



# Bychowskicotylids (Monogenoidea: Gastrocotylinea) infecting the gills of the sweetlips *Diagramma labiosum* Macleay (Haemulidae) in Moreton Bay, Queensland, Australia, with the proposal of *Lebedevia* n. gen. and description of *Lebedevia lebedevi* n. sp.

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**Abstract** Two species of Bychowskicotylidae (Monogenoidea: Gastrocotylinea) were collected from the gills of the sweetlips *Diagramma labiosum* Macleay (Haemulidae) obtained from Moreton Bay, Queensland, Australia, during January 2016. *Lebedevia* n. gen. is proposed for bychowskicotylids having 1) a bilaterally symmetrical haptor with four pairs of gastrocotylid-like clamps and lacking an armed lappet (anchors and hooks absent); 2) longitudinal sclerotized internal ridges lining the vas deferens, 3) an unarmed male copulatory organ, and 4) four interconnected vesicles located posterior to the genital atrium and lying on the body midline dorsal to the uterus and ventral to the vas deferens. *Lebedevia lebedevi* n. sp., the type and only species of the genus, is described, and *Tonkinopsis transfretanus* Lebedev, 1972 is recorded for the first time in Moreton Bay. *Yamaguticotyla* Price, 1959 (Bychowskicotylidae) is considered

*nomen nudum*, and the authorship of the genus is corrected to *Yamaguticotyla* Yamaguti, 1963.

**Keywords** Monogenoidea · Bychowskicotylidae · *Lebedevia* n. gen. · *Lebedevia lebedevi* n. sp. · *Tonkinopsis transfretanus* · Haemulidae · *Diagramma labiosum*

## Introduction

During a survey of the parasites of marine fishes occurring in Moreton Bay, Queensland, Australia, two bychowskicotylid species (Monogenoidea; Gastrocotylinea) were collected from the gills of the sweetlips *Diagramma labiosum* Macleay (Haemulidae). The helminth specimens were identified as *Tonkinopsis transfretanus* Lebedev, 1972 and as an undescribed species herein assigned to a new genus. Species of *Benedenia* and *Encotyllabe* (both Capsalidae) were also collected from the sweetlips and will be formally reported in a subsequent paper. The present paper is the seventh on the monogenoids recovered from Moreton Bay during the survey (see Kritsky, 2018a, b, 2019; Kritsky & Nitta, 2019; Kritsky & Chisholm, 2020; Chisholm & Kritsky, 2020) and includes the diagnosis for the new genus, the description of the new species, and the first report of *T. transfretanus* in Morton Bay.

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## Materials and methods

Specimens of the sweetlips *D. labiosum* were collected from Moreton Bay, Queensland, Australia, during January 2016. The fishes were transported alive to the Moreton Bay Research Station located in Dunwich, North Stradbroke Island, Queensland, where they were euthanized, identified using Johnson (2010), and necropsied for parasitic infections. Methods for collection, preparation, illustration, and measurement of the monogenoidean specimens were those of Kritsky (2018a). Measurements, all in micrometers, represented straight-line distances between extreme points and were expressed as the range followed by the mean and number (n) of structures measured in parentheses; body length included that of the haptor. The scientific name of the host was that presented in Johnson (2010) and verified in Fricke et al. (2022). Type and voucher specimens of helminths were deposited in the Queensland Museum, Brisbane, Australia (QM), and the University of Nebraska State Museum, Harold W. Manter Laboratory, Lincoln, Nebraska, U.S.A. (HWML), as indicated in the following species accounts.

## Results

The gills of two sweetlips *D. labiosum* were examined for monogenoids. Both hosts were parasitized by two species of Bychowskicotylidae: *Lebedevia lebedevi* n. gen., n. sp. (hosts infected with one and five specimens, respectively) and *T. transfretanus* (hosts infected with one specimen each).

**Subclass Heteronchoinea Boeger & Kritsky, 2002**

**Infrasubclass Oligonchoinea Bychowsky, 1937**

**Order Mazocraeidea Bychowsky, 1937**

**Suborder Gastrocotylina Lebedev, 1972**

**Bychowskicotylidae Lebedev, 1969**

***Lebedevia* n. gen.**

*Type and only species: Lebedevia lebedevi* n. sp. from *Diagramma labiosum* Macleay (Haemulidae).

