Rearing Animals in Captivity for the Study of Trematode Life Histories.
I. *Larus ridibundus* L., the Black-headed Gull.

By
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Introduction.

A troublesome problem arises in connexion with the tracing of Trematode life histories; namely how to obtain the intermediate and final hosts free from Helminth infections. It was discovered—fortunately early—during the study of the parasites of *Peringia ulvæ* Pennant 1777, that all the species of certain groups of cercariæ, and also related species from other molluscan hosts, encyst most readily in the same species of fish or crab. It is therefore not surprising if the mature trematodes are also to be found in the same host. It is obvious that the greatest confusion can arise from these facts. To add to the difficulty it is often impossible to distinguish between the worms within the cyst, and therefore the dissecting out of cysts for feeding purposes is impracticable.

By far the most satisfactory results are obtained by rearing the hosts in the Laboratory, but unfortunately with marine organisms this is often impossible.

The Black-headed Gull was selected as the final host in a series of experiments, approximately 40 Helminth parasites having been recovered from this bird in Europe. Attempts were made to rear the bird in captivity.

Two dozen eggs were first placed under various hens, but all those were lost owing to the great fragility of the shells. The birds invariably smashed the eggs in turning them. An incubator was then tried but a large series of failures also occurred before the discovery of the correct temperature. Subsequently half the birds died on account of wrong treatment after hatching.

Successful Experiment.

The eggs, which varied greatly in size, were collected immediately after they were laid and dispatched by rail. They were placed in the incubator (The Curfew Electric Incubator) approximately 14 hours later. The incubator was raised to a temperature of 101–102° F. (38° C.) and maintained at this heat until after the birds were removed to the brooder.

The humidity was about the same as that usually employed for the artificial incubation of ducks' eggs. The upper troughs were filled with sea water.

The following table gives the daily treatment of the eggs :

1st day	(May 22nd)	Set eggs. Closed incubator.
2nd ,,		Eggs not touched.
3rd ,,		,, turned twice daily.
4th ,,		,, ,, ,, ,,
5th ,,		,, ,, ,, ,,
6th ,,		,, ,, ,, ,,
7th ,,		,, ,, ,, ,,
8th ,,		,, ,, ,, ,, and cooled for 5 mins. at night.
9th ,,		,, ,, ,, ,, ,, ,, 8 ,, ,,
10th ,,		,, ,, ,, ,, ,, ,, 10 ,, ,,
11th ,,		,, ,, ,, ,, ,, ,, 12 ,, ,,
12th ,,		,, ,, ,, ,, ,, ,, 14 ,, ,,
13th ,,		,, ,, ,, ,, ,, ,, 15 ,, ,,
14th ,,		,, ,, ,, ,, ,, ,, 15 ,, ,,
15th ,,		,, ,, ,, ,, ,, ,, 16 ,, ,,
16th ,,		,, ,, ,, ,, ,, ,, 18 ,, ,,
17th ,,		,, ,, ,, ,, ,, ,, 20 ,, ,,
18th ,,		,, ,, ,, ,, ,, ,, 20 ,, ,,
19th ,,		,, ,, ,, ,, ,, ,, 14 ,, ,,
20th ,,		,, turned. Cooled 1 minute.
21st ,,		,, not touched. Cooled 1 minute (hatching begins).
22nd ,,		,, ,, ,, ,, 1 ,,
23rd ,,		,, ,, ,, ,, 1 ,,
24th ,,	(June 14th)	(hatching over).

Hatching took place between the 20th and 24th day. It was noted that the small eggs failed to develop. Without exception the birds experienced difficulty in liberating themselves from the shell and many died in the process. At this stage the mortality was 50 per cent.

After the chicks hatched they were removed to the cooling chamber, but not permitted to move about in it. Activity immediately after hatching had proved fatal in several cases. They were fed approximately seven hours later while still within the cooling chamber. Ten hours later they were removed to the brooder (Curfew Electric Brooder) which was heated to 90° F. (32° C.) and from then onwards fed every 20–30 minutes. The temperature of the brooder was gradually lowered to 70° F. (21° C.) and on the third day the chicks were allowed to run freely in a pen at room temperature.

Care was taken to avoid accidental infection through the food supply. In the case of the final host it is usual to declare an animal free from Helminth parasites if routine examination of the fæces reveals no sign of eggs. Yet it has been shewn repeatedly that many trematode parasites can be present, especially in animals used in the laboratory, and yet no eggs appear in the fæces.

By feeding with boiled food and regulating the supply of vitamins with patent preparations it was hoped to reduce the risk of accidental infection

to a minimum. Throughout these experiments it was assumed that water from the hot taps (in London) was free from viable helminth parasites.

Although fish does not appear to be one of the principal components of the food of the Black-headed Gull in nature, it formed the major portion of the diet supplied to these birds in captivity.

The fish was mixed with breadcrumbs, cooked with water or milk, and passed through a sieve until it formed a semi-liquid gruel. This was given with a pipette. De Vons' insect food, thoroughly baked, was added to the food on the third day, the birds pecking at it themselves from off a dish on the floor. In addition to the patent vitamin preparations, a pinch of calcium lactate was added to the diet from time to time.

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