TEACHER'S GUIDE TO

"MOSQUITO CONTROL - SCIENCE AT WORK"

Developed by Thomas Seeger

New Orleans Mosquito Control Board
6601 Lakeshore Drive
New Orleans, Louisiana 70126

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(8-8-85)

TEACHER'S GUIDE TO "MOSQUITO CONTROL - SCIENCE AT WORK"

INTRODUCTION:

"Mosquito Control - Science at Work" is a fifteen minute video cassette designed to educate the public about the procedures used by the New Orleans Mosquito Control Board (NOMCB) to guarantee the effectiveness, efficiency, and safety in our battle against the mosquito.

This tape was designed as a complement to the high school students' science class. We hope that this tape will reinforce what has been learned in class with examples of actual applications used in our everyday operations here at New Orleans Mosquito Control.

MATERIALS NEEDED:

1) VHS or BETA video cassette recorder
2) 1 copy of pretest for each student *
3) 1 copy of posttest for each student *
4) 1 copy of the handout Stop Raising Mosquitoes for each student *
5) 1 copy of the checklist for each student *

* Master copy provided to be reproduced for each student by teacher.

PROCEDURE - DAY 1:

1) The teacher should make a copy of pretest and posttest for each student.
2) Administer pretest
3) Show and view videotape - have students answer questions on pretest as they are viewing the tape
4) Review for posttest

DAY 2:

1) Review pretest/answer questions
2) Administer posttest
3) Correct test
4) Teacher will complete enclosed information sheet

GOALS:

1) Students will learn why and how mosquitoes bite.
2) Students will become familiar with the life cycle of the mosquito.
3) Students will know that certain species of mosquitoes transmit disease-carrying agents and that when these species are identified, NOMCB makes appropriate treatments to protect the citizens of New Orleans from disease.

4) Students will learn how some pesticides work to kill mosquitoes.

5) Students will become aware of the relative toxicities of our primary insecticide (Malathion) here at NOMCB.

6) Students will become familiar with several other methods used to control larvae.

7) Students will learn the "scientific method" and be able to identify ways New Orleans Mosquito Control use it in day-to-day operations.

OBJECTIVES:

1) Students will take a pretest. They will use this pretest as a guide to the tape. (5-10 minutes to pretest)

2) Students will be able to state the reason mosquitoes bite, which is to obtain blood with which to nourish the eggs.

3) Students will be able to recognize the name of the mouthpiece inserted to obtain the blood, the proboscis.

4) Students will know that the itching associated with mosquito bites is caused when salt and bacteria enter the wound while it is scratched.

5) Students will learn that female mosquitoes store sperm in the spermatheca until they are ready to lay their 100-300 eggs.

6) Students will know that eggs hatch into larvae.

7) Students will know that larvae breathe through air tubes on their tails and they filter food from the water.

8) Students will know that larvae shed their skins 4 times or that there are 4 "instars" in this stage of a mosquito's life.

9) Students will define metamorphosis.

10) Students will identify "pupa" as the stage between larva and adult. They should also recognize this as an example of metamorphosis.

11) Students will know that pupae breathe through breathing trumpets and that pupae don't ingest food.

12) Students will observe the transition from egg to adult on tape.

13) Students will identify the female mosquito as the only sex that takes blood meals.

14) Students will know that male mosquitoes get nourishment from plant juices.

"MOSQUITO CONTROL - SCIENCE AT WORK"

PRETEST

NAME: _____ DATE: _____

1) Why do mosquitoes bite?

2) Define:

larva -

pupa -

proboscis -

spermatheca -

metamorphosis -

axon -

dendrite -

synapse -

acetycholine -

insecticide -

cholinesterase -

Toxorhynchites -

control group -

4) Be able to associate some diseases with specific species of mosquitoes.

A. Yellow Fever and Dengue

B. Malaria

C. Encephalitis, dog heartworms

3) List the 5 steps of the scientific method in sequence.

15) Students will know that there are about 50 species of mosquitoes in the Greater New Orleans area.

16) Students will be able to associate the following mosquitoes with the disease they can be vectors of.

A. Aedes aegypti - Yellow Fever and Dengue

B. Anopheles quadrimaculatus - Malaria

C. Culex quinquefasciatus - Encephalitis, Dog Heartworms

17) Students will define:

A. axon - the core of a nerve fiber that conducts impulses away from the nerve cell

B. dendrite - the branched part of a nerve cell that transmits impulses toward the nerve cell

C. synapse - the point at which a nerve impulse passes from an axon of one nerve cell to the dendrite of another

D. acetycholine - a chemical that transmits nerve impulses across the synapse

E. cholinesterase - a chemical which breaks down acetycholine

18) Students will know that insecticides work by inhibiting the formation of cholinesterase, causing a short circuit between the nerve cells.

19) Students will learn that 1 droplet (the size of a blood cell) applied topically will kill a mosquito but to kill a man 6 - 12 ounces must be taken orally.

20) Students will be able to recognize the following methods NOMCB uses to combat mosquitoes

A. Toxorhynchites (Tox) - cannibal mosquitoes

B. Larviciding - oil on top of the water

C. Chemical Control - the type of chemical used and the dosage depend on many variables and are determined beforehand by using the scientific method

21) Students will list the steps of the "scientific method" in order. They are:

A. Define the problem

B. Form a hypothesis

C. Test the hypothesis

D. Assess the findings of the test

E. Draw a conclusion

22) Students will associate the five steps of the scientific method to answer the question "Is a particular chemical effective in killing mosquitoes?"

23) Students will realize the importance of putting science to work to keep our New Orleans Mosquito Control program effective, efficient, and safe.

24) Students will score at least 70% on posttest.

KEY TO POSTTEST:

I. MATCHING:

1.	J	6.	I
2.	F	7.	D
3.	C	8.	B
4.	A	9.	G
5.	H	10.	E

II. QUESTIONS:

1. To get blood to nourish eggs.
2. When we scratch we rub salt & bacteria in.
3. A. Define problem; B. Form hypothesis; C. Test hypothesis; D. Assess findings; E. Draw conclusion.

III. MATCHING STEPS:

1. A
2. E
3. C
4. B
5. D

IV. TRUE OR FALSE:

1. F
2. T
3. F
4. T
5. T
6. F

COMMENTS:

This tape and study guide is a service of New Orleans Mosquito Control Board. It was completely developed, filmed, taped, and produced at our facility in an attempt to educate the youth of our City in the science of mosquito control. In order to help us do this, we would appreciate your comments.

1) Did you as a teacher find the tape and study guide beneficial?

2) How many students viewed the tape?

3) How do you feel the students responded to this program?

4) Do you think we succeeded in making them aware of the science involved in mosquito control?

NEW ORLEANS MOSQUITO CONTROL BOARD
6601 LAKESHORE DRIVE
NEW ORLEANS, LA. 70126
241-2370

PUBLIC INFORMATION PROGRAM - VIDEOTAPE

TITLE: "MOSQUITO CONTROL - SCIENCE AT WORK"

SCHOOL NAME: ____________________

Teacher(s) Name	Total No. Students	No. of Times Shown	Date(s)	Comments

"MOSQUITO CONTROL - SCIENCE AT WORK"

NAME: _____ DATE: _____

POSTTEST: All questions are worth 4 points each.

I. MATCHING: Place the appropriate letter to the left of the number.

_____ 1.	control group	A. A mouthpiece used by a mosquito to draw blood.
_____ 2.	synapse	B. A chemical that transmits nerve impulses.
_____ 3.	metamorphosis	C. Changing shape or form
_____ 4.	proboscis	D. the core of a nerve fiber conducting impulses away from the cell.
_____ 5.	insecticide	E. Branched part of the nerve cell carrying impulses toward the nerve cell.
_____ 6.	Toxorhynchites	F. The point at which a nerve impulse passes from the axon of 1 cell to the dendrite of another.
_____ 7.	axon	G. A chemical that short circuits nerve cells.
_____ 8.	acetycholine	H. Used to kill mosquitoes, ants, and roaches.
_____ 9.	cholinesterase	I. Cannibal mosquito
_____ 10.	dendrite	J. A sample group used to test the validity of a scientific experiment.

II. QUESTIONS: Question briefly.

1) Why do mosquitoes bite people?

2) Why do mosquito bites itch?

3) List the 5 steps of the scientific method in proper sequence.

III. MATCH THE STEP involved with that actually used at NOMCB.

_____ Step 1	A) Is a chemical effective in killing mosquitoes or not?
_____ Step 2	B) Experiment results are studied.
_____ Step 3	C) A controlled experiment is performed
_____ Step 4	D) Yes, the chemical is effective in killing mosquitoes.
_____ Step 5	E) A particular chemical is effective in controlling mosquitoes when applied at the label rate.

IV. TRUE OR FALSE: Place a T or F next to the appropriate number.

_____ 1. Larvae breathe through trumpets.

_____ 2. *Aedes aegypti* can be vectors of yellow fever.

_____ 3. *Alotof gumption* can be vectors of dengue.

_____ 4. *Culex quinquefasciatus* is the major vector of encephalitis and dog heartworm.

_____ 5. *Anopheles quadrimaculatus* is a vector of malaria.

_____ 6. Pupa breathe through their tails.

MOSQUITOES !

THEY CAN CARRY SERIOUS DISEASES SUCH AS:

ENCEPHALITIS
(SLEEPING SICKNESS)

YELLOW FEVER

DENGUE

MALARIA

DESTROY MOSQUITO BREEDING PLACES

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HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
Atlanta, Georgia 30333

STOP MOSQUITO DEVELOPMENT

GET RID OF STANDING WATER!

Empty, remove, cover or turn upside down any receptacle that would hold water – particularly old bottles and tin cans.

Change water and scrub vases holding flowers or cuttings twice each week – or grow cuttings in sand.

Discard old tires or store them indoors.

Screen rain barrels and openings to water tanks or cisterns.

