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(From the Department of Zoology, University of Calcutta.)

Observations on the Life-history of *Nina navillae* MITRA and CHAKRAVARTY, from the intestine of the Centipede *Scolopendra* sp.

By

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With 5 figures in the text.

Introduction.

This paper contains the life-history of *Nina navillae*¹⁾. In 1931 this form of gregarine was observed by Dr. H. N. RAY, and in handing over the entire material he suggested me to make a detailed study of it. The genus *Nina* was established by GREBNECKI (1873, *vide* WATSON, 1916) to receive the type species *Nina gracilis*. Since then only three species have further been recorded which are *N. giardi* (LEGER) SOKOLOW (1900), *N. giardi corsicum* (LEGER and DUBOSCQ) SOKOLOW (1911), and *N. indica* MERTON (1911). *N. navillae* resembles more or less with *N. giardi corsicum* (LEGER and DUBOSCQ) SOKOLOW in the nature of its protomerite, but differs from it in having a definite epimerite placed at the top of the protomerite and in the absence of filaments. For the reasons stated above, it has been considered as a new species and named *Nina navillae*.

¹⁾ *Nina navillae* was reported by MITRA and myself as a new species of gregarine before the 24th meeting of the Indian Science Congress held at Hyderabad in January, 1937.

The centipedes were collected from our college compound and other places in the neighbourhood of Calcutta.

The methods employed in studying its morphology and life-history are the same as outlined by RAY (1933) and CHAKRAVARTY (1935). Here I wish to express my indebtedness to Mr. D. MUKERJI for helping me in various ways and to Dr. H. N. RAY for kindly placing the entire material at my disposal. His sections of the gametocysts have helped me a great deal in counting the number of chromosomes in a dividing gamete nucleus.

Observations.

The youngest forms that I could see in smears measured $50\ \mu$ in length and $15\ \mu$ in breadth. Such forms were also encountered in the sections of the gut. In none of the sections, however, I could see any intracellular stages; this suggests their extra-cellular mode of development. The epimerite at this stage is a rounded mass placed at the top of the cup-shaped protomerite. The nucleus has a definite nuclear membrane, a spherical karyosome and two or three chromatin granules.

With the growth of the gregarine the epimerite becomes flattened and sends two horn-like processes one of which is more prominent than the other (Fig. 1). It now gives off numerous small digitiform prolongations from its inner surface, which are without any filaments as shown in *N. giardi corsicum* (LEGER and DUBOSCQ) SOKOLOW. In an adult gregarine when stained in DELAFIELD'S haematoxylin the region of union between the epimerite and protomerite can be distinguished as a deeply stained thickened ridge (Fig. 2).

The protomerite is more or less cup-shaped and when fully grown measures $50\ \mu$ in length and $90\ \mu$ in breadth. Myoneme fibres that diverge from the ridge are seen to terminate at the sides and posterior end of the protomerite (Fig. 2). By these fibres the epimerite can both be retracted and expanded. Ratio length protomerite: total length :: 1 : 21.3. Ratio width protomerite: width deutomerite :: 1 : 1.3.

The deutomerite is the longest segment of the body, the broadest part being at the anterior end where it joins with the protomerite. It gradually tapers as it passes backwards and ends in a blunt point. An adult gregarine measures $624\text{--}975\ \mu$ in length and $95\text{--}190\ \mu$ in breadth.

In the majority of the individuals the nucleus appears spherical and in the adult gregarine it measures about $35\ \mu$ in diameter. In

the nucleus of young forms a definite karyosome and two or three small chromatin granules can be distinguished from the rest of the

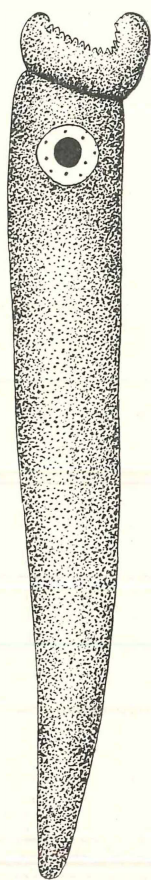


Fig. 1. *Nina navillae*, an adult gregarine from a smear. $\times 150$.



Fig. 4. *N. navillae*. A spore from a smear stained with DELAFIELD'S haematoxylin. $\times 1666$.

