Isoglaridacris hexacotyle comb. n. (Cestoidea: Caryophyllidea) from Catostomid Fishes in Southwestern North America

JOHN S. MACKIEWICZ
State University of New York at Albany, Albany, New York

Glaridacris hexacotyle (Linton, 1897) is known only from the superficial description of Linton (1897) and the more detailed account of Hunter (1930); both descriptions were based on the same eight specimens from "Catostomus sp." from the Gila and Salt Rivers in Arizona. This paper presents additional descriptive data and proposes nomenclatorial changes based upon a restudy of the original material and of new collections from the Salt River.

Materials and Methods

A total of 160 cestodes from 15 of 16 sonora suckers, Catostomus insignis Baird and Girard, and 17 from 7 of 29 gila suckers, Catostomus (Pantosteus) clarki Baird and Girard, was collected in December 1964, at Coons Bluff on the Salt River in Tonto National Forest near Tempe, Arizona (Maricopa County). The sonora suckers ranged in total length from 225-494 mm (mean: 359 mm) whereas the gila suckers ranged from 213-375 mm (mean: 260 mm). Living cestodes were fixed in steaming AFA or 5 per cent formalin and stained with Semichon's carmine.

Only 108 cestodes (82 gravid) from the sonora sucker and 16 (nine gravid) from the gila sucker were stained and mounted; two gravid individuals from the sonora sucker were sectioned. Measurements were made on a selected sample of 30 gravid worms from 12 sonora suckers and five from three gila suckers. Host nomenclature is according to the recent treatment of Smith (1966).

Comparative material included: Glaridacris hexacotyle (Linton, 1897), USNM Helm. Coll. No. 49727 (label: USNM Helm. Coll. 49727 from 4793) consisting of a vial with three posterior regions, two scolexes, and darkly stained fragments of the testicular region; 19 of Hunter's original slides of this species (his numbers: 584.1 a-g, .2 to .4 a-b, .5 to .7 a-d, and .8 to .9); Isoglaridacris folius Fredrickson and Ulmer, 1967, paratype, USNM Helm. Coll. No. 60301; I. longus Fredrickson and Ulmer, 1967, holotype, USNM Helm. Coll. No. 60302; and I. bulbocirrhus Mackiewicz, 1965, topotypes, 136 whole mounts of gravid and immature worms from the author's collection.

Isoglaridacris hexacotyle comb. n. (Figs. 1-8)

SYNONYMY: Monobothrium hexacotyle Linton, 1897; Caryophyllaeus hexacotyle (Linton, 1897) Woodland, 1923; Glaridacris hexacotyle (Linton, 1897) Hunter, 1927.

HOSTS AND DISTRIBUTION: Catostomus sp., Gila and Salt River, Arizona (Linton, 1897); White River, 8 km W. Meeker, Rio Blanco County, Colorado (collected by G. Schmidt). Catostomus insignis Baird and Girard, Gila River, Tonto National Forest, Maricopa County, Arizona. Catostomus (Pantosteus) clarki Baird and Girard, same as C. insignis as well as Birch Creek, a tributary of the Virgin River, Zion National Park, Washington County, Utah.

HABITAT: Small intestine, weakly attached or free.


MORPHOLOGY: There appears to be some confusion regarding the number of gonopores found in this species. According to Hunter (1930: 66), "The cirrus sac opens flush with the ventral surface of the parasite, and the female system empties in a similar fashion just behind that of the male." In his specific diagnosis, however, he seems to imply that there is one gonopore since the terms "common genital atrium" are used. Linton (1897), on the other hand, mentioned a genital aperture and clearly pictured one in his figure 3, plate...
XXVIII. That the cirrus joins the uterovaginal canal that in turn opens on the surface as a single gonopore is borne out by a reexamination of the fragments in Linton's vial, of Hunter's slides, particularly numbers 584.7c and 584.9 and examination of 108 cestodes in the present study. Sections on Hunter's slide, that includes the one used for his figure 41, have the cirrus partially everted through a single gonopore. Since *Glaridacris* Cooper, 1920, has two gonopores, it is necessary to make the nomenclatorial changes indicated above.

My other data are in general agreement with Hunter's (1930) detailed description but indicate that there is a greater variation in the species. Mean measurements (in mm, ranges in parentheses) of a selected sample of 30 gravid worms from sonora suckers are: length 10.4 (7-15.5), width at gonopore 0.74 (0.5-1.1), and number of testes 162 (132-205). Measurements of five specimens from gila suckers are: length 10.1 (8.7-12), width at gonopore 0.54 (0.5-0.6), and number of testes 174 (143-223). Immature worms resembled adults and lacked a cercomer (Fig. 8). The characteristic hexagonal scolex, from which the species derives its name, is found only on contracted specimens that have the apex of the scolex thrust forward. Normally the scolex is much like that of *Glaridacris catostomii* Cooper, 1920 (Fig. 2); some of the variations are shown in figure 3. In all cases (91) the vitellaria extended more anteriorly than the testes (Fig. 1) and posteriorly to the cirrus; postovarian vitellaria were always present. Two vitelline ducts connect the postovarian vitellaria with the vitelline reservoir; Hunter (1930) reported only one.