Repair leaky plumbing and outside faucets.

Connect open waste-water drains to a sewage system, or construct separate sump or leach lines.

Clean clogged roof gutters and drain flat roofs.

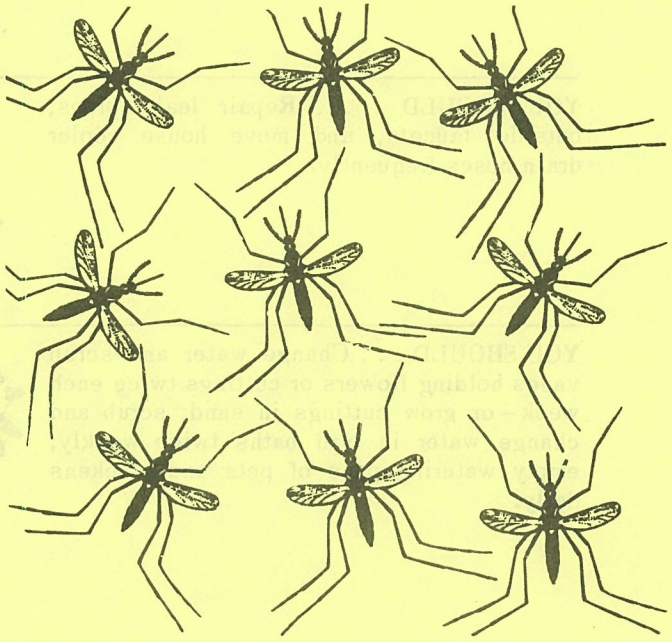
Fill holes in trees with sand or mortar, or drain or spray them, as required.

Stock ornamental ponds with mosquito fish.

MOSQUITOES develop only in water . . . and water standing just a few days can produce a crop of mosquitoes!

Orleans Parish Mosquito Control
6601 Lakeshore Drive
New Orleans, La. 70126
241-2370

STOP RAISING MOSQUITOES IN YOUR YARD & HOME!

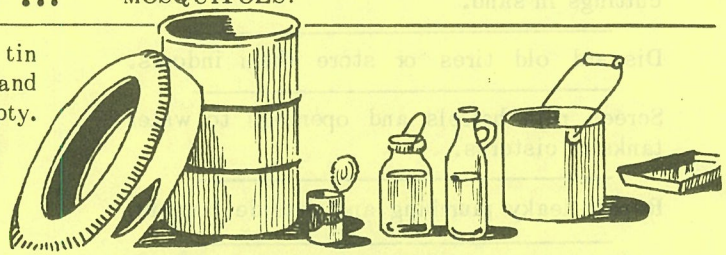


STOP MOSQUITOES!

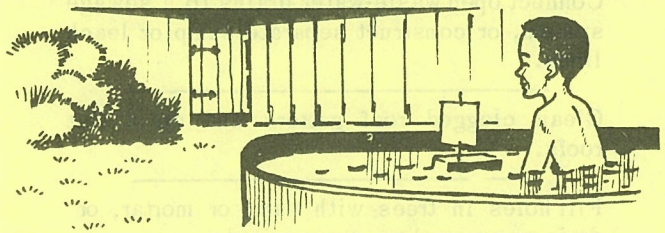
CHECK YOUR YARD & HOME ...

If there are any places around your home where water collects, such as water-holding containers, house cooler drains, and ornamental ponds – YOU MAY BE RAISING MOSQUITOES!

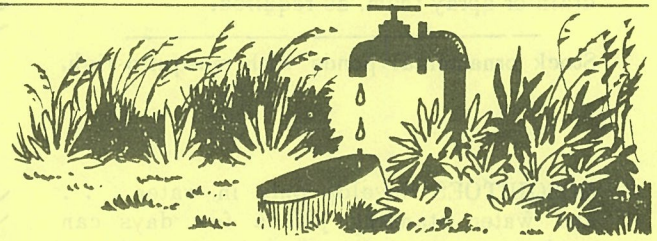
YOU SHOULD . . . Get rid of old tires, tin cans, bottles, jars, buckets, drums and other containers, or should keep them empty.



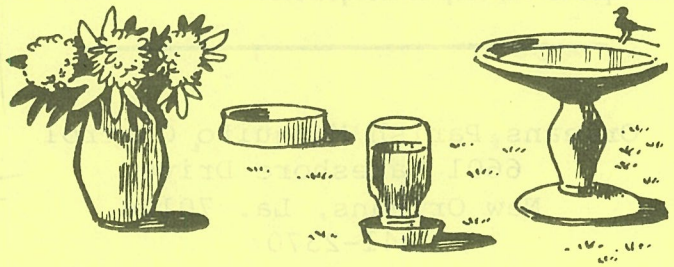
YOU SHOULD . . . Empty your plastic wading pool weekly and store it indoors when not in use.



YOU SHOULD . . . Repair leaky pipes, outside faucets, and move house cooler drain hoses frequently.

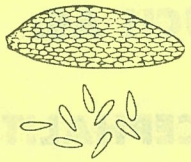


YOU SHOULD . . . Change water and scrub vases holding flowers or cuttings twice each week – or grow cuttings in sand; scrub and change water in bird baths twice weekly; empty watering pans of pets and chickens daily.



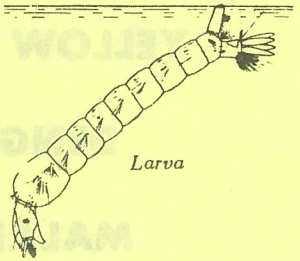
IT'S A FACT . . .

All mosquitoes need water in which to pass their early life stages . . . Adult flying mosquitoes frequently rest in grass, shrubbery or other foliage, but they never develop there . . .

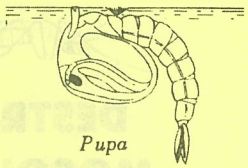


Egg

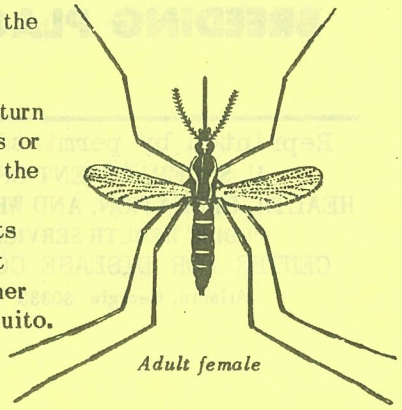
Some mosquitoes lay their eggs in standing water where they hatch in a day or two. Other mosquitoes lay their eggs in old tires, tin cans, or other water-holding containers in which they may remain unhatched for weeks or months until they are covered with water. With both types of mosquitoes, the wigglers or larvae grow quickly and turn into tumblers or pupae. Soon the skin of the tumbler splits open and out climbs another hungry mosquito.



Larva



Pupa

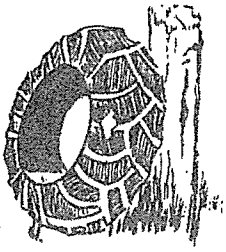


Adult female

HAVE YOU CHECKED AROUND YOUR HOME FOR MOSQUITO BREEDING SITES ?

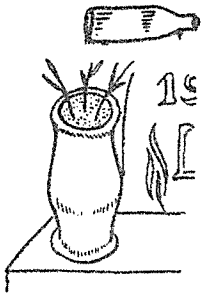
YES	NO

DO YOU WASH OUT YOUR PET'S DISH OFTEN?

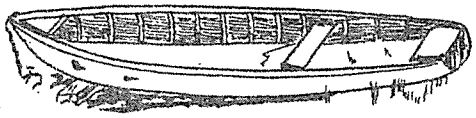


HAVE YOU THROWN AWAY OR PUT UNDER COVER ANY OLD TIRES YOU MAY HAVE?

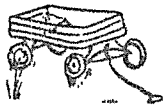
HAVE YOU THROWN AWAY ANY OLD TIN CANS OR BOTTLES WHICH MAY HAVE BEEN IN YOUR YARD?



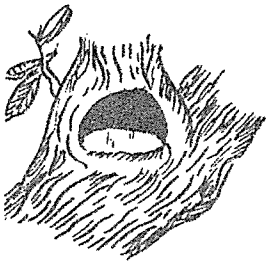
HAVE YOU ASKED YOUR PARENTS TO GROW THEIR HOUSE PLANTS IN SOIL INSTEAD OF WATER?



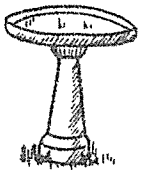
HAVE YOU ASKED YOUR PARENTS TO TURN THE BOAT UPSIDE-DOWN ?



HAVE YOU PUT ALL THE TOYS UNDER COVER?



IF THERE IS A HOLE IN THE TREE IN YOUR YARD HAVE YOU FILLED IT WITH SAND?



DO YOU SCRUB THE BIRDBATH ONCE A WEEK?

REMEMBER! MOSQUITOES NEED WATER IN WHICH TO BREED! HELP GET RID OF AEDES AEGYPTI MOSQUITOES BY GETTING RID OF WATER IN CONTAINERS IN AND AROUND YOUR HOME.

MOSQUITO CONTROL

Wherever man is, there are mosquitoes, and wherever mosquitoes are, man is annoyed or made ill by their presence. They have played and will play a major role in human civilization. In addition to being a carrier of many organisms that cause disease, they adversely affect industries, real estate, recreation, commerce, tourism, farming and wildlife.

Living conditions continually improve with advances in mosquito control technology. The mosquito control worker is no longer a man with a can of oil or DDT; he now uses many techniques. He must kill mosquitoes, but should not kill or injure other insects, animals or plants which are beneficial. He should not contaminate water, air, land or other elements of the environment. He must guard against the development of insecticide resistance. All of this must be attained with maximum economy. Therefore, he now uses integrated mosquito control approaches, which is a judicious combination of the methods most applicable to the situation. This includes chemical control, source reduction and biological control.

