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Insect Migration Studies
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January 17,1983

Dear Mrs.Elliott:

I just realised in looking at the record we keep of memberships in the I.M.S. that you have been working with us for almost 20 years. I am sure that that must be some kind of record for faithfulness and devotion to a cause!

Thank you for your report of tagging and for the information about the newsp p releases.

We were interested to learn that the work done on the monarch had been presented to the School Board. We were quite impressed that you would use our joint research in such a presentation.

Also we were pleased to learn that you had continued to give slide programs to school and garden groups.

Prof.Urquhart is now very busy working on a second book about the monarch. It is amazing what we have learned since the first one was published in 1960.

Thank you for your generous donation.

Yours sincerely,

Norah Urquhart

Norah Urquhart

VELUT ARBOR ÆVO

ANNUAL NEWSLETTER TO RESEARCH ASSOCIATES

OF THE INTERNATIONAL ASSOCIATION OF INSECT MIGRATION RESEARCH

IMA

PRODUCED BY SCARBOROUGH COLLEGE, UNIVERSITY OF TORONTO

FOREWORD

Having received a number of letters from our associates expressing particular interest in some of the articles bearing on the life history and tagging of the Monarch butterfly that appeared in the 1982 Insect Migration Studies (vol. 19) and bearing in mind that each year we welcome a number of new members to our research family, we decided to repeat the following:

MILKWEED

MONARCH MATING HABITS

FROM EGG TO ADULT

TAGGING REARED VS. WILD SPECIMENS

RELEASING OF TAGGED MONARCHS IN POPULATED AREAS

DISEASES, PARASITES AND PREDATORS.

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TO OUR ASSOCIATES
FROM
NORAH AND FRED URQUHART

We were pleased to receive so many letters from our associated informing us that the articles contained in the last report (vol. 19) were so helpful. Realizing that such articles should also be available to our new members, we decided to continue them in this and subsequent reports - if you wish to do so, they may be removed from the report and given to those wishing such information. The main purpose of the annual report is, of course, to review the activities of our Monarch butterfly family.

We continue to receive many letters concerning the promiscuous misuse of insecticides and herbicides. In our last report we considered the Monarch butterfly as a possible endangered species, implying that eventually it may become extinct. We wish to qualify this statement.

As a result of our travels over the continent of North America we have become aware of the vast stretches of land which, because of the arid nature of the soil, is of no value in agriculture. However, various species of milkweed plants prefer such soil conditions and grow luxuriantly. Thus, the larvae of the Monarch butterfly will have an ample supply of food to continue its species. To this we would add that our little migrant has spread to many of the islands of the South Pacific where they have established small to large populations, thus giving a reservoir for the species if it should be endangered in North America. However, there is a great possibility that it may become rare or extinct in certain localities as the result of the many poison sprays being used, especially in agricultural areas. Many of our associates have taken action to stop the indiscriminate use of poisons, particularly in those areas where control methods are not required, such as along railway lines, roadways, and conservation areas.

In our research we not only increase our knowledge of the Monarch butterfly, we also add to our knowledge of insects in general. In addition we realize, and emphasize to others, the importance of insect conservation since these six-legged creatures are most important in the intricate web of life for without them there would be no cross-pollination and birds and other insectivorous animals would be without food. Thus, by conserving the Monarch butterfl- we conserve all animals with which it is associated.

In addition to the scientific aspect of our mutual interests, there is the academic aspect. Teachers throughout North America are now using the Monarch butterfly as a class project in order to introduce students to the study of

Natural History, with considerable success. Many of the students of the past have thus been inspired to continue their studies through to graduation from various Universities and Colleges.

Then there is the pleasurable aspect. We sometimes think that this project has done more than any other scientific project to give much pleasure, not only to the members of the IMA, but also to those with whom our members come into contact. By television, radio, and newspaper articles, the Monarch butterfly has been brought to the attention of literally thousands of lay persons throughout the world. As a result insects are being placed in their proper perspective as worthy members of our earth's society - not dreadful little creatures that should be exterminated.

As mentioned in another section of this report, we are busily engaged in writing another book on the Monarch butterfly. As a result we are extremely busy and we would ask your cooperation in requesting alar tags as soon as possible.

If you have any suggestions as to what you would like to have added to our annual report, please send them along.

We trust that you will enjoy another pleasant summer studying our Monarch butterfly. Perhaps this year we will learn where the migrants from the more eastern parts of the continent overwinter; we know they do so in Mexico, but where? This is still one of our big questions and one which perhaps your tagged butterfly will answer.

MEMBERSHIP RENEWAL FORM: 1983-84

Please fill out the following form and send it to:

Professor F. A. Urquhart,
Scarborough College,
University of Toronto,
1265 Military Trail,
West Hill, Ontario, Canada M1C 1A4.

Based upon the present cost of materials, postage, reprints of science articles, annual Newsletter, etc. we would suggest a donation to our research fund of $15.00 for an individual and $20.00 for a group (schools, clubs, scout troops, etc.).

- -

Name _____

Mailing Address _____

_____

_____ Postal or Zip Code _____

If you are in a rural district, please indicate the nearest town or city

_____

Occupation _____

Age if under 18 _____

Please make cheque or money order payable to: Insect Migration Studies

Number of tags required _____

Serial number of tags on hand for use in 1983 _____

Date renewal form submitted _____

When did you receive your 1983 copy of Insect Migration Studies?

Date received _____

- -

PLEASE ORDER YOUR TAG SUPPLY BEFORE JULY 1, 1983.

Since we will be absent from the College during the months of July and August on field studies, would you please estimate the number of tags you expect to use and send the request before July 1st. After this date we will be unable to assure further tags until September 1st at which time the peak of the migration will start.

