



Checklist of the species under the Genus *Stomatophora* Drzhevetskii, 1907 (Apicomplexa: Eugregarinida) described from Annelid Hosts

Sutapa Sarkar, Partha Mallik and Probir K. Bandyopadhyay*

Department of Zoology, University of Kalyani, Kalyani - 741235, West Bengal, India; prabir0432@hotmail.com

Abstract

A checklist of 12 species of the genus *Stomatophora* Drzhevetskii, 1907 has been recorded from different annelid hosts (namely Oligochaete and Polychaete). The species have been found from the seminal vesicles and intestines of the hosts of different geographical locations.

Keywords: Annelid, Checklist, Eugregarinida, *Stomatophora* Apicomplexa

Introduction

One of the most diverse protist monophyletic lineages is the Apicomplexa. According to Levine (1988), the Apicomplexa are divided into over 300 genera and more than 60 families, but this division is deceiving. Most of these groups contain only one or a few species. There are fewer than 50 genera with 10 or more named species, and only 8 with 100 or more. These 8 genera namely *Eimeria*, *Haemogregarina*, *Gregarina*, *Isospora*, *Haemoproteus*, *Plasmodium*, *Sarcocystis*, and *Babesia* comprise more than half of the species. The 'gregarines' are a diverse group of apicomplexa, classified as a 'Gregarinasina' or 'Gregarina'. The large (roughly half a millimeter) gregarine parasites inhabit the intestine, coelom and reproductive organ of invertebrates. Arthropods tend to harbor septate gregarines, aseptate gregarines are frequently found in the seminal vesicles and coelomic cavity of the earthworms. Approximately, 250 genera and 1650 species of aseptate gregarines have so far been described from annelid hosts (Levine 1976, 1977 and 1988; Clopton 2000; Hausmann *et al.*, 2003). Bhatia (1930) established the sub-family Stomatophorinae, having the characteristic features;

gamonts highly variable in shape (cylindrical, globular, stellate etc.), solitary; mucron transformed into a sucker, myocyte complex; oocysts navicular with truncate ends, with eight spopozoites. Sub-family Stomatophorinae includes the genus *Stomatophora* Drzhevetskii, 1907; *Craterocystis* Cognetti de Martiis, 1918; *Astrocystella* Cognetti de Martiis, 1918; *Albertisella* Cognetti de Martiis, 1926; *Beccaricystis* Cognetti de Martiis, 1926; *Parachoanocystoides* de Saedeleer, 1930; *Choanocystoides* Cognetti de Martiis, 1925; *Zeylanocystis* Dissanaiké, 1953; *Arborocystis* Rees and Howell, 1966; *Chakravartiella* Misra and Raychaudhury, 1973. Levine (1988) put forward a revised classification where he put *Stomatophora* under under the class-Conoidasida; order-Eugregarinorida; sub-family Stomatophorinae.

Drzhevetskii (1907) erected the genus *Stomatophora* with the type species *S. coronata* (Hesse, 1904) Drzhevetskii, 1907 having the characteristic feature that gamonts spherical or ovoidal; sucker petaloid with radiating sides; oocysts biconical with a flattened button at each end, attached to each other end to end in long chains inside gametocysts.

* Author for correspondence

Only 12 species of *Stomatophora* have so far been recorded throughout the world. Out of which, 10 have been described from India (Bhatia and Setna, 1926; Pradhan and Dasgupta, 1980; Roychoudhury and Haldar, 1984; Bhatia and Setna, 1938; Bandyopadhyay *et al.*, 2001, 2004 and 2005).

But there is no systematic checklist with description of *Stomatophora* species that have so far been recorded. In view of this, it is considered useful to compile a further checklist to include later additional species. The checklist with description of the different *Stomatophora* species is described below including the infected organs, type host, type locality and original reference to the species.

1. *Stomatophora bahli* Pradhan and Dasgupta, 1980

Infected organ: Seminal vesicles

Type host: *Pheretima diffringens*

Type locality: Darjeeling, West Bengal, India

Description: Trophozoite is disc like, flattened outline wavy, petaloid in appearance. It measures 43.2-82.8 µm in diameter. Ectosarc is wavy. The mucron ring like and centrally located. Sucker 4.32-10.8 µm in diameter. Nucleus eccentric, rounded to ellipsoidal and 10.8-25.2 µm in diameter. Gametocyst and oocyst are not stated.