HISTORY OF MOSQUITO CONTROL IN NEW ORLEANS

The New Orleans Mosquito Control Board had its beginning in June 1964, at which time the City of New Orleans established a "Mosquito Control Operating Fund" and budgeted funds to start the operation. This followed a year (1963) in which the salt marsh mosquito had increased in numbers to a point where they literally prevented any outside activities, work or play, and were seriously effecting the economy and growth of the City. The Orleans Levee Board contributed monies to help start the program, and also provided space (1.5 acres) on the Lakefront Airport to be used as the base of operation. The cost for mosquito control in New Orleans for the past 18 years has averaged less than $1 a person per year.

The New Orleans Mosquito Control Board program was designed to include all practical phases of operational mosquito control and be labeled as a truly intergrated pest managment program. The basic methods of chemical control (larviciding and adulticiding) were established to be guided by a continuing surveillance program to constantly define the problem as to type of mosquito and as to location. Source reduction, or the elimination of the breeding areas, was determined to be the major part of our control efforts.

These basic methods are supported by adult density surveys, rainfall information, larval surveys, encephalitis surveillance and other operations necessary to assure a successful and economical method of controlling mosquitoes and protecting the people of the City of New Orleans.

GENERAL STRUCTURE AND LIFE CYCLE OF THE MOSQUITO

The mosquito is a small, fragile-bodied insect that belongs to the family Culicidae of the order Diptera (true flies). The adult has characteristic wing venation, modified, flattened scales on the wing veins and a fringe of scales along the posterior (rear) margin of the wing. The larva has three distinct body segments; head, thorax and abdomen. The pupa is composed of a combined head/thorax- the cephlothorax and abdomen, and moves vertically in its water environment. Pictures of the larva, pupa and adult can be seen on the following pages.

LIFE HISTORY

The mosquito has four distinct stages in its life history: the adult, egg, larva and pupa. The adult is an active flying insect, while the other stages occur in water. Some species lay eggs singly while others lay them in rafts of 50-300 eggs. Some species, notably those of Aedes and Psorophora, lay their eggs singly on moist soil or other moist substrates such as plant stems or the insides of containers. Other species, particularly in the genera Culex and Culiseta, lay eggs in rafts on the water's surface, while Anopheles lay individual eggs with floats attached to them. These, likewise, are deposited on the water's surface. Regardless of the egg deposition site, it must be submerged in water in order to hatch.

GENERAL STRUCTURE

ADULTS:

The adult mosquito varies in length from approximately 1/16 to 1/2 inch and has three distinct body regions; these are the head, thorax and abdomen (see illustrations). All parts of the body are covered to some degree with course hairs or scales, which are variously colored.

These color patterns are often useful for identification of species.

HEAD: The head of the mosquito is almost spherecal and bears a pair of large compound eyes, a pair of antennae, a pair of palpi and a large proboscis (piercing mouth). The probosis projects forward and slightly downward from the lower margin of the head. It contains 5 stylets (2 maxillae, 2 mandibles and 1 hypopharynx) which form the fasical. The fasical is inserted into the host by the female to suck blood. In males, it is modified and used only to suck nectar or plant juices where no piercing is required.

THORAX: The middle region of the body, the thorax, is made up mostly of the second thoracic, called the mesothorax. The first thoracic segment (prothorax) and the third thoracic segment (metathorax) are reduced. A pair of long, slender legs arise from the lower side of each of the three segments of the thorax. Each leg bears a pair of tarsi at the tip. The wings are long, narrow and are provided with several longitudinal and a few cross veins. Like other parts of the body, they are also covered with scales, often of varying colors, which may be distributed to form definite patterns. A pair of small knobbed structures, known as halteres, are located behind and slightly below the wings. They vibrate rapidly when the mosquito is in flight and serve as organs for balance.

ABDOMEN: The abdomen is elongate-cylindrical and is composed of ten segments, the first eight of which are distinct and unmodified. The ninth and tenth segments are greatly modified for sexual functions in both sexes. The modified terminal segments of the males are extremely useful in taxonomic classifications, but they are too complicated to be considered for general information. The tip of the abdomen is either tapered or blunt and aids in the identification of different genera of mosquitoes. The color pattern of the abdomen may vary from one species to another, depending on the color and density of the scales and hairs.

EGGS:

Eggs are white when first deposited, becoming dark within 12 to 24 hours. Single eggs are about 1/50 inch long, and the individual eggs of all species (except Anopheles) appear similar when seen by the naked eye (see illustrations).

LARVAE:

The larvae of all mosquitoes live in water and have four developmental instars (stages). At the end of each instar, the larva sheds its skin (molts). Mosquito larvae have three distinct regions: Head, thorax and abdomen.

The head bears the antennae, eyes, mouthparts and hairs of various sizes. Behind the antennae, the eyes are located near the hind margin of the head. The mouthparts are on the underside of the head near the front and include a series of brushes which are used for feeding.

The thorax is broader than the head or abdomen, and somewhat flattened dorsoventrally (top to bottom). It has several groups of hairs which are useful in identification of species. Neither legs or wings are present in the larval stage.

The abdomen is long and subcylindrical, consisting of nine distinct segments. The first seven segments are similar, but the eight and ninth are considerably modified. The eighth segment bears a respiratory apparatus. The ninth segment is out of line with other segments and bears two of four anal gills.

PUPAE:

The mosquito pupa, unlike the pupae of other insects, is very active and, like the mosquito larva, lives in water. However, it differs greatly from the larva in shape and appearance. The pupa is comma-shaped and its body is divisible into two distinct regions. The front part, consisting of the head and thorax (cephalothorax) is greatly enlarged and bears a pair of respiratory trumpets on its upper surface. The second region is the abdomen, which consists of eight freely movable segments with a pair of paddles at the tip.

SCIENTIFIC NAME	COMMON NAME	HABITAT	FLIGHT RANGE	PUBLIC HEALTH
Culex salinarius	"Sal"	Permanent fresh water breeder	3- 5 miles	Bites humans readily out-of-doors at dawn and dusk. Not considered to be a good vector of disease.
Anopheles crucians	"Crucians"	Permanent fresh water breeder	3- 5 miles	Susceptible to infection with Malaria Parasites. Poor Eastern Equine Encephalitis.
Aedes vexans	"Vexans"	Floodwater breeder (Fresh)	10-20 miles	Fair vector potential for Eastern, Western and St. Louis Encephalitis. Moderate host for Dog Heart Worm.
Aedes sollicitans	"Salt-marsh Mosquito"	Floodwater breeder (Salt)	20-40 miles	Excellent for Eastern Encephalitis; Good for Western Encephalitis.
Mansonia perturbans	"Mansonia	Permanent fresh-water breeder	8-10 miles	Probable vector of Eastern Equine Encephalitis
Culiseta inornata	"Winter Mosq."	Permanent water fresh or polluted	1- 3 miles	Western Equine Encephalitis has been isolated. Japanese B Encephalitis Virus transmitted.
Anopheles quadrimaculatus	"Quad"	Permanent fresh water breeder	1- 2 miles	Principal vector of Malaria. Efficient host of Dog Heart Worm. Poor vector for Eastern and Western Encephalitis.
Culex quinquefasciatus	"Quink	Permanent foul ditch water breeder	Less than 1 mile	Readily infected with filariasis. Vector of St. Louis Encephalitis. Possible vector of yellow fever.
Aedes aegypti	"Gyp" Yellow Fever Mosquito	Permanent Water Breeder; artificial containers	100-500 ft.	Most important vector of yellow fever and dengue. Experimentally transmits Eastern, Western & St. Louis Encephalitis.