If you should run out of tags and you have a number of monarchs on hand, send a self-addressed envelope to us and we will make some arrangements to have the tags sent to you. Do not use U.S. stamps on the envelope since they are not valid in Canada.

TAGGING REARED VS. WILD SPECIMENS

It would appear that in some manner, as yet not clearly understood, the larvae of the Monarch are influenced by lowering temperatures and decreasing amount of daylight causing a cessation of the development of the reproductive organs. The adult butterflies from such affected larvae become the "true migrants", which are those individuals that have undeveloped reproductive organs and exhibit "reproductive dormancy" which is broken after they have journeyed to the overwintering site and spent weeks under moist, cool conditions in the mountains of Mexico.

However, there are members of the fall migrants that do not have reproductive dormancy but nevertheless migrate southward the females depositing their eggs and mating with males that likewise have developed reproductive organs along their migratory route. This accounts for the appearance in the fall of mated pairs of Monarchs and the presence of larvae on the milkweed plants, which have been absent during the summer months, in southern States such as Georgia, Mississippi, Texas, etc. Such larvae and sexually mature adults may occur in these southern States as late as December. One of our Associates, Dorothy Yeager of Pearsall, Texas, reported finding larvae and eggs on milkweed plants in December even though a frost had destroyed many of the milkweed plants; Dorothy reared some of the larvae on milkweed plants growing near her home that had escaped the sharp, killing frost.

If you rear Monarchs out of doors so that the larvae are subjected to natural lowering of temperatures and lessening light periods, the resulting adults will be true migrants. If, however, your rearing is carried out indoors where there are continuous high temperatures and exposure to artificial light during the day and part of the night, whether continuously or at odd moments, then sexually mature individuals will result. These sexually mature individuals may move southward, at least for part of the migratory journey, but will die after laying the full complement of eggs and hence will never reach the overwintering site. Occasionally, a female may reach the overwintering site with eggs still located in the oviducts. We have never found this among the overwintering Loci in Mexico but approximately one percent have been obtained in the California Site. This is correlated with the distances travelled, a shorter distance from the breeding grounds to the overwintering site in California as compared to the very long distances travelled by the Eastern Population to Mexico, the latter allowing for the deposit of the full complement of eggs.

If you wish to experience the recapture of tagged Monarchs over a long distance, and even to the overwintering site in Mexico, you should do all rearing out of doors.

If you wish to keep live Monarch butterflies during the winter months the following will be of interest to you:

It is important to use only those with reproductive dormancy, namely those collected in the field in late August, September, October or November. To be certain of having such physiological specimens, obtain them from an overnight roosting tree because, from our records of the examination of hundreds of such specimens, all were in reproductive dormancy.

You may allow these butterflies to fly freely in a room, as has been done successfully by one of our associates, the butterflies being caught once per day and fed a solution of honey and water. It is most important to have water and food available, particularly water. In the overwintering site in Mexico, only water is available, the Monarchs using the fat stored up within their bodies laid down during the larval stage.

In our laboratory at the University we kept specimens during the winter months in the following manner: Specimens were placed in plastic envelopes, one to an envelope, containing a small piece of cotton wool moistened with water so as to give a humid atmosphere. These envelopes were placed in a cardboard box and held in a "cool room" at a temperature of 7°C. Once a day the specimens were removed from the envelopes and the body temperatures raised to that of the room thus causing them to become active at which time they could be fed a solution of honey water.

If you are keeping the Monarchs in a flight cage be sure to keep the material composing the cage moist at all times and suspend a rag soaked in honey solution in the cage.

Since Monarchs will not fly at night, a simple method of keeping them overwinter is to place the cage in a dark room. Thus the Monarchs will remain inactive until taken into the lighted room at which time they can be fed. Again, keep the material of the cage moist at all times.

The above are of particular interest to teachers since they can have live specimens at times when the students are at school. It also adds to the interest in the study of insects to have live specimens available.

If you wish to attempt breeding Monarchs during the winter months, collect the specimens in June or July when breeding is carried out in the fields. Place such specimens in the flight cages with milkweed so as to obtain eggs. Keep the resulting larvae indoors in a room that will be lighted most of the time. When such larvae reach maturity they will give rise to butterflies with developed reproductive organs. You can then obtain another supply of eggs; and so on. To do this you must have potted milkweed plants upon which the females will lay their eggs and a goodly supply of frozen milkweed leaves - the latter gathered in early summer from small plants and placed immediately in a deep freeze refrigerator, the leaves placed in bundles, like a deck of cards, and contained in plastic envelopes of the type used for freezing vegetables and the like.

If you do attempt any of the above we would appreciate hearing from you as to your success or failure which we will report in our next copy of Insect Migration Studies.

RELEASING OF TAGGED MONARCHS IN POPULATED AREAS

We would like to urge you strongly to release your tagged specimens away from populated areas as the release of tagged specimens in areas of dense population means that the chance of recapture in the same area are greatly increased. This defeats the purpose of tagging in two ways. It results in many tagged specimens being recaptured before they have had a chance to make a significant flight and the recapture may result in the destruction of those monarchs which have been properly tagged and are the most active flyers.

TAGGING NEWLY EMERGED MONARCHS

When the Monarch butterfly first emerges from the pupa case, the space between the upper and lower membranes of the wing is filled with body fluid; thus the wings remain soft. If you attempt to place an alar tag on the wing when it has not been thoroughly dried not only will the tag fail to adhere to the wing membrane but, when attempting to remove the scales, you will cause a blister to form.

If you are rearing the Monarch butterfly indoors in a moist environment it may take two or three days, at times as much as six days, before the wings have become thoroughly dried. If you are rearing them outdoors in cages, particularly in a warm area and where the sun's rays fall upon the cage, then the wings will dry much more rapidly and the specimens can be tagged the day following their emergence.

