OBSERVATIONS MADE BY E. L. TÄNZER AND JHR. W. C. VAN HEURN WITH REFERENCE TO THE PROPAGATION OF THE VARANUS KOMODOENSIS OUW.

In his publication on the *Varanus komodoensis* Ouw. (Nat. Tijdschr. v. Ned. Ind., vol. 97, 1937, p. 193) Dr. J. K. de Jong had to state: "The biology of its propagation, we regret to state, as yet remains a closed book" [1]). The Editor of Treubia has now received a report on observations with reference to the mating and the depositing of eggs, sent in by Mr. E. L. Tänzer, made in the Sourabaya Botanical and Zoological Gardens, and in connection therewith also with reference to the results of the examination of a few of these eggs on the part of Jhr. W. C. van Heurn. Both these gentlemen were good enough to put their notes at the disposal of the Editor who has prepared therefrom the following extract.

The animals.

In the Sourabaya Botanical and Zoological Gardens there are 4 Komodo Varanus, as follows:

1. a large male (length 2.77 m) presented in 1927 by Mr. H. R. Rookmaaker, at that time Assistent Resident of Flores;

2. two specimens, both of them probably males (length 2.40 and 2.50 m, respectively), caught by members of the expedition to Komodo in the spring of 1935; this expedition was headed by Mr. F. F. Schoenmakers, at that time the Director of the Gardens, now deceased;

3. a small female (length 1.55 m), presented also by Mr. H. R. Rookmaaker in 1927. This female, which has grown little or not at all since that time, deposited eggs twice, once about 6 years ago, and once 4 years ago, in neither instance, however, fertilized.

Copulation.

On July 4th, 1937, Mr. Ch. Tänzer witnessed the copulation between the female Varanus and one of the two smaller males, in the Gardens since 1935.

Subsequently Mr. G. Hompes, the Manager of the Gardens, witnessed some more copulations, as communicated by him on July 10th, 1937. Such copulations were repeated several times since.

In the course of the copulation the male lies over the female, in the usual manner.

[1]) See also the article published by Dr. L. D. Brongersma: Über die Ei-ablage und die Eier von Varanus komodoensis Ouwens. Zoöl. Garten Leipzig, 1932, N.F. 5, pp. 45 - 48. (But the behaviour of the female here described was most likely altogether abnormal).

When the urge to copulate had noticeably declined, the female, on July 24, 1937, was transferred to a separate enclosure which was partly shaded.

The depositing of the eggs. [2])

The floor of the "lying-in room" had been dug out to a depth of from 1 - 1½ metres, and had been filled in with humus and also raised by means of humus.

On one of its sides, at the foot of the hillock, an entrance was made of plates of concrete resting upon concrete corbels. The female, immediately upon being freed within its new enclosure, made use of this entrance by digging itself in there. During the greater part of the day the animal remained in its lair.

It was very rarely seen outside. It took food regularly. So as not to frighten the animal no night observations were made with lamps or lights.

On August 13, 1937, it was discovered that the animal had laid eggs. At that time two eggs had been deposited outside the actual breeding place, at about 1½ metres distance from the entrance to the lair. When after two days both eggs were still lying there, one of them was taken away to find out, if possible, whether it had been fecundated. The examinations made by Jhr. VAN HEURN proved that the egg was entirely addled, so that it was impossible to establish the development of an embryo.

The other egg had utterly disappeared a couple of days later.

On December 14, 1937, Mr. HOMPES saw the animal digging into the side of the hillock. So as not to disturb it he did not further pursue his observation. A couple of hours later he discovered that in the spot where the animal had been digging there was no hole; only the soil showed signs of having been rooted up. Upon further investigation a nest was found here. One of its eggs was extracted to be submitted to a second examination, but so as not to disturb the nest the number of eggs deposited was not ascertained.

The eggs.

