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t: Medical Entomological Surveillance of Enewetak Atoll

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1. GENERAL:

a. By the direction of DASG a medical entomological survey was conducted on selected coral islets of the Enewetak Atoll to determine all real and potential entomological problems to be encountered during cleanup operations.

b. Biologically and ecologically the islets are still ~~evolving and~~ represent a fragile and unstable biological community. The introduction of higher animal life forms has been artificial. This situation has allowed a number of species to inhabit the islets unchecked by natural predation.

c. A variety of factors have successfully limited the the establishment of various pests.

1) Limited accessability of the islets.

2) High winds.

3) Limited land area, breeding sites, appropriate food sources and harborage.

d. These factors have, for the most part, restricted the establishment of medically important arthropoda on the islets.

2. METHODOLOGY:

a. A total of 12 islets were selected for surveillance. Selection was based on the following criteria:

1) Size.

2) Vegetation and structural harborage.

3) Operational aspects related to cleanup mission.

4) Information provided by Mid Pacific Marine Laboratory (MPML) civilians and natives.

5) Information provided by engineers surveying various islets.

b. Each islet was surveyed identically. Walk-through surveillance with insect nets and collecting equipment was conducted. All possible breeding sites and harborages were sampled. Light traps were set out in areas where wind shelter was provided to sample nocturnal activity. Rodent surveillance was visual and with traps. Have-a-Heart traps were set in association with burrows, nests, high activity areas and harborage.

c. Laboratory areas provided by Mid Pacific Marine Laboratory (MPML) and equipment indigenous to the survey teams provided ample work and identification requirements. Insect identifications were made microscopically with the use of appropriate keys.

d. The following islets were surveyed:

1)	Enewetak	(Fred)
2)	Medren	(Walt)
3)	Jedrol	(Rex)
4)	Japtan	(David)
5)	Ananij	(Bruce)
6)	Runit	(Yvonne)
7)	Billae	(Wilma)
8)	Alembel	(Vera)
9)	Lojwa	(Ursula)
10)	Aomon	(Sally)
11)	Aej	(Olive)
12)	Enjebi	(Janet)

3. RESULTS:

a. The predominanat problem on the atoll is the large population of rats. Two species of rats were noted.

1) *Rattus rattus* (roof rat)

2) *Rattus exculaus* (Polynesian rat)

b. The total absence of natural predation on the islets has allowed the population to soar and be limited only by population pressure, competition between species and food/harborage availability. With the exception of the islet of Enewetak the rat population reached the maximum carrying of the islets surveyed.

c. Mice, though not taken in traps, are present on the islets. Evidence used to determine their presence was the collection of frass and signs of damage. The population of mice on the individual islets is probably low due to successful competition from the rat population.

d. Ectoparasites found on rats were limited to mites of undetermined species. No ticks or fleas were found. Three methods were used to obtain ectoparasites from the rats.

1) Combing.

2) Washing.

3) Visual examination of the body and hair with the aid of magnifying optics.

e. Lack of higher ectoparasitic population is attributed to extremely limited contact with other mammalian species. Various species of stinging (aculeate) wasps are present on all of the islets. Polistes fuscatus var. aurifer is the most aggressive. Ropalidia marginata and an unidentified species in the family Vespidae are also present. Parasitic wasps of the family Sphecidae were also collected.

1) In all cases the wasp populations per islet is low. However, where present the wasps tend to be concentrated in small areas. For example, on the islet of Jedrol (Rex) a P. fuscatus colony was located in a refrigerator building. The colony was old but viable and nests varied in size from the diameter of a quarter to the size of a football.

2) About 25 wasps were present in the refrigerator building and a number were observed foraging in the area. The estimated living population of the colony is between 100 and 150 wasps.

3) Limited natural food sources and high winds have severly restricted the numbers of wasps capable of surviving on the islets. Normal foods such as lepidopterous larvae, nectar etc, are extremely limited. Colonies are therefore small and focal. They may usually be located in dense foliage, well shielded from the wind and close to the ground. Some R. marginata were observed nesting up to six feet above ground on the lee side of the foliage.

4) The wasps normally are not aggressive and do not seek out or attack people. The sting is in accordance with most polistene type stings with a wheel-flair reaction and pain lasting from ten - twenty minutes. "En Masse" attacks were not reported although some people recalled being stung 4 or 5 times. One report of 20 stings could not be confirmed and is considered unlikely. It should be noted that aggressive reactions were only noticed when the integrity and safety of the colony or nest was directly threatened.

f. No mosquitoes were collected though light traps, natural and artificial nesting stations were used. Furthermore, interviews indicated no one has been bitten by a mosquito. High winds are the major factor restricting the establishment of mosquito populations.

g. Spiders are present throughout the atoll's islets. Specimens of what appears to be the black widow have been collected by personnel of the MPML though none were found during this survey. The only island reporting the collection of L. mactans is Enjebi (Jane). Specimens have been sent to the Bishop Museum, Hawaii for confirmation. No other venomous spiders have been reported from or collected from the islets.

h. Snakes are not present on Enewetak Atoll.

i. Flies affecting man appear limited to several species of the genus Musca or house flies and sarcophaga (flesh flies). In most cases the breeding areas are in and around waste disposal sites. Populations are small and of nuisance value. Some transmission of enteric diseases is possible though not likely due to good sanitary practices and structural integrity of buildings.