If the rearing is done in the classroom, be certain to have a large enough cage, preferably of mosquito netting or cheesecloth, so that the butterfly can fly about without injuring its wings. If a butterfly emerges one day, alar tag it the next day, not the same day it emerges because, if you do so, the tag will not adhere and you will not obtain a long distance flight record.

If specimens are captured outdoors the tags can be placed on the wings immediately since such specimens have had a long enough period in which to insure the wings being dry.

It is well to have at least two cages, one for rearing purposes and the other to allow the butterflies room to fly about for at least one day before tagging. As the butterflies emerge in the rearing cage they can be removed and placed in the flight cage. Students soon learn how to handle the butterflies without injury to the wings.

When a specimen has had its tag fastened to its wing, do not release it in a populated area. If you do so, it will be soon recaptured and hence be unable to travel to its overwintering site. If your residence, or school, is situated in a heavily populated area, try to have the butterflies released in the open country. The importance of alar tagging the Monarch butterfly is to trace its migratory routes; it is useless to liberate them where they will be immediately recaptured and sent to us. Such procedures do not add to our knowledge of the migration and, what is most unfortunate, it results in many would-be travellers being killed and mailed to us. Perhaps teachers could allow the students to liberate a few near the school and then arrange for the others to be liberated in the open country away from habitations.

MILKWEED

We have received enquiries concerning the growing of milkweed. The following may be of some assistance to you:

The Family of Milkweeds, the Asclepiadaceae, is fairly large consisting of over 2000 world species in over 200 Genera. In North America the common genus is Asclepias of which there are approximately 100 species.

As in other families of plants, the various species grow in a wide diversity of ecological conditions, from hot desert sands to cool deciduous or coniferous forest humus. In the Monarch Butterfly book a list of species to be found in each State of the United States is given east of the Mississippi drainage which encompasses the largest areas of breeding grounds.

If you wish to grow milkweed plants in your home garden or in neighbouring fields from seed, or from roots, you should first ascertain the kind of soil and climatic conditions most suitable. Thus species that grow in forested areas will not survive on sand dunes, and vice versa. Some species cover a wide range of ecological conditions, such as Asclepias syriaca, and may be grown in most home gardens. This also applies to the ubiquitous A. curassavica.

In the past we have supplied many of our associates with seeds of A. syriaca and they have been grown with considerable success in most home gardens. If you want seeds of A. syriaca, please let us know.

Place the seeds in a flower pot, scattering the seeds over the surface of the soil thinly and covering with about 6 cm. of soil, preferably sandy soil or potting soil. Keep the soil slightly moist - too wet will cause the seeds to rot. Place a sheet of glass, or plastic, over the pot so as to retain the correct moisture content.

When the small plants have two sets of leaves, transfer them to larger pots. When the plants are about 10 cm. in height they can them be transferred to your garden. Place the plants in a sunny situation.

If you find a few plants growing wild, dig up the "roots"; you will notice vegetative centers along the length of the root which gives rise to the future plants. Thus, the root system of A. syriaca resembles that of a potato. This is the quickest and surest way to obtain good, rapidly growing plants.

THE MORE MILKWEED PLANTS AVAILABLE THE MORE MONARCH BUTTERFLIES WILL OVERWINTER IN MEXICO.

FROM EGG TO ADULT

In response to a letter received from Gary Williams, the following brief description of the development of the Monarch butterfly may be of interest to others of our associates who might not be familiar with insects that possess a complete metamorphosis.

All species of Lepidoptera (butterflies and moths) pass through four stages in their development - egg to larvae (caterpillar) to pupa (chrysalid) to adults. Many species of butterflies deposit their eggs singly upon the leaves of the larval food plant, the milkweed in the case of the Monarch. The female exercises a considerable degree of selection when depositing her eggs, usually upon small seedling milkweed plants which have small, tender leaves; however, when such small seedling leaves are not available, the female will deposit eggs upon the older and tougher leaves or upon the small leaves surrounding the flowers of the flower heads. However, if you are searching for eggs you should concentrate on the small plants looking at the undersides of the leaves. If you observe a female flying close to the ground across a grassy field in which there are a number of small milkweed plants pausing every now and then to alight upon them, you will be able to collect a great many eggs. If you wish to obtain a number of eggs for rearing purposes you should capture such an ovipositing female and place her in a large flight cage with a goodly supply of fresh milkweed plants. Don't forget to hang a rag soaked in a weak honey solution in the cage - adult Monarch butterflies die within a short time if deprived of moisture and food.

We have found it advisable to remove the eggs from the leaf by cutting out a small section of the latter containing the egg by means of a pair of fine scissors. These eggs should then be placed on a flat container, such as a saucer, well separated from each other because when the larva emerges from its egg it usually devours the empty egg shell and if an unhatched egg is close by it will also devour it. When the minute larvae hatch from the eggs they may be transferred to your reading jars or cages; use a finely pointed artist's paint brush to pick up the larvae the tip of the brush slightly moistened; in this manner the small, delicate larvae will not be injured.

The larva passes through five stages in its development each stage marked by the shedding of the skin to allow for further growth. This process of shedding the skin is referred to as an "ecdysis" and the cast-off skin is termed an "exuvium" (Pl. exuvia).

The final stage in development is the pupa. The rearing cage should be large enough to allow for the larva to move about in its selecting of a suitable place to enter the pupa stage. We use a large screen cage open at the top and bottom so that we can easily remove old milkweed plants and the larval droppings that have accumulated on a piece of paper placed under the cage, and at the same time by placing a stiff piece of cardboard on the top of the cage the cardboard containing the suspended pupa can be removed and suspended in a suitable place to observe the emergence of the adult. You can place the cardboard on four pedestals, such as fruit jars.

