MINISTERIE VAN ONDERWIJS, KUNSTEN EN WETENSCHAPPEN

ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN

DEEL XXXVII, No. 14 28 september 1961

TWO INTERESTING INVERTEBRATES, LIMNADIA LENTICULARIS (L.) (CRUSTACEA PHYLLOPODA) AND GONIONEMUS VERTENS A. AGASSIZ (LIMNOMEDUSAE), FOUND IN THE NETHERLANDS [1])

by

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(with 1 textfigure, and 1 plate)

Limnadia lenticularis (L.)

In July 1960 Mr. E. Blok of the Netherlands Fishery Inspection showed me some specimens of a Crustacean which he had identified as *Limnadia lenticularis* (L.) (Phyllopoda Conchostraca). The specimens were found in fish ponds in the municipality of Valkenswaard, province of Noord-Brabant.

These fish ponds are used to rear carp and pike. They are nowhere over 0.75 m deep and have a sandy bottom covered with mud. The vegetation is rich and consists of reed and aquatic plants (*Ceratophyllum demersum* L., *Myriophyllum spicatum* L., *Potamogeton natans* L., and algae). The water in the ponds is artificially fertilized. At certain times the ponds are emptied; in filling them the water is taken from a small nearby stream, the Tongelreep. This is a lowland rivulet flowing in a sandy soil which originally was covered with heather but which now is brought into cultivation and turned into meadow land. The water, which is clear, is eutrophic and fresh (30-60 mg Cl/l).

The *Limnadia* specimens were found among algae of the genus *Cladophora*.

1) R.I.V.O.N. — Communication no. 100.

Fig. 1. Known localities of *Limnadia lenticularis* (L.) (▲) and *Gonionemus vertens* A. Agassiz (●) in the Netherlands.

At several occasions specimens were seen swimming near the surface of the water.

According to Wesenberg-Lund (1937, p. 420) *Limnadia* seems to prefer shallow water habitats, such as ponds with a rich aquatic vegetation and pools which dry out in the summer. This corresponds strikingly with the environmental conditions found in the fish ponds in Valkenswaard.

Gislén (1937) in his paper on the ecology of *Limnadia* studied the various habitats in central and northern Europe in which the species is found. He came to the conclusoion that pools in which *Limnadia* is found do not harbour a normal aquatic fauna. Such pools as a rule are mainly inhabited by mosquito larvae, Cladocera, Ostracoda, Copepoda, and other non-predatory animals; the only predators found in them being water beetles. According to Gislén this is important as the large and slow *Limnadia* is defenceless against predators. The ponds of Valkenswaard do not fit into Gislén's picture, since they contain many predators such as *Dytiscus, Aeshna* larvae, waterbugs (*Notonecta* and *Naucoris*), and fishes. It is possible that the *Limnadia* specimens here may find shelter from their enemies by living among filamentous algae.

We do not know the way in which *Limnadia* got introduced into the fish ponds at Valkenswaard. Though fish is only rarely imported there from Germany or France, the animals may have been introduced together with such fishes, either as adults or as eggs; more probably as eggs. I found, namely, that adult *Limnadia* specimens do not survive transportation very long and I did not succeed in keeping the animals alive for more than one day in glass jars filled with water from the fish ponds. A transportation from other localities as eggs therefore seems the more probable. There is also the possibility that the eggs are carried in by waterfowl.

This is not the first time that *Limnadia* is found in the Netherlands. The Rijksmuseum van Natuurlijke Historie at Leiden holds three specimens of the species which were collected in July 1906 at Vaassen, municipality of Epe, province of Gelderland. However, as far as I know, the species has not been reported before from this country, though Nierstrasz (1928, p. 263) indicated the genus *Limnadia* as occurring in the Netherlands. Nierstrasz's statement in all probability is based on the Vaassen specimens which must have been known to him.

In other countries the species also proves to be quite rare. So far it has been recorded from Sweden, Finland, Germany, France, Switzerland, Roumania, and Russia, but not from Denmark.

A note on the present specimens has also been published in Dutch (Leentvaar, 1960).