*Etymology:* The names of the genus and its type species are proposed in honor of the late Dr. Boris Lebedev, formerly of the Far East Science Center,

USSR Academy of Sciences, Vladivostok, in recognition of our friendship and as an acknowledgment of his important contributions regarding the taxonomy and systematics of the Monogenoidea, particularly those dealing with the Suborder Gastrocotylina. Dr. Lebedev's (1986) comprehensive revision of the suborder remains the principal reference for anyone working on this group of helminths.

*ZooBank registration:* To comply with the regulations set out in article 8.5 of the 2012 version of the *International Code of Zoological Nomenclature* (ICZN, 2012), details of the new genus have been submitted to ZooBank. The Life Science Identifier (LSID) for *Lebedevia* n. gen. is urn:lsid:zoobank.org:act:D3DB2C60-9965-4C79-B79E-6109FF9CDF38.

## Diagnosis

Body comprising cephalic region, trunk, haptor; peduncle absent. Haptor symmetrical, with two bilateral rows of four gastrocotylinae clamps each; haptoral lappet, anchors, hooks absent. Paired pro-haptoral suckers with septa, small denticles *sensu* Chisholm et al. (1996) along margins of anterior lips. Eyespots absent. Mouth subterminal, ventral; pharynx muscular; esophagus bifurcating to form two intestinal ceca; ceca terminating blindly in haptor. Common genital pore midventral at level of esophageal bifurcation; genital atrium muscular, armed with elongate delicate spines. Male copulatory organ (MCO) unarmed. Seminal vesicle absent; vas deferens with longitudinal internal sclerotized ridges extending from level of anterior limit of gonadal field into MCO. Four interconnected vesicles lying posterior to genital atrium, ventral to vas deferens, dorsal to uterus. Testes numerous, intercecal, postgerminal. Germarium shaped as inverted U; genitointestinal canal present; seminal receptacle lying to left of body midline anterior to testicular field; uterus extending along body midline to genital atrium and ventral to vas deferens. Vitellarium coextensive with intestinal ceca, extending into haptor; vitelline reservoir ventral to uterus. Vaginal pore, vagina, egg not observed.

## Remarks

The Bychowskicotylidae presently contains *Yamaguticotyla* Yamaguti, 1963 (syn. *Yamaguticotyla* Price, 1959, see below) with two species and four monotypic genera: *Bychowskicotyle* Lebedev, 1969,

*Tonkinopsis* Lebedev, 1972, *Gaterinia* Lebedev, 1972, and ***Lebedevia* n. gen.** All bychowskicotylids are parasitic on the gills of haemulid fishes of the Indo-Pacific Ocean. ***Lebedevia* n. gen.**, represented by its type and only species ***Lebedevia lebedevi* n. sp.**, differs from other genera assigned to the Bychowskicotylidae by its species having 1) a bilaterally symmetrical haptor armed with four pairs of gastrocotyloid-like clamps (10 to 13 pairs in *Bychowskicotyle* spp., six or seven in *Gaterinia* spp., 10–12 in *Yamaguticotyla* spp., and three in *Tonkinopsis* spp.), 2) sclerotized ridges lining the vas deferens (ridges absent in all other bychowskicotylids), 3) an unarmed MCO (MCO armed with spines in the remaining species of the family), and 4) four interconnected vesicles located posterior to the genital atrium and lying dorsal to the uterus and ventral to the vas deferens (homologs absent in other bychowskicotylid spp.). *Lebedevia* is most similar to *Tonkinopsis* by their species having comparatively few pairs of haptor clamps (see Lebedev, 1986; Chisholm et al., 1996).

#### ***Lebedevia lebedevi* n. sp.**

*Type host:* Sweetlips, *Diagramma labiosum* Macleay (Haemulidae).

*Type locality:* Moreton Bay off Dunwich, North Stradbroke Island, Queensland, Australia (27°29'S, 153°23'E), 10, 19 January 2016.

*Infection site:* Gills.

*Specimens studied:* Holotype, QM G240115; 5 paratypes, QM G240116–G240117, HWML 216821.