4. RECOMMENDATIONS:

a. The rodent populations require control of the earliest possible date. Baiting with zinc phosphide is the most acceptable to this writer. However other baits are available. A special annex to this report will be prepared with specific guidelines on baiting requirements.

b. Bait stations containing zinc phosphide in a formulation acceptable to the rats should be used. Several prebaits should be tested without the presence of zinc phosphide to determine which is the most acceptable to the rats. Upon completion of prebaiting the actual zinc phosphide bait should be employed. Each islet should be prebaited immediately prior to baiting.

c. Prebait and bait stations should be placed in the exact same locations. Placement of prebait and bait should be directly associated with rodent burrows, harborage and feeding areas.

d. Post surveillance should be conducted immediately after the conclusion of the baiting cycle. Unconsumed baits should be retrieved within 48 - 72 hours of their placement to limit contact with non target organisms.

e. The process of cleaning up the islets by engineers will itself have an impact on rodent populations by significantly reducing harborage and food sources. This combined integrated control should significantly reduce, but not eradicate the rodent population. Continued surveillance will be required along with "rodent proofing" of buildings.

f. Critical prebaiting, baiting and post surveillance should be conducted by certified pest control personnel (MOS-91S, civilian or engineers) under the direct supervision of a professional entomologist. Thereafter engineering personnel will be adequate to maintain control.

g. Manpower and time requirements will be directly proportional to the number and size of the islets selected for control. If control is required for the base camps of Lojwa and Enewetak only, then approximately seven - fourteen days will be required utilizing seven pest control personnel and one Entomologist.

h. Control on most or all of the islets may require a minimum of 21 people (20, 91's, 1 Entomologist) and a period of 3 - 4 weeks. Accessability to the islets by helicopter would reduce the time requirements.

i. No specific control is required for the wasps. However, certain precautic are warranted for personnel working in thick foliage.

1) Head gear.

2) Long sleeves and pants.

3) No bright colored or pastel colored clothing such as reds, yellows, blues, etc.

4) Insect repellents are of no value in protecting against wasps and be

5) Nests may be destroyed with Wasp Kill or similar registered insecticides as they are located.

6) Personnel known to be allergic to insect venoms should not be permitted to work in risk areas as described.

7) While caution is advised it should be repeated that the overall Hymenoptera (wasps, bees and ants) population is relatively small and not at a level which in anyway is to be considered a problem.

5. CONCLUSIONS:

a. Entomologically, Enewetak is an unusually safe environment in which to work as a comparatively small number of insects have been successfully introduced on the atoll. It would be helpful if incoming cargo were screened to insure that new pests are not introduced.

b. Pest control on any large scale is not required for any animal or insect other than the rodents as indicated.

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1. Arthropoda: The taxonomic classification which includes insects, spiders, millipedes, scorpions, etc,

2. Ectoparasites: Fleas, ticks, lice, mites, etc., living on the body of a host organism such as a rat.

3. Entomology: The study of insects.

4. Harborage: Areas providing shelter and/or breeding sites for insects, rodents, etc. Examples would be trash dumps, buildings, etc.

5. Have-A-Heart Traps: A brand name of a rodent trap which catches the animal alive and without injury.

6. L. mactans: The black widow spider.

7. Lepidopterous Larvae: Moth and butterfly catterpillers.

8. Musca: The genus of flies to which house flies belong.

9. P. fuscatus: See 10 below.

10. Polistes fuscatus Var. aurifer: A common variety of paper wasp.

11. Polistene Type Sting: Typical sting of the paper wasp (see Wheel Flair Reaction).

12. Prebaiting: Positioning a bait without the presence of a poison to measure the acceptability and consumption by the rodent to be controlled. Furthermore, it indicates if other non-target organisms will be attracted to it.

13. Predator: Usually an animal which specifically seeks out and destroys another animal; i.e., cats to rats and mice.

14. R. marginata: See 15 below.

15. Ropalidia marginata: A common paper wasp similar to the Polistes group.

16. Sphecidae: A mud wasp which is predacious against spiders. Normally, it does not sting man but is capable.

17. Vespidae: A large taxonomic group of wasps which include the paper wasps.

18. Wheel-Flair Reaction: A common local reaction to the sting of many wasps. One typically has a raised blanched center about 1/2 to 1 centimeter across surrounded by a large red circle with a common total diameter around the size of a quarter to a half dollar.