Depending on temperature - the higher the temperature the more rapid the development - the eggs hatch in three to four days; larvae reach maturity in two to three weeks; pupae reach full development in approximately two weeks.

There is much, much more to the development of the Monarch butterfly and we would refer you to the book, THE MONARCH BUTTERFLY published by the University of Toronto Press (1960) which may be available to you at your local library or a University library.

DISEASE, PARASITES AND PREDATORS

We have, from time to time, discussed the various parasites, diseases and predators of the Monarch butterfly. However, because of recent enquiries we present the following:

DISEASE: Like all living organisms, the Monarch butterfly suffers from a multitude of disease organisms. There are over fifty strains of bacteria that have been isolated from the larvae. We were able to show that an epidemic that drastically reduces the population in certain years, is due to a nuclear polyhedrosis virus. Usually, this epidemic starts in the mid-west and spreads eastward, according to our records over the past many years, for reasons still unknown. When at its peak Monarchs become rare and this has led to the conclusion that promiscuous spraying of insecticides was responsible. For the past number of years, however, there has not been such a con-tinent wide epidemic. At one time we had considered that it occurred every seven or eleven years, but this has been found to have been a false conclusion.

PARASITES: There are four species of flies that parasitize the Monarch. These belong to the Family Tachinidae. In appearance they resemble large, hairy house flies. They deposit their eggs upon the surface of the body of the larva. The eggs are

about 1 mm in length, oval in shape and white in colour. When the larva, or maggot, hatches from the egg it burrows through the Monarch larva integument thus entering the body cavity. Here it feeds upon various body tissues, with the exception of the nervous system. As a result of the latter discrimination the Monarch larva continues to feed and grow even though thus infested. When the fly maggot reaches full development it then feeds upon the nerve tissue of its host causing the infected larva to become lethargic, finally becoming stationary, at times spinning a mat of silk and fastening its legs to it. Thus anchored in one place, the fly maggot burrows through the larval integument to the outside. The maggot then secretes a string-like mucous that assists in lowering the maggot to the ground. It then burrows below the surface of the soil and enters the puparium stage - the puparium consisting of the pupa surrounded by the last larval skin of the maggot. The puparium is a dark reddish brown in colour and approximately one centimeter in length - the smallest species has a slightly smaller puparium, approximately 8 mm in length.

If the fly maggot does not reach full maturity during the Monarch larval stage, it will remain in the body of its host through to the pupa stage. Because of the length of time taken for the development of the pupa, the fly maggots do not occur in the adult butterfly body, the maggot having completed its life cycle before the final stages in the Monarch development.

There are two species of parasitic wasps that occasionally attack the Monarch larvae. One of these belongs to the Family, Ichneumonidae. This parasite is about 7 mm in length; the body is laterally flattened; reddish brown in colour; and a long, thread-like organ, the ovipositor, protrudes from the apex of its abdomen. By means of the ovipositor, the female Ichneumon burrows through the Monarch larvae integument and deposits an egg in the larval body cavity. A number of eggs may thus be deposited in the Monarch larva.

The other species of parasitic wasp belongs to the Family Braconidae. This minute parasite, not more than three or four millimeters in length, deposit an egg within the Monarch larva. This single egg, by multiple division, produces a number of individuals all from the one egg and all of the same sex. When these small wasps reach maturity they burrow through the larval integument and, unlike the other parasites that leave the host body to enter the pupa stage, they spin small cocoons on the surface of the body of the Monarch larva. There may be as many as twenty or thirty of these small cocoons. In many species of braconids there are no males - all larva are produced from unfertilized eggs and all adults are female. Other species of braconids complete the life cycle within the body of the Monarch larva, issuing as minute wasps, often of a metallic green in colour.

PREDATORS: Like most species of butterflies, the Monarch is fairly free of vertebrate predators, such as birds. However, the Black-billed Cuckoo feeds its young on the larva of the

Monarch. If a larva falls to the ground it may be attacked by shrews or mice. Perhaps frogs and toads will eat larvae although we have no definitive proof of this: Perhaps you might try to run a little experiment to see if frogs and toads will eat them and if you do we would be most pleased if you would send us the results of your experiment.

The most active predators are species of "true bugs" belonging to the Order Hemiptera. The predaceous bugs, by inserting their sucking proboscis into the body of the larva, suck out the body fluid. Most of these species are rather flat, oval in shape, and light to dark brown in colour; immature stages, referred to as nymphs, may have brighter colours, such as markings of red, orange and green. The praying mantis will devour Monarch larvae; spiders, especially the large garden spider with its large orb web, captures the occasional adult Monarch.

We have received reports from many of our associates stating that ants will attack the larvae of the Monarch. As a result of plants being infested with aphids, ants will swarm over such plants in order to obtain the sweet secretions given off by these insects. In our part of the country, and particularly in our milkweed patch, we have never observed ants attacking Monarch larvae. However, there are many species of ants and perhaps in some parts of the Continent some of them do so; the attack on insect life by army ants is well known and perhaps there are many others. We would appreciate any accurate observations on this subject that you may make.

MONARCH MATING HABITS

Before leaving the overwintering site and during the entire breeding season, the male Monarch mates with the female in a rather interesting fashion: The male, as in the case of species of birds, stakes out a certain area, usually where there is an abundance of wild flowers, as his particular domain. He assiduously patrols this area, flying leisurely over the field, chasing any stray butterflies, leaves blown in the wind, and even small birds, such as chipping sparrows - it is interesting to note that the Monarch butterfly chases birds rather than the reverse as believed by some biologists involved in the study of the hypothesis of Batesian Mimicry, a fanciful idea based on very little field observations.

