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Rogue Turtles with Exotic Leeches: the Northwestern Pond Turtle (*Actinemys marmorata*) as a Host for the Common North American Turtle Leech (*Placobdella parasitica*)

***Jason M. Reilly*[1,7], *Don T. Ashton*[2], *James P. Holley*[3], *Max C. McClarnon*[4], *William E. Moser*[5], and *Anna J. Phillips*[6]**

[1]*Bureau of Land Management (BLM), Medford District, Grants Pass Field Office, 2164 Northeast Spalding Avenue, Grants Pass, Oregon 97526, USA*
[2]*McBain Associates, Applied River Sciences, 980 7th Street, Arcata, California 95521, USA*
[3]*Northwest Ecological Research Institute, 130 Northwest 114th Avenue, Portland, Oregon 97229, USA*
[4]*Southern Oregon University, 1250 Siskiyou Boulevard, Ashland, Oregon 97520, USA*
[5]*Smithsonian Institution, National Museum of Natural History, Department of Invertebrate Zoology, Museum Support Center, 4210 Silver Hill Road, Suitland, Maryland 20746, USA*
[6]*Smithsonian Institution, National Museum of Natural History, Department of Invertebrate Zoology, 10th Street and Constitution Avenue, Northwest, Washington, D.C. 20560-0163, USA*
[7]*Corresponding author, e-mail: jreilly@blm.gov*

Abstract.—**There is conservation concern for the Northwestern Pond Turtle (*Actinemys marmorata*) throughout its range and non-native parasitic leeches using *A. marmorata* as a host could impose an additional threat. Freshwater turtles native to eastern and central North America are common hosts of parasitic leeches and associated blood pathogens, although the health impacts on turtles are not well-studied. The Common North American Turtle Leech (*Placobdella parasitica*) is widespread east of the Rocky Mountains where it parasitizes a wide range of turtle species. Occurrences of *P. parasitica* west of the Rocky Mountains are presumed to be from translocations of their turtle hosts from east of this mountain range. Herein, we report *P. parasitica* using *A. marmorata* as a host in the Lower Rogue River, southwestern Oregon, USA. Leeches appear to be well-established in this stretch of river. Leech prevalence on turtles was significantly higher for adults than for juveniles but was not significantly different between adult male and female turtles. We did not detect a significant difference in body condition between adult turtles with or without leeches, although body condition was slightly lower in turtles with leeches. The health impacts of leech introductions on the only native turtle in southwestern Oregon warrants further investigation to determine if *P. parasitica* represents an emerging threat by reducing fitness or serving as a vector to spread pathogens within populations of *A. marmorata*.**

Key Words.—biological invasion; Hirudinea; Hirudinida; Glossiphoniidae; Glossiphoniformes; introduced parasite; naive host

Introduction

Compared to the diverse assemblage of freshwater turtles in eastern and central North America, the Pacific Coast states of the U.S. have lower turtle diversity (Ernst and Barbour 1972; Lovich and Gibbons 2021). The Northwestern Pond Turtle (*Actinemys marmorata*) is the predominant freshwater turtle in the Pacific Coast states, and it is the only native turtle throughout most of its range (Bury et al. 2012). Populations have declined over the past century, despite their high degree of ecological plasticity and relatively large latitudinal distribution spanning from northern Washington to central California (Bury et al. 2012; Manzo et al. 2021). The species is currently state listed as Endangered in Washington (Hays et al. 1999; Hallock et al. 2017), listed as Sensitive in Oregon (Oregon Department of Fish and Wildlife 2015), a Species of Conservation Priority in Nevada (Nevada Department of Wildlife 2012), and a Species of Special Concern in California (Thomson et al. 2016). The U.S. Fish and Wildlife Service has proposed Threatened status under the Endangered Species Act (ESA 1973, as amended) and a final ruling is due in 2024 (U.S. Fish and Wildlife Service 2023).

