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NOTES

Seasonal Prevalence of the Digenetic Trematode *Proterometra edneyi* (Azygiidae) in the Snail *Elimia ebenum* (Pleurocercidae) at Anglin Falls, Kentucky.—*Proterometra edneyi* is a digenetic trematode whose larval and adult stages were first described from the snail *Elimia semicarinata* and experimental and natural infections of several species of darters (*Etheostoma* spp.), respectively (1). To our knowledge, natural snail infections have been reported from streams in only seven Kentucky counties (1, 2, 3). The prevalence of *P. edneyi* infections in snail populations has been low at these sites, ranging from 0.45% at North Elkhorn Creek in Scott County (2) to 12.6% at South Elkhorn Creek in Fayette County (1). Little information is available concerning the seasonal prevalence of this worm. Uglem and Aliff (1) observed mature cercariae between March and October from their monthly (July 1980 to October 1981) collections of *Elimia semicarinata*, but no specific data regarding monthly prevalence were reported. Monthly prevalence can provide critical information regarding annual loss/recruitment of trematodes within snail populations and optimal times for transmission to the next host in the worm's life cycle.

Our preliminary survey revealed the presence of *P. edneyi* rediae and cercariae in the snail *Elimia ebenum* and the adult worm in the striped darter *Etheostoma virgatum* at Anglin Falls, Rockcastle County, Kentucky. Our study was initiated to assess the seasonal prevalence of *P. edneyi* in the snail population at this site.

Anglin Falls is part of the Cumberland River drainage. The falls area, currently maintained by Berea College, is dedicated as a Kentucky State Nature Preserve encompassing 123 acres containing a number of intermittent streams. Beginning in June 1998, we collected 146–150 *Elimia ebenum* during the 4th week of each month through May 1999. Snails were placed individually into 50-ml beakers containing ca. 35–40 ml of filtered stream water. The beakers were then incubated in an environmental chamber at 20°C and a 12 hr light:12 hr dark cycle for 24 hr. Beakers were observed twice during this period

