Eriocaulon sexangulare appears to be the first record as an alternate host of *P. separata* and *C. loreyi*.

Department of Entomology,
J. N. Krishi Vishwa Vidyalaya,
College of Agriculture,
Krishaknagar, Raipur (M.P.),
March 3, 1970.

V. P. GARGAV
O. P. KATIYAR
R. K. PATEL

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24. PRELIMINARY OBSERVATIONS ON USE OF ' MALARIAL " B " ', A LARVICIDAL OIL IN THE CONTROL OF AQUATIC INSECTS IN NURSERY PONDS

The occurrence of notonectids, *Anisops* spp., which prey upon and destroy large numbers of young carp fry in nursery ponds, is a common menace in pond culture operations. Pakrasi (1953), while devising the method of oil emulsion treatment, has shown that mustard oil emulsified with soap solution, 50 lb. per acre as standard dose, is very useful in controlling aquatic insects in ponds. Konar (1964) has recommended DDVP as a cheap, suitable and selective toxicant for the eradication of insect predators. In India, as proposed by Pakrasi (op. cit.), mustard oil is being extensively used everywhere as an insect killer in the preparation of carp nurseries. But now on account of the high cost of mustard oil its use in oil emulsion treatment is not economical. The search for cheaper and suitable substitute for mustard oil led to the successful employment of a mineral oil during nursery preparation at the Government Fish Farm, Bhopal (M.P.). This oil is dark brown in colour and is manufactured by Indian Oil Corporation under the commercial name ' Malarial " B " ', and costs only 35 Paise per litre. As the name indicates this larvicidal oil is being commonly used in antimalarial work, for controlling mosquito larvae in ponds and ditches.

With a view to judge the efficacy of this mineral oil on aquatic insects, laboratory experiments were conducted in galvanised iron tubs measuring $65 \times 65 \times 45$ cm, with a surface water area of 0·4 sq metres. The treatment with the oil was tried in three dosages of 40, 50 and 55 litres per hectare. The dose of 50 litres per hectare was found to be satisfactory.

The test insects used for this experiment were *Anisops* spp., *Ranatra* sp., *Nepa* sp., beetles, water bugs and dragon-fly nymphs, among which the notonectids were the first to be affected in all the three cases. Their complete kill in the dose of 50 litres/hectare was observed in 35 minutes, as against 120 minutes as maximum time taken by *Nepa* sp. The zooplankton, fish spawn and fry released in experimental tubs were not adversely affected. The complete kill of *Anisops* spp. and *Ranatra* sp., with the standard dose of mustard oil, which was also tried simultaneously in the laboratory, was found to take 50 minutes thereby showing that ' Malarial " B " ' is as effective as mustard oil. Though the higher dose of 55 litres/hectare gives quicker effect, the dose of 50 litres/hectare is found to be comparatively economical. No insects other than notonectids were affected in the lower dose of 40 litres/hectare. The results of laboratory experiments are given below in Table I.

TABLE I

EFFICACY OF ' MALARIAL " B " ' ON AQUATIC INSECTS

Dose per hectare of water surface (litres)	Time taken for complete kill of insects (minutes)								Cost of treatment (per hectare) Mustard oil
	Anisops spp.	*Ranatra* sp.	*Nepa* sp.	Beetles	Water bugs	Dragonfly nymphs	Mustard oil (standard dose)	Malarial ' B '	
								Rs.	Rs.
40	90	—	—	—	—	—	—	14·00	
50	35	90	120	not used	90	80	50[1]	17·50	30·00
55	25	60	90	60	60	60		19·25	

The efficacy of the lower dose of 40 litres/hectare was subsequently confirmed by field trial in nursery pond, when complete kill of insects, mostly notonectids, was observed in 60 minutes (*see* Table II). Thus the dose of 40 litres/hectare appeared to be quite sufficient for complete eradication of notonectids, which are more commonly encountered in nursery ponds. Further field trials with higher doses could not be made due to inadequate sample of oil, but on the basis of laboratory experiments it can be inferred that the dose of 50 litres/hectare can cause complete kill of all the insects present in nursery ponds. The dose of 40 litres/hectare will, however, serve the purpose exclusively for notonec-

[1] Only *Anisops* and *Ranatra* were used.

tids, while the higher dose may be given when other varieties of insects are also present in appreciable numbers.

TABLE II

EFFICACY OF 'MALARIAL "B"' ON AQUATIC INSECTS UNDER NATURAL CONDITIONS

Water area of pond (m^2)	Dose per hectare (litres)	Quantity of oil used (ml.)	Reaction on insects (*Anisops* spp. and *Ranatra* sp. only)	
			Time taken for majority kill (minutes)	Time taken for complete kill (minutes)
160	40	640	35	60

In the trials, the oil was poured along the four sides of the ponds and gradually spread to form a uniform thin film over the water surface. Unlike mustard oil, soap was not required and it was found that wind could not easily break the surface film when 'Malarial "B"' was used. As such, it is felt that the application of this oil may be effective on windy days as well.

It is evident from Table I that the cost involved in treating one hectare water area with 50 litres of 'Malarial "B"' comes to only Rs. 17·50, which is relatively low in comparison to the high expenditure (Rs. 300·00) involved in the use of mustard oil. It is at least as efficacious as mustard oil, has no harmful effect on zooplankton and fish spawn, takes lesser time for complete kill and is more resistant to wind action and is therefore an effective and economical substitute for mustard oil for control of aquatic insects in nursery ponds.

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CENTRAL INLAND FISHERIES,
ALLAHABAD, (U.P.). V. R. DESAI

CENTRAL INLAND FISHERIES,
PERAMBUR, MADRAS-11, K. J. RAO

February 6, 1971.

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25. TREMATODE GILL PARASITES FROM THE FLYING GURNARD *DACTYLOPTENA ORIENTALIS* (CUV.) OF THE INDIAN OCEAN

(*With three text-figures*)

During the first scientific cruise (February to April 1963) of the United States Research Vessel *ANTON BRUUN* in the Indian Ocean, as part of U.S. Programme in Biology of the International Indian Ocean Expedition, I had the opportunity on two occasions to examine from the trawl collection specimens of Flying Gurnard fish for parasites. On 23 March, 1963, from the trawl collection at Station 20 (9° 13′N, 97° 51′E) off Phuket, three specimens of the fish *Dactyloptena orientalis* (Cuv.) were examined. The gills of the host though devoid of heavy mucous coating, showed infection by parasitic copepods and several specimens of monogenetic trematodes. The oesophageal and intestinal regions were occupied by digenetic trematodes. Two host specimens obtained from the trawl collection on 1st April, 1963 at Station 43 (15° 08′N, 94° 04′E) off Chittagong showed infection by the same species of monogenetic trematodes obtained on the previous occasion while the parasitic copepods of the gills and the Digenea of the intestinal organs were all absent. The monogenetic trematodes collected on both occasions belong to the same new species and new genus which is named *Glandulocephalus* gen. nov. and species *G. bruuni* sp. nov. and described below.

Family TETRAONCHOIDIDAE Bychowsky 1951

Glandulocephalus gen. nov.

Diagnosis : Tetraonchoididae, with a very small body ; haptor well demarcated from body, with two similar pairs of large anchors, no haptoral bars, marginal hooklets scanty ; head with a pair of lateral long cephalic glands one on each side of the pharynx towards the margin of the body ; two pairs of eyes ; pharynx large, crura confluent posteriorly ; seminal vesicle present ; male intromittent organ (cirrus) jointed, tubular and with a basal bulb ; vagina may or may not be present.

Parasitic on the gills of marine fishes.

Genotype : *Glandulocephalus bruuni*