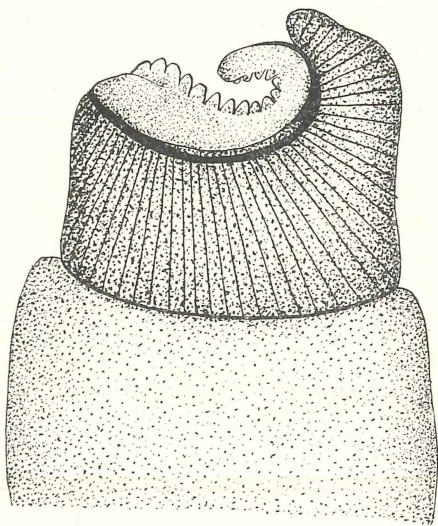


Fig. 2. *N. navillae*, anterior portion to show the epimerite with digitiform processes and myoneme fibres. From a smear. $\times 730$.

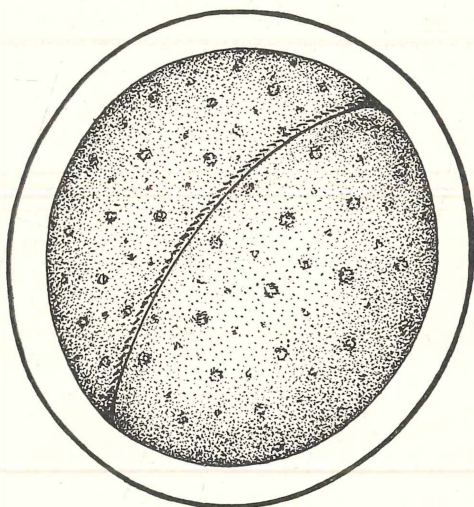


Fig. 3. *N. navillae*. A gametocyst from a section. $\times 180$.

nucleoplasm. As the gregarine attains maturity these chromatin granules increase in number and in a full grown nucleus they are seen scattered irregularly throughout the nucleoplasm.

Sporogony.

Oval gametocysts (Fig. 3) measuring $125\text{--}170\ \mu \times 95\text{--}105\ \mu$ were encountered in the sections of the gut as well as in the smears of the gut contents. They were also found in the faecal matter of the centipede and if kept in moist chamber reaptured by simple dehiscence within three to four days. The spores are spherical or oval measuring $17.5\ \mu$ in diameter and come out of the gametocyst in chains. The spores are with two envelopes (Fig. 4).

LEGER and DUBOSCQ (1909) described in detail the spore formation of *Nina gracilis*. They showed four chromosomes of equal size and a big axial chromosome in mitosis during gamete formation. After cell division according to their ob-

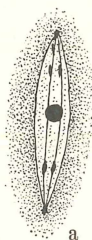


Fig. 5 a, b, c. *N. navillae*, from the section of a gametocyst showing nuclear division. $\times 1666$.

servation the latter formed the karyosome. In my preparations, however, the haploid number of chromosomes is two, there being no axial chromosome (Fig. 5, a and b). Fig. 5c represents a newly formed resting gamete nucleus. At an early stage of development of the gametocyst one of the gametocytes is differentiated from the other by the possession of mucous plates along the edge of their union with one another (Fig. 3). According to LEGER and DUBOSCQ male gametes are formed from the gametocyte with mucous plates while the other forms female gametes. The above authors have described anisogamy in *N. gracilis*. In my preparations I could not see fully formed gametes and hence it is difficult to conclude whether the gametes are isogamous or anisogamous.

Diagnosis.

Sporonts solitary, elongate, and measure $624\text{--}975\ \mu$ in length and $95\text{--}190\ \mu$ in breadth; intracellular forms are not known but develop extracellularly. Epimerite formed of two long horns with digitiform processes. Cup-shaped protomerite with myoneme fibres diverging from the base where it meets the epimerite. Nucleus

spherical measuring $35\ \mu$ in diameter, with numerous small granules in the nucleoplasm. Gametocysts oval measure $125\text{--}170\ \mu \times 95\text{--}105\ \mu$. Spores spherical or oval with two envelopes measuring $17.5\ \mu$ in diameter and are liberated in chains, by simple dehiscence of the cyst.

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