*ZooBank registration:* To comply with the regulations set out in Article 8.5 of the 2012 version of the *International Code of Zoological Nomenclature* (ICZN, 2012), details of the new species have been submitted to ZooBank. The Life Science Identifier (LSID) for ***Lebedevia lebedevi* n. sp.** is urn:lsid:zoobank.org:act:75B741AD-2D85-4C69-BA8C-810F7CFCA4C9.

#### *Description* (Figs. 1–8)

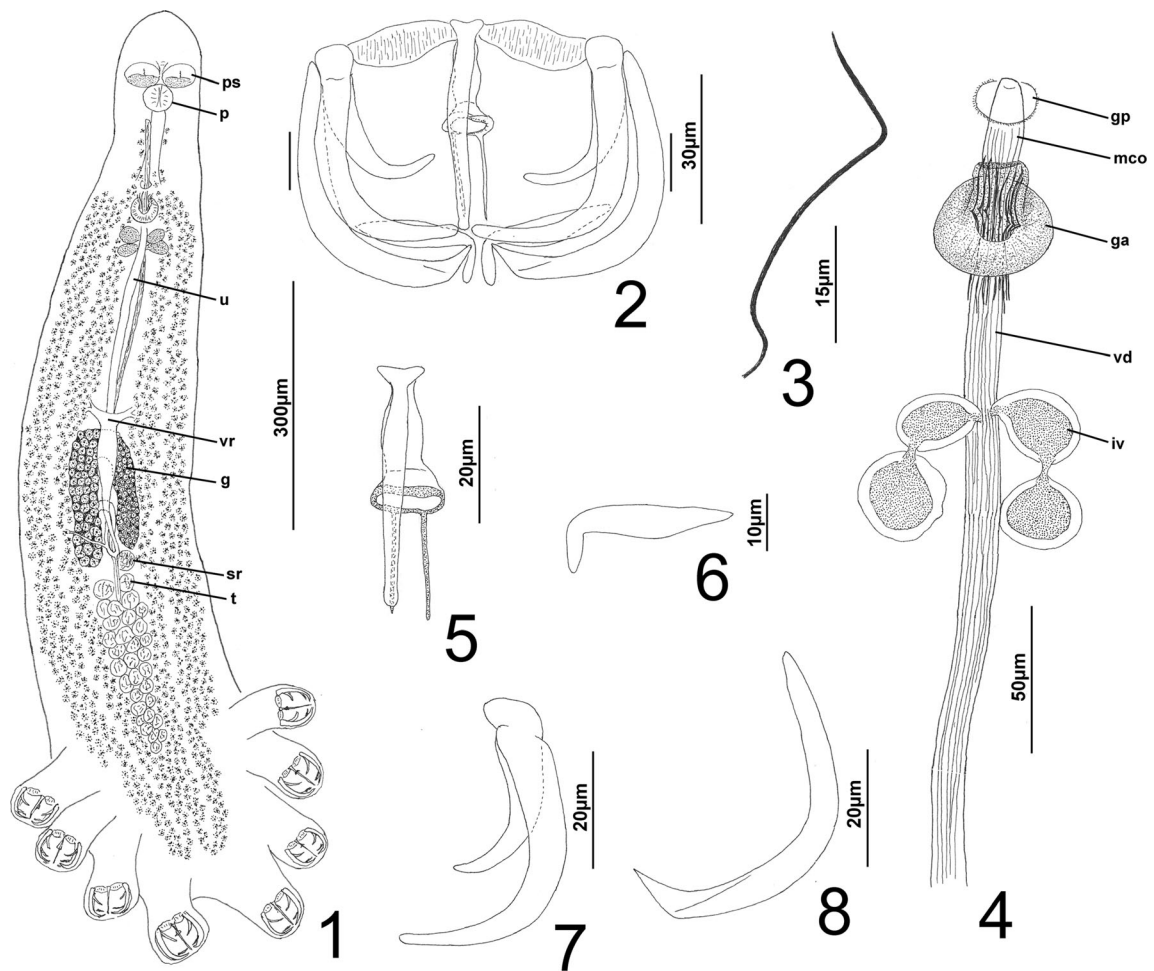
Body proper dorsoventrally flattened, tapering anteriorly from level of testicular field; haptor poorly differentiated from trunk (Fig. 1). Haptor clamps subequal in size (Fig. 2), pedunculate; peduncles short. Ventrolateral clamp sclerite with ventral and dorsal