Nine species of *Placobdella* leeches (Glossiphoniidae) are ectoparasites of freshwater turtles in eastern and central North America (Ernst and Barbour 1972; Sawyer 1972; Moser et al. 2012; Richardson et al. 2015; Fan et al. 2022). Among these species is the Common North American Turtle Leech, *Placobdella parasitica*, which is abundant and widely distributed throughout eastern and central North America (Sawyer 1972, 2022; Klemm 1982, 1985). The native range of *P. parasitica* extends as far west as the eastern regions of Nebraska, Oklahoma, and Texas (Richardson et al. 2020). *Placobdella parasitica* is an opportunistic sanguivore hosted by at least 18 species of freshwater turtle (Moser 1995; Watermolen 1996; Richardson et al. 2020), suggesting that *P. parasitica* is not closely associated with any single host turtle species and any freshwater turtle may potentially serve as a host. There are occurrence records of *P. parasitica* from Arizona and Nevada (Klemm 1982, 1985); however, these records appear dubious. We determined that the voucher specimen of *P. parasitica* from Nevada (U.S. National Museum [USNM] #33987) was actually *Placobdella* cf. *kwetlumye* (no common name [NCN]). Neither the reference nor the voucher specimen associated with the record of *P. parasitica* from Arizona could be located (Moser et al. 2005). Moser et al. (2005) reported four specimens of *P. parasitica* collected on a non-native Red-eared Slider (*Trachemys scripta elegans*) in southern California and another two free-living specimens collected from a lake in the Sierra Nevada of California. They speculated that *P. parasitica* may have been accidentally introduced to California with the introduction of exotic turtles from the eastern and central U.S. and predicted this leech species would likely be found in more localities in the western U.S. In addition to published records (Klemm 1982, 1985; Richardson et al. 2020), the native range of *P. parasitica* is easily discerned in a collection of occurrence records with image vouchers in iNaturalist (www.iNaturalist.org; [Accessed 18 August 2023]) with abundant occurrences in central and eastern North America. In iNaturalist, there are a small number of isolated records in New Mexico, Washington, and California, disjunct from the records east of the Rocky Mountains (iNatualist records verified by WEM).

Numerous studies on *A. marmorata* over the past 50 y have encountered few leeches on this species (Bury and Germano 2008; Bury et al. 2012; Dan Holland, unpubl. report). Confirmed reports of parasitic leeches using *A. marmorata* as hosts are often presumed to be the result of introductions of leeches originating from east of the Rocky Mountains (Moser et al. 2005). A 1991 report mentioned leeches attached to some *A. marmorata* in central and northern California and central Oregon, referring to these as possibly a species of *Placobdella,* but prevalence and species identification was uncertain and voucher specimens are not available for examination (Dan Holland, unpubl. report). Bury et al. (2012) and Wilcox and Alvarez (2023) both show photographs of a leech attached to the shell of *A. marmorata* in northern California, but the photographs do not offer enough resolution to identify the leech species. Leeches on *A. marmorata* are regularly observed at a northern California site where invasive turtles are common (David Cook, pers. comm.). Hovingh (2016, 2022) reported observations of *P. parasitica* from the Rogue River in southwest Oregon, but prevalence was not reported.

In a turtle mark-recapture pilot study on the Lower Rogue River in 2019 (further discussed below), we detected leeches on five of 29 (17%) turtles captured. Our observations of leeches on *A. marmorata* in 2019 prompted us to sample turtles again in 2021. An objective in 2021 was to collect leech specimens and document the species identity of leeches using *A. marmorata* as a host within the Lower Rogue River in southwest Oregon, where it is the only native freshwater turtle.

Materials and Methods

Study area.—We sampled turtles along a 65 km (40 mi) stretch of the Lower Rogue River in Josephine and Curry counties, southwest Oregon, USA (Fig. 1). This stretch of the Lower Rogue River, known as the Rogue Wild and Scenic River, is managed as a wilderness river under the National Wild and Scenic Rivers Act of 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) and runs from the confluence of Grave Creek westward to Foster Bar. The upper portion of the Rogue Wild and Scenic River is located on U.S. Bureau of Land Management administered lands and the lower portion is located on land administered by the U.S. Forest Service (Fig. 1). The Rogue Wild and Scenic River is a popular destination for multi-day white-water rafting adventures and the lower portion has frequent jet boat traffic.