When a female Monarch flies over the field which the male is patrolling he will immediately take after her. There then ensues a courtship flight in which the pair circle each other as they fly higher and higher. During this prenuptial flight the male extrudes his anal glands which exude a strong odor resembling that of flowering plants. The male and female eventually come to rest on the foliage of a nearby bush. The male then inserts his sexual organ, the penis, into the bursa

of the female at the same time clinging to the tip of the female abdomen by means of his strong, chitinous claspers. Thus joined together they may fly from one bush to another with frequent rest periods. The sperm cells of the male are contained in a thin membranous envelope. The inner surface of the bursa of the female bears a number of sharp chitinous teeth. As the eggs pass down the oviduct, the female, by contraction of the bursa, rips open the packet of sperm cells thus fertilizing the eggs.

At the overwintering site in late winter and early spring, at a time when the Monarchs are preparing to return to the breeding grounds, or along their northward migration, mating takes place. This is a remarkable orgy with many males attempting to copulate with one female or with clusters of males attempting to copulate with each other. Thus females are prepared to deposit fertilized eggs along the migratory route where milkweed plants are available. Since only the very occasional overwintering male returns to the more northern breeding grounds, mating takes place only in the early stages of the migration of the overwintering individuals.

The sexual organs of the male and female Monarch butterflies are quite complex; we refer you to the book, THE MONARCH BUTTERFLY, for further information.

A NEW MONARCH BUTTERFLY BOOK

In 1960 my book, The Monarch Butterfly, was published by the University of Toronto Press. It has been long out of print and copies are impossible to obtain.

In 1977 the book publishers, Nelson-Hall of Chicago, wrote to me suggesting that I might write a book for them. Owing to other commitments, I was unable to give a firm commitment. However, I did so last summer and Norah and I have been working on the manuscript and illustrations during this past year. I anticipate sending the completed text to the publishers not later than May of this year.

Unlike my former book, this one is written specifically for the lay audience - teachers and students of primary and secondary schools; junior colleges; naturalists. It will contain all of the data which I have accumulated over the past 42 years. It will be amply illustrated with drawings, diagrams and photographs in full colour.

Norah has worked along with me, gathering the data together - especially concerning our studies of the population in New Zealand - and proofing the text as it comes off my typewriter.

I am certain that you will find this book most useful and enjoyable reading.

HERBICIDES

Members of the insect world are having a tough time maintaining their species. They are blasted with insecticides in fields and forests; their food plants are being destroyed by herbicides. Those who believe the statement, "All insects are pests and should be exterminated" are woefully unaware of the important role insects play in the web of life.

We received the following letter from Phyllis Perzanowski of Havre de Grace, Maryland:

"As you can see from the enclosed records I had one great disappointment. Our State Road Commission sprayed herbicides along the highway where I have been doing the majority of my collecting near Northeast, Maryland. There was no reason for the spraying that I could see. The milkweed and other plants were far from the highway and were not obstructing the view of drivers. My husband and I collected caterpillars from these plants, as well as leaves for feeding, before we realized the spraying had taken place, therefore, we lost 236 due to the spraying."

Phyllis then asks the question: "What possibly can be done on the state-by-state basis to have the Monarch and the milkweed protected?"

Frankly, we do not have an answer. How do you teach politicians the facts of life? We, in Canada, are having the same problem; weed control is used indiscriminately along our roads and highways, killing off our attractive roadside flowers and insect food. And for what purpose?

All we can suggest is that you write to your representatives; write articles for the newspapers; when possible, bring the matter to the attention of the public by radio and television; and, what is most effective, tell your children, through the schools, what is happening to our wild life. We can use the Monarch butterfly and its relationship to the milkweed plant to emphasize the need for legislation, not only to protect the Monarch butterfly but also all creatures within its family of insects.

The title of one of James Herriot's books comes to mind: "ALL CREATURES GREAT AND SMALL: THE LORD GOD MADE THEM ALL".

Note: As we go to press we are pleased to include the following quote from a letter from Phyllis Perzanowski dated February 22, 1983: "I met with a representative of a State Highway Administrator last week regarding the spraying of herbicides along the highway where I do the majority of my collecting. I received a phone call from him to-day saying that they cannot stop the spraying but they will delay it until the third week in September, after the Monarchs have matured and my collecting completed...".

RETURN OF SPRING MIGRANTS

For those of us interested in the Monarch butterfly, the advent of spring is a welcome event not only because of spring flowers but the expected thrill of seeing our first Monarch butterfly of the season. In our eager anticipation we sometimes mistake the flight of the resident butterflies such as the Red Admiral, the Anglewings or the Mourning Cloak for that of the Monarch and it is a happy day when we can declare for sure, "It's a Monarch!"

Since the spring migration is a part of the research about which we know very little due to the small number of migrants that are seen returning and due to the characteristic speedy flight of those returning to the breeding grounds, it is especially interesting for us to receive reports from many parts of the continent showing the gradual spreading out of the migrants as they return from Mexico.