ANOPHELINES

CULICINES

ANOPHELES

AEDES

CULEX

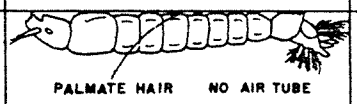
EGGS

WITH FLOATS — LAID SINGLY ON WATER

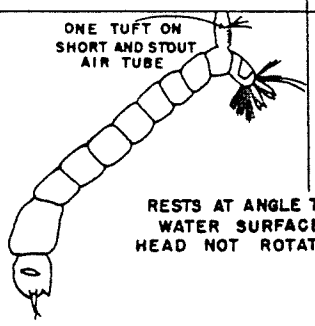
NO FLOATS — LAID SINGLY ON DRY SURFACE

NO FLOATS — LAID IN RAFTS ON WATER

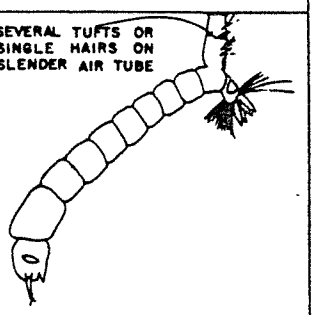
LARVAE



RESTS PARALLEL TO WATER SURFACE
HEAD ROTATED 180° WHEN FEEDING

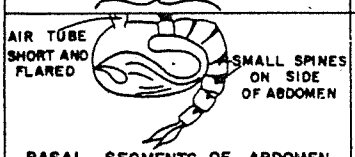


RESTS AT ANGLE TO WATER SURFACE
HEAD NOT ROTATED



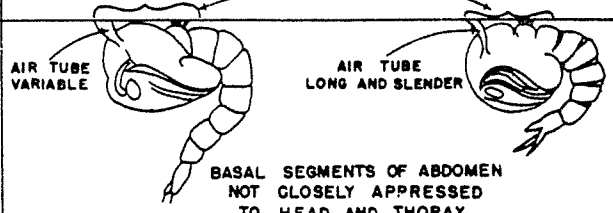
PUPAE

GREATER PROPORTION OF BODY CONTACTING WATER SURFACE



BASAL SEGMENTS OF ABDOMEN CLOSELY APPRESSED TO HEAD AND THORAX

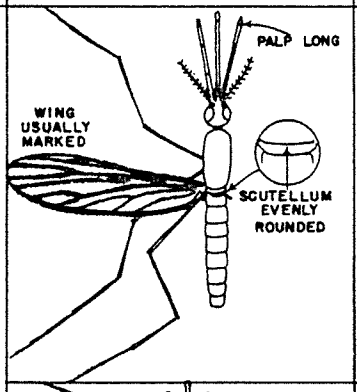
SMALLER PROPORTION OF BODY CONTACTING WATER SURFACE

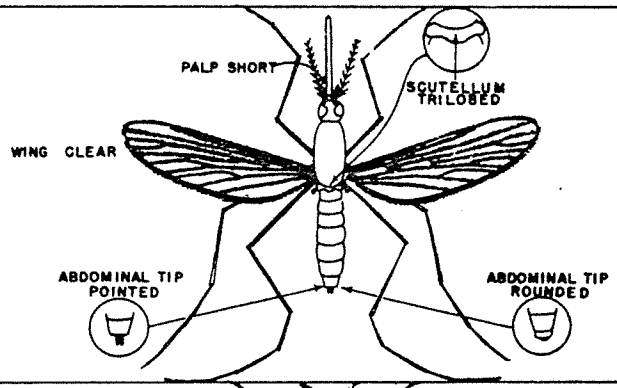


BASAL SEGMENTS OF ABDOMEN NOT CLOSELY APPRESSED TO HEAD AND THORAX

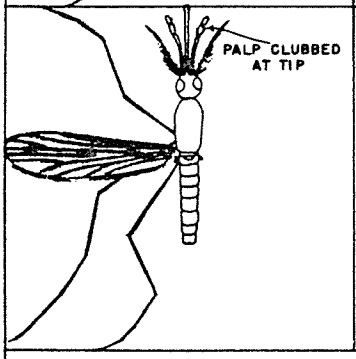
ADULTS

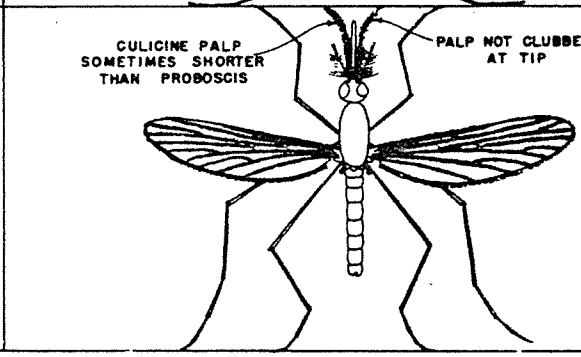
FEMALES



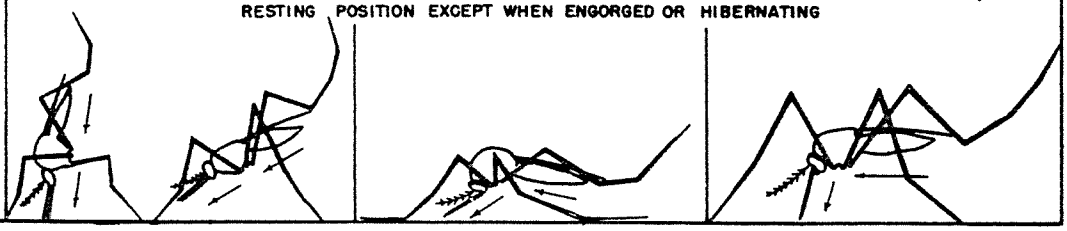


MALES





RESTING POSITION EXCEPT WHEN ENGORGED OR HIBERNATING



PICTORIAL KEY TO UNITED STATES GENERA OF FEMALE MOSQUITOES

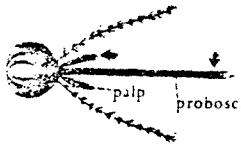
Harry D. Pratt and Chester J. Stojanovich

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333
1963

palp as long as proboscis

Anopheles

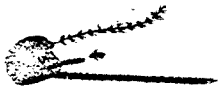
palp much shorter than proboscis



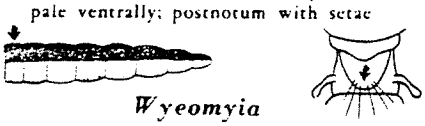
proboscis stout on basal half, outer half tapered and strongly turned downward

Toxorhynchites
Formerly *Megarhinus*

proboscis slender and never curved downward

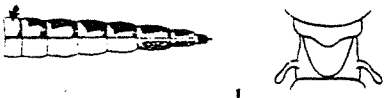


abdominal scales dark dorsally and pale ventrally; postnotum with setae



Wyeomyia

abdominal tergites with pale bands or lateral spots; postnotum without setae



wing with second marginal cell less than half as long as its petiole

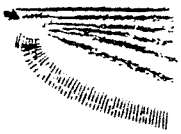
Uranotaenia

wing with second marginal cell at least as long as its petiole

abdomen blunt

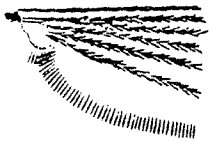
abdomen pointed

base of subcosta with row of bristles on under side

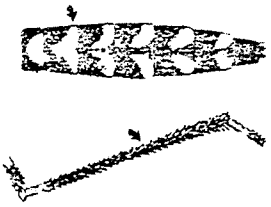


Culiseta

base of subcosta without row of bristles on under side

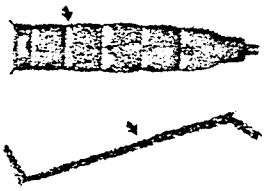


dorsal segments of abdomen with pale scales apically, or if absent, hind tibia with long, erect scales



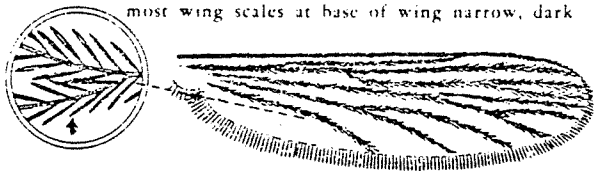
Psorophora

dorsal segments of abdomen with pale scales basally, hind tibia without erect scales

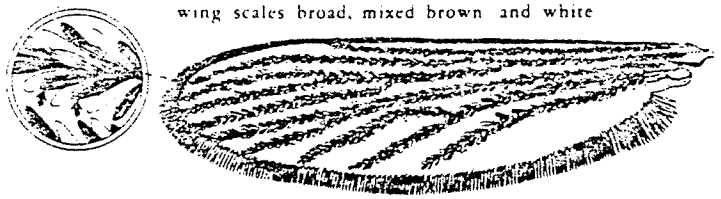


Aedes

most wing scales at base of wing narrow, dark



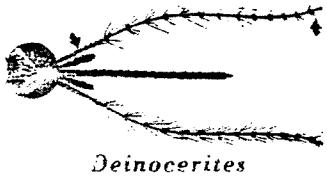
wing scales broad, mixed brown and white



antenna not longer than proboscis, first flagellar segment about as long as following segments

Culex

antenna much longer than proboscis, first flagellar segment as long as next two segments

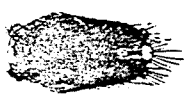


Deinocerites

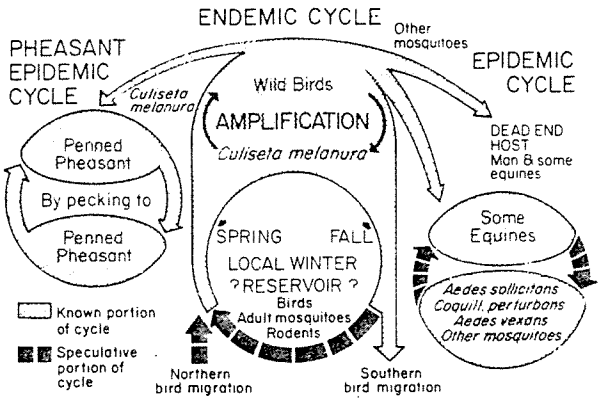
mesonotum with fine longitudinal lines of white scales

Orthopodomyia

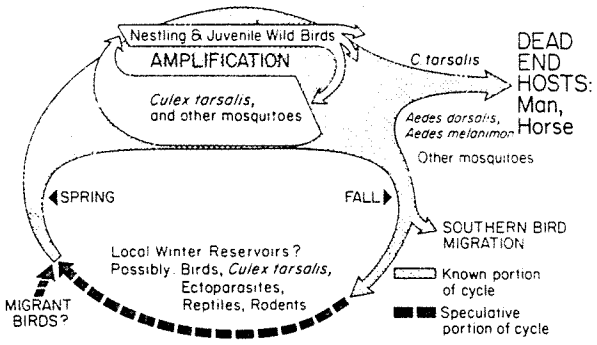
mesonotum without lines of white scales



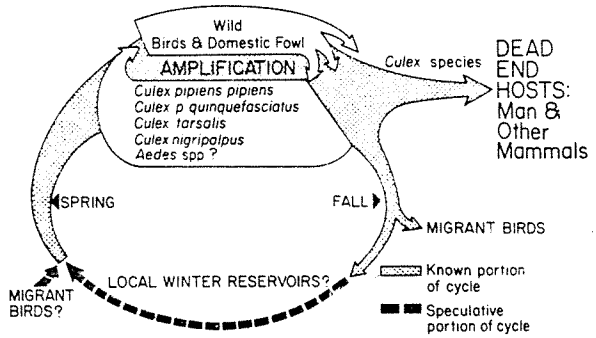
Mansonia



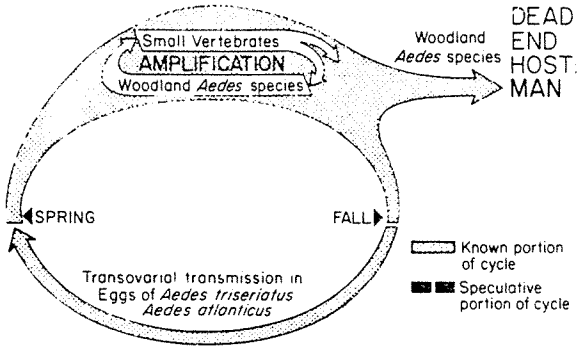
EE virus cycle in U.S.