Sampling trips.—Access through the study reach was by guided raft in a series of four-day, three-night float trips to monitor the population status of *A. marmorata*. A pilot float trip was completed 1–3 July 2019, during which leeches were initially detected but not collected; these leeches appeared morphologically and behaviorally identical to specimens subsequently collected in 2021 and reported on here. We made three additional float trips during the spring and summer of 2021 when we collected leech specimens during each trip: 24–27 May; 15–18 June; and 13–16 July. Our survey team floated downstream in rafts conducting visual encounter surveys by scanning with binoculars to detect basking turtles. Where subpopulations of *A. marmorata* were observed basking, one or two snorkelers would slip into the water and attempt to hand-capture turtles from basking perches or as they attempted to escape into the deep, dark waters. Water depth was commonly > 3 m near basking sites, water clarity was poor (visibility < 2 m), and often dense aquatic vegetation provided escape cover, so underwater pursuit of turtles was not effective. Our methods and study area were similar to those of a previous turtle mark-recapture study conducted by Frank Galea (Galea

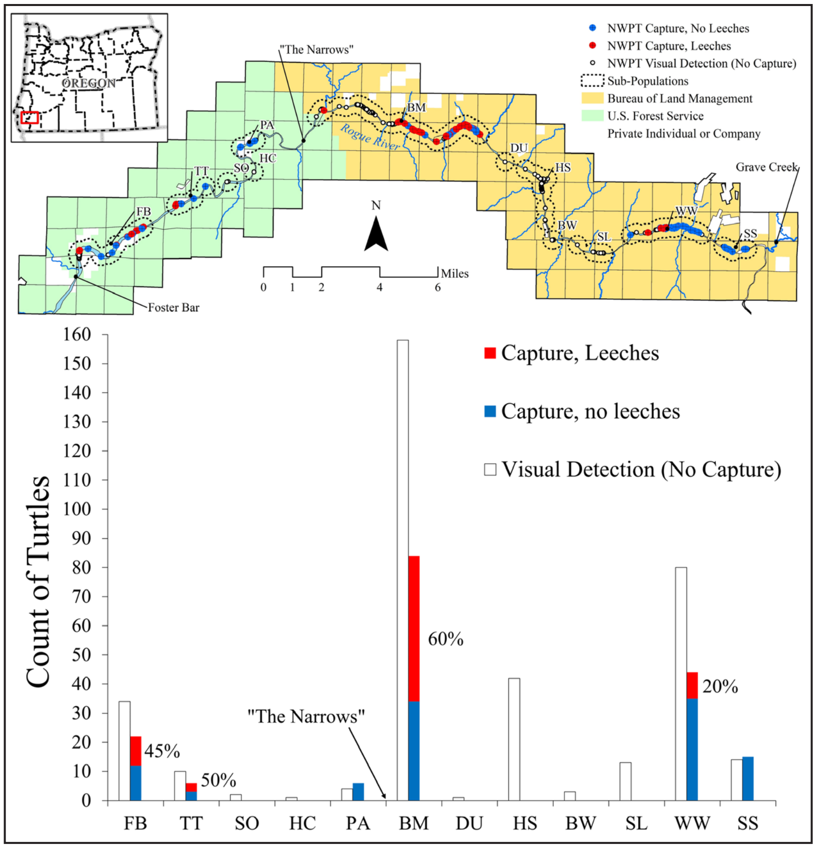

Figure 1. (Top) Lower Rogue River Wild and Scenic section in Josephine and Curry counties, southwestern Oregon, USA. The study area follows the Rogue River from the confluence of Grave Creek (right) downstream to Foster Bar (left). Locations are shown for turtle captures without leeches, with leeches, and visual detections where turtles were not captured. Subpopulation boundaries are based on 1-km separation between nearest capture or visual detection. The Narrows may present a significant barrier for upstream dispersal of turtles and leeches. (Bottom) Number of turtles captured by subpopulation (Y-axis), with stacked bars representing counts of turtles without leeches (blue) and turtles with leeches (red); open bars are visual encounters of turtles only. Subpopulations are FB = Foster Bar; TT = Tate, Tacoma, and Clayhill; SO = Solitude; HC = Huggins Canyon; PA = Paradise; BM = Battle Bar, Missouri Bar, and Mule; DU = Dulog; HS = Horseshoe; BW = Big Windy; SL = Slate Slide; WW = Whiskey, Doe, Fawn, Tyee, and Wildcat; SS = Sanderson and Single Tree.

