to tag.

Edmundo F. Thomae D. of Monarca A.C. reported that 3600 monarchs were tagged at El Rosario and Sierra Chincua, Michoacan, Mexico between April 8-11/90, which he remarked was very late for the monarchs to be at the overwintering site.

Edna Sutton, Richland Center, Wisconsin reported that she could not find much milkweed or very many monarchs in her area.

SUGGESTION FOR TAGGING

Wendy Nolin finds that keeping newly emerged monarch butterflies in a covered cage keeps them quiet during the period of 24 hours necessary to allow their wings to dry and harden before they are tagged.

PLEASE KEEP YOUR LEFTOVER TAGS

We would like you to keep any tags that you have left over at the end of the season for use next year.

The reason for this is that the tag numbers that are sent to you are kept on permanent record here at our office and will not be reissued to any one else.

Since the adhesive on the tags is permanent and will remain sticky for many years there should be no problem in their drying out. However, if you live in a dry climate we recommend that you keep them wrapped in plastic film.

When you renew your membership in our group, please list the numbers of your leftover tags so that we may verify the numbers on the tags of recaptured butterflies that are reported to us.

DEFECTIVE TAGS

Although most of the tags that we issue are clearly printed, occasionally some are sent out that do not have clearly printed numbers. This may happen especially where large numbers of tags are issued to one associate.

In any case, please examine your tags carefully before using them in order to be sure that all the numbers are easy to read.

If you have been given any defective tags, please return them to us and we shall send new ones to you.

THE AMAZING WORLD OF INSECTS

To our Teachers: When discussing the life of the monarch butterfly with your students perhaps you might also discuss the importance of insects in our natural world and their importance to man. Such topics as: Insects as pollinators; insects as food for birds, mammals, fish, reptiles and man.

Of over a million kinds of insects that have been described by entomologists and given scientific names only a few of them can be considered as "pests." Can one imagine what kind of world it would be without insects? No other group of animals exist in the number of fascinating and diverse forms of life and structure as do insects. This topic would take many volumes to describe but there are a few common forms that could be used to illustrate such diversity.

I wrote a book entitled "Introducing the Insect" and as I prepared the manuscript I became enthralled at the diversity of life existing among these little six legged creatures. There are many books in libraries written for children and adults. You might introduce your sudents to them.

As I write this little note to our teaching associates I recall one of my lectures. It was the last lecture in the series delivered to students enrolled in a study of Entomology. I entered the classroom armed with a fly swater. At the conclusion of the lecture I stated, in words to this effect: " I sincerely trust that the next time you see an insect crawling on your floor or your desk top that you will take time to look at it and marvel at its unique structure before killing it." And with that I gazed fixedly at the surface of the lectern, as if examining some strange creature. There was a deep silence as the students wondered what I was doing. Then I lifed my fly swaters and brought it down with a resounding SMACK as if to squash what I was looking at. The class broke into a thunderous laughter. I made my point.

It is most unfortunate that insecticides are used so indiscriminately not only killing the "pest" but all insects within range of the poison dust or spray not to mention the direct effect on humans as the fumes are inhaled or the poison entering our bodies from fruit and vegetables covered with the insecticides,not to omit poluting our streams, lakes and ground water. But until other methods of control are found we must, I suppose, learn to live with it or die because of it.

POPULATION 1990

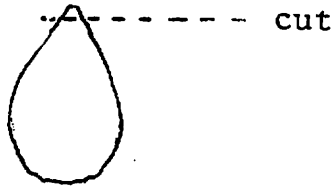
Unfortunately it is not possible to plot a population chart since so few questionnaires were submitted. However from the few questionnaires received and from letters , it would appear that there was an increase in population density in most parts of the United States and a drop in eastern Canada. There were very few reports of any heavy infestations of tachinid flies or polyhedrosis virus.

GROWING MILKWEED PLANTS FROM SEED

Some of the Associates have written to us concerning the difficulties they are having in germinating milkweed seeds. The following is a method to overcome this difficulty and at the same time introduce students to an experimental control method.

Many kinds of seeds have tough outer cellulose coverings or husks that inhibit water penetration. This allows for seeds to remain dormant for considerable lengths of time - years in some cases. Seeds taken from the same plant will not germinate at precisely the same time interval so there are always a few seeds ready to take over if something should happen to the plants. This is apparently due to variations in the thickness of the husks or perhaps different biochemical properties. Gardeners and farmers are aware of this variation in germination. A farmer once remarked to me:"One year's seeds; seven years weeds." Horsemen are aware that whole oats given to horses pass throught the alimentary tract without digestion. So the oats are slightly crushed- rolled or crimped - to break the husks thus allowing the penetration of digestive enzymes. This variation in time of germination is of considerable benefit to plants since it allows the plants to survive unfavourable climatic conditions.

In order to overcome this difficulty in the case of milkweed seeds, cut a very small piece from the narrow, beak-like end of the seed.