arms, each with blunt ends (Fig. 7); posterolateral clamp sclerite J shaped, with acute blade-like posterior end (Fig. 8); median clamp sclerite (spring) with straight ventral arm having rounded tip, vase-shaped dorsal arm having two spikes directed posteriorly (Fig. 5); accessory clamp sclerite fusiform with medial end bent perpendicularly and directed posteriorly in clamp (Fig. 6). Each prohaptor sucker with thickened posterior lip, anterior lip with numerous small denticles, internal septum delicate, often inconspicuous. Mouth located in cephalic depression, flanked by prohaptor suckers. Pharynx subspherical, immediately posterior to mouth and prohaptor suckers; esophagus elongate, bifurcating dorsal to genital atrium to form intestinal ceca; esophageal and intestinal diverticula absent. Common genital pore anterior to genital atrium; genital atrium doughnut shaped, with thin-walled cylinder arising from its inner circular margin, armed with approximately 10 delicate hair-like spines (Figs. 3, 4). Approximately 20–30 subspherical testes. MCO penis like, usually protruding from genital atrium and genital pore; prostates not observed. Germarium an inverted U; oviduct directed anteriorly from distal end of germarium, then recurved posteriorly to unite with other female ducts; genitointestinal canal uniting with right intestinal cecum; vitelline reservoir bifurcating anterior to germarium. Vitellarium coextensive with intestinal ceca, extending into haptor.

*Measurements:* Body 1,080–1,280 (1,150; n = 5) long; width of trunk (at level of testicular field) 222–319 (278; n = 5). Haptor 267–301 (281; n = 3) long; 352–395 (372; n = 4) wide. Clamp pair 1 (anterior most) 61–67 (64; n = 4) wide; clamp 2 65–70 (68; n = 4) wide; clamp 3 64–75 (69; n = 5) wide; clamp 4 (posterior most) 65–70 (67; n = 5) wide. Prohaptor sucker 38–44 (41; n = 5) long, 44–49 (46; n = 5) wide. Pharynx 33–43 (38; n = 5) wide. Testicular field 157–203 (186; n = 4) long, 74–121 (98; n = 4) wide; testis 34–48 (40; n = 4) in diameter. Genital atrium 37–47 (43; n = 5) long, 39–48 (44; n = 5) wide. Germarium 152–171 (161; n = 4) long, 104–143 (122; n = 5) wide.

#### *Remarks*

***Lebedevia lebedevi* n. sp.** is the type species of the genus.



**Fig. 1–8** *Lebedevia lebedevi* n. sp. from the gills of the sweetlips *Diagramma labiosum* from Moreton Bay, Queensland, Australia. 1, Whole-mount (composite, ventral view); 2, Haptorial clamp (ventral view; the perpendicular distance between the short parallel lines indicates the measurement [width] taken during this study); 3, Hook of the genital atrium; 4, Terminal male genitalia (ventral view); 5, Medial clamp sclerite (ventral view); 6, Left accessory clamp sclerite; 7, Left ventrolateral clamp sclerite (ventral view); 8, Left dorsolateral clamp sclerite. Abbreviations: g, germarium; ga, genital atrium; gp, genital pore; iv, interconnected vesicles; mco, male copulatory organ; p, pharynx; ps, prohaptorial sucker; sr, seminal receptacle; t, testis; u, uterus; vd, vas deferens; vr, vitelline reservoir.

***Tonkinopsis transfretanus* Lebedev, 1972**

(Fig. 9)

*Type host*: Crescent sweetlips, *Plectorthynchus cinctus* (Temminck & Schlegel) (Haemulidae).

*Type locality*: Gulf of Tonkin, South China Sea.

*Current record*: Sweetlips, *Diagramma labiosum* Macleay (Haemulidae): Moreton Bay off Dunwich, North Stradbroke Island, Queensland, Australia (27°29'S, 153°23'E), 10, 19 January 2016.

*Previous records*: *P. cinctus*: Gulf of Tonkin, South China Sea (Lebedev, 1972b). *D. labiosum*: Heron

Island, Great Barrier Reef, Queensland, Australia (23°27'S, 151°55'E) (Chisholm et al., 1996).