Wildlife Consulting), who conducted turtle surveys in four consecutive years (2001–2004) under contract with the U.S. Forest Service. No turtle leeches were reported during those surveys (Galea Wildlife Consulting, unpubl. reports), although no specific inspections were made for leeches (Frank Galea, pers. comm.).

Due to float logistics, weather variables, localized density of turtles, and challenging capture conditions, we only captured turtles in some of the areas where we observed aggregations of basking turtles (Fig. 1). We recorded turtles that were visually detected but not captured as visual encounters and we estimated the location, number, and size class of these turtles. Visual encounter observations lack information on leeches and therefore we did not include these data in determining the prevalence of leeches on *A. marmorata*. We did, however, use visual observations to help define the boundaries of discrete aggregations of turtles, or subpopulations (Wells and Richmond 1995). These subpopulations occurred in calm sections of the river, separated by less hospitable rapids. Based on approximate linear home range size for pond turtles in a river (Goodman and Stewart 2000; Bury et al. 2012) and natural patterns in the data, we placed a 500-m buffer around each turtle detection location (visual and capture) and we considered groups of turtle detections with intersecting buffers to be discrete subpopulations.

***Turtle morphometrics and marking*.**—Upon capture, we brought turtles onto the raft to record mark-recapture data and collect leech specimens. We recorded morphometric measurements (Bury et al. 2012) and GPS coordinates for every turtle capture event (i.e., new captures and recaptures). We inspected turtles for injuries and previous marks from prior mark-recapture efforts (Galea Wildlife Consulting, unpubl. reports) or our surveys conducted in 2019 and 2021. We marked turtles by carapace notching (Cagle 1939) following the numbering scheme of Dan Holland (unpubl. report), except for 26 turtles captured in 2019 marked using the

