Researches on Malaria.*

"THE Transactions of the Far Eastern Association for Tropical Medicine," recently published, contains twenty papers dealing with recent researches on Malaria. The topics may be reviewed under the following heads.

The Question of Time in Control of Malaria.—It is beyond the comprehension of an average malariologist to have to look ahead fifty or a hundred years to visualise the completion of a programme. He likes to point to Panama where malaria was controlled in a matter of months, and he views with pride the recent attack on the Pontine Marshes, where a few years have seen such a splendid victory over this disease. He forgets the enormous initial costs of these two control projects, justified of course by the results, but impossible for average tropical areas.

Moreover, the malariologist tends to seek perfection in this method and is unhappy if a single larva escapes his larvicide. Yet perfection costs money and the simple truth of the matter is that the tropics cannot afford perfection in malaria control or anything else. It is time that malariologists began to rely more on Time and less on Money, insisting on continuity of effort but not on perfection, which will always be so expensive as to be either utterly impossible or fatally sporadic.

Therefore, more and more effort must be expended in searching for biological and automatic methods of control. Such methods offer little hope at present of ever being either perfect or rapid. But they do offer the possibility of continuity and of the desired results in time.

Species of Mosquitoes.—In Europe it has been shown that the puzzling fact that in some places *A. maculipennis* carries malaria and in other places not, could be explained by the existence of different races of this species.

In the Far East analogous problems exist. Why does *A. subpictus* carry malaria in the Netherlands Indies, and not in British India? Why do *A. hyrcanus* (and its varieties) and *A. aconitus*, for example, carry malaria in some parts of the Netherlands Indies and not in others? Probably in the latter cases this can partly be explained by the number of cattle present, but it seems quite possible that also racial differentiation or a differentiation into varieties might be responsible, at least partly, for this phenomenon.

Mosquito Surveys.—Since the success of local anti-malarial measures depends chiefly upon the virtual abolition of the larvæ of dangerous mosquitoes breeding within effective range of the protected villages, it is essential that a constant check be maintained over all the potential breeding places that are to be abolished within such areas. Mosquito-larvæ surveys are consequently essential, first for the discovery of all dangerous breeding places and then for keeping watch on those that need to be eradicated.

It is necessary for efficiency that the overseers in charge of oiling should have a thorough knowledge of the habits of mosquito larvæ and still more essential that constant watch should be kept over their work by other larvæ searchers whose work is independent of the oiling staff. Larvæ surveys are thus of supreme importance in the conduct of all anti-malarial works.

Permanent Control Measures.—In the Netherlands Indies the control of malaria consisted of:

(1) The installation of a drainage system.
(2) Regular cleaning of the small grassy irrigation ditches (because they also harboured larvæ of *A. aconitus*).
(3) Planting of rice only once a year in the wet season by all the people at the same time; so that during the dry season the plain was dry and anopheles breeding well nigh impossible.

The effect of this has been to transform the appearance of villages. In place of miserable and weakly children there are now sturdy youngsters. Squalor that was induced by sickness has given way to comfort and good health.

Temporary Measures.—The use of Paris green (copper acetoarsenite) to destroy anopheline larvæ was first introduced by Barber in 1921. It has been widely applied in the United States as well as in European countries. Its low cost, portability, effectiveness for killing the larvæ in thickly vegetated surface and harmlessness to other forms of aquatic life and to domestic animals are generally recognised, and its use is, therefore, universally applicable.

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"Paris green has the advantage of not killing vegetation, as would be the case with anti-malarial oil. Its use, therefore, in the botanical gardens is of special advantage—malaria is controlled while the natural beauty of the ponds and of the river is maintained."

Anti-Malarials.—Amongst the many factors that must be considered in estimating the therapeutic value of the three best known anti-malarials—quinine, plasmoquine and atebrin—one of the most important is the toxic action of the drugs on various organs.

It is probable that these do not act directly as parasiticides, but cause recovery from malaria through indirect means. For this reason the question of the general action of these remedies on the organism is of more importance than was thought up to a short time ago.

If plasmoquine or atebrin should be administered intravenously to patients, they should always be combined with a suitable dose of adrenaline. In case of prolonged cardiac depression after the administration of plasmoquine or atebrin, besides adrenaline and its analogues, the usually employed heart stimulants must be thought of.

Taking all forms of infections together, it has been found that quino-plasmoquine is the most effective in reducing the size of enlarged spleen, the next being totaquina Type I, atebrin, quinine and totaquina Type II, in the order named.

In tertian malaria the spleen-reducing property of all the drugs is about the same with the exception of atebrin. In quartan infection they are also effective, especially totaquina Type I and quinine. In subtertian fever all the drugs are less effective, although quino-plasmoquine shows slightly better results.

Quinine and atebrin were found to be superior to the other drugs in freeing the peripheral blood from parasites both in tertian and quartan infections.

Advantages of Atebrin.—Atebrin is the best drug available for the treatment of all types of malaria, especially in the case of controlled populations.

The treatment is short, simple and effective —one 1½ grain tablet of atebrin for 5 days only; it has seldom to be repeated.

If administered as a prophylactic in the field each day's treatment may be given in one dose. Actual attacks of malaria should, if possible, be treated in hospital.

It is usually as efficacious as quinine in abating the clinical symptoms of malaria.

It is greatly superior to quinine in the prevention of relapses: judging by present experience the atebrin relapse rates do not exceed from 5 to 8 per cent. in subtertian, and from 5 to 16 per cent. in benign tertian malaria.