The following is a list of observations of spring migrants:

Walter Zimmerman, Rockwall, Texas, March 15, 1982.
Dorothy Yeager, Pearsall, Texas, March 15, 1982.
Lynne Lankford, Baytown, Texas, first week of April, 1982.
Frances Buchanan, Tucson, Arizona, May 1, 1982.
Helen Zimmerman, Vineland, Ontario, May 6, 1982.
Jim Gilbert, Waconia, Minnesota, May 14, 1982.
Margaret Elliott, Muskegon, Michigan, May 15, 1982.
Betsy Briggs, first larva, Marshfield Hills, Massachusetts, May 29, 198
Lorraine Houck, Decorah, Iowa, June 1, 1982.
Ann Irwin, Bloomfield Hills, Michigan, June 6, 1982.
Eva Kendrick, Sault Ste. Marie, Ontario, June 8, 1982.
Andy Klukas, Atwater, Minnesota, June 9, 1982.
Gina Jordan, Battle Creek, Michigan, June 12, 1982.
Debbie Knutson, Iron Mountain, Michigan, June 13, 1982.
Alice Hopf, Upper Black Eddy, Pennsylvania, June 27, 1982.
Marion Hill (first egg) Lyndhurst, New Jersey, July 1, 1982.
Joan Senghas, Mount Clemens, Michigan, June 24, 1982.

EARLY FALL MIGRATION IN 1982

Joseph Moss of Roanoke, Louisiana reported that the "first fall scout" of the fall migration arrived in his area in September 28, 1981 whereas the first fall migrant arrived there in August 26, 1982 confirming our observations that the fall migration began very early in 1982.

SPECIAL ACTIVITIES OF OUR ASSOCIATES

The following associates who demonstrated their keen and lively interest in this study reported giving lectures, conducting field trips, and holding demonstrations with various stages of the Monarch life history. They also presented slide shows to a variety of audiences including schools, churches, 4-h clubs, Nature Centers, a forum sponsored by the University of Wisconsin, a School Board, civic groups and a kindergarten workshop:

Joan DeWind, Margaret Elliott, Mary Henshall, Joan Johnson, Marilyn Kaestner, Donna Kessler, Harold Mahan, Trudy Smith, Edna Sutton.

AWARDS

In 1982, Jennifer Ortt, of Marietta, Ohio, a ninth grade student, won a superior rating at the school science fair, at the district fair and the state contest as a result of entering her project on the Monarch butterfly migration.

POSTAL DELIVERY OF INSECT MIGRATION STUDIES

Apparently the difficulties of the postal service have not yet been ironed out. In 1982, several associates reported that the I.M.S. was delivered to them 4-6 weeks after we put it in the mail. Two associates reported that their copy did not arrive at all. We have tried sending the I.M.S. at first class rates and at printed matter rates, with no improvement shown by the former. Therefore we now send it at printed matter rates and hope that your 1983 copy reaches you after a reasonable interval.

ASSOCIATES REPORTS OF TAGGING BUTTERFLIES

We would like to thank all of you for returning your reports of tagging to us so promptly. It is important for us to have your tagging reports so that we can complete the data when tagged butterflies that are recaptured are reported to us or returned to us at the University. We can then notify you of this fact. We urge you strongly to keep duplicates of your tagging reports. Occasionally, reports are lost in the mail and because of this potentially valuable data is lost and cannot be completed.

RE ADHESIVE ON TAGS

The adhesive on the alar tags is supposed to be of a permanent type, we are assured by the manufacturer. Occasionally, however, some associates experience difficulty in making the tags adhere to the wing of the butterfly perhaps because the tag was not properly made. If you have any difficulty with the tags please return them to us immediately and we shall be pleased to send you a new supply.

Please remember, however, that all scales in the vicinity of the tag are removed, otherwise the tag will not adhere properly.

SPECIAL DONORS

The University of Toronto provides the Insect Migration Association with office supplies only, no financial assistance is given. Such costs as the purchase of alar tags, postage, secretarial assistance, translation of letters in Spanish, xerox copying and the publication of this annual report are all covered by your donations. Naturally, we are pleased when you make donations in excess of the requested amount, those who do so we list as special donors so that their generosity will be recognized. This year we were delighted to find that the number of special donors has increased markedly over previous years. Special donors are listed below:

George and Connie Abraham
Bob Allen
Carl Allgrove
Tim Anderson
Ron Austing
Kenny Brooks
Gabriel Brown
Frances Buchanan
Barbara de Montes
Joan DeWind
Erma DeWitt
Margaret Elliott
Bernard Fashingbauer
Betty Fink
Jim Gilbert
Jessie Glynn
Jeri Goldman
Janet Grew
Barbara Hagenson
Marion Hill
Carol Hillman
Mrs. Franklin Hupp
Joan Johnson
Niel and Sheila Karrow
Norwood Keeney Jr.
Eva Kendrick
Donna Kessler
Patricia Kester
Marion Lopina
Harold Mahan
Joyce Mallery
Roland Matson
Helen Millward
Molly Monica
Joseph Moss
Naturalists Club of Broome County
Marlene Neerdaels
Elizabeth Radens
Randy Reese
Walter Regula
Dale Reichert
Millicent Scott
Marion Smith
Sally Spooner
Edna Sutton
Roger Wilson
Dorothy Yeager
Walter Zimmerman

RECAPTURE RECORDS FOR 1982

The year 1982 was a very successful one from the standpoint of tagging Monarch butterflies. There was a significant increase in the number of tagged specimens that were reported or returned to us. The only regrettable fact is that many of those returned to us had been liberated in highly populated areas, where, of course, the chance of recapture and the destruction of the butterfly is greatly increased. We do want to urge you to release your tagged Monarchs away from large centers so that they may make a significant flight before they are reported or recaptured.

All of the associates whose tagged Monarchs were reported or returned to us have already been notified.

