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## A discussion on the validity of the genus *Loxogenes* stafford, 1905 and suppression of the genus *Loxogenoides* kaw, 1945 (*Lecithodendriidae*: trematoda)

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**Abstract** :The genera *Loxogenes* Stafford, 1905 & *Loxogenoides* Kaw, 1945 under *Lecithodendriidae*: Trematoda had been controversial genera as both genera met suppression by various authors from time to time where as others supported the validity of at least one (ie. The genus *Loxogenes*.)

Varma & Sahay, 1985 modified the generic diagnosis of the genus *Loxogenes* while describing *Loxogenes staffordii* from *Rana tigrina* at Pathsala Assam. Varma, 1982 considered *Loxogenoides* a nomenclatural change of the genus *Loxogenes* & applied the rule of priority in retaining the genus *Loxogenes*.

The present authors have valid reasons in considering the genus *Loxogenes* Stafford, 1905 valid whereas have sufficient grounds to suppress the genus *Loxogenoides* kaw, 1950 & thus accord support to the views of Tubangui, 1928; Fuhrmann, 1928; Krull, 1936 Yamaguti, 1958; Yamaguti, 1971 & Varma 1982 who also supported the existence of the genus *Loxogenes* but without any arguments.

**Keywords:** *Loxogenes*; *Loxogenoides*.

### INTRODUCTION

Stafford (1905)<sup>1</sup> erected the genus *Loxogenes* for *Distoma arcanum* Nickerson (1900)<sup>2</sup> on account of the position of its genital pore on the ventral side mid way between the left intestinal caecum and the body margin. As per Yamaguti (1971)<sup>3</sup> this genus includes two genera viz.

I. Subgenus: *Loxogenes* Stafford (1905)<sup>1</sup>. Type species *D. arcanum* (characterised by caeca not surpassing testes, ovary distinctly lobed, pre acetabular genital pore extra caecal in ovarian zone). Species known under the genus are:—

1. *L. kashmirensis* Kaw (1950)<sup>4</sup>, Yamaguti, 1958<sup>5</sup> recovered from *Rana cyanophlyctis* & *Bufo varidis* in

Kashmir.

2. *L. liberum* Seno (1908)<sup>6</sup> recovered from *Rana nigromaculata* in Japan.

3. *L. staffordi* Varma (1982)<sup>7</sup> in *Rana cyanophlyctis* at Pathsala Assam.

II. Subgenus *Langeronia* Caballero et Bravo Hollis (1949)<sup>8</sup>. Type species- *macrocirra*. Characterised by caeca surpassing testes, ovary rounded not distinctly lobed in acetabular or post acetabular zone, genital pore extra caecal in pre ovarian zone. Following species have been reported under this subgenus :—

1. *L. macrocirra* Caballero & Bravo Hollis (1949)<sup>8</sup> n. comb. recovered from *Rana pipiens* in Mexico.

2. *L. parvum* Christian (1970)<sup>9</sup> n. comb. found in *Rana pipiens* at Vermont.

3. *L. provitellaria* (Sacks 1952)<sup>10</sup> Yamaguti, 1958<sup>5</sup> in *Sphenocephala* at Florida.

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## MATERIALS AND METHODS

Original articles of various authors and few slides were consulted & observed.

**Discussion:** Mehra and Negi (1928)<sup>11</sup> dropped the genus *Loxogenes* and considered it to be a synonym of the genus *Pleurogenes* Looss (1896<sup>12</sup>). Srivastava (1934) suppressed the genus and considered *Loxogenes* to be synonym of *Pleurogenes* as the genital pore does not lie exactly on the body margin in several species of *Pleurogenes* (i.e., *P. sphericus* and *P. intermedius* in which the genital pore occupies a position far inverse to the left body margin.)

Kaw (1943, 1945)<sup>14,15</sup> emended the genus *Loxogenes* and removed its type species *L. arcanum* to the genus *Pleurogenoides* and left *L. bicolor* Krull (1933)<sup>16</sup> as the only representative of *Loxogenes*.

Kaw later in (1943, 1945)<sup>14,15</sup> suppressed the genus *Loxogenes* instead proposed a new genus *Loxogenoides* for accommodating *L. bicolor* Krull (1933)<sup>16</sup>.