The weight of the egg taken out of this nest on December 14th amounted to 136 grammes. Its colour was evenly white, with a circlet of purplish red spots round one of the poles. The egg shell was parchment-like, and within the circlet of spots mentioned it was softer and less elastic than was the remainder of the shell. The egg was not a perfect ellipsoid, and exhibited a few dents that need not be attributed to decay but could very well have been caused by the evaporation of water. It was opaque. Upon being opened a caked layer of a fairly thick substance, of a rose to creamish yellow colour, was found deposited on the inside of the shell, within which layer, surrounded by a disorganized creamish mass, a dead embryo was discovered. Though data are lacking that might suggest the age of the egg, it is nevertheless surmised that it may have developed for two or three months, whilst the embryo probably had died about a month prior to the egg having been opened.

[2]) For a reproduction of the egg see the article of Dr. L. D. BRONGERSMA, referred to in Note 1.

Although, therefore, this egg contained a dead embryo, the nest was not exposed until January 10, 1938, when it proved to contain 14 dessicated egg shells.

In the course of the exposure of this nest a second nest with eggs was discovered close to the first one. It had been made at a greater depth (± 45 cm) and contained 10 eggs, one of which was empty and dessicated. One of the 9 undamaged eggs was taken away and examined. It weighed 176 grammes. Its colour was a dirty white with an admixture of a somewhat rusty tint. The shell was leathery, the length of the empty egg shell being ± 92 mm, and its transverse section 60 mm. The shell weighed 6 grammes. Upon being opened it was found to contain a living embryo which had not become immersed in the mass of the light yellow yolk, as Jhr. VAN HEURN had very often found in the case of snake eggs. The white of the egg was clear and looked somewhat like the fresh white of a hen's egg. The area vasculosa, situated against the egg shell, was less definitely developed than in the case of hatching birds' eggs, and upon incision exhibited but slight bleeding. As had been done with the preceding embryo, so also this one was fixed in alcohol-formaline according to Apathy.

On February 18 the nest was once again laid open.

The eight remaining eggs at that time were all of them more or less dented and shrivelled.

The examination of these eggs resulted in the following:

Colour of an uneven rustiness with but a few small purple spots. Of the 8 eggs 6 were perforated, one was torn across, and only one had remained intact.

In two of the eggs there was no embryo, their contents being dessicated and disorganized.

The remaining 6 eggs contained embryos in various stages of development, and in various stages of decomposition. The egg that had remained intact contained the largest embryo, measuring 12 cm from snout to anus, and 27 cm from snout to the tip of the tail. The umbilical cord and the membranes of the yolk mass still were almost intact. It must have died after the last but one egg examination on July 10, 1938; the other 5 embryos prior to that time.

Also in these eggs the embryo in all cases was found to lie outside along the yolk mass. The yolks were all of them but little consumed, and in weight and in volume were several times larger than the embryo pertaining to each.

Also these six embryos, like the previous two, were fixed with alcohol-formaline according to Apathy.

The embryonic material, together with 25 egg shells, was placed at the disposal of the Zoological Museum at Buitenzorg, where it is to be submitted to a closer anatomical examination.

Final Remarks.

It is clear that the embryos had died at a comparatively early stage of their development, whilst death had ensued at various periods. In view of the fact that one of the last eight eggs was still undamaged the cause of death cannot

have been violence. It is not likely that rats were the cause, nor were any larvae of flies found anywhere, whilst if they had been damaged by the nails of the mother animal the eggs, on account of its great weight, would have been damaged more severely.

The primary cause, therefore, of the failure of these two nests will most probably have to be looked for in the inappropriate soil. This was too close, and perhaps also too moist, so that there was insufficient air for the embryos to breathe, impairing their development and finally resulting in their death.

Also in other animals in the course of the years too great value has sometimes been attached to the warmth required for incubating in the humus within which the eggs are deposited.

Very often the eggs themselves are warmer than their surroundings, so that the heat seems to emanate rather from the embryo in the course of its development than from the hatching nest material.

It is to be hoped that before long it may again be possible to induce a *Varanus komodoensis* to procreate, in which case there may be a better chance of the outcome being favourable in view of the experience now gained.