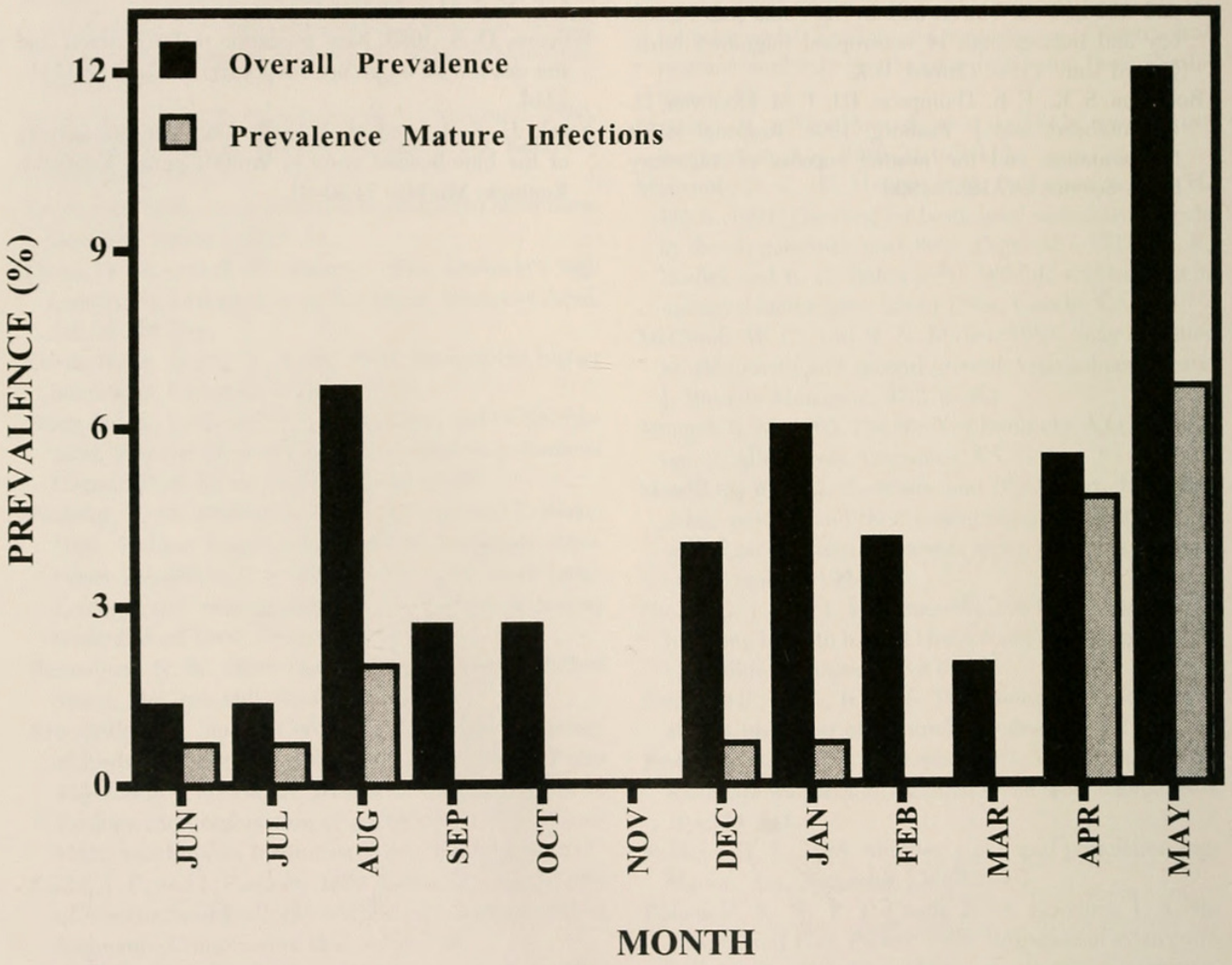

Figure 1. Monthly prevalence of *Proterometra edneyi* in the snail *Elimia ebenum* (solid box) and snails releasing mature cercariae of this species (stippled box) during June–May 1998–1999 at Anglin Falls, Kentucky.

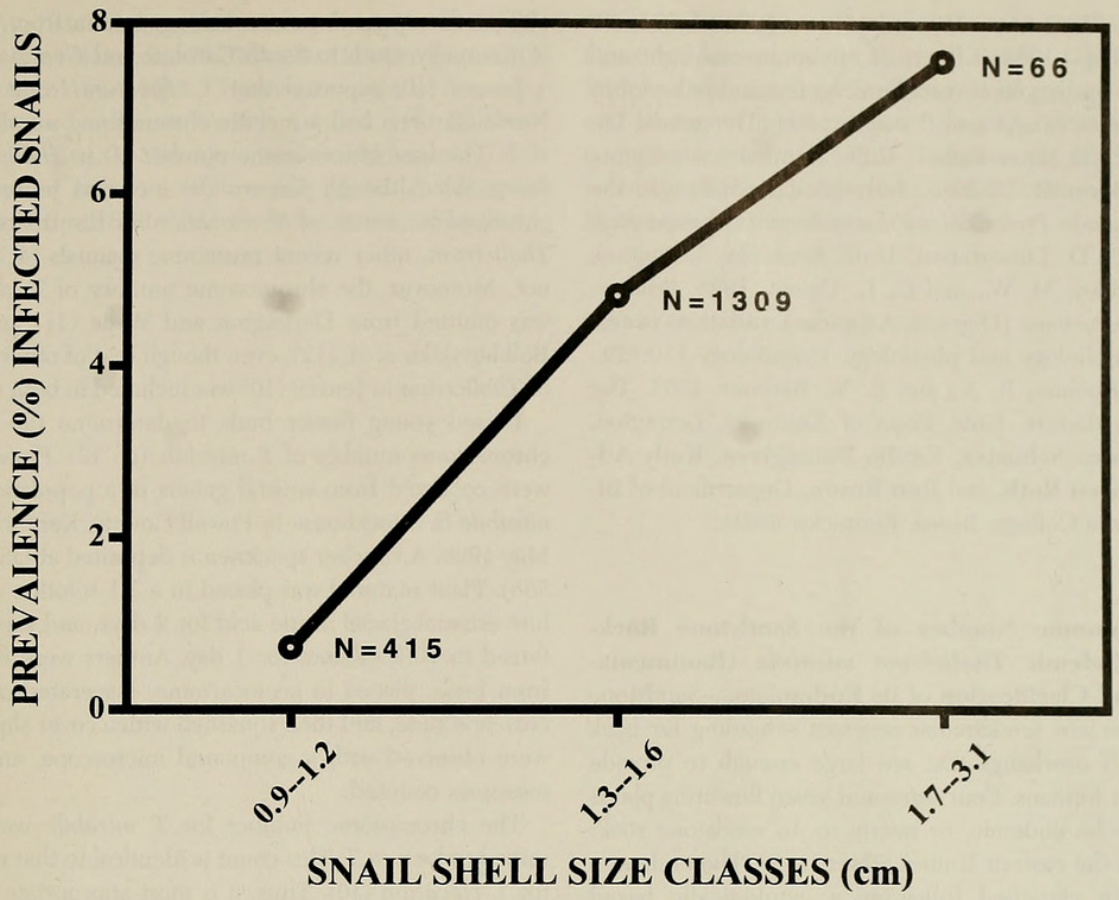

Figure 2. Prevalence of *Proterometra edneyi* in three size classes of the snail *Elimia ebenum* collected from June to May 1998–1999 at Anglin Falls, Kentucky. N = number of snails/size class.

with a dissecting microscope to determine which snails were releasing cercariae and thus possessed mature cercarial infections. Snail shell length was then recorded, and all snails were crushed to determine the presence/absence of rediae. Representative specimens were deposited in the U.S. National Parasite Collection (USNPC) with the following accession numbers: immature cercariae, 088844.0; cercariae, 088845.0; and rediae, 088846.0.

