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Cicerina debrae n. sp. (Platyhelminthes: Kalyptorhynchia, Cicerinidae) from the Southern Atlantic Coast, USA

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Cicerina debrae is described as a new species of kalyptorhynch flatworm belonging to the Cicerinidae. This species was found in surface sediment from the lower half of the beach at two sites in North Carolina and is identical to museum material previously collected from North Carolina and from the Atlantic coast of Florida. *C. debrae* differs from its congeners in the shape of the ductus spermatici and the copulatory cirrus.

Specimens were found in surface sediment collected from the lower half of a high-energy beach near Emerald Isle (EI), North Carolina (within 10 m of N34°38’41”; W77°5’22.8”—Type Locality) and from a beach near Salter Path (SP), North Carolina (within 10m of N34°41'18.28"; W76°51'54.25") in October of 2011, in January, February, March, and October of 2012, and in May of 2013. Specimens were extracted from the sand samples, photographed and drawn, and processed for confocal laser-scanning microscopy (CLSM) and resin-embedment/serial-sectioning (Whitson *et al.* 2011; Smith & Tyler 1984). Wholemount resin slides were prepared of all meiofauna from ten lower-mid-tide level core samples (100cc each) taken in March 2012 at Emerald Isle (EI) (see “Locales” below), using a modification of the method originally described by Rieger & Ruppert (1978). Changes from their protocol comprised initial fixation and storage (refrigerated) in a variant of Trump’s fixative (4% Paraformaldehyde, 1% Glutaraldehyde, 200mM Sucrose, 0.1mM CaCl2 in 0.1M Sorensen’s Phosphate buffer, pH 7.2), and secondary fixation in 1% Osmium tetroxide. DNA was separately extracted from two specimens as described in Whitson *et al*. (2011) and a portion of the 18S rDNA gene was recovered by PCR and sequenced as described in Maghsoud *et al.* (2014).

Material examined comprised: four specimens prepared for CLSM, three specimens prepared for TEM and serially-sectioned for light microscopy, one specimen observed as a whole-mount in a resin-slide preparation, and one specimen thin-sectioned for TEM examination. Additional material examined comprised seven slides of preserved, whole-mounted specimens inventoried at the Swedish Museum of Natural History, Stockholm (SMNHS), originally collected from Bogue Banks, NC, near Morehead city January 1971, and from the Atlantic coast of Florida near Marineland in January of 1971 (SMNHS #134201-02, #134204-06 and #134197-98, respectively; leg. Tor Karling) and drawings, notes, and one whole-mount of “*Cicerina* orthocirri” collected at the site of the old Iron Steamer Pier on Bogue Banks, NC, probably in winter of 1969–1970, by Reinhard Rieger. In the description below, positions along the longitudinal body axis are expressed as percentage of the body length and given as "U-values," where U0 is the anterior tip of the body and U100 is the posterior end (Rieger & Sterrer 1968).

Cicerina debrae **n.sp.**

The specific epithet is in honor of the first author’s mother. This species is listed in the unpublished notes by Rieger (see below) as both “CinciAugi” and “*Cicerina* orthocirri”. It is identical with *Cicerina* “debrae” in Magshoud *et al.* (2014). Type material was deposited at the Smithsonian National Museum of Natural History (USNM) and the SMNHS as follows: Holotype—a sagittally sectioned specimen from EI (USNM 1231542); Paratypes: One whole-mount (USNM 1231544) and two serially-sectioned specimens from EI (USNM 1231543, SMNH Type-8664), and two whole-mounted specimens from SMNHS (SMNH Type-8662 & 8663).

In transmitted light, the free-swimming animal was faintly golden-brown and the body was slightly flattened, most obviously at the posterior end. Proboscis, eyes, pharynx, and posterior adhesive papillae were easily seen. Specimens were threadlike, measuring approximately 1 mm long by 75 µm wide when fully extended. This species was present year-round, but generally more abundant in our samples during fall, winter, and early spring.

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two modifications prevents specimens from being so overstained by osmium tetroxide that internal structures cannot be clearly seen. Finally, we make a plea to current workers on flatworm systematics for more wide-spread use of resin-embedment serial sectioning and a corresponding move away from whole-mounts as the sole type material for new species. As originally pointed out (Smith & Tyler 1984), the anatomical detail obtained by this technique is far superior to that obtained in ordinary paraffin sections.

Authors' Contributions and Acknowledgements: KT carried out the initial confocal studies and drafted the manuscript. CS conducted a serial-section study of the copulatory bulb by TEM and also contributed LM and confocal observations to the present paper. JSIII contributed DIC micrographs, prepared the serial sections, made CLSM observations, obtained the DNA sequences, drew the figure, and made final revisions to the manuscript. The authors are grateful to Dr. Stephen Fegley and the UNC-IMS for laboratory space during the 2010 through 2013 field seasons, to Dr. Marian Litvaitis for reading and commenting on the manuscript, to Dr. Bart Tessens for sharing results from their molecular study and the unpublished 18S sequence from *Cicerina tetradactyla*, to the Swedish Museum of Natural History (especially Dr. Sven Boström) for sharing Karling's unpublished (and formerly uncatalogued) material of this species, and to Dr. Gunde Rieger and the estate of the late Dr. R.M. Rieger for permission to use his unpublished work on "*Cicerina* orthocirra". All three authors reviewed and approved the final manuscript before submission. Housing and travel support for collection were provided by the WU research Council to JSIII. Summer-stipend support for JSIII was provided by the National Center for Research Resources (5 P20 RR016461) and the National Institute of General Medical Sciences (8 P20 GM103499) from the National Institutes of Health.

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