Associate	Tagged at	Recaptured at
R. Austing	Harrison, Ohio	Lexington,Kentucky
R. Austing	Harrison, Ohio	Austin, Texas
A. Horr	Gretna, Nebraska	near Pryor, Oklahoma
Island Science School	Toronto, Ontario	Verona, Pennsylvania
M. Monica	Westfield, New Jersey	Staten Island,New York
P. Perzanowski	Havre de Grace,Maryland	Sanford, North Carolina
M. Pittman	Maclean, New York	Sapelo Island,Georgia
D. Reichert	Hanover, Pennsylvania	Stevensburg, Virginia
D. Reichert	Hanover, Pennsylvania	Port Tobacco, Maryland
J. Stull	Erie, Pennsylvania	Winston-Salem,North Carolina
J. Stull	Erie, Pennsylvania	Girard, Ohio
J. Stull	Erie, Pennsylvania	Chatsworth, Georgia
E. Swanson	Pickett, Wisconsin	Pella, Iowa

Monarch butterflies that were tagged in these states and provinces were recaptured in the same general areas:

California, District of Columbia, Georgia, Illinois, Kentucky, Maryland, Michigan, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Ontario, Pennsylvania, Texas, Virginia, Wisconsin.

PUBLICITY

We would like to thank the following for sending us newspaper and magazine clippings that deal with our joint research on the migration of the Monarch butterfly. Many articles are profusely illustrated and make enjoyable reading. We feel that the interest aroused by press coverage furthers our study since it increases the awareness of the public about this remarkable insect and, we are sure, creates more interest in the preservation and conservation of the Monarch butterfly:

Kenny Brooks, Margaret Elliott, Virgil Inman, Joan Johnson, Patricia Kester, Harold Mahan, Joseph Moss, Jenny Ortt, Vicki Preston, Joan Senghas, Edna Sutton, Audrey Wilson, Cyril Zewe.

Excerpts were sent to us from the following publications:

The Spectator, Sault Ste. Marie, Ontario; The Hamilton Spectator, Hamilton, Ontario; a Florida newspaper; The Standard Observer, Irwin, Pa.; The Milwaukee Journal, Wisc.; The Capitol Times, Madison, Wis.; Green Bay Press, Wis., The Examiner, Muskegon, Mich.; New Era, Lancaster, Pa.; Detroit Free Press, Detroit, Mich.; Cincinnati Post and Times-Star, Ohio; South Bend Tribune, Ind.; Spotlight; The Post-Crescent, New London, Wis.; Lake Charles American Press, La.; The Winchester Star, Winchester, Va.; The Argus, Rock Island; Ill. Spectrum.

GEORGE SMITH - IN MEMORIAM

We are very sorry to have to report the passing of George Smith of Robin Hill, Lyndonville, New York.

Since George and his sister, Marion joined our group in 1978 they have been very active in studying Monarchs and were able to do a great deal of valuable tagging although they were also very much occupied with business responsibilities and the care of their extensive arboretum. They also contributed generously to our research fund.

We extend our deepest sympathy to Marion Smith but are pleased to learn that Marion intends to continue her membership in our Insect Migration Association.

RESEARCH ASSOCIATES 1982-1983

Those listed below are research associates actively involved in the study of the ecology and migrations of the Monarch butterfly for the period 1982-83.

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.

Abraham, G.W. and Connie. Waseca, Minnesota.
Alder, Lee Ann. Ontario, New York.
Allen, Bob L. San Luis Obispo, California.
Allgrove, Carl G. Windsor, Connecticut.
Anderson, Carolyn. Madison, Wisconsin.
Anderson, Timothy P. Richfield, Minnesota.
Armstrong, Fred. Red Bank, New Jersey.
Austin, G. Ronald. Harrison, Ohio.

B.

Banet, Mary. Calomet City, Illinois.
Banet, Sister Laura. New Ulm, Minnesota.
Bartlett, Bobbye. Mountain Home, Idaho.
Blanchard, Yvonne. Lake Shastina, California.
Bracebridge and Muskoka Lakes Secondary School, Bracebridge, Ontario.
Bracher, Ray W. South Bend, Indiana.
Breen, Jean. Brookfield, Connecticut.
Briggs, Betsy. Marshfield Hills, Massachusetts.
Brooks, Kenneth A. Junction City, Kansas.
Brown, Gabriel. Baltimore, Maryland.
Buchanan, Frances B. New Paltz, New York.
Buegler, Richard P. Staten Island, New York.
Bush, Patricia M. Farmington, Pennsylvania.

C.

Carter, F. Gray. Winston-Salem, North Carolina.
Cavanna, Pedro E. Norfolk, Connecticut.
Clements, Marta. West Paris, Maine.
Coleman, Wm. J. Ventura, California.

D.

Denison, Larry. Lansing, New York.
Deppe, Fred. Nashua, New Hampshire.
DeWind, Joan M. Sherman, Connecticut.
DeWitt, Erma R. New Paltz, New York.

E.

Elliott, P. A. Muskegon, Michigan.
Emery, Calvin C. Nevada, Missouri.

F.

Fashingbauer, Bernard D. St. Paul, Minnesota.
Fink, Betty. Huntington Station, New York.
Frandy, James W. Minocque, Wisconsin.

G.

Garner, Peggy. LeClaire, Iowa.
Gilbert, James R. Waconia, Minnesota.
Glass, Floyd Mrs. Gallion, Alabama.
Glovas, G.S. Bethlehem, Pennsylvania.
Glynn, J. Limehouse, Ontario.
Goldman, Jeri. Harrisburg, Pennsylvania.
Grew, Janet M. Maplewood, Minnesota.
Golden, Frank. and Allen. Miles, Texas.

H.

