Salsuginus seculus (Monogenoidea: Dactylogyrida: Ancyrocephalidae) from the Western Mosquitofish, *Gambusia affinis* (Cyprinodontiformes: Poeciliidae): New distributional records for Arkansas, Kansas and Oklahoma

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Studies on fish monogeneans in Oklahoma are relatively uncommon (Seamster 1937, 1938, 1960; Mizelle 1938; Monaco and Mizelle 1955; McDaniel 1963; McDaniel and Bailey 1966; Wheeler and Beverley-Burton 1989) with little or no published work in the past two decades or more. Members of the ancyrocephalid genus *Salsuginus* (Beverley-Burton) Murith and Beverley-Burton have been reported from various fundulid fishes including those from Alabama, Arkansas, Illinois, Kentucky, Nebraska, New York, Tennessee, and Texas, and Newfoundland and Ontario, Canada, and the Bahama Islands; additionally, two species have been reported from the Western Mosquitofish, *Gambusia affinis* (Poeciliidae) from California, Louisiana, and Texas, and the Bahama Islands (see Hoffman 1999).

To our knowledge, nothing has been published on any species of *Salsuginus* in Oklahoma. In Arkansas, two species were recently reported in fundulid fishes, including *S. umbraensis* (Mizelle) Murith and Beverley-Burton in Blackspotted Topminnow, *Fundulus olivaceus*, and *S. fundulus* (Mizelle) Murith and Beverley-Burton in Northern Studfish, *Fundulus catenatus* (McAllister et al. 2015, 2016). In Kansas, a single species, *S. thalkeni* Janovy, Ruhnke, and Wheeler (syn. *S. fundulus*) has been reported from Northern Plains Killifish, *Fundulus kansae* (see Janovy et al. 1989). Here, we report new distributional records for a species of *Salsuginus* in Arkansas, Kansas and Oklahoma.

During June 1983 (Kansas only) and again between April 2014 and September 2015, 36 Western Mosquitofish, *Gambusia affinis* were collected by dipnet, seine (3.7 m, 1.6 mm mesh) or backpack electrofisher from Big Spring at Spring Mill, Independence County, Arkansas (n = 4; 35.828152°N, 91.724273°W), Rolling Fork River, Sevier County, Arkansas (n = 10; 34.064701°N, 94.38003°W), Yashau Creek in Broken Bow, McCurtain County, Oklahoma (n = 21; 34.011507°N, 94.749615°W), and Rattlesnake Creek, 10 km S of Macksville, Stafford County, Kansas (n = 1, 37.845555°N, 98.967777°W). Fish from Arkansas and Oklahoma were placed in

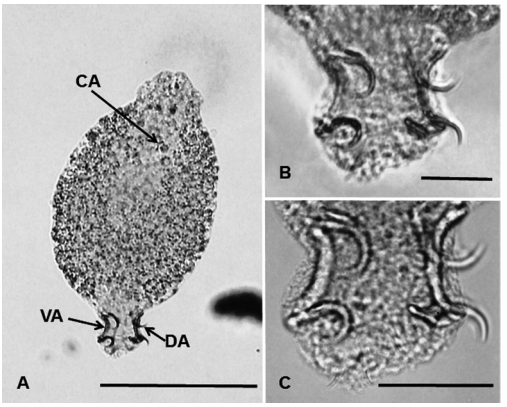

Figure 1. *Salsuginus seculus* from *Gambusia affinis* (HWML 101873). A. Entire specimen showing male copulatory apparatus (CA); dorsal anchor and dorsal bar (DA); ventral anchors and ventral bar (VA). Scale bar = 100 µm. B. View showing marginal hooks on haptor. Scale bar = 20 µm. C. Closer view showing marginal hooks. Scale bar = 20 µm.

containers with cool aerated water from their collection site and necropsied within 24 hr. We followed accepted guidelines for the use of fish in research (AFS, 2004); specimens were overdosed by immersion in a concentrated chloretone solution for approximately one hr and preserved in 10% formalin. The fish from Kansas was placed on ice for approximately one hr and preserved in 10% formalin. The gills of all the fish were examined under a stereomicroscope for monogeneans, and when found, they were picked with minuten nadeln directly from the gills. The parasites from Kansas were mounted in glycerin jelly and those from Arkansas and Oklahoma in Gray and Wess medium stained with Gomori's trichrome. Voucher specimens were deposited in the Harold W. Manter Laboratory of Parasitology (HWML), Lincoln, Nebraska as HWML 101873-101876. Host voucher specimens were deposited in the Henderson State University Collection (HSU), Arkadelphia, Arkansas.

