REVIEWS AND ABSTRACTS

THE SARDINIAN PROJECT—AN EXPERIMENT IN MALARIA CONTROL BY SPECIES ERADICATION. John A. Logan. Proc. of the Institution of Civil Engineers, (London) April 1953, 14 pp. The author explains that the Sardinian Project was suggested as an application of modern scientific information on a large-scale experimental basis. It was planned to eradicate *Anopheles labranchiae* on the second largest island in the Mediterranean having an area of over 9,000 square miles and a population of 1,250,000. This rough and primitive land includes large areas not served by roads nor railways and is given over to large coastal flats fringed with swamps of brackish or salt-water and shallow, irregular rivers choked with vegetation. The problem was complicated with small blockage, and flooding is widely practiced. In spite of many almost insurmountable problems, malaria as a public health problem was eliminated, but *labranchiae* was not. On October 1, 1945, the International Health Division of the Rockefeller Foundation agreed to assume technical direction of the project which was first suggested and financed to a considerable extent by UNRRA, the United Nations Relief and Rehabilitation Administration and later by ECA, the Economic Cooperation Administration. The cost of the project amounted to more than six billion lire and was active for more than 4½ years. Some idea may be gained of the reduction in numbers of this mosquito when after 5 years of control it took more than 330 scout-days to find a single *labranchiae* infestation. From the evidence presented it was evident that the indigenous *labranchiae* has a whole series of survival characteristics which have been developed over many thousands of years and that these normally make them much more difficult to eradicate than an imported species, such as for example, *A. gambiae* in South America.—H. H. Stage.

EXCHANGES OF SODIUM AND POTASSIUM IN MOSQUITO LARVAE. By Ramsay, J. A. J. Exp. Biol. 30(1):79–89. 1953. This paper is a continuation of the interesting work on osmo-regulation in *Aedes aegypti* larvae. The anal gills of mosquito larvae (which are the only parts of the integument normally permeable to water) can secrete chloride into the hemolymph from the external medium against a gradient. It was shown earlier by the above author that the hypotonic Malpighian tubule fluid was partly reabsorbed into the hemolymph after first passing up the midgut into the gastric caeca and was partly eliminated via the rectum.

The present work shows that while amounts of Na and K in the hemolymph remain relatively constant in spite of considerable changes of these ions the hemolymph still reflects to a limited extent the external changes. The Na:K ratio of whole normal larvae is 2.5:1, that of the hemolymph *ca.* 25:1. It is assumed by the author that Na is only in the hemolymph and the potassium largely held in the tissues. It is clear from this study and others by the same investigator that the anal gills are concerned with the uptake of Na and K, secreting them into the hemolymph. These two ions leave the body via the hindgut. They can be absorbed from the rectum against a gradient back into the hemolymph. Ramsay found that the concentration of K in the intestinal fluid is greater than the Na irrespective of the composition of the external medium.

One of the most interesting of Ramsay's experiments was to inject a larva with hemolymph collected from 5 others and by application of pressure or suction cause stretching or collapse of the larval body. When the larvae were thus stretched the number of droplets passing down the gut was increased over the normal condition. He felt that this was sufficient for concluding that the body volume of the larva is regulated by a simple nervous mechanism. From the observation that gut peristalses of *Aedes* ceased after its removal from the body he infers that gut peristalses are ". . . initiated and probably coordinated by the central nervous system." Finally he writes "increase in the volume of the haemolymph . . . initiates peristalsis" of the gut. Whether he is justified in these statements would appear to require considerably more evidence than is presented.—Jack Colvard Jones.