Gonionemus vertens A. Agassiz

In July 1960 I received 6 specimens of a small medusa collected in a brackish creek in the municipality of Ritthem not far from Vlissingen (Flushing) on the island of Walcheren, province of Zeeland. The living specimens had a yellowish brown tinge with a distinct dark brown cross-like figure on the umbrella indicating the radial canals. The edge of the umbrella carried many fine tentacles. The specimens which were about 15 mm wide, were found swiming among the aquatic vegetation which in that part of the creek consisted mainly of the filamentous alga *Cladophora fracta* (Dillw.) Kütz.

The specimens were sent to Dr. P. L. Kramp of the Zoological Museum at Copenhagen, who kindly consented to identify them. Dr. Kramp provided me with the following information on this material: "The medusae you have sent me belong to an American species, *Gonionemus vertens* A. Agassiz, a Limnomedusa from the family Olindiidae. The species is common on both sides of North America. In recent years the species is recorded from several locations in Europe, Japan, and China, probably transported by ships. Records in Europe are dated from England (1913), Norway (1922), Sweden (1930), France (1930, 1932, 1950), Belgium (1948), N.W. Germany (1950), Mediterranean (1952, 1953), and Ireland (1953). It is the first record of the species in Holland". The species is well described and figured by Russell (1953, p. 398, text fig. 263, pl. 23 fig. 2).

The creek in which the specimens were found forms part of the nature reserve "Rammekenshoek", of which Butot (1960) when dealing with the molluscs of the area gave a description and a map. The creek was formed in 1944 when during war action the dike of the island of Walcheren at that place was destroyed by bombs, so that the water of the Westerschelde could enter the island. After the restoration of the dike, which was closed in 1946, the present creek became cut off from the Westerschelde and was made part of the polder "Zuidwatering". It is now connected with the ditches and small canals of this polder system, but there is no direct connection either with the big shipping canal which bisects the island or with the harbour of Vlissingen. After being separated from the salt water of the mouth of the Westerschelde, the salinity of the water in the creek gradually diminished and at present it is brackish; in July 1959 the salinity was found there to be $14^0/_{00}$ Cl. The creek itself is shallow near the shore, being several meters deep in the centre. Dr. M. F. Mörzer Bruyns who studied the flora and fauna of the creek in the years 1949-1959 gave the following account of the habitat and its changes during that period. In

1950 numerous green tufts of floating *Enteromorpha* were seen in many places in the creek; it was less numerous in 1951 and decreased still more in later years. The same picture is shown by *Ulva lactuca* L. This species was abundant in 1949 and 1950, a notable decrease started in 1951 so that in 1959 the species, though still present, was scarce. *Cladophora fracta* (Dillw.) Kütz. was seen for the first time in 1953 occurring in great abundance in many parts of the creek; it remained abundant ever since. The first specimens of *Potamogeton pectinatus* L. were found in 1952 in a remote corner of the creek; in 1957 the species occurred in several localities, and in 1959 it had extended its range still more and was found in a great many places. As far as the fauna is concerned, purely marine animals such as *Cardium edule* L. and *Mya arenaria* L. are still to be found in the creek, although they are not as abundant as they were in 1949 and 1950. *Arenicola marina* (L.) and *Carcinus maenas* (L.) were abundant in 1950; their numbers have decreased since and in 1959 both were rare and found in a few places only. *Hydrobia stagnalis* (Baster) was found for the first time in the creek in 1952, by 1954 the species was common, and in 1957 and later even abundant. *Gobius* cf. *minutus* Gmelin has always been numerous in the creek, while *Pleuronectes flesus* L. was caught there in the first year after the closure of the dike. These data show that after 1946 the environmental conditions in the creek gradually changed from salt to brackish. Particularly since 1958 the number of organisms characteristic of brackish water increased considerably. Whether or not the change in the environmental conditions is responsible for the occurrence of *Gonionemus* in the creek is an open question. More extensive investigations on the ecology of the area are now in progress.

In view of the fact that the creek has no direct connection either with Vlissingen harbour or with the shipping canal through Walcheren, it seems unlikely that *Gonionemus* has been introduced that way. Furthermore it seems improbable that the species was introduced in 1944: the area has been studied quite intensively by biologists after that time and it is difficult to see how either the hydroids or the medusae would have remained unobserved. A logical explanation for the presence of the medusae in the creek therefore still has to be found.