Two types of ovarian variation were observed: unequal arm lengths (Figs. 1, 4) and fusion of the posterior arms to form an inverted A-shaped ovary. This latter variation was found in 8 of the 82 gravid worms from only the sonora sucker.

Ten ova dissected from the distal part of the uterus and measured in water were 35 (32-40) μ long and 29 (28-30) μ wide. The shell is rough, being covered with what appears to be excess shell-material globules; there is a small operculum and there are three to five vitelline cells per egg (Fig. 7).

Additional data on variation growth and incidence have been presented by Chandra (1966) and Amin (1968).

**Host-Parasite Relationships:** There were striking differences in the incidence and worm burden between sonora and gila suckers collected from the same pool. While a mean of 10.7 (3-20) cestodes occurred in 15 of 16 sonora suckers only 2.4 (1-6) were found in 7 of 29 gila suckers. Using the chi square contingency test, the probability is less than 0.005 per cent that the two hosts are infected to the same degree. Such a significant difference may be associated with the different feeding habits of the hosts as reflected in the structure of their mouths. For example, the sonora sucker has thick, fleshy papillose lips that aid in sucking material from mud, sand, or the surface of rocks. The gila sucker, on the other hand, has the same soft, papillose lips but with a tough cartilaginous inner edge that aids in scraping or tearing material from the surface of rocks. Sonora suckers are, therefore, more apt to ingest the probably intermediate host of *I. hexacotyle*, tubificid worms, which normally live in mud.

In August 1964, an average of three (1-12) cestodes were found in four of seven gila suckers, ranging in size from 8.5-18 cm, from Birch Creek in Zion National Park, Utah. Fish were observed scraping and tearing algae and other growths from the surface of large rocks.

**Systematics:** This species is placed in the genus *Isoglaridacris* Mackiewicz, 1965, primarily on the basis of its having a single gonopore; *Glaridacris* has two gonopores and, therefore, cannot receive this species. All of the other characters, such as vitellaria in lateral rows, cuneiform scolex, and type of ovary, are clearly those of *Isoglaridacris*. There are three other species of *Isoglaridacris*: *I. bulboarterus* Mackiewicz, 1965, from *C. commersoni* (Lacépède) (Mackiewicz, 1965), and *I. longus* Fredrickson and Ulmer, 1967, from *Moxostoma macrolepidotum* (LeSueur) and *I. folius* Fredrickson and Ulmer, 1967, from *M. erythrum* (Ref.) (Fredrickson and Ulmer, 1967).

According to Linton (1897: 426) the type is USNM No. 4793 with the label "From sucker (*Catostomus* sp.) inhabiting the Gila and Salt River, Arizona; E. Palmer." This number, since recatalogued as No. 49727, consists of a vial with only fragments of worms; no specimen has been designated as...
Discussion

This nomenclatorial change reduces the number of nearctic *Glaridacris* species to four; Kennedy (1965) has recently considered the palearctic species, *G. brachurus* (Mrázek, 1908) and *G. limnodrili* Yamaguti, 1934, as synonyms of *Archigetes* Leuckart, 1878. The nearctic species fall into two dissimilar groups: one represented by *G. catostomi*, which is long and filiform, has a cuneiform scolex, annularly arranged vitellaria and widely separated gonosores; and the other by *G. laruei* (Lamont, 1921), *G. oligorchis* Haderlie, 1953 and *G. confusa* Hunter, 1927, which are relatively short forms having a terminal disc on the scolex, vitellaria in two lateral rows and gonosores close together.

Such a grouping strongly suggests that the genus *Glaridacris* should be revised to include forms more similar to each other. Indeed, the type of the genus, *G. catostomi*, more closely resembles *Caryophyllaeus terebrans* (Linton, 1893) than it does any other species of *Glaridacris*. Not only do both species have a similar general morphology but study of living and preserved *C. terebrans* from *Catostomus ardens* Jordan and Gilbert in Wyoming clearly confirms the presence of loculi on a weakly developed cuneiform scolex. The scolex of palearctic *Caryophyllaeus* Mueller, 1787, is basically of another type, however, being expanded with apical folds or fimbriae and completely lacking loculi. Comparative studies of the cirrus complex of *G. catostomi* and *C. terebrans* are now in progress; hopefully they should further elucidate the relationship of the nearctic and palearctic *Caryophyllaeus* to each other and to *Glaridacris*.

Acknowledgments

Thanks are extended to Mr. Richard Koehn, graduate student at Arizona State University, for his generous help in collecting hosts from the Salt River; to the National Park Service for permission to examine fish from Zion National Park; to Dr. G. W. Hunter III for loan of the *Glaridacris* part of his collection; and to Dr. G. Smith for his opinion regarding the identity of the Birch Creek fish.

The Arizona collections were supported by Grant No. 20-147-A from ASRC of the State University of New York.

Literature Cited