He opined “*Loxogenes* ceases to exist as an independent genus for according to the author kaw (1943, 1945)<sup>14,15</sup> its genotype *L. arcanum* Nikerson (1900)<sup>2</sup> Stafford, 1905<sup>1</sup> belongs to *Pleurogenoides* and therefore *Loxogenes* automatically become a synonym to the latter genus”.

Varma (1982)<sup>7</sup> considered this to be change of nomenclature from *Loxogenes* to *Loxogenoides* & applied the rule of priority is retaining “*Loxogenes*”.

Gupta (1954)<sup>17</sup> also suppressed the genus *Loxogenes*. He opined “Kaw (1945)<sup>15</sup> changed the genus *Loxogenes* to *Loxogenoides*”.

As mentioned earlier *Loxogenes* was erected by Stafford (1905<sup>1</sup>) for *D. arcanum* Nikerson (1900)<sup>2</sup> on account of the position of genital pore but in *P. sphericus* and *P. intermedius* genital pore lie far inwards to the left body margin. “In *Distoma arcanum* the position of genital pore is therefore, under dispute. Stafford (1904)<sup>18</sup> pointed the presence of genital pore on the dorsal surface behind pharynx whereas Osborn (1912)<sup>19</sup> observed its presence near intestinal bifurcation. Since the genital pore also lies far inwards in some other species it is necessary to drop genera *Loxogenes* & *Loxogenoides*” —Verma & Sahay (1985)<sup>20</sup>

Gupta (1954)<sup>17</sup> & Gupta and Agarwal (1966)<sup>21</sup> agreed with Srivastava (1934)<sup>13</sup> in suppressing the genus *Loxogenes*

because the position of genital pore is a variable character & also as it is synonym of *Pleurogenes*.

Varma (1982)<sup>7</sup> remarked” Thus it is true that the distinction about the position of genital pore in *Loxogenes* and *Pleurogenes* (used by Stafford in creating the genus *Loxogenes* becomes nullified by the findings (of positional variation of genital pore in a number of *Pleurogenes* & *Loxogenes*) of later workers- Osborn (1912)<sup>19</sup>.

Srivastava (1934)<sup>13</sup>, Gupta (1954)<sup>17</sup> Gupta & Agarwal (1966)<sup>21</sup> considering these facts felt like dropping the genus *Loxogenes* as synonym of *Pleurogenes*.

Yamaguti (1958)<sup>5</sup> though maintained genera *Loxogenes* and *Loxogenoides* as valid genera (vide key to the genera of subfamily *Pleurogenetinae*) yet while proposing key to the genera *Pleurogeninae* Yamaguti (1971)<sup>3</sup> dropped *Loxogenoides* but considered genus *Loxogenes* valid.

Yamaguti (1971)<sup>3</sup> seems to have based the distinction between *Loxogenes* & *Pleurogenes* not only on the basis of position of genital pore but also on the extent of uterine coils. In *Loxogenes* the uterine coil extends into fore body in *Pleurogenes* the extension of uterine coil is confined mainly in the hind body. Therefore, even if the distinction based on the position of genital pore in *Loxogenes* & *Pleurogenes* is negated the distinguishing feature of uterine coil in *Loxogenes* & *Pleurogenes* remains valid. Hence Varma (1982)<sup>7</sup> & Varma and Sahay (1985)<sup>20</sup> considered the genus *Loxogenes* valid.

Even Tubangui (1928)<sup>22</sup> and Fuhrmann (1928)<sup>23</sup> maintained the genus *Loxogenes* as valid genus. Krull (1933)<sup>16</sup> also retained the genus *Loxogenes* valid and added a new species *L. bicolor*.

A paradoxical situation was met by Varma (1982)<sup>7</sup> when he was trying to place *L. staffordii* in the sub generic characters of *Loxogenes* and *Langeronia* Cabellero and Bravo Hollis (1949)<sup>8</sup> he miserably failed but when he merged the characters of above subgenera, *Loxogenes staffordii* fitted well. Therefore, Varma (1982)<sup>7</sup> derecognised subgeneric divisions & considered *Loxogenes* to be valid. Accordingly he along with Sahay<sup>20</sup> modified the generic diagnosis of *Loxogenes* as under:—

**Generic diagnosis of *Loxogenes* slightly modified by Varma and Sahay (1985)<sup>20</sup>**

“Body flattened, oval to subglobular spinulate. Acetabulum small in equatorial region. Oral sucker small