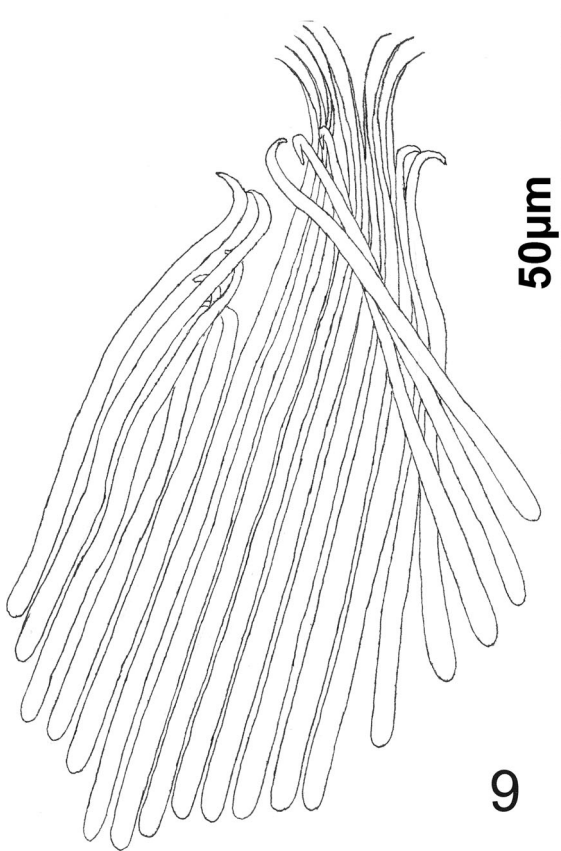
*Infection site*: Gills.

*Specimens studied*: 2 voucher specimens, QM G240118–240119.

**Remarks**

Only two specimens of *T. transfretanus* were collected during the Moreton Bay survey; one was unstained and mounted in Gray & Wess medium and the other stained with hematoxylin and mounted in Canada





**Fig. 9** Genital corona of *Tonkinopsis transfretanus* Lebedev, 1972, from the gills of sweetlips *Diagramma labiosum* from Moreton Bay, Queensland, Australia.

balsam. Although the two specimens were insufficient for determination of soft anatomy, they clearly are conspecific with those identified as *T. transfretanus* from the Great Barrier Reef by Chisholm et al. (1996). Present specimens differed from the previous descriptions of the species only by 1) septa being present in the prohaptoral suckers and 2) presence of eight elongate narrow spines in the genital corona (Fig. 9). Lebedev (1972b) and Chisholm et al. (1996) reported a varying number of hooked and narrow spines in the genital corona (see figure 9 in Chisholm et al. [1996] and figure B in Lebedev [1972b]). In addition, Chisholm et al. (1996) considered the hooked spines to be associated with the genital atrium and the narrow spines with the MCO, but these associations were not confirmed in the present specimens.

The finding of *T. transfretanus* on the gills of the sweetlips in Moreton Bay represents a new faunal record for the bay.

## Discussion

Lebedev (1969) proposed the Bychowskicotylineae Lebedev, 1969 as a subordinate taxon of the Gastrocotylidae Price, 1943. The subfamily initially included three genera: *Bychowskicotyle* Lebedev, 1969, *Gaterinia* Lebedev, 1969, and *Yamaguticotyla* Price, 1959 (now *Yamaguticotyla* Yamaguti, 1963, see below). Shortly thereafter, Lebedev (1972a, b) proposed the Calyxinellidae Lebedev, 1972, for *Calyxinella* Lebedev, 1972, and *Tonkinopsis* Lebedev, 1972. Upon determination that *Calyxinella* was a junior synonym of *Yamaguticotyla*, Lebedev (1984) elevated the Bychowskicotylineae to family status, to which two subfamilies, the Bychowskicotylineae (containing *Bychowskicotyle* and *Gaterinia*) and the Calyxinellinae (containing *Yamaguticotyla* and *Tonkinopsis*) were assigned. Prior to the present study, the Bychowskicotylidae contained five described species all parasitic on the gills of haemulid fishes: *Bychowskicotyle plectorhynchi* Lebedev, 1969 on *Plectorhynchus cinctus* (Temminck & Schlegel); *Gaterinia talaensis* Lebedev, 1969 on *Gaterin punctatissimus* (Playfair) [now *Plectorhynchus picus* (Cuvier)]; *Tonkinopsis transfretanus* Lebedev, 1972, on *P. cinctus* and *Diagramma labiosum* Macleay; *Yamaguticotyla truncata* (Goto, 1894) Price, 1959 on *Pristipoma japonicum* Cuvier [now *Parapristipoma trilineatum* (Thunberg)], and *Yamaguticotyla jucunda* (Lebedev, 1972) Lebedev, 1984 (syn. *Calyxinella jucunda* Lebedev, 1972) on an unidentified fish of the Pomadasidae (now Haemulidae) (see Lebedev, 1986; Chisholm et al., 1996).