MAP OF THE WORLD DISTRIBUTION OF MALARIA VECTORS. May, Jacques M., 1951. Geographical Review, 41(4):638–639, with map. The writer of this paper, who also prepared the accompanying map, is head of the Department of Medical Geography of the American Geographical Society. Dr. May apparently drew many of his distribution records of *Anopheles* from out-dated publications, such as that of Kumm (1929), for in several respects the information given is erroneous. The reviewer does not claim personal knowledge of the anopheline vectors outside of the neotropical region, but he notes the inclusion of such species as *A. aquasalis* in northern Argentina, where it is absent (the species is probably *noroestensis* Galvão & Lane). No mention of its presence in Trinidad is made, but Senior-White considers it to be a coastal vector in that island. It is said to range northward into Nicaragua, but is not present much beyond northeast Panama. *A. albimanus* is shown as present in far eastern Venezuela, at the mouths of the Orinoco, and in Dutch Guiana, but it is not found in either locality. *A. darlingi*, the most important vector in South America, avoids water with the least trace of salt, an important matter which is not noted. So far as the reviewer is aware, this species is not present in northern Yucatan or in southwest Mexico, west coastal Guatemala, or northern Nicaragua. The larvae are often found in full sunlight, not in "shade."

In Saudi Arabia, *A. pharoensis* is shown as

present all over the country, but actually it is scarce or absent there; it is found in Iran. The legend at the upper-righthand corner of the map states: "No [species] symbols are shown for deserts." Much of Saudi Arabia is desert, particularly in the south.

In Thailand (named Siam on the maps) *A. minimus* is the principal vector, but this is not indicated. In the Philippines, *A. minimus flavirostris* is considered the primary vector, but this also is not indicated. *A. aconitus* is indcated on the inset of species "locally distributed over southern Asia and Indonesia," but it is not believed to be a vector in Thailand.

In the "Resumé of Natural History" inset in the upper right-hand corner of the sheet, the peculiar statement is made that the larva of *A. bellator* is found in "holes of bromeliads." Actually, the water in which the larvae breed is held in the rosette-like leaf bases of arboricolous bromeliads. The type of water mentioned for *A. (Kerteszia) cruzii* is "stagnant, fresh," which is true, but it is not stated that this water is held in the leaf bases of bromeliads, the same habitat in which *bellator* larvae are found. Neither *A. bellator* or *A. cruzii* should be considered "extensively distributed," as the first is found in Trinidad and southern Brazil, and the second has a restricted distribution in southern Brazil, where it may be locally common.

Some egregious errors concerning the distribution of species of malaria parasites are to be found on the map at the bottom center of the sheet. The reviewer has had extensive experience in malaria surveys in Panama and Central America, and takes issue with the indications that *Plasmodium vivax* is the predominant species in Panama. *P. falciparum* and *P. vivax* occurred in most of Panama in a ratio of 70 to 30. In Haiti, where the reviewer assisted in the examination of over 6,000 adult males, *P. malariae* was found in about 25 per cent of all positives. The presence of *P. malariae* in the intermountain valleys of Bolivia is not noted.

A dotted red line on the largest map shows the "approximate limit of Anophelism without malaria," but this statement should be qualified, as the line represents the *southern limit*. A similar line should be shown for the Southern Hemisphere, as anophelism without malaria exists in Chile, southern Argentina, and Uruguay, and doubtless also in South Africa.

It is unfortunate that the author did not consult with authorities on the various subjects covered in his article and accompanying map, as he would have received authentic and up-to-date information. His article on page 638 is correct, with the exception of the statement that "malaria exists wherever malaria vectors are found except in the Northern Hemisphere zone indicated as having anophelism without malaria." South America has similar zones, and presumably also South Africa.—W. H. W. Komp.

NOTES ON IRANIAN MOSQUITOES. R. P. Dow. Amer. J. Trop. Med. Hyg. 2(4):683–695. 1953. In collecting adult mosquitoes, it was an easy matter to sample the populations occurring in the vicinity of man. Most Iranians, especially in the rural areas, live in similar mud-walled houses in close association with their domestic animals. Sometimes, the living quarters are in a story above the stables, but generally both are reached from a common courtyard. Moreover, in the arid parts of Iran, the typical village is so compact and the streets and alleys so bare of shade that there are few spaces other than man-made shelters which are suitable for those mosquitoes that rest in dark places during the day.