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subterminal, **prepharynx may be present or absent**, pharynx well developed, oesophagus very short, caeca short not reaching equator. Testes one on each side of equatorial or **slight preequatorial zone**. Cirrus pouch elongate **extending obliquely from in front or side of acetabulum** to genital pore **but not extending to post acetabular region** containing winding tubular seminal vesicle, well developed prostatic complex & spinose ejaculatory duct. Genital pore sublateral (left) at varying levels (in ovarian zone in type species). Ovary median or little to right between acetabulum and intestinal bifurcation or right caecum **may be intercaecal or extra caecal or over lapping to the caecum of its own side**, uterine coils occupying lateral fields as well as inter & post testicular areas, finally post ovarian area, metraterm strongly developed, eggs small. Vitellaria mainly in shoulder region confluent in median field between level of pharynx or oesophagus & level of caecal ends or **not in the median field between level of pharynx or oesophagus and level of caecal ends**. Excretory vesicle V shaped with wide arms. Intestinal parasites of amphibians”

**CONCLUSION**

A comparative chart of the genera *Loxogenes* Stafford (1905)<sup>1</sup>, *Loxogenoides* Kaw, (1945)<sup>15</sup> and *Pleurogenes* Looss, 1896<sup>12</sup> (annexed) reveals that the genus *Loxogenes* is valid because:—

1. Intestinal caeca is short not reaching equator in *Loxogenes* where as caeca reach posterior extremity in

*Loxogenoides* (Similar to *Pleurogenes*).

2. Seminal vesicle is tubular and ejaculatory duct is spinose in *Loxogenes* where as it is bipartite in *Loxogenoides* & winding in *Pleurogenes*.

3. Genital spore sublateral (left) at varying levels in ovarian zone in type species whereas it is submedian at post pharyngeal region in *Loxogenoides* (Similar in *Pleurogenes*).

4. Ovary – median or a little to right between acetabulum & int bifurcation or right caecum in *Loxogenes* but lobate in acetabular zone slightly to one side of median line in *Loxogenoids* (similar in *Pleurogenes*).

5. Vitellaria are mainly in shoulder region confluent in median field between level of pharynx or oesophagus & level of caecal ends in *Loxogenes* whereas vitellaria form bunches of small follicles in lateral fields of fore body may be united dorsally in *Loxogenoides* (similar to *Pleurogenes*)

6. Excretory vesicle is V shaped in *Loxogenes* whereas it is T shaped in *Loxogenoides*.

7. Testes are symmetrical & post acetabular in *P. lobatus* (in hind body in *P. claviger*) - Similar in *Pleurogenes*.

8. Cirrus sac similar in *Loxogenoides* & *Pleurogenes*.

9. Majority of the characters of *Loxogenoides* Kaw (1945)<sup>15</sup> are Similar to *Pleurogenes* Looss (1896) hence *Loxogenoides* is a synonym of *Pleurogenes*.

**Table 1: Comparative chart of *Loxogenes* Stafford, 1905<sup>1</sup> and *Loxogenoides* Kaw, 1945**

	<i>Loxogenes</i> Stafford, 1905 <sup>1</sup> ( <i>Lecithodendriidae</i> , <i>Pleurogeninae</i> )	<i>Loxogenoides</i> Kaw, 1945 <sup>15</sup> <i>Lecithodendriidae</i> : <i>Loxogenoidinae</i>	<i>Pleurogenes</i> Looss, 1896 <sup>12</sup> <i>Lecithodendriidae</i> : <i>Pleurogeninae</i>
Body	Flattened oval to subglobular, spinulate	Elongate oval, flat spinulate	elliptical to oval, spinulate
Acetabulum	Small in equatorial region	Small in mid region of body	Comparatively small in anterior half of body
Oral Sucker	Small subterminal	Well developed	subterminal, usually larger than acetabulum
Pre-pharynx	Present	not mentioned	-
Pharynx	Well developed	Well developed	Small
Oesophagus	Very short	Short	Short
Caeca	Short, not reaching equator	wide reaching to post extremity	extending well into hind body

Table continued.....

Continued table 1.....