In his most recent revision of the Suborder Gastrocotylinea, Lebedev (1986) characterized the Bychowskicotylidae to include monogenoids having postgermarial testes, a (bilaterally) symmetrical haptor armed with two rows of a small number of (gastrocotylid-like) clamps each, and copulatory organs (genital atrium and MCO) with a crown of curved hooks (parentheses *ex nobis*), while the Bychowskicotylineae and Calyxinellinae were differentiated primarily on morphological differences in the crown of hooks associated with the genital atrium and

MCO. Although a feature of all bychowskicotylid species, absence of an armed haptor lappet was considered a diagnostic feature of only the Bychowskicotylinae; the character was not mentioned in the diagnoses of either the family or that of the Calyxinellinae by Lebedev (1969, 1984, 1986).

**Lebedevia** n. gen. is clearly a member of the Suborder Gastrocotylinae and of the Bychowskicotylidae by its species having a bilaterally symmetrical haptor armed with comparatively few gastrocotylid-like clamps and lacking an armed haptor lappet. Assignment of the genus at the subfamily level, however, is problematical. The genus is probably most closely aligned with the Bychowskicotylinae by its species having an unarmed MCO and non-diverging copulatory spines enclosed within a doughnut-shaped genital atrium. In species of the Calyxinellinae, the weakly developed genital atrium and the MCO are armed with diverging spines, a feature that excludes *Lebedevia* from the subfamily (see Chisholm et al., 1996). The genus differs from *Bychowskicotyle* and *Gaterinia* (both Bychowskicotylinae) by its members having four interconnected vesicles lying on the body midline posterior to the genital atrium, by possessing longitudinal sclerotized ridges lining the vas deferens, and by having four pairs of haptor clamps (vesicles and ridges of the vas deferens absent and six or seven pairs of haptor clamps in species of *Gaterinia*; vesicles and ridges absent and 10 to 13 pairs of clamps in species of *Bychowskicotyle*).

#### A note on the nomenclatural status of *Yamaguticotyla* Price, 1959

In a published abstract of a paper presented at the Thirty-Fourth Annual Meeting of the American Society of Parasitologists, Price (1959) introduced the genus-group *Yamaguticotyla* as a member of the Gastrocotylidae (Gastrocotylinae) with *Yamaguticotyla truncata* (Goto, 1894) Price, 1959 as its type and only species. *Yamaguticotyla* Price, 1959 was accepted as an available and valid taxon *sensu* the International Code of Zoological Nomenclature (ICZN) by Yamaguti (1963) and subsequently by Lebedev (1972a, b, 1984, 1986). However, Article 13.1.1 of the ICZN (International Commission on Zoological Nomenclature, 1999) requires that every new name published after 1930 must “be accompanied by a description or definition that states in words characters that ... differentiate the taxon.” Other than

introducing *Yamaguticotyla* as a new genus and identifying its type species, Price (1959) failed to provide any statement that could be considered to have fulfilled Article 13.1.1. Thus, *Yamaguticotyla* Price, 1959 did not meet the requirements for availability *sensu* the ICZN and is herein considered *nomen nudum*.

Yamaguti (1963) first made the epithet *Yamaguticotyla* available, when in addition to identifying the type species as *Y. truncata*, he provided a generic diagnosis for the taxon and fulfilled all other nomenclatural requirements (Articles 10 to 20) for publication. Thus, the correct authorship for the taxon is *Yamaguticotyla* Yamaguti, 1963, not Price, 1959.

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**Data availability** All data used in during this study is presented within the paper.

#### Declarations

**Competing interests** The author declare no competing interests.

**Conflict of interest** The author declares that they have no conflict of interest.

**Ethical approval** The author asserts that all applicable institutional, national, and international guidelines for the care and use of animals were followed.

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