The 12-month prevalence of *P. edneyi* in *Elimia ebenum* at Anglin Falls was 4.02% (72/1790) in snails measuring between 0.9 and 3.1 cm. With the exception of November, prevalence revealed a continuous low-level infection in the snail population from June 1998 through May 1999 (prevalence range = 1.33–12.00%; Figure 1). There was a marked increase in the number of mature cercarial infections in April and May along with an overall increase in May prevalence (Figure 1). An increase in the prevalence of infection was also observed with increases in snail size (Figure 2).

The low prevalence of infection observed for *P. edneyi* in *Elimia ebenum* at Anglin Falls corroborates the observations made for this parasite in *Elimia semicarinata* (1, 2). Our observation of higher worm prevalence with increased snail size (Figure 2) also supports previous observations of *P. edneyi* infections in *Elimia semicarinata* (1). In samples of snails between 1.0 and 2.0 cm in length, Uglem and Aliff (1) found the greatest prevalence in snails between 1.6 and 1.8 cm.

Based on the prevalence of mature cercarial infections, the primary period of *P. edneyi* transmission to *Etheostoma virgatum* at Anglin Falls must occur in spring. Riley and Uglem (4) speculated that seasonal emergence peaks of cercaria, are, in part, associated with the arrival of migrant hosts in their study of strains of the closely related species *Proterometra macrostoma*. According to Kuehne and Barbour (5), *Etheostoma virgatum* (which is common in second-, third-, and fourth order streams), sometimes enters the lower reaches of tiny woodland tributaries (like those found at Anglin Falls) in April to spawn. Such behavior would place this definitive host in close proximity with the mature/infective cercarial stage, which is most prevalent during this time (Figure 1). Further investigations into seasonal movements of this darter at Anglin Falls will be required to verify this association.

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Chromosome Number of the Sandstone Rockhouse Endemic *Thalictrum mirabile* (Ranunculaceae), and Clarification of its Endemism.—Sandstone rockhouses are semicircular recesses extending far back under cliff overhangs that are large enough to provide shelter for humans. Four ferns and seven flowering plants appear to be endemic, or nearly so, to sandstone rockhouses in the eastern United States (1, 2). The endemics have been classified following a cytologically based scheme: paleoendemic, neoschizoendemic, holoschizoendemic, patroendemic, or apoendemic (1, 3). A diploid or polyploid species with no apparent closely related extant diploid ancestor is a paleoendemic. Schizoendemics have the same chromosome number as their closely related parental taxa but are of various ages: geographically restricted, youthful species (neoschizoendemic) and widespread, "mature" or ancient species (holoschizoendemic). A restricted diploid species ancestral to a widespread polyploid is a patroendemic, whereas a restricted polyploid derived from a widespread diploid is an apoendemic.

Thalictrum mirabile Small (Ranunculaceae) was the only endemic flowering plant of the rockhouses that lacked a chromosome count, and thus it was classified tentatively as a neoschizoendemic (1). The purpose of my study was to (1) determine the chromosome number of *T. mirabile*, and (2) evaluate the species' classification as a neoschizoendemic.

Thalictrum mirabile grows mostly around plunge basins and groundwater seeps/springs and at the heads of streams on the floor of rockhouses, and it is present on wet cliffs with slight overhangs (1, 4). The species was reported from Kentucky, Tennessee, North Carolina, Georgia, and Alabama by Park and Festerling (4). On the other hand, it is not listed for Tennessee by Wofford and Chester (5), North Carolina by Radford et al. (6), or Georgia by Jones and Coile (7). *Thalictrum mirabile* is very similar to its putative parental taxon, *T. clavatum* DC. The species are distinguished primarily by achene morphology (1, 4, 8). *Thalictrum clavatum* occurs in rich woods, on cliffs and seepage slopes, and along streams from Virginia to Kentucky south to South Carolina and Georgia (4, 9).

Jensen (10) reported that *T. clavatum* from western North Carolina had a meiotic chromosome number of $n = 7$. The base chromosome number (x) in *Thalictrum* is seven (8). Although Keener (9) included Jensen's (10) chromosome count of *T. clavatum* in his treatment of *Thalictrum*, other recent taxonomic manuals (4, 8) have not. Moreover, the chromosome number of *T. clavatum* was omitted from Darlington and Wylie (11) and from Bolkhovskikh et al. (12), even though that of other species of *Thalictrum* in Jensen (10) was included in both sources.

I used young flower buds to determine the meiotic chromosome number of *T. mirabile* (cf. 13). Flower buds were collected from several genets in a population of *T. mirabile* in a rockhouse in Powell County, Kentucky, on 7 May 1999. A voucher specimen is deposited at OS (*Walck* 568). Plant material was placed in a 3:1 solution of absolute ethanol:glacial acetic acid for 2 days, and then transferred to 70% ethanol for 1 day. Anthers were removed from buds, placed in acetocarmine, macerated on a microscope slide, and then squashed with a cover slip. Slides were observed with a compound microscope, and chromosomes counted.

The chromosome number for *T. mirabile* was determined to be $n = 7$. This count is identical to that reported for *T. clavatum* (10). Thus, it is most appropriate to keep *T. mirabile* as a neoschizoendemic.

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