Hagenson, Barbara. Clinton, Iowa.
Hansen, R. E. Staten Island, New York.
Hatch, Wendy. Port Carling, Ontario.
Herler, Caroline. Bronx, New York.
Henshall, Mary S. Nampa, Idaho.
Hill, Marion. Lyndhurst, New Jersey.
Hillman, Carol B. Harrison, New York.
Holck, Bert. Landenberg, Pennsylvania.
Holden, Joann. Birmingham, Michigan.
Holliday, M. Reno, Nevada.
Hopf, Alice. Upper Black Eddy, Pennsylvania.
Horr, Alta L. Gretna, Nebraska.
Horstman, Eric. Weaverville, California.
Hoskins, Dorothy M. Weston, Massachusetts.
Houck, Harvey and Lorraine. Decorah, Iowa.
Huber, Mabel L. Fernley, Nevada.
Hummer, Larry. Vista, California.
Hupp, Franklin. Hinton, Virginia.

I.

Independent School District 191. Burnsville, Minnesota.
Inman, Virgil. South Bend, Indiana.
Irwin, Ann D. Bloomfield Hills, Michigan.

J.

Johnson, Joan L. Berryville, Virginia.
Jordan, Gina. Battle Creek, Michigan.

K.

Kaestner, K. Northville, Missouri.
Karrow, Niel and Sheila, Waterloo, Ont.
Keeney, Norwood H. Hudson, New Hampshire.
Kelchner, Susan. Lansing, New York.
Kendrick, E. Sault Ste. Marie, Ont.
Kessler, Donna. Audubon, Iowa.
Kester, Patricia A. Appleton, Wisconsin.
Klukas, Andy. Atwater, Minnesota.
Knutson, Debbie. Iron Mountain, Michigan.
Kough, Ruth. Dysart, Pennsylvania.

L.

Lachelt, Ron. Minneapolis, Minnesota.
Lapin, Danna. Hockessin, Delaware.
Larcheveque, Lee. Glastonbury, Connecticut.
Larsen, Kirk L. Ann Arbor, Michigan.
Larson, Donald W. Minnetonka, Minnesota.
Lombard, Matt. Guilford, Connecticut.
Lopina, Marion T. Wauwatosa, Wisconsin.
Lorimer, John and Family. West Bloomfield, Michigan.

M.

Magdich, Mitchell L. Toledo, Ohio.
Mahan, Harold. Cleveland, Ohio.
Malick, Patricia. Stevens Point, Wisconsin.
Mallery, C. Vestal, New York.
Mathes, G. Eldred and Marjorie. Pontiac, Michigan.
Matson, R. R. Minneapolis, Minnesota.
McCoy, Patty. Marion, Iowa.
Merrill, Kristy. Berlin, Pennsylvania.
Meyer, Norman, Babs and Andy. Monterrey, NL. Mexico.
Milani, Ruth. Meaford, Ontario.
Millett, Carol. Jacksonville, Vermont.
Millward, Helen. Fallon, Nevada.
Monica, Molly. Berkeley Heights, New Jersey.
Moss, Joseph. Roanoke. Louisiana.
Murphy, Diana, Downers Grove, Illinois.

N.

Naturalists Club of Broome County, Vestal, New York.
Neerdaels, Ronald G. Green Bay, Wisconsin.
Neri, Jennifer. Montreal, Quebec.
Norenberg, Marilynn. Duluth, Minnesota.

O.

Olson, Eric John. Minneapolis, Minnesota.
O'Rourke, David. Buffalo, New York.
Ortt, Marilyn and Jennifer. Marietta, Ohio.
Osborn, Patricia A. Merced, California.

P.

Pendleton, Emily V. Montevallo, Alabama.
Penn, Linda. Toledo, Ohio.
Perry, Wesley Lee. Memphis. Tennessee.
Perzanowski, Phillis A. Havre de Grace, Maryland.
Pittman, Mary R. Freeville, New York.
Post, Earle M. West Milford, New Jersey.
Preston, Vicki L. Whiteford, Maryland.

Q.

Quick, Tim. Ruthven, Ontario.

R.

Radanovich, Paula D. Hershey, Pennsylvania.
Radens, Elizabeth. Riverdale, New York.
Ransom, Christina and Shani Darden. Plattsburgh, New York.
Reese, Randy. Newark Valley, New York.
Regula, Walter F. Hamilton, Ont.
Reichert, Dale. Hanover, Pennsylvania.

S.

Schaefer, Christine. Muncy, Pennsylvania.
Scott, Millicent. Casper, Wyoming.
Senghas, Joan. Mount Clemens, Michigan.
Siegel, Russell. Danbury, Connecticut.
Sinclair, Mary Lu. Falls Village, Connecticut.
Smith, Leslie V. Citrus Heights, California.
Smith, Marion. Lyndonville, New York.
Smith, Trudy. Mumford, Connecticut.
Spooner, Sally. Lakerville, Massachusetts.
Stifel, Doris N. Toledo, Ohio.
Stuart, Robert. Glen Carbon, Illinois.
Stull, Jean H. Waterford, Pennsylvania.
Sutherland, Faye. Boise, Idaho.
Sutton, Edna M. Richland Centre, Wisconsin.
Swanson, Elaine. Pickett, Wisconsin.

T.

Teed, L. B. Wichita, Kansas.
Terry, Willie G. Baytown, Texas.
Totton, Larry W. Granger, Iowa.
Tribo, Matthew, D. Ponca City, Oklahoma.

W.

Watson, Dena. Healdsburg, California.
White, Margaret. Oakland, Iowa.
Williams, Gary. Glen Ellyn, Illinois.
Wilson, Audrey. Cobourg, Ontario.
Wilson, Roger L. Moville, Iowa.
Woodcock, Alice P. Upper Montclair, New Jersey.

Y.

Yeager, Dorothy. Pearsall, Texas.

Z.

Zewe, Cyril. North Huntingdon, Pennsylvania.
Zimmerman, Helen. Vineland Station, Ontario.
Zimmerman, Walter. Rockwall, Texas.