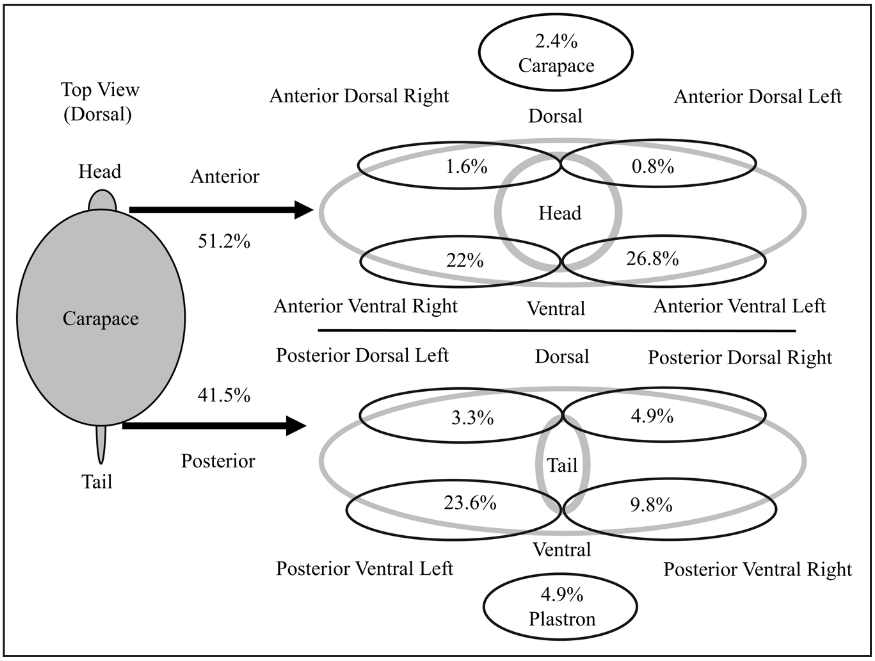

Figure 2. Ten primary zones of leech attachment on Northwestern Pond Turtles (*Actinemys marmorata*) in the Lower Rogue River Wild and Scenic section, southwestern Oregon, USA. Black ellipses indicate attachment zones with the percentage of leeches for that zone.

numbering system of Bury (1972). We took photographs of individual turtles on each capture to confirm turtle identity between the two marking schemes.

Leech collection and identification.—We visually examined each hand-captured turtle for leeches and when detected, we attempted to collect all leeches, noting where leeches were attached on the turtle, counting large and medium-sized leeches, and estimating numbers to the extent feasible for small or hatchling leeches. We removed leeches using fine forceps (Featherweight Entomology Forceps, DR Instruments, Bridgeview, Illinois, USA), placing the leeches into a 15-ml vial filled with river water, labeled with the mark number and collection date of the turtle. Loosely based on methods employed with fishes (Richardson et al. 2014), we defined 10 attachment zones on the turtle body used by leeches in our sample (Fig. 2); if one or more leeches occurred on a turtle within an attachment zone, we recorded it as having what we called leech attachment for that zone and multiple zones could be occupied on the same turtle. After measurements and leech removal, we released turtles at or near their capture point within the hour.

We kept vials with live leech specimens in a cooler in the field, then stored vials in refrigeration for 5–10 d until fixation. Fixing of leech specimens involved a two-step procedure: first adding 0.75 ml of ethanol (95% lab grade ethanol) to each vial to produce a 5% ethanol solution for 12 h to relax the leeches and avoid contraction. After 12 h, we replaced the 5% ethanol solution with 95% ethanol for preservation until laboratory identification was performed.

We examined and measured the preserved leech specimens in the laboratory with a Wild M5 stereomicroscope (Wild Heerbrugg AG, Heerbrugg, Saint Gallen, Switzerland) to determine leech counts per turtle and to confirm species identity using the keys in Klemm (1982; 1985) and Moser et al. (2016). Blood-feeding species of the genus *Placobdella* that feed readily on turtles can be differentiated by the papillar pattern on the dorsal surface of the leech (Moser et al. 2016). Only *P. parasitica* has a smooth dorsal surface. In addition, *P. parasitica* can be differentiated from its congeners by a simple to elaborate pigmentation pattern on its dorsal surface and a ventral surface with stripes (Moser et al. 2013). We sorted leeches by size class: small or hatchlings (≤ 1 cm); medium (1–2 cm); and large or adults (≥ 2 cm). We deposited voucher specimens in the Smithsonian Institution, National Museum of Natural History, Department of Invertebrate Zoology Collections (NMNH-IZ Accession # 2093382). We compared the frequency of leech prevalence between male and female turtles and between adults and juveniles using Chi-square Tests with the Yates' Correction (α = 0.05). We used the weight (WT), carapace length (CL), shell height (SH), and carapace width (CW) of turtles to calculate volumetric body condition index (vBCI) as described in Ashton et al. (2015), following the formula of Loehr et al. (2007):