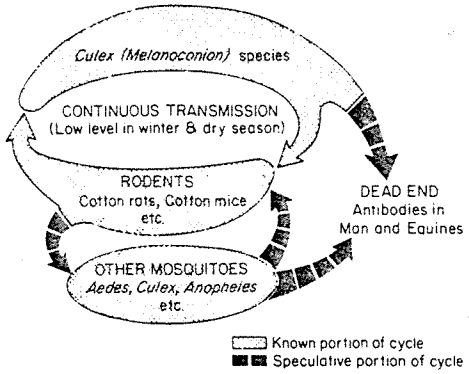
WE virus cycle in western U.S.



SLE virus cycle in U.S.

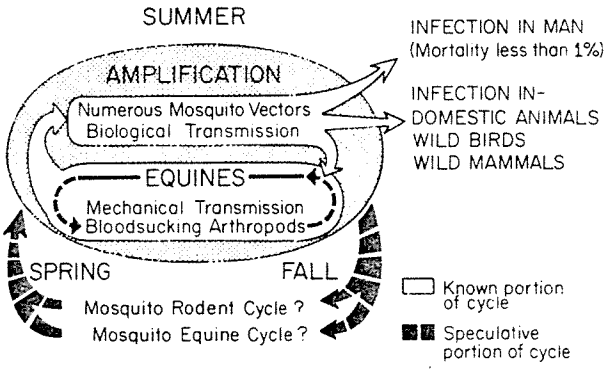


CE group virus cycle in U.S.
LaCrosse and Keystone Subtypes



Endemic cycle of VE*

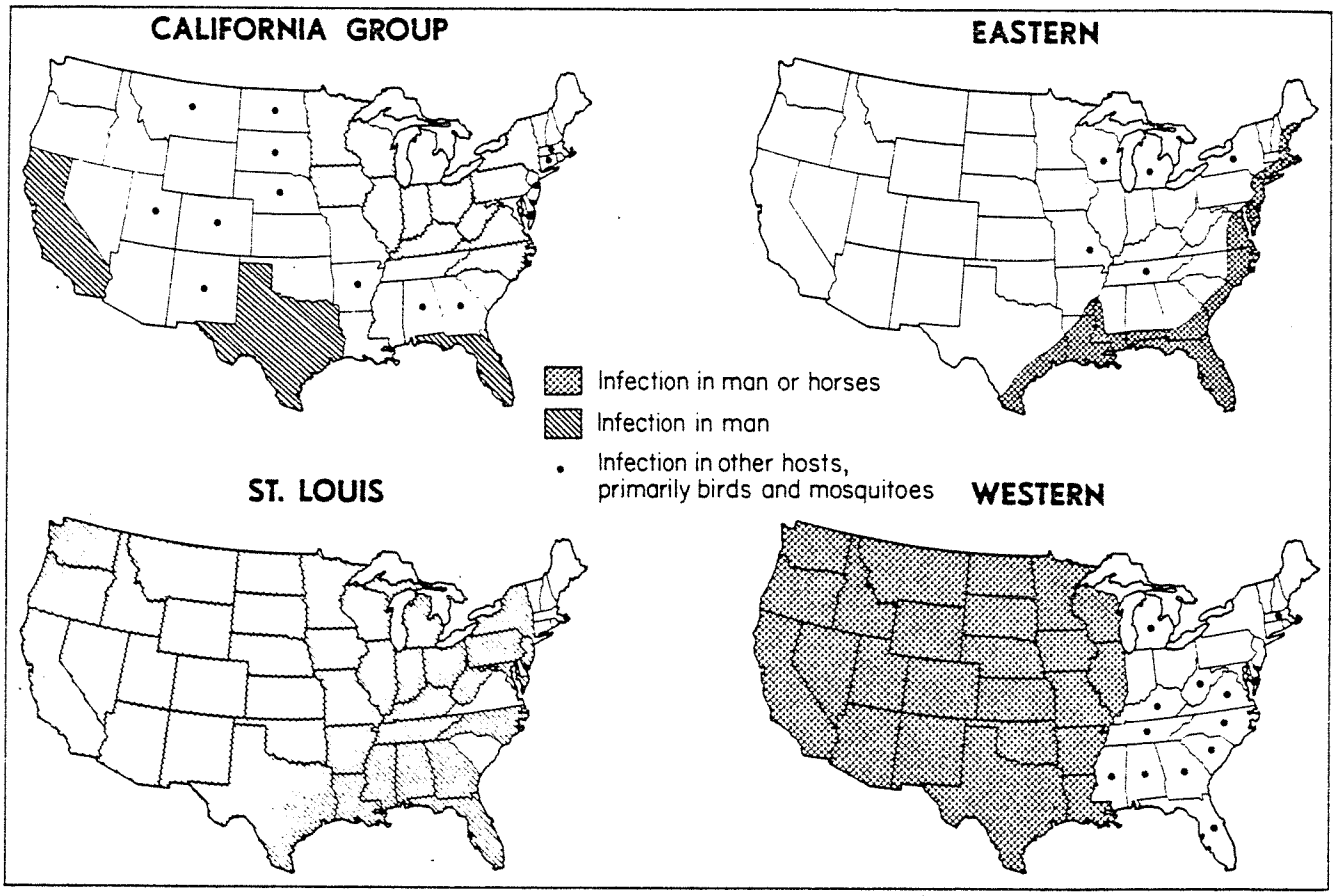
*Representative of ID, IE, II, III, IV antigenic subgroups



Epidemic VEE virus cycle*

*Representative of 1A, 1B, and 1C

North American Mosquitoborne Arboviral Encephalitis Cycles

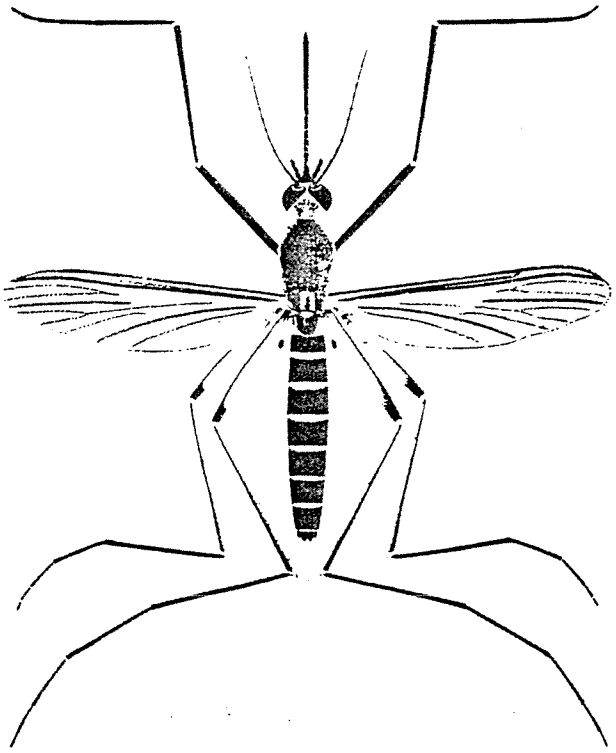


Distribution of 4 Types of Mosquitoborne Arboviral Encephalitis

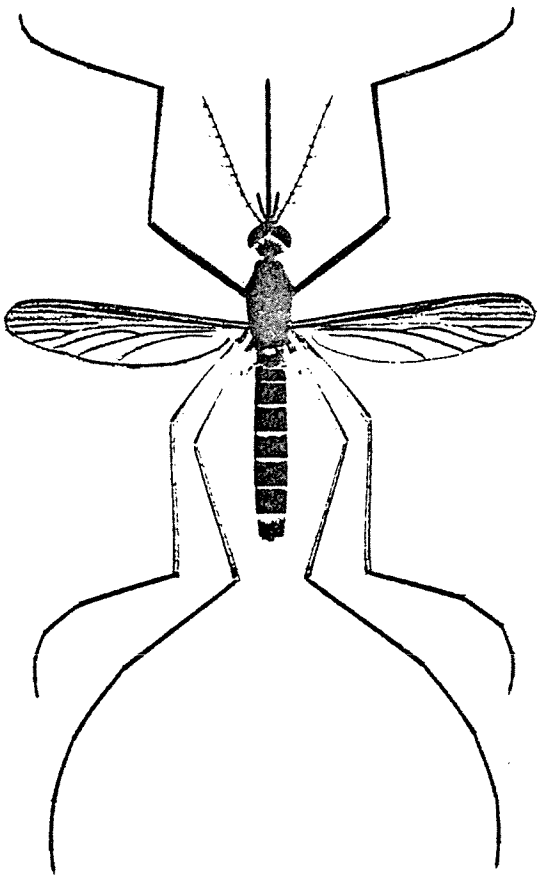
HUMAN CASES OF ARTHROPOD -BORNE ENCEPHALITIS, 1955-1975

YEAR*	TYPE OF ENCEPHALITIS					TOTAL
	WEE	EEE	SLE	CE	VEE	
1955	37	15	107	0		159
1956	47	15	563	0		625
1957	35	5	147	0		187
1958	141	2	94	0		237
1959	14	36	118	0		168
1960	11	3	21	0		35
1961	27	1	42	0		70
1962	17	0	253	0		270
1963	56	0	19	1		76
1964	64	5	470	42		581
1965	172	8	58	59		297
1966	47	4	323	64		438
1967	18	1	11	53		83
1968	17	12	35	66	1	131
1969	21	3	16	67	1	108
1970	4	2	15	89		110
1971	11	4	57	58	19	149
1972	8	0	13	46	2**	69
1973	4	7	5	75		91
1974	2	4	72	30		108
1975	133	3	1,791	146		2,073