A note in Dutch has been published on the present material (Leentvaar, 1960a).

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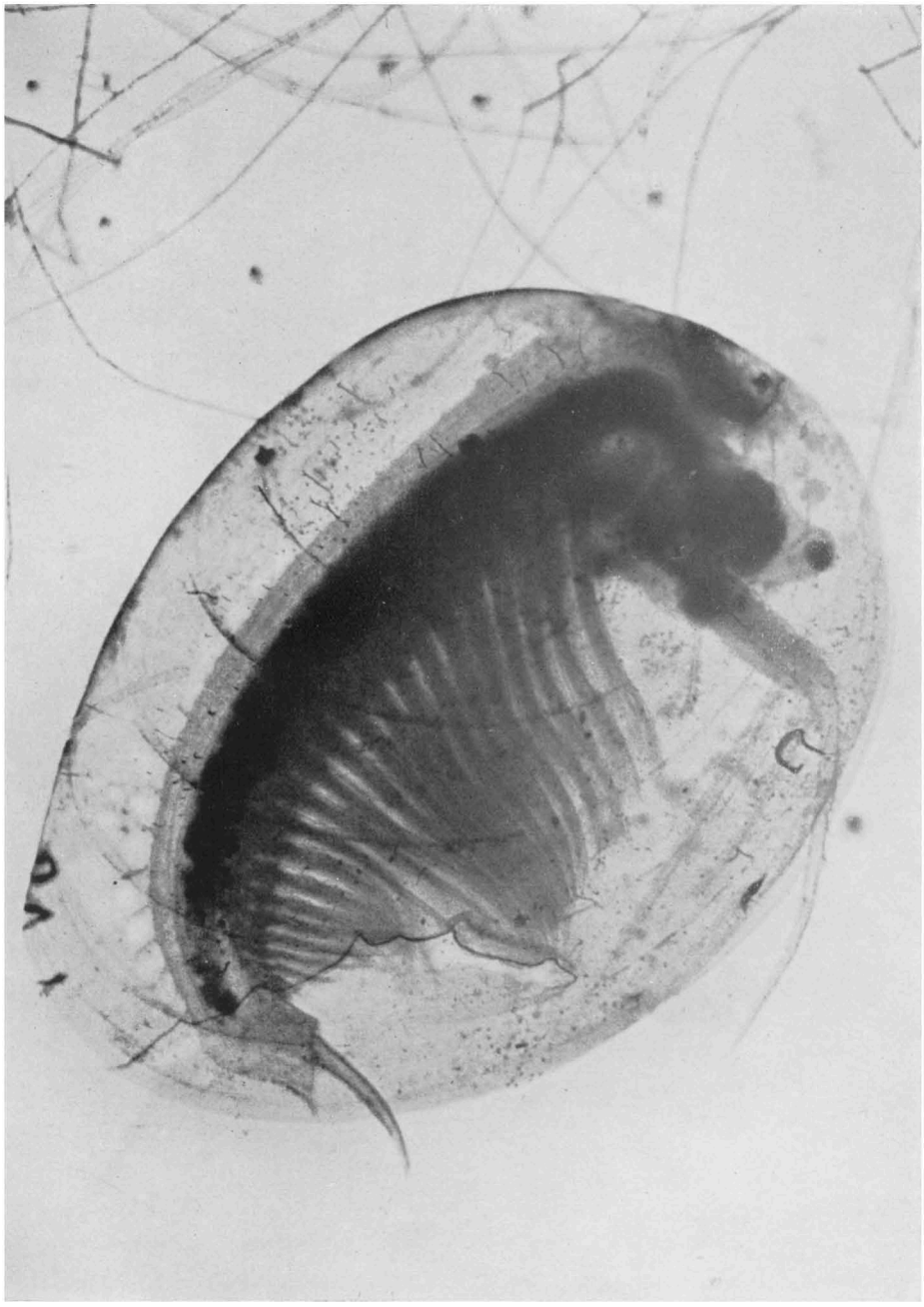

Limnadia lenticularis (L.), Valkenswaard, 1960. × 10.