Testes	One on each side in equatorial zone	Irregular in shape, post acetabular nearly symmetrical	Symmetrical, subsymmetrical or diagonal, post-acetabular or nearposterior extremity
Cirrus pouch	elongate extending obliquely from in front of acetabulum to genital pore containing winding tubular seminal vesicle, well developed, prostatic complex & SPINOSE ejaculatory duct	Elongate, preacetabular enclosing elongate bipartite seminal vesicle past prostatica & narrow ejaculatory duct.	Claviform containing winding seminal vesicle, well developed prostatic complex and protrusible cirrus
Genital atrium	–	small genital atrium may be present	–
Genital pore	Sublateral (left) at varying levels (in ovarian zone in type species)*	Submedian post pharyngeal (Similar to <i>Pleurogenes</i> )	Marginal half way between two suckers
Ovary	Median or a little to right between acetabulum & int. bifurcation or rt. caecum.	Lobate in acetabular zone slightly to one side of median line	Ventral medial dorsal or lateral to rt. caecum in acetabular zone
Sem. Canal	–	Preovarian/present	–
Uterine Coils	Occupy lateral field as well as inter & post testicular areas, finally post ovarian area	Occupy all available space from ant. extremity to testes with a few coils extending further backwards	occupy most of hind body
Metraterm	STRONGLY developed	–	well differentiated
Eggs	Small	Small	–
Vitellaria	Mainly in shoulder region confluent in median field between level of pharynx or oesophagus & level of caecal ends.	Forming bunches of small follicles in Lateral fields of forebody & may be united dorsally	bunch like in shoulder region
Exc. vesicle	‘V’ shaped with wide arms	‘T’ shaped with long stem and short arms	with comparatively short or long arms
Parasites of	intestine of amphibians	amphibians	amphibians
Type sps.	<i>L. arcanum</i> Nickerson, (1900) Stafford, (1905) <sup>1</sup>	<i>L. bicolor</i> (Knull, 1933) <sup>11</sup>	<i>P. claviger</i> (Rud, 1819) looss, 1899

**REMARKS**

(1) Yamaguti (1971) opines that mere lobation of ovary & testes is not sufficient to justify the erection of a separate genus *Pleuro lobatus* Kaw, 1943.

(2) In *Loxogenoides* & in *Pleurogenes*.

(a) Caeca extend into hind body.

(b) Testes are symmetrical & post acetabular region (in *P. lobatus*, in hind body in *P. claviger*)

(c) Cirrus sac more or less similar

(d) Genital pore marginal half way between two

suckers.

(e) Lateral medial position of ovary to rt caecum.

(f) Uterus occupy most part of body.

(g) Vit follicle – bunches in shoulder region

(h) Excretory vesicle-differ.

Majority of the characters of *Loxogenoides* kaw, 1945

resemble *Pleurogenes*

Hence former is a Synonym of latter.

*Pleurogenes (telegonella)* includes type species of

*Pleurogenes* hence Yamaguti (1971) suppressed it.