2. *Stomatophora bulbifera* Bhatia and Setna, 1926

Infected organ: Seminal vesicles

Type host: *Pheretima elongata*

Type locality: India

Description: Trophozoite with an elongate cylindro-conical body, a broad and round anterior end and a narrow and pointed posterior end. It measures 56-119 µm in length and 24.5-52.5 µm in width. Body not marked by any furrows or epicytal striations. The sucker at the anterior end is with a central mucron. Nucleus is oval with a large spherical kariosome. It measures 10.5-15.7 µm × 7.0-11.3 µm.

3. *Stomatophora cloptoni* Bandyopadhyay and Mitra, 2005

Infected organ: Seminal vesicles

Type host: *Eutyphoeus orientalis*

Type locality: Diamond Harbour, South 24 Parganas, West Bengal, India

Description: Trophozoite spheroidal and measures 95.0-135.0 (110.0±9.0) µm in diameter. A conical sucker 40.0-62.0 (55.0±1.5) µm is present marked by eight furrows dividing the lateral margin of the sucker into eight lobes. Nucleus spherical, 18.0-24.0 (20.0±2.0) µm in diameter and placed very close to the sucker. Gametocyst ovoidal, measuring 59.0-86.0 µm × 58.0-68.0 µm. Oocyst biconical with bluntly pointed ends, measuring 13.0-19.0 µm × 10.0-12.0 µm.

4. *Stomatophora coronata* (Hesse, 1904), Drzhevetskii, 1907

Infected organ: Seminal vesicles

Type host: *Pheretima rodericensis*, *P. hawayana*, *P. peguana*, *P. barbadensis*, *P. elongata*

Type locality: France, England, Malaya

Description: A well developed petaloid crown of sarcocyte surrounding the sucker, marked by epicytal striations. Trophozoite measures 180 µ by 130 µ; average measurements 80 µ by 60 µ. Cysts spherical or slightly ellipsoidal measuring, 72 to 80 µ by 50 to 60 µ. Spores navicular, sometimes sticking end to end to form chains. It measures 9 to 11 µ by 5 to 6 µ and 7 to 7.5 µ by 3 µ.

5. *Stomatophora diadema* Hesse, 1909

Infected organ: Seminal vesicles

Type host: *Pheretima hawayana*, *P. barbadensis*, *P. elognata* and *Pheretima* sp.

Type locality: India

Description: Trophozoite spherical, compressed, disc like, 105 µm in diameter, marked by furrows and irregular lobes. Sucker shallow cup like depression in the centre of the body with a central conical projection. Nucleus rounded to ovoidal, eccentric with a large karyosome. Gametocyst spherical measuring 125-170 µm in diameter. Sporocyst navicular with truncated ends.

6. *Stomatophora globa* Pradhan and Dasgupta, 1980

Infected organ: Seminal vesicles

Type host: *Pheretima alexandri*

Type locality: Darjeeling, West Bengal, India

Description: Trophozoite spherical, measuring 30.6-97.2 μm in diameter. Cytoplasm alveolated. Sucker surrounded by a clear halo with variable number of long prolongations radiating outwards. It measures 12.6-39.8 μm in diameter. Mucron not visible. Rounded nucleus measuring 10.8-25.2 μm in diameter, located towards the periphery. Karyosome not visible. Gametocyst and oocyst are not stated.

7. *Stomatophora janovyi* Bandyopadhyay *et al.*, 2004

Infected organ: Seminal vesicles

Type host: *Amyntas hawayanus*

Type locality: Singamari, Darjeeling, West Bengal, India

Description: Trophozoite flattened, flower like and petaloid in appearance, measuring 80-85 (82.0 \pm 2.0) μm . Pellicle thin. Mucron ring like, centrally located, measuring 17-23 (20 \pm 2.0) μm . Nucleus rounded to ellipsoidal, measuring 9.0-14.0 (11.0-3.0) μm , located close to mucron. Cytoplasm densely granulated, epicystal striations not distinct but in mature stages observed to extend from periphery towards mucron. Ectosarc very thin without external processes. Gametocyst ovoidal measuring 52.0-66.0 (60.0 \pm 4.0) μm \times 33.0-39 (37.0 \pm 3.0) μm . each gametocyst encloses with two gametes. Oocysts navicular with rounded ends, measuring 10.0-12.0 (12.0 \pm 0.5) μm \times 6.0-7.0 (6.0 \pm 0.6) μm .