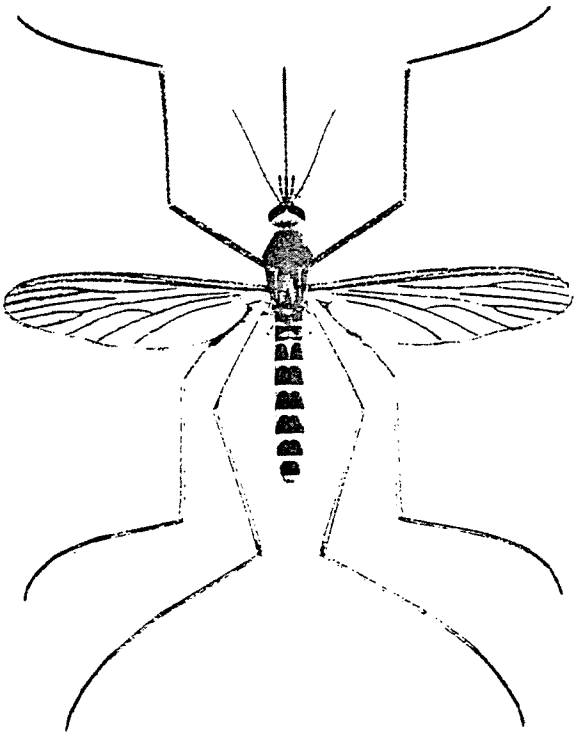
* (CDC 1976): 1975, unpublished data, CDC.
** Imported into the U.S. from Mexico



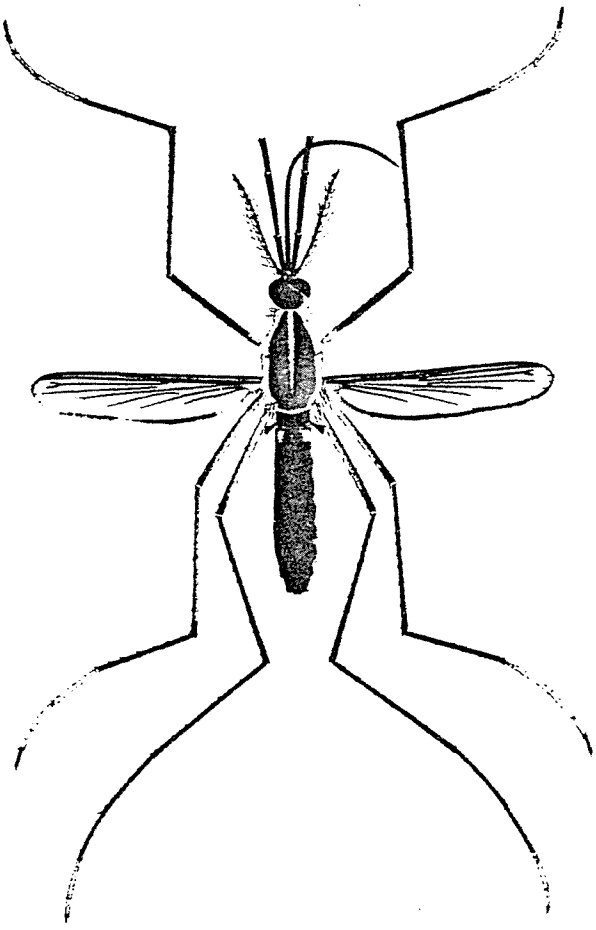
Culex quinquefasciatus (Say), female



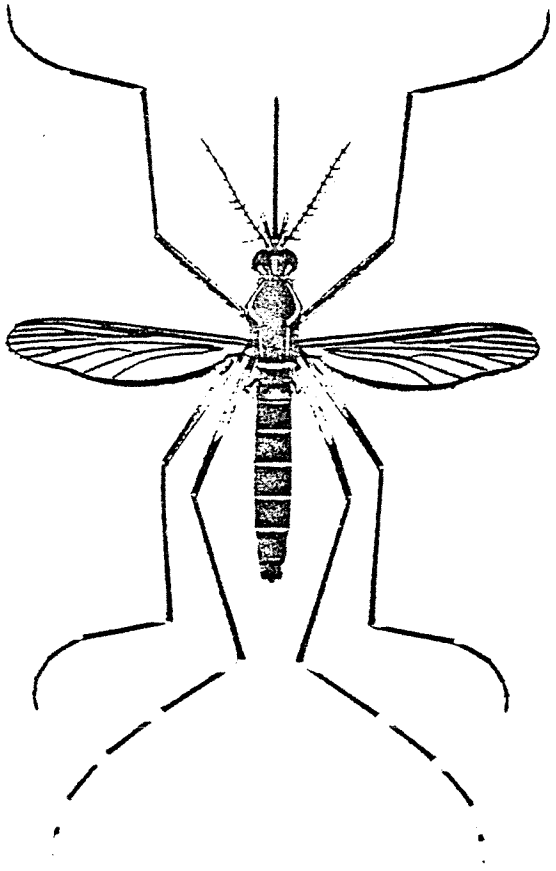
Culex salinarius (COQUILLETT), female



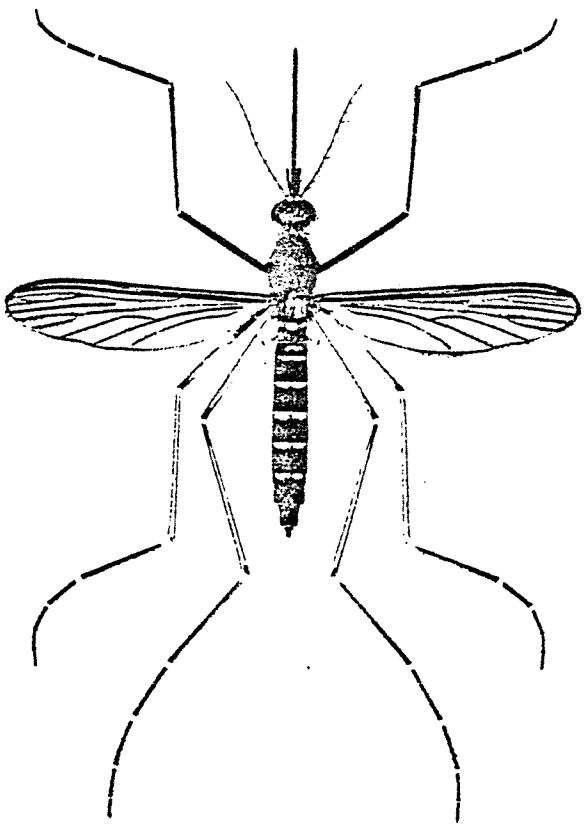
Culiseta inornata (Williston), female



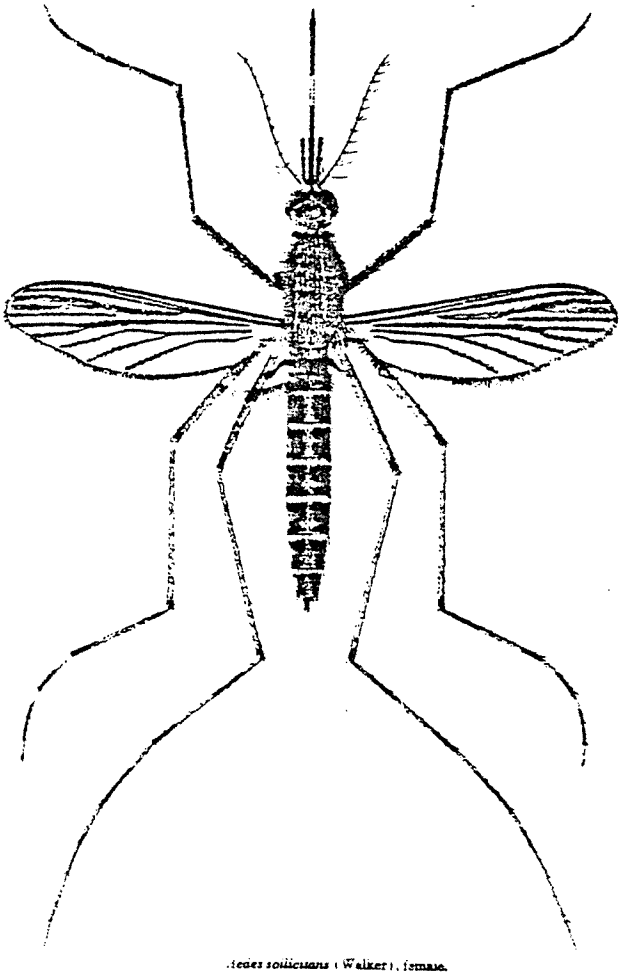
Toxorhynchites rutilus septentrionalis (Dyar and Knab), female.



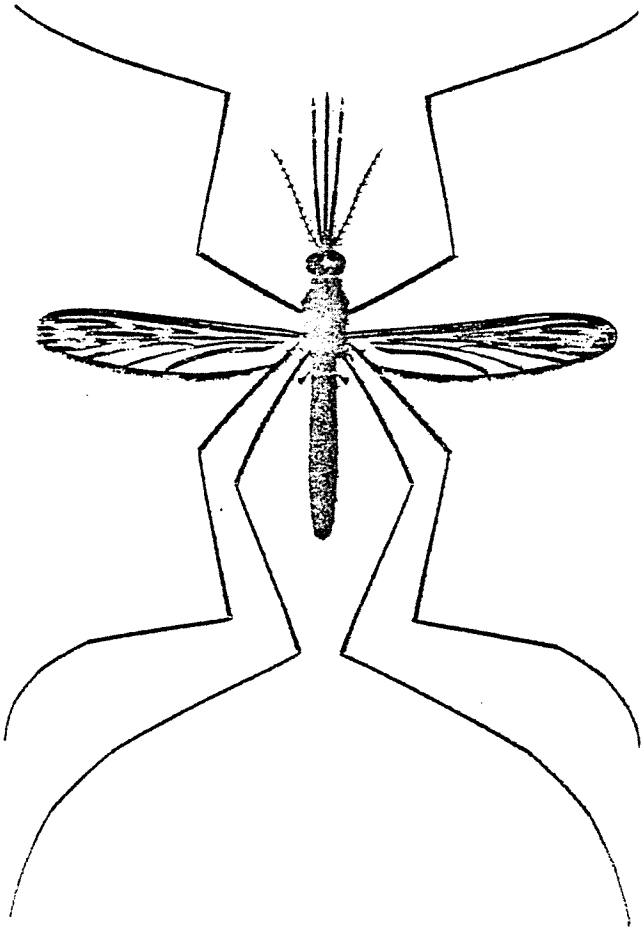
Aedes aegypti (Linnaeus), female.