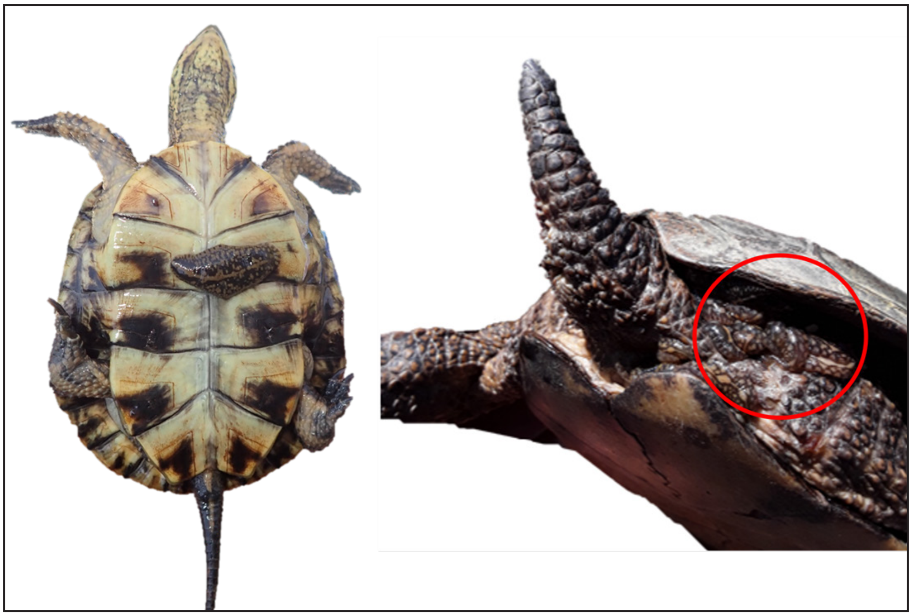

Figure 3. Examples of Common North American Turtle Leech (*Placobdella parasitica*), on the Northwestern Pond Turtle (*Actinemys marmorata*). Attachments to the exterior shell surface were rare (7.3%) as seen on this juvenile (left). More commonly, leeches attached to the flesh, hidden under the shell (92.7%), as seen on this adult with a cluster of leeches (red circle) attached near the base of the tail beneath the carapace (right). (Left: Photographed by Don Ashton; Right: Photographed by Jason Reilly).

$$\text{vBCI} = (\text{WT}) / (\pi * (\text{CL}) * (\text{SH}) * (\text{CW}) / 6000)$$

We tested for differences in vBCI between adult turtles with and without leeches using a Two-sample *t*-test assuming unequal variance ($\alpha = 0.05$).

Results

We identified 12 discrete subpopulations of turtles along the 65 km (40 mi) Rogue Wild and Scenic River study reach, with each subpopulation separated by at least a 1-km gap between turtle detections (Fig. 1). We captured turtles in six of these subpopulations (Fig. 1). We detected leeches in four of the six (67%) turtle subpopulations where we captured turtles (Fig. 1). Of all turtle captures in 2021 (n = 173), 43% were females, 36% were males, and 21% were juveniles. Forty percent (n = 69) of the turtles captured had one or more leeches. Of the turtles with leeches, 50.7% were females, 40.6% were males, and 8.7% were juveniles. Leech prevalence by turtle sex and age class was 46.7% for females, 45.2% for males, and 16.7% for juveniles. We found no significant difference in leech prevalence between adult male and female turtles ($X^2 < 0.001$, df = 1, $P = 0.997$), but we found a significant difference in leech prevalence between adult and juvenile turtles ($X^2 = 9.034$, df = 1, $P = 0.003$). The mean volumetric body condition index was slightly higher for adult turtles without leeches (mean vBCI = 1.103, n = 72) compared to adult turtles with leeches (mean vBCI = 1.097, n = 63), but the difference was not significant ($t = 0.196$, df = 93, $P = 0.845$).

We identified the leech specimens as *P. parasitica* (n = 915) with infestation intensity that varied from 1–70 leeches per turtle: 1–10 large (or adults), 1–60 medium, and 1–69 small leeches. Most leeches were categorized in the small size class (43%) or the medium size class (43%) and occurred in clusters at feeding sites. The large size class of leeches (adults) accounted for 14% of *P. parasitica* observations on the turtles.