8. *Stomatophora majumdari* Bandyopadhyay *et al.*, 2001

Infected organ: Seminal vesicles

Type host: *Metaphire posthuma*

Type locality: Krishnanagar, Nadia, West Bengal, India

Description: Trophozoite spherical, ovoidal, flattened and compressed between its poles. It measures 40.0-63.4 μm in diameter. Sucker present in the centre of the body

and shows a central mucron measuring 16.5-24.9 μm in diameter. Nucleus rounded, measuring 4.0-8.6 μm in diameter. There are a few epicystal striations on the surface of the sucker which extends from the central mucron towards the periphery of the trophozoite. Cytoplasm highly vacuolated. Gametocyst ovoidal, large gametocyte measuring 90.1-130.5 \times 90.1-115.5 μm and small one measures 49.9-90.0 μm \times 36.6-55.5 μm . Oocyst navicular, measures 8.0 μm \times 4.8 μm .

9. *Stomatophora pedongensis* Pradhan and Dasgupta, 1980

Infected organ: Seminal vesicles

Type host: *Pheretima diffringens*

Type locality: Darjeeling, West Bengal, India

Description: Trophozoite disc like, flattened outline wavy, petaloid in appearance. It measures 50.4-93.6 μm in diameter. Ectosarc wavy. Mucron wide, filled with small vacuole like areas, measuring 10.8-28.8 μm in diameter. Nucleus rounded to ellipsoidal 10.8-18.0 μm in diameter. Gametocyst spherical and measures 90-11.8.8 μm in diameter. Oocyst navicular and 7.10 \times 3.55-4.4 μm in diameter.

10. *Stomatophora pradhanis* Roy Choudhury and Halder, 1984

Infected organ: Seminal vesicles

Type host: *Metaphire posthuma*

Type locality: North 24 Parganas, West Bengal, India

Description: Trophozoites 33.2-50.0 μm in diameter, flattened, disc like with epicystal striations. Pellicle well developed, sucker cup like, almost centrally located, measuring 12.5 μm \times 17.5 μm . Nucleus rounded, eccentric, measuring 4.1-8.3 μm in diameter with an endosome inside. Gametocyst ovoidal, 89.0 μm \times 75.0 μm . Spore biconvex with sharply pointed ends measuring 83 μm \times 3.3 μm in dimension.

11. *Stomatophora primitiva* Bhatia and Setna, 1938

Infected organ: Intestine

Type host: *Eunice siciliensis* (Polychaetascida)

Type locality: India

Description: Trophozoite almost spherical, with a cup-like sucker near the anterior end. It measures average 222.0 $\mu\text{m} \times 203.5 \mu\text{m}$. The sucker is not provided with a central mucron. Numerous epicytial striations radiate outwards over the body for some distance round the sucker. Nucleus rounded, with a large spherical karyosome and measures average 44.4 $\mu\text{m} \times 37.0 \mu\text{m}$.

12. *Stomatophora simplex* Bhatia, 1924

Infected organ: Seminal vesicles

Type host: *Pheretima rodericensis*

Type locality: India

Description: Trophozoite spherical, ovoidal or elliptical measuring 55 μ in length. The body is not marked with any furrows or epicytal striations. The sucker is a circular cup with a central projection portion from which meridional ribs radiate outwards to the rim of the sucker. Nucleus spherical and may be located at any part of the body. Cyst elliptical, measuring 68 μ to 84 μ by 48 μ to 75 μ . Spores navicular with the extremities flattened, irregularly crowded together in the cyst. It measures 8.5 μ to 18.6 μ by 5 μ to 6.8 μ .

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Conclusion

In this checklist, 12 species belonging to the genus *Stomatophora* Drzhevetskii, 1907 have been recorded. All the species have been described from different annelid hosts from different geographical locations, including the site of infections. It is expected that this paper will throw some light on the systematics and evolution of the genus *Stomatophora*. Thus, this approach may also be helpful to future investigators.

Acknowledgments

One of the authors (SS) is thankful to the authorities of the University of Kalyani, Kalyani for extending their permission to work at the Parasitology Laboratory of the Department of Zoology, University of Kalyani, Nadia, Kalyani 741235, West Bengal, India.

Another author (PM), former URS (Sr) is thankful to the authorities of the University of Kalyani, for providing scholarship to carry out his work at the Parasitology Laboratory of the Department of Zoology, University of Kalyani.

We are also thankful to Zoological Survey of India (ZSI), Calcutta - 700016 for identification of the host specimens at different times.

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