Aedes vexans (Meigen), female



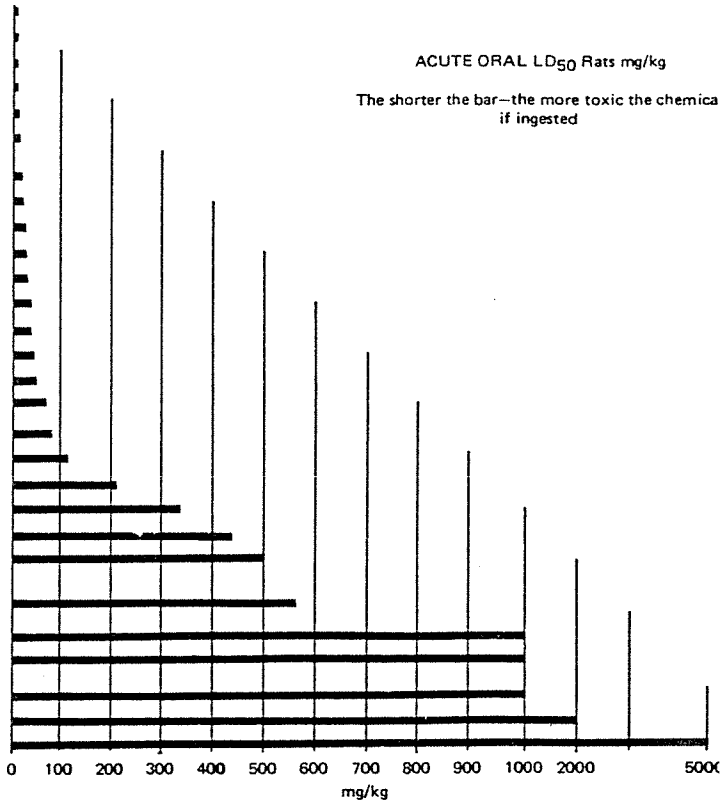
Aedes sollicitans (Walker), female.



Anopheles crucians Wiedemann, female.

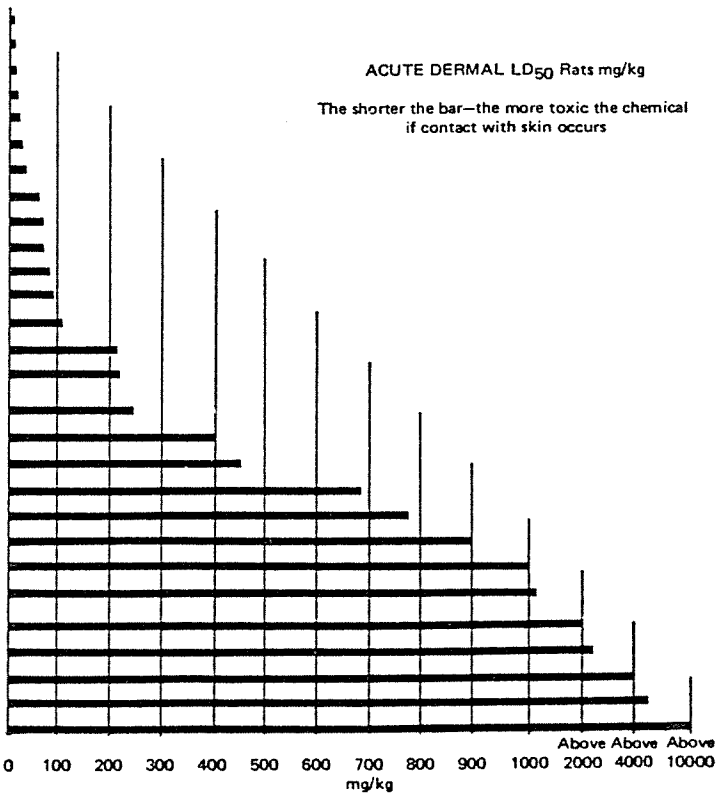
Examples of insecticide toxicity

tepp	1.05
phorate (Thimet®)	1.1–2.3
demeton (Systox®)	2.5–6.2
parathion (Thiophos®)	3.6–13.0
mevinphos (Phosdrin®)	3.7–6.1
endrin	5–17.8
carbophenothion (Trithion®)	10–30
azinphosmethyl (Guthion®)	11–13
methyl parathion	14–24
Bidrin®	15–22
endosulfan (Thiodan®)	18–43
phosphamidon (Dimecron®)	23.5
ethion (Nialate®)	27–65
aldrin	39–60
dieldrin	46
diazinon	76–108
toxaphene	80–90
DDT	113–118
dimethoate (Cygon®)	215
chlordane	335–430
naled (Dibrom®)	430
carbaryl (Sevin®)	500–850
trichlorofon (Dylox®) (Dipterex®)	560–630
dicofol (Kelthane®)	1000–1100
malathion	1000–1375
chlorobenzilate	1040–1220
Aramite	2000–3900
tetradifon (Tedion®)	5000–14700



tepp	2.4
phorate (Thimet®)	2.5–6.0
mevinphos (Phosdrin®)	4.2–4.7
parathion (Thiophos®)	7–21
demeton (Systox®)	8–14
endrin	15
carbophenothion (Trithion®)	27–54
dieldrin	60–90
ethion (Nialate®)	62–245
methyl parathion	67
endosulfan (Thiodan®)	74–130
aldrin	98
phosphamidon (Dimecron®)	107–143
azinphosmethyl (Guthion®)	220
Bidrin®	225
oxydemetonmethyl (Meta-Systox®-R)	250
dimethoate (Cygon®)	400
diazinon	455–900
chlordane	690–840
toxaphene	780–1075
lindane	900–1000
dicofol (Kelthane®)	1000–1232
naled (Dibrom®)	1100
trichlorofon (Dylox®, Dipterex®)	>2000
DDT	2510
carbaryl (Sevin®)	>4000
malathion	>4444
tetradifon (Tedion®)*	>10000

>= greater than
* rabbits



The bar graphs above show the relative toxicity to humans of certain common insecticides when exposure is by skin, or when swallowed.

Reprinted from "Pesticide Information and Safety Manual"

"MOSQUITO CONTROL - SCIENCE AT WORK"

PRETEST

NAME: _____ DATE: _____

1) Why do mosquitoes bite?

2) Define:

larva -

pupa -

proboscis -

spermatheca -

metamorphosis -

axon -

dendrite -

synapse -

acetycholine -

insecticide -

cholinesterase -

Toxorhynchites -

control group -

4) Be able to associate some diseases with specific species of mosquitoes.

A. Yellow Fever and Dengue

B. Malaria

C. Encephalitis, dog heartworms

3) List the 5 steps of the scientific method in sequence.

"MOSQUITO CONTROL - SCIENCE AT WORK"

NAME: _____ DATE: _____

POSTTEST: All questions are worth 4 points each.

I. MATCHING: Place the appropriate letter to the left of the number.

_____ 1.	control group	A. A mouthpiece used by a mosquito to draw blood.
_____ 2.	synapse	B. A chemical that transmits nerve impulses.
_____ 3.	metamorphosis	C. Changing shape or form.
_____ 4.	proboscis	D. the core of a nerve fiber conducting impulses away from the cell.
_____ 5.	insecticide	E. Branched part of the nerve cell carrying impulses toward the nerve cell.
_____ 6.	Toxorhynchites	F. The point at which a nerve impulse passes from the axon of 1 cell to the dendrite of another.
_____ 7.	axon	G. A chemical that short circuits nerve cells.
_____ 8.	acetycholine	H. Used to kill mosquitoes, ants, and roaches.
_____ 9.	cholinesterase	I. Cannibal mosquito
_____ 10.	dendrite	J. A sample group used to test the validity of a scientific experiment.

II. QUESTIONS: Question briefly.

1) Why do mosquitoes bite people?

2) Why do mosquito bites itch?

3) List the 5 steps of the scientific method in proper sequence.

III. MATCH THE STEP involved with that actually used at NOMCB.

_____ Step 1	A) Is a chemical effective in killing mosquitoes or not?
_____ Step 2	B) Experiment results are studied.
_____ Step 3	C) A controlled experiment is performed
_____ Step 4	D) Yes, the chemical is effective in killing mosquitoes.
_____ Step 5	E) A particular chemical is effective in controlling mosquitoes when applied at the label rate.

IV. TRUE OR FALSE: Place a T or F next to the appropriate number.

_____ 1. Larvae breathe through trumpets.

_____ 2. Aedes aegypti can be vectors of yellow fever.

_____ 3. Alotof gumption can be vectors of dengue.

_____ 4. Culex quinquefasciatus is the major vector of encephalitis and dog heartworm.

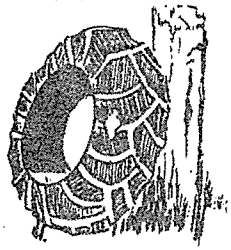
_____ 5. Anopheles quadrimaculatus is a vector of malaria.