This can be done using a sharp knife or razor blade. Place the seeds in a plastic container on pieces of damp paper, such as paper towel. Keep the lids on to reduce evaporation.

Clasroom Experiment: To illustrate the above, students can perform the following controlled experiment: Divide a number of milkweed seeds into two separate groups of equal numbers. Place one group, with husks intact, in one plastic container marked "control." Place the other group with small pieces of the beak removed in a second container marked "experiment." In a note book record the nature of the experiment; mark the date and time when the experiment was set up. Each day at the same time examine the two groups of seeds recording the number of seeds germinated or not germinated. Seeds that have germinated may be removed and placed in soil contained in flower pots and held on a window ledge to observe the growth of the milkweed plants.

This simple experiment will not only augment the teacher's discussion but will also introduce the students to experimental method. Unused seeds may be held until the following year and the experiment repeated to investigate if seeds held over for a year germinate as well as fresh seeds. Seeds may be kept for any number of years to investigate the effect of long time storage.

UNITED STATES NATIONAL INSECT

The following is an excerpt from "Nesta Reports" of the National Science Teachers Association.

"At its January meeting, the NSTA Board of Directors unanimously endorsed a resolution, entered into the House of Representatives by Leon Panetta (D-Calif.), that would designate the monarch butterfly as the national insect."

"You can join the campaign to designate the monarch as the national insect. Write to your state's representatives and request that they volunteer to become cosponsors of the resolution (H.J. RES, 411) and that they vote for the resolution.

"Involve your students by making this effort a class project. Students also can write to members of Congress ....."

Hans Andersen,
Indiana University

LARVAL CANNIBALISM

We have received reports concerning larval cannibalism. This occurs when too many larvae are housed in a small space, especially in the absence of a sufficient supply of milkweed leaves. Larvae will attack other larvae and pupae causing the death of the former and distortion of the latter.

It is interesting to note that at first the cannibal larva feeds on the newly produced faeces as it issues from the cloacal opening; then progresses to devour the larva hind end first. Pupae are attacked when they are in the prepupa stage, shortly after the larval skin has been shed and the pupa is in a soft, somewhat spongy condition.

To prevent such occurrences, overcrowding should be avoided. It is not a natural habit.

THE MONARCH BUTTERFLY: INTERNATIONAL TRAVELLER

If you wish an autographed copy of the above book send a cheque payable to me for the sum of $42.95 ($39.95 + $3.00 postage). Please make payment in U.S. funds.

SPECIAL ACTIVITIES OF ASSOCIATES

It is always gratifying to learn of the many different kinds of activities and contacts that our associates are involved in with respect to the study of the monarch butterfly. The enthusiasm and energy that our associates devote to this research is quite amazing, and seems to increase with each passing year.

Listed below are some of the special activities our associates took part in during the past year.

Cheryl Benyi says that she is excited about the possibility of the monarch butterfly being declared the national insect for the U.S.A. In this connection she had all of her students and students of other teachers write to their Congressmen supporting this proposal.

Cele Burnett says"We perform the taggings as part of our field trip to study prairies and insects. We tag the monarchs to demonstrate the importance of this international research program to our students."

Janet Grew has established an area to attract butterflies and has enlarged the milkweed patch in her garden. She also held a Butterfly Festival.

Lorraine Houck gave a talk and demonstration to two third grade classes about tagging monarch butterflies.

Greg and Kari Keller sent us a diagram of an ingenious screened cage for rearing butterflies. After use, the cage separates into panels for easy storage.

Donna Kessler made several trips to local communities to talk about monarch butterflies to many classes in different schools. Donaa says,"This is my donation to the communities to help cultivate their appreciation of the wonders of nature."
Donna took one of her pupae on a trip and released the butterfly at her destination. She also sent a pattern for a fabric butterfly.

Lee Zieke-Lee visited a third grade class and banded the monarch butterflies that the students had raised.

Chris Leslie, a student of Kay Dreyer, was interviewed ona radio program about his interest in the monarch butterfly.

Marion Lopina in addition to teaching about the monarch butterfly at her school, presented programs at two other schools as well as a class on "Butterfly Gardening".

Patricia Lovallo of Rochester,N.Y. mailed pupae to her sister-in-law, a teacher in Buffalo,N.Y. who distributed them among the classes and reported that the butterfly hatchings were a great success.
Patricia also helped another teacher to find larvae in a field where she was searching for them herself. She enjoyed meeting a Rochester family who brought butterflies for her to tag.

- activities Cont'd

ACTIVITIES cont'd.

Jodi Newton and Martin McAllister made a concerted effort to carry on their tagging despite the disruption involved in moving their residence from Oxford to Rarden,Ohio.

Tami Nielsen featured a display of live monarch butterflies on flowers in glass containers at her wedding in the summer of 1990.

Janie O'Connor-Conlon sent us a long letter detailing the reactions of people to whom she had given pupae of the monarch buterfly so that they could witness the emergence of the butterfly. Her graphic descriptions are a tribute not only to her interest in the monarch but illustrate the depth of emotion that this event evokes.