Throughout the Caspian Region and Azerbaijan, the procedure in inspecting villages was sufficiently uniform to permit some quantitative as well as qualitative comparison of the different areas. When there was not enough time to make a thorough search of all the roofed space used by one family, it was customary to inspect a minimum of one room and one stable or other animal shelter in each home visited. Though females of the *A. maculipennis* group (and also of *A. superpictus*) were quite generally less common in rooms occupied by man, eggs of *A. sacharovi* typical *A. maculipennis,* and *A. subalpinus* were laid by specimens caught there as well as in stables. It is well known, of course, that the diurnal resting habitats of *Anopheles* are not necessarily the places where they feed. Actually, in this day of controlling malaria by residual insecticides, the important point to determine is whether the types of man-made shelter which can be readily and safely sprayed are also the usual resting places of the principal vectors.

On various kinds of evidence, the important vectors of human malaria in western Iran, both known and probable, can be limited to the following species: *A. sacharovi, A. maculipennis, A. superpictus, A. stephensi,* and *A. culicifacies.* Since each of these as shown in Table 1 and confirmed by other observers, has been found resting in man-made shelters, the second question is, to what extent does the adult population of each species rest in buildings. In the dry regions of Azerbaijan and the Central Plateau, the lack of other daytime habitats appears to concentrate *A. superpictus* as well as *A. sacharovi* and *A. maculipennis* in the villages. Probably *A. superpictus* is a partially wild species in the moist Caspian lowlands (where only one specimen was found in a home). In fact, one of the observations on this behavior by Macan (1950, pp. 202–203) was duplicated by the writer at Klayebon where a rocky stream in which the larvae of *A. superpictus* were abundant was within a few yards of houses from which he did not obtain a single adult. Since *A. sacharovi* and *A. maculipennis* are more abundant in the Caspian Region and of definite house-frequenting habits, the control of *A. superpictus* by indoor residuals may never present a real difficulty.

In southwestern Iran, the problems of malaria control are more circumstantial. Fortunately *A.*

stephensi, of great importance at Abadan, appears to rest commonly in ordinary buildings, but at Bushehr, adult *A. culicifacies* was taken only in the large covered cisterns where the winter rains are collected and stored for use during the dry season. Since they are dark, cool, and not adequately screened, they provide ideal breeding and resting places in which spraying with a toxic insecticide would be most inadvisable. When this minor difficulty has been resolved, perhaps by an engineer, there appears to be no entomological obstacle, other than the behavior of *A. superpictus* in humid areas, to the final control of malaria in western Iran.—Author's discussion.

THE CUTANEOUS REACTION TO THE BITE OF THE MOSQUITO, AEDES AEGYPTI (L.) AND ITS ALLEVIATION BY THE TOPICAL APPLICATION OF AN ANTIHISTAMINIC CREAM (PYRIBENZAMINE). F. J. O'Rourke and M. F. Murnaghan. Journal of Allergy, Vol. 24, No. 2, 120–125, 9 refs. The reactions of 36 medical students to the bites of *Aedes aegypti* mosquitoes are described. These workers found that an antihistaminic cream containing 2 percent Pyribenzamine reduced the severity of irritation following bites from this mosquito. Secondary infections following scratching mosquito bites was considerably reduced.—H. H. Stage.

We trust that our membership read under the "Reviews and Abstracts" in the June issue of *Mosquito News,* the report of the Expert Committee on Insecticides WHO. The fourth paragraph defines the particle size ranges for coarse sprays to aerosols.

It is with a great deal of satisfaction we note that the definitions this Committee set forth are identical with those published on page 15 of the Association's *Bulletin No. 2,* "Ground Equipment and Insecticides for Mosquito Control," that preceded the WHO report by some ten months.

This is a real "First" for our Association and the editors of *Bulletin No. 2* are to be congratulated.

ROBERT L. VANNOTE

MALE SPECIMENS OF THE CULEX PIPIENS COMPLEX (*C. pipiens,* "C. molestus," or *C. fatigans* [=*quinquefasciatus*]) are needed for a study to determine to what extent these forms hybridize in the field. A series of 30 or more males of any of these forms from any locality would be appreciated. The specimens may be in alcohol, pill-boxes, or on pins.—A. R. Barr, Dept. of Entomology, Univ. of Minnesota, University Farm, St. Paul 1, Minn.