_____ 6. Pupa breathe through their tails.

HAVE YOU CHECKED AROUND YOUR HOME FOR MOSQUITO BREEDING SITES ?

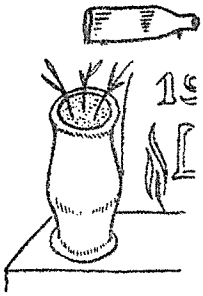
YES	NO

DO YOU WASH OUT YOUR PET'S DISH OFTEN?

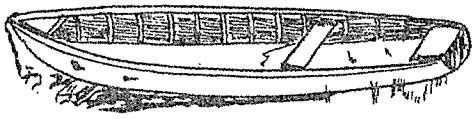


HAVE YOU THROWN AWAY OR PUT UNDER COVER ANY OLD TIRES YOU MAY HAVE?

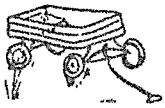
HAVE YOU THROWN AWAY ANY OLD TIN CANS OR BOTTLES WHICH MAY HAVE BEEN IN YOUR YARD?



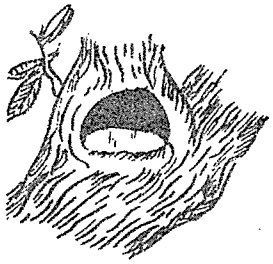
HAVE YOU ASKED YOUR PARENTS TO GROW THEIR HOUSE PLANTS IN SOIL INSTEAD OF WATER?



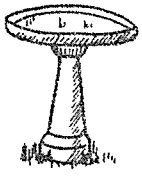
HAVE YOU ASKED YOUR PARENTS TO TURN THE BOAT UPSIDE-DOWN ?



HAVE YOU PUT ALL THE TOYS UNDER COVER?



IF THERE IS A HOLE IN THE TREE IN YOUR YARD HAVE YOU FILLED IT WITH SAND?



DO YOU SCRUB THE BIRDBATH ONCE A WEEK?

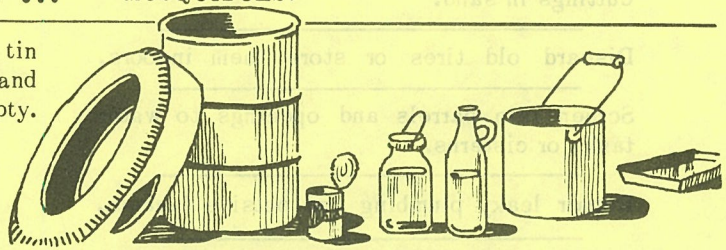
REMEMBER! MOSQUITOES NEED WATER IN WHICH TO BREED!! HELP GET RID OF AEDES AEGYPTI MOSQUITOES BY GETTING RID OF WATER IN CONTAINERS IN AND AROUND YOUR HOME.

STOP MOSQUITOES!

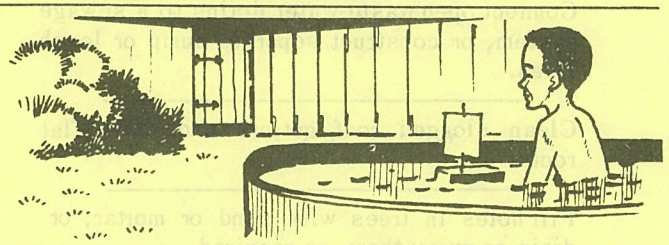
CHECK YOUR YARD & HOME ...

If there are any places around your home where water collects, such as water-holding containers, house cooler drains, and ornamental ponds – YOU MAY BE RAISING MOSQUITOES!

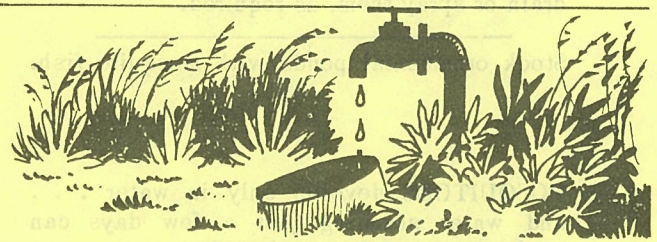
YOU SHOULD . . . Get rid of old tires, tin cans, bottles, jars, buckets, drums and other containers, or should keep them empty.



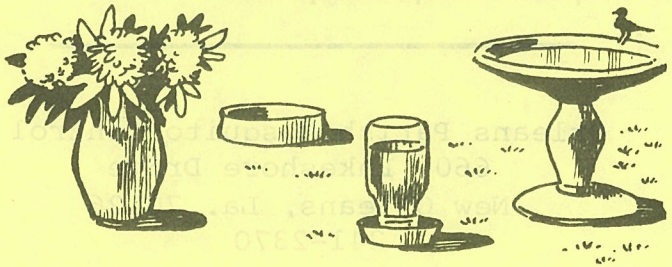
YOU SHOULD . . . Empty your plastic wading pool weekly and store it indoors when not in use.



YOU SHOULD . . . Repair leaky pipes, outside faucets, and move house cooler drain hoses frequently.

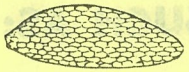


YOU SHOULD . . . Change water and scrub vases holding flowers or cuttings twice each week – or grow cuttings in sand; scrub and change water in bird baths twice weekly; empty watering pans of pets and chickens daily.



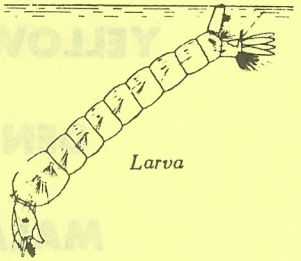
IT'S A FACT . . .

All mosquitoes need water in which to pass their early life stages . . . Adult flying mosquitoes frequently rest in grass, shrubbery or other foliage, but they never develop there . . .

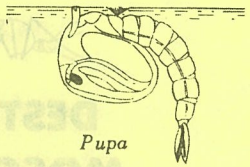


Egg

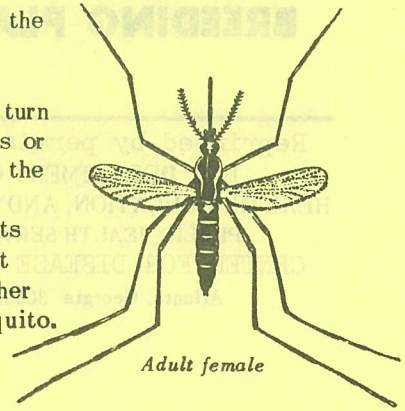
Some mosquitoes lay their eggs in standing water where they hatch in a day or two. Other mosquitoes lay their eggs in old tires, tin cans, or other water-holding containers in which they may remain unhatched for weeks or months until they are covered with water. With both types of mosquitoes, the wigglers or larvae grow quickly and turn into tumblers or pupae. Soon the skin of the tumbler splits open and out climbs another hungry mosquito.



Larva



Pupa



Adult female

MOSQUITOES !

THEY CAN CARRY SERIOUS DISEASES SUCH AS:

ENCEPHALITIS
(SLEEPING SICKNESS)

YELLOW FEVER

DENGUE

MALARIA

DESTROY MOSQUITO BREEDING PLACES

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HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
Atlanta, Georgia 30333

STOP MOSQUITO DEVELOPMENT

GET RID OF STANDING WATER!

Empty, remove, cover or turn upside down any receptacle that would hold water – particularly old bottles and tin cans.

Change water and scrub vases holding flowers or cuttings twice each week – or grow cuttings in sand.

Discard old tires or store them indoors.

Screen rain barrels and openings to water tanks or cisterns.

Repair leaky plumbing and outside faucets.

Connect open waste-water drains to a sewage system, or construct separate sump or leach lines.

Clean clogged roof gutters and drain flat roofs.

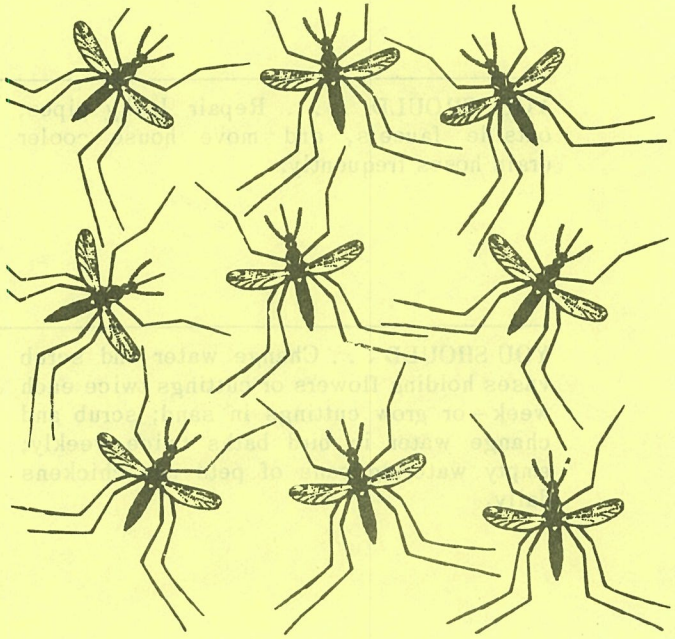
Fill holes in trees with sand or mortar, or drain or spray them, as required.

Stock ornamental ponds with mosquito fish.

MOSQUITOES develop only in water . . . and water standing just a few days can produce a crop of mosquitoes!

Orleans Parish Mosquito Control
6601 Lakeshore Drive
New Orleans, La. 70126
241-2370

STOP RAISING MOSQUITOES IN YOUR YARD & HOME!



NEW ORLEANS MOSQUITO CONTROL BOARD
6601 LAKESHORE DRIVE
NEW ORLEANS, LA. 70126
241-2370

PUBLIC INFORMATION PROGRAM - VIDEOTAPE

TITLE: "MOSQUITO CONTROL - SCIENCE AT WORK"

SCHOOL NAME: ______________________________

Teacher(s) Name	Total No. Students	No. of Times Shown	Date(s)	Comments