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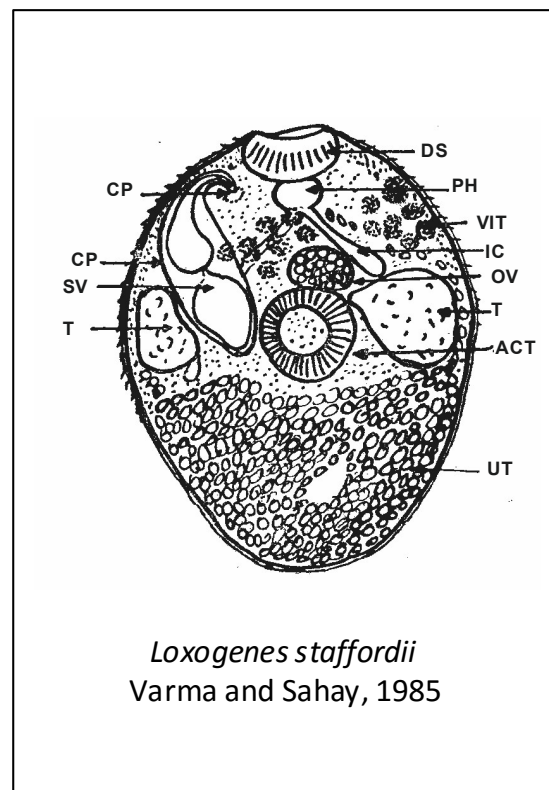
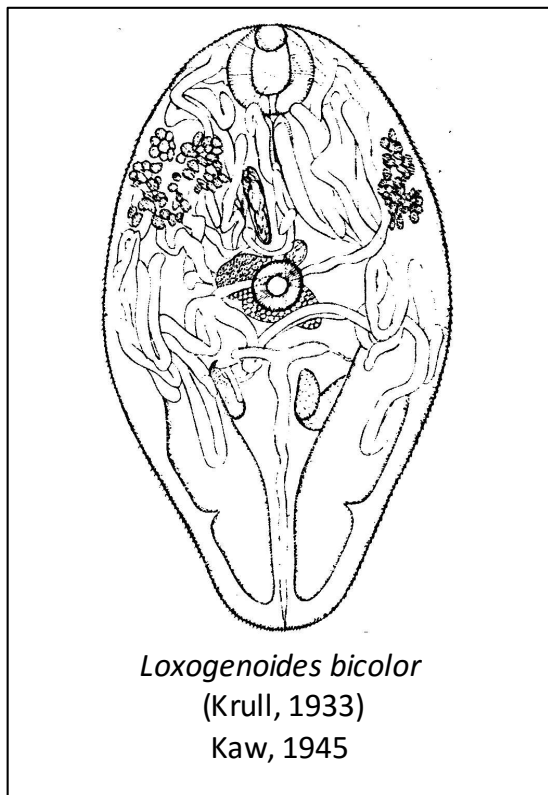
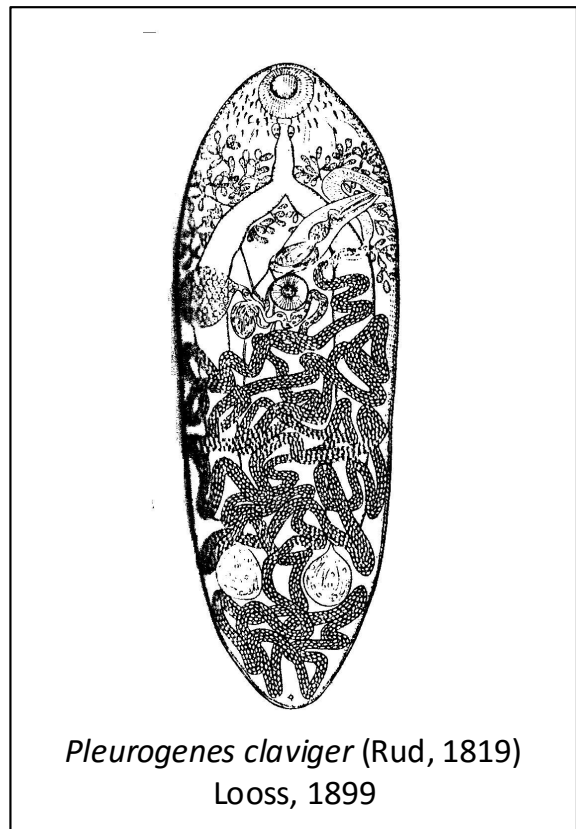
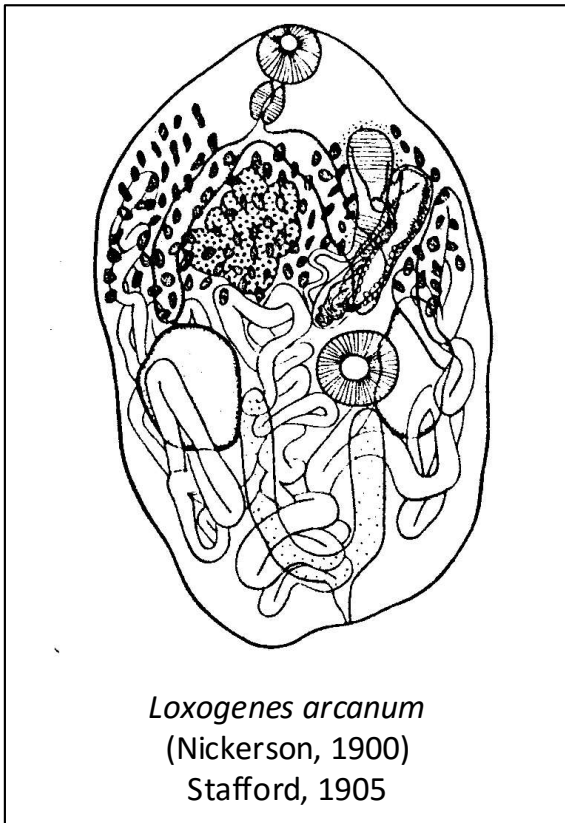


Fig. 1



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