Joan Scancarelli sent us a calendar showing a different picture of the monareh butterfly and its development for each month of the year.

Jane Seibel who teaches grade 5 and 6 classes sent pictures of students excitedly watching the "launch" of a tagged monarch butterfly. Jane takes a picture of each student with the butterfly.

Faye Sutherland of Boise,Idaho had her students write on November 19,1990 to authorities and friends of the monarch in Pacific Grove, California thanking them for encouraging the city to pass legislation to buy a threatened monarch habitat.
Faye also gave eggs to many people to encourage them to raise monarch butterflies.

Bev Thames had her students write to the authorities in Bay City,Texas to urge them to preserve the local milkweed stands and as a result some of the milkweed will now be protected against spraying and destruction.

Bill Thomas held a talk and demonstration at Springfield(Missouri) Nature re tagging monarch butterflies which was titled,'Monarchs of the Ozarks".

Sylvia Thompson writes,"I have completed another season of rewarding and fascinating observations of the metamorphosis of the monarch. I have written a short play and created a group of felt puppets to tell the life story of the monarch to 4 classes (60 children, ages 4and 5) of nursery children that I teach.

Judy Van Hook's butterfly garden was visited on a field trip by students of West Bloomfield Schools as a supplement to their science program.
Judy also distributed milkweed plants to students with instructions for growing it as food for the monarch butterfly.
Judy also influenced many people to write to their Congressmen in favour of making the monarch butterfly the national insect for the U.S.A. of these Irene Van hook's teacher was one who wrote in this connection.

SPECIAL DONORS

Our associates demonstrate their interest in this research by supporting it with donations which help cover the cost of tags, instructions, photocopying clerical assistance, the annual report and mailing expenses. Some associates increase thier donation above the suggested one - this allows us more latitude in dealing with the cost of long distance calls, Spanish translations and priority mail when needed.

Listed below are special donors to our research fund:

Fred Armstrong
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Doris Stifel
Edna Sutton
Sonja Teraguchi
Bev Thames
Bill Thomas
Regina Van Scoy
Elaine Warner
Douglas Wilson
Marshal Wilson
Douglas Wood

PUBLICITY

The large number of articles and pictures in the press attest to the increasing interest in the monarch butterfly and its unique life history. Many of our associates have kindly sent us clippings showing the fascination generated by this amazing butterfly. Listed below are the associates and the publications for the past year.

Bernadette Argana, Darlene Bamman, Don Davis, Pearl Eslinger, Anne Firlit, Goldie Gerrity, Gregory Glovs, Sophia Godbout, Barbara Hagenson, Marion Hill, Wood Keeney, Donna Kessler, Joseph Klinkon, James Kupcho, Steve Kupcho, Kirk Larsen, Steve Lee, Helen Millward, Tami Nielsen, Megan Strike, Faye Sutherland, Bev Thames, Bill Thomas Judy Van Hook, Larry Wade, Elaine Warner.

publicity cont'd

PUBLICITY cont'd.

Westside News, The Press Enterprise,Calgary Herald,The Trentonian,The Globe and Mail,The Tribune-Star,Chicago Tribune,The Globe-Times,The Morning Call, Miami Herald,St.Petersburg Times,Houston Chronicle,The Immortal Wilderness, Times Herald,Times,The Morning Sun,Atom Tabloid,Linden Leader,Citizen,News Graphic,Michigan Natural Resources Magazine,brochure-Entomological Society of America,ESA Newsletter, The Western Star, Motorland Magazine, Times Leader, NSTA Reports, Tamarack Nature Center Program, The Idaho Statesman,Bay City Tribune,Arkansas Democrat,The New Leader, Detroit Free Press,The Oakland Press,The Laker,Westside News.

Please note: If you are sending in a clipping please be sure to identify the publication which it is taken from.

NUMBER OF MONARCH BUTTERFLIES TAGGED

The total number of monarch butterflies tagged by our associates in 1990 was 19,820 much more than double the 8,813 tagged in 1988.

Please remebere however, that it very important to place each tag carefully on the butterfly's wing as each properly tagged butterfly may provide a recapture record in the future.

DISTORTED PROBOSCIS

Keven Den Boer of Grandville, Michigan informed us of difficulties he was having with some of his newly emerged butterflies: The two parts of the proboscis failed to come together and hence was unable to be coiled.

The proboscis is a complicated structure composed of two parts, the maxillae. They are held together by hooks and spines forming a sort of zipper. Occasionally the zipper does not work too well and the maxillae remain separate. For details of the anatomy of the proboscis you may consult my book, page 83.

To overcome this aberration simply stroke the proboscis gently with a tooth pick from the base to the tip on the under surface. This will bring the maxillae together allowing the zipper to fasten them.

RESEARCH ASSOCIATES

If your name does not appear on this list it is because you joined after this issue was submitted for printing. If there are other omissions, please bring them to our attention. Names are removed from the list if we have had no response over two year period.

Adams Bob: Dallas, TX.
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