to this species as well, because both the species are similar in their breeding habits and fall in the same category.[8] Thus the agreement of length frequency modes with the modes of first two age groups, determined through scales, provides another evidence about the annual nature of these zones in the light of Hile's second argument, "*modes in the length frequency distributions of small fish coincide with modal lengths of age groups based on scale readings*".

An attempt was made to compare the average length of various age groups with the back calculated length obtained through the regression equation Log $L = a + n \log l$ (where L being length of fish and l the length-wise diameter of the scales). The observed average lengths of fish at various ages agree with the back-calculated length to a considerable degree (Table I). This again supports the validity of the annual nature in the light of the third argument presented by Hile, "*Length at the end of various years of life calculated from scale measurements agree well with the corresponding lengths of younger age groups whose ages were determined by scale examination*".

TABLE I

Comparison of observed and calculated lengths of various age groups

Age (years)	Mean length observed from scale reading	Back-calculated length
0+	20·9	25·20 (I)
I+	35·1	31·99 (II)
II+	41·1	38·75 (III)
III+	45·1	44·53 (IV)
IV+	48·1	49·36 (V)
V+	53·1	..

In the light of foregoing comments, the growth zones on the scales of *Ophicephalus striatus* can be recognised as annual marks. The observations on the annulations in different seasons can at least throw some light on the period, if not exactly on the causes of the zone formation. Such studies will help to discover the exact causes of the zone formation in tropical fishes.

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National Institute of Oceanography (CSIR),
Rafi Marg, New Delhi,
October 25, 1968.

V. S. BHATT.

1. Qasim, S. Z., *Proc. Zool. Soc. Lond.*, 1957 *a*, **128** (2), 161.
2. Natarajan, A. V. and Jhingran, A. G., *Proc. Natn. Inst. Sci. India*, 1963, **29**, 326.
3. Qasim, S Z. and Bhatt, V. S., *Hydrobiologia*. 1966, **27**, 289.
4. Pantulu, V. R., *J. Cons. Int. Explor. Mar.*, 1963, **28**, 295.
5. Qasim, S. Z. and Bhatt, V. S., *Curr. Sci.*, 1964. **33**, 19.
6. Hile, Ralph, *Trans. Wis. Acad. Sci.*, 1941, **33**, 189.
7. Venicek, David C., *Iowa State Journal of Science*, 1964, **38**, 481.
8. Qasim. S Z. and Qayyum, A., *Indian J. Fish.*, 1961, **8**, 24.

A NOTE ON AN OUTBREAK OF RABIES IN HORSES

ALTHOUGH sporadic cases of rabies have been reported in equines in India since long, rabies in the form of an outbreak in equines has been reported only recently (Pavri *et al.*[1]). These authors found that almost at monthly intervals four proven cases occurred on a single stud farm near Poona, without any apparent history of bite.

The present report describes an outbreak which occurred in February 1968 at Remount Police Depot, Moradabad, where 45 riding horses were maintained and out of these four animals died within a period of about 10 days.

The authors were deputed to investigate an obscure disease in horses simulating African Horse Sickness. It was reported that inspite of the treatment with broad spectrum antibiotics and sulphonamides one animal had died exhibiting marked rise in temperature, acute respiratory distress and inco-ordination of movements. Since rabies had not been suspected at that stage the tests for detection of rabies were not done.

From the remaining sick animals mare 'Roopkala' was reported to have died that morning after exhibiting the symptoms similar to those described above.

Mare 'Phoolkunwar' was prostrate with high temperature (104° F.), produced gurgling sounds with difficult breathing and struck head constantly against the ground.

Mare 'Savitri' showed nervous symptoms and bit at all objects. The animal was too ferocious

to be approached and as such its temperature record could not be kept. She, however, drank Chloral-hydras given in water.

'Roopkala' and 'Phoolkunwar' were also reported to have been treated with broad spectrum antibiotics and sulphas without any success.

On postmortem examination of 'Roopkala' certain lesions simulating those of African Horse Sickness, namely, presence of frothy exudate in the lumen of trachea and bronchi, accumulation of large quantities of straw-coloured fluid in the pericardial sac and thoracic cavity, along with slight hæmorrhages on myocardium, were seen. These lesions simulating African Horse Sickness were probably due in part to the previous vaccination with the live attenuated African Horse Sickness vaccine. On histopathological examination lesions suggestive of viral encephalitis characterised by perivascular cuffing, satellitosis and neuronophagia were observed in the hippocampus.

The blood from 'Phoolkunwar' was examined for the presence of protozoan parasites. No parasites could, however, be detected even on repeated examinations. Unfortunately the postmortem examination of this animal which died the next day could not be done. However, the possibility of rabies being the cause of death cannot be ruled out.

In 'Savitri' which died two days later, on postmortem examination no significant gross lesions were detected but Negri bodies were found in the Purkinje cells of cerebellum.

A 10% antibiotic treated brain suspension of 'Roopkala' and 'Savitri' was each inoculated intracranially into a group of 3 to 4 weeks old Swiss albino mice. These mice died showing typical paralysis of hind quarters and Negri bodies were demonstrated both in the impression smears and in sections. Both these virus isolates were got confirmed by serum neutralization test in mice.

The report is particularly interesting because rabies was confirmed in more than one animal without any history of apparent animal bite. The very similar incubation period is intriguing and cannot be properly explained. The role of mongoose, bats, or other small mammals as the reservoir of the disease is suspected, although no further report of rabies has been received.

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S. KUMAR.
R. M. SHARMA.
T. S. GULRAJANI.

1. Pavri, K. M., Anderson, C. R. and Singh, K. R. P., *Curr. Sci.*, 1964, **33** (11), 329.

USE OF ADULT MICE FOR POTENCY TESTING OF INACTIVATED TYPE 'O' FOOT AND MOUTH DISEASE VACCINE

MICE have been used for testing the immunogenicity of foot and mouth disease (FMD) vaccine with encouraging results (Gayot *et al.*,[1] Onufriev *et al.*[2,3]). The present report describes the use of adult mice for test of immunogenicity of formalin inactivated, aluminium hydroxide gel adsorbed type 'O' FMD vaccine.

Three batches of vaccine, namely, OIV, OV, OVI produced for field trial of the vaccine and four batches of experimental vaccine, namely, A, B, C and D containing 20, 30, 40 and 50% virus respectively were used. These vaccines were prepared in accordance, with the method recommended by Frederiks.[4] The potency of each of these vaccines was tested in mice. For this purpose, groups of twenty one-month-old Swiss albino mice were vaccinated subcutaneously with 0·75 ml. of various dilutions of the vaccine. During observation period, some mice from each group died non-specifically and were discarded. After 18 days, the mice in each group along with control group of mice was challenged subcutaneously with 10,000 LD50 of type 'O' mouse adapted virus. The deaths due to FMD virus infection were confirmed by complement fixation test. The protection dose 50 (PD50) was calculated by the method of Reed and Muench.[5] The OIV, OV, OVI batches of vaccine were also tested for their immunogenicity by the method recommended by Frederiks[4] in hill cattle whose prevaccination sera were shown to be free of type 'O' antibodies by serum neutralization test in goat kidney monolayer cultures. The results of potency testing of different batches of vaccine by both the methods are presented in Table I.

It is seen from Table I that a definite immune response was elicited by the adult mice. In general, the degree of protection conferred with the more concentrated vaccine was better than that with the dilutions of the vaccine.