Twenty-eight of 36 (78%) of the Western Mosquitofish were found to be infected with a monogenean matching the description of *S. seculus* (Mizelle and Arcadi, 1945) Murith and Beverley-Burton, 1985 (Fig. 1). These included two of four (50%, mean ± 1SD intensity = 4.0

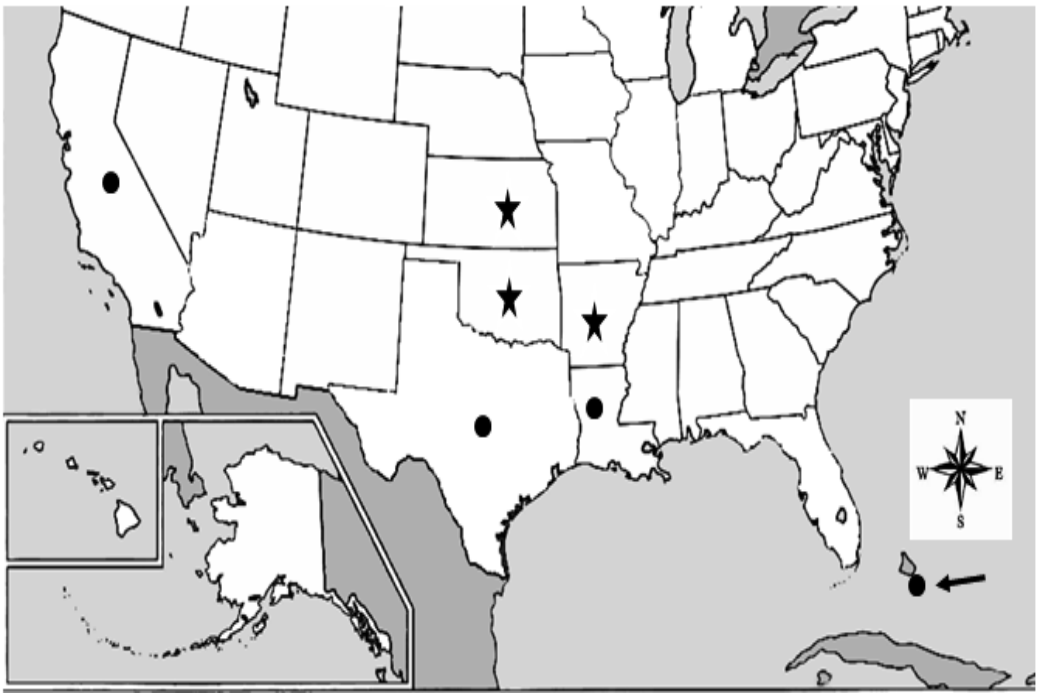

Figure 2. Records of *Salsuginus seculus* in the USA and the Bahamas (arrow). Dots = previous records; stars = new records.

± 1.4, range 3–5) from Big Spring at Spring Mill, Arkansas, eight of 10 (80%, 2.5 ± 0.8, 2–4) from the Rolling Fork River, Arkansas, 17 of 21 (81%, 5.3 ± 2.5, 1–14) from Yashau Creek, Oklahoma, and one of one (100%, 4 worms) from Rattlesnake Creek, Kansas.

This monogenean has previously been reported on *G. affinis* from California, Louisiana, Texas and the Bahama Islands (Mizelle and Arcadi 1945; Seamster 1948; Nowlin et al. 1967; Hanek and Fernando 1972; Meade and Bedinger 1972; Duobinis-Gray and Corkum 1985) (Fig. 2). In their revision of the monogenean genus *Salsuginus*, Murith and Beverley-Burton (1985) reported on previously unrecognized diversity and high host specificity within the genus due to difficulty in observing the weakly developed male copulatory apparatus. *Salsuginus seculus* appears to be monoxenous and widely distributed on *G. affinis*, including populations introduced outside its native range (Page and Burr 2011) in the Bahamas, California, and Kansas.

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