For this reason it is a cheaper drug to use than quinine.

Children need and tolerate relatively larger doses of atebrin than adults.

In serious cases of malaria the injection of atebrin seems as effective as the injection of quinine bihydrochloride.

The toxicity of atebrin is low.

A short course of plasmoquine not exceeding 0·03 gram daily for from 5 to 8 days should be given after atebrin treatment in subtertian malaria—to destroy the gametocytes. A similar course of plasmoquine will lower the relapse rate in benign tertian atebrin-treated cases.

The prophylactic use of atebrin is, under certain conditions, worthy of trial, because of its slow excretion from the body and its cumulative effect. A mass treatment of labour on heavily infected estates at the beginning of the malarial season should prove of value.

It is a powerful preventive of malaria in the sense that most of those treated with it, being cured, are rid of the disease and become non-infective to their fellows, except in areas where sub-tertian is predominant as atebrin seems to have no action on crescents.

To get the best results on estates all persons harbouring malaria, including infants, should be given atebrin, especially if they are newcomers. If this is done, it may be possible to decrease such anti-malarial measures as oiling on some estates during the relatively non-malarious season.

General.—The following resolution on malaria was passed by the Conference:

"The Ninth Congress of the Far Eastern Association of Tropical Medicine, recognising the pressing need for co-operative investigations in the problems of malaria control, wishes, in particular, to emphasise direct attention to the fundamental importance in malarial epidemiology of studying biochemical changes occurring in the breeding places of anopheline mosquitoes."

"This Congress considers that advances of practical utility in the control of malaria might be made if the data obtained by workers in the countries of the Far East were made comparable,"

"It is resolved, therefore, that, with the consent of the Governments concerned, such investigations, conducted in various countries, be co-ordinated through the appointment of a joint committee of chemists and malariologists resident in these countries."

B. A. RAO.

The Cape Crawfish Industry of South Africa with Some Observations on the Prawn and Crab Fisheries in India.*

By B. Chopra, D.Sc.

(*Zoological Survey of India, Calcutta.*)

THE recently started series of Fishery Bulletins of the Department of Commerce and Industries of the Union of South Africa, of which No. I was published in February last year, offers an excellent opportunity for taking stock of the conditions in reference to prawn and crab fisheries in India. In the present note after reviewing the report on the Cape Crawfish Industry of South Africa, a short account of somewhat similar fisheries in different parts of India is given and a few suggestions are offered for developing the fisheries along scientific and commercial lines, as is done in South Africa and several other countries.

The crawfish industry has been in existence in South Africa for a long time past, but it is only during recent years that it has been established on a firm footing. The publication by Messrs. Cecil Von Bonde and J. M. Marchand of a pamphlet entitled "The Natural History and Utilisation of the Cape Crawfish, Kreef, or Spiny Lobster, *Jasus* (*Palinurus*) *lalandii* (Milne Edwards) Ortmann" as Fishery Bulletin No. I of the Department of Commerce and Industries, Fisheries and Marine Biological Survey Division, of the Union of South Africa, shows on what sound lines the industry is being run under the helpful and vigilant guidance of the Fisheries Department.

The report is divided into two parts, the first dealing with the natural history of the crawfish and the second on its utilisation. The importance of a scientific study of the species on which the industry is based is clearly brought out in the report. Questions connected with reproduction, life-history, ecdysis, food, migration, etc., etc., have not only a purely scientific value, but the application of the knowledge acquired by their study to the various processes of the industry is of a fundamental importance.

The first chapter of the report deals with the taxonomic position of the crawfish and thirteen other allied species occurring in South Africa. It is unfortunate that the authors have called the Cape crawfish by the zoological name of *Jasus* (*Palinurus*) *lalandii*. *Jasus*, as the systematists know, is the name that Jeffrey Parker gave in 1883 to a subgenus of *Palinurus* having certain characters on which Spence Bate later (1888) founded his genus *Palinosystus*. The latter name was, therefore, so to say, still-born and *Jasus* has thus for a long time been recognised as a subgenus of *Palinurus*. Some authors, like de Man,[1] for instance, consider *Jasus* as a distinct genus, of the same rank as *Palinurus*. The correct name for the "Kreef" would, therefore, be either *Palinurus* (*Jasus*) *lalandii*, or (if the authors consider the characters on which *Jasus* is based to be of generic importance—a view that is generally held now) *Jasus lalandii*, but in no case can *Palinurus* be considered a subgenus of *Jasus*. It may also be mentioned here that Lamarck has generally been credited as the author of the specific name *lalandii*, but as this appears to have been only a manuscript name, the authors of the report are quite justified in ascribing it to Milne-Edwards[2], who was the first to publish it with a proper description. Another point of some systematic importance is that according to de Man *Panulirus fasciatus* of Fabricius 1798, should be known by Herbst's specific name of *polyphagus* 1796; the authors have used the former name in the report.

The anatomy of the crawfish is briefly described in simple language, and the distinguishing characters between the two sexes are clearly brought out. The process of reproduction is also briefly referred to, and the hatching period is stated to last from

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* Published with the permission of the Director, Zoological Survey of India.

[1] de Man, *Siboga Expd. Rep.*, 1916, **39** a[2], part 3, 31-32.

[2] Milne-Edwards, *Hist. Nat. Crust.*, 1837, **2**, 293-294.