

and parasitic life, it is improbable that the shell would grow 25 mm. in one season, and we take it that these young shells represent the growth of something more than a year, probably about eighteen months. The second region probably represents that of one year more, but does the third region correspond to the growth of one year or of six? Probably of one, to judge from the striae on a large series of shells. If this be so, *Lamellidens marginalis rhadinaeus* probably lives as a rule for a little over three years and then dies directly or indirectly of old age. The great majority of the shells collected must, if our surmises are correct, have been of this age, and the animals through weakness or for some other reason, have failed to burrow down to the subsoil water through the very stiff clay on the bottom of the basins in which they lived, when the water began to dry up with the retreat of the floods.

NOTE ON THE LIVER-FLUKE OF SHEEP IN SEISTAN.

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When in Seistan we were informed that both sheep and cattle are frequently infected by a liver-fluke which causes a heavy mortality at certain places in the early summer of each year. On enquiry we learnt that the Seistanis associated this parasite with the fact that when the annual floods recede the flocks are grazed on the peculiar vegetation that springs up on recently inundated land.

I was able (in December) to examine the livers of three sheep, the bile-ducts of two of which contained flukes of the genus *Fasciola*, s.s. In one of the livers the worms were unfortunately dead and in a putrefying condition. The other contained eleven specimens, all of which were alive.

Unfortunately the literature on this genus is poorly represented in our Calcutta libraries and several important American memoirs on the subject are lacking. Notwithstanding this fact, however, there appears to be little doubt as to the specific identity of the Seistan form, for most of our specimens agree in every particular except size with the excellent figures of Cobbold's *Fasciola gigantea*, reproduced from Looss by Stevens in "*The Animal Parasites of Man* (London, 1916).

The chief characters by which this species is distinguished from *Fasciola hepatica* are the following:—

- (i) The form is generally much more elongate and band-like instead of leaf-shaped, the tapering of the posterior extremity being confined to a very small area.
- (ii) The cephalic cone is considerably shorter in proportion to the length of the whole organism.
- (iii) The posterior sucker is larger and more prominent and is situated on a line with the junction of the cephalic cone and body, instead of well behind the cone.

- (iv) The main lateral diverticula of the gut are considerably more numerous.
- (v) The posterior testis does not extend to the posterior third of the body.
- (vi) The eggs are larger.

In all these characters except the first our Persian specimens are constant. In eight of the specimens the length varies from 38 to 43 mm. and the breadth from 9 to 11 mm., the proportion of length to breadth being from 3.5 to 4.4. Two specimens are damaged. The remaining individual is abnormal in form; its length is 28 mm., its breadth 12 mm. and it is leaf-shaped in outline. In structural characters, however, it is identical with other individuals from the same sheep.

The eggs are approximately 156 to 173 μ in length and 86 to 95 μ in breadth.

The small size of the specimens may possibly be due to the fact that they were examined before they had attained their full dimensions, though they were sexually mature. We were, indeed, informed by the sergeant in charge of the slaughtering of sheep for the troops at Nasratabad that he had noticed very much larger individuals later in the year.

In my examination of freshwater snails in Seistan I found no cercariae that could be associated with *Fasciola*, probably because the incidence of the parasite in the molluscan host is seasonal. Judging, however, from the abundance of shells in the soil of inundated land at the edge of the Hamun, the intermediate host is probably *Limnaea gedrosiana*, Annandale and Prashad. As this mollusc is also common in the hill-country of Baluchistan it would be interesting to know whether the fluke occurs there also.

So far as we are aware *F. gigantea* has not hitherto been recorded from Asia. Looss cites *F. angusta* (Railliet) and *F. aegyptiaca*, Looss, as synonyms¹ and states that the species is widely distributed in Northern Africa, including Egypt. It is said to have occurred accidentally in man in South America.

¹ Looss, *Zool. Jahrb., Syst.*, XVI, p. 783 (1902).