Of the 10 attachment zones defined for turtles with leeches (Fig. 2), we most often found leeches attached in one or more of the eight zones with exposed skin (92.7%) and leeches in these zones often appeared to be feeding. We only occasionally observed leeches attached to the exterior surface of the carapace (2.4%) or plastron (4.9%; Fig. 3). Leeches tended to occur near the interface between the skin and shell at the anterior or posterior of the turtle, between the head and forelimbs, or between the tail and hindlimbs (Fig. 3). Most leech attachments (82.2%) occurred in the ventral zones where the skin meets the plastron, either under the neck (anterior zones, 48.8%) or under the tail (posterior zones, 33.4%; Fig. 2).

Discussion

We found that *P. parasitica* is established on the Rogue Wild and Scenic River and is using *A. marmorata* as a host. Most often, we found leeches attached at the interface of the skin and shell around the base of the neck or tail. These places offer some protection from environmental conditions and are inaccessible to the turtle for removal by mouth or claw. Furthermore, these areas are easily overlooked by human observers, thus leeches may go unnoticed without careful inspection.

Our observations of leech feeding and brooding behavior on *A. marmorata* in the Rogue River followed patterns that were similar but not identical to those described for *P. parasitica* on other turtle species in the native range of the leech (Dodd 1988). We found a significant difference in the frequency of leech infestation on adult compared to juvenile turtles and no significant difference in prevalence between male and female turtles, similar to the findings of Dodd (1988). He reported that sexually mature, and thus larger Flattened Musk Turtles (*Sternotherus depressus*) were more likely to have leeches than juvenile turtles and he found no difference in *P. parasitica* prevalence between male and female turtles. In contrast, a study of the Common Snapping Turtle (*Chelydra serpentina*) showed a marked difference in the number of *P. parasitica* on adult male compared to female turtles (Brooks et al. 1990), as did a study of Northern Map Turtles (*Graptemys geographica*; Graham et al. 1997). In both studies, authors speculated that the difference in prevalence observed between males and females may be accounted for by variation in behavior or sexual size dimorphism. Size differences between sexually mature male and female *A. marmorata* are relatively minor and basking or foraging behaviors are similar for males and females (Bury et al. 2012), which corresponds with our observation of no significant difference in use of males versus females as hosts by *P. parasitica*.

We frequently observed clusters of many small leeches attached to the ventral anterior region (below the neck), suggesting this area may provide optimal conditions for development of young leeches. Brooks et al. (1990) found the highest incidence of *P. parasitica* on the posterior region of *C. serpentina*. Variation in attachment location preference among host turtle species may result from differences in morphology and basking behavior between host species providing different microhabitats.

Parasitic glossiphoniid leeches brood their young on their ventral surface and when the hatchling leeches are ready to blood-feed, the adult takes them to a host, where the hatchlings attach in clusters (Moser et al. 2013; Govedich and Moser 2015). On about 10% of *A. marmorata* with leeches, we observed a larger leech accompanied by clusters of many small leeches; we presume this was an adult leech with recently brooded hatchlings. Dodd (1988), Brooks et al. (1990), and McCoy et al. (2007) also reported attachment clusters of *P. parasitica* on turtles, and Readel et al. (2008) suggested that cluster attachment is a behavioral adaptation in leeches to reduce desiccation on basking turtles.

Literature on parasite ecology suggests parasite prevalence often increases with host density (Arneberg et al. 1998; Hopkins et al. 2020). In our study, the subpopulation with the highest turtle density had the highest leech prevalence, although this pattern was not stable for subpopulations with smaller sample sizes. Locations with habitat conditions able to support high densities of turtles (slower portions of the river) may also provide optimal habitat conditions for *P. parasitica*. Radio-telemetry and mark-recapture studies indicate *A. marmorata* are capable of significant movements along watercourses and over land (e.g., Reese 1996), and therefore could facilitate dispersal of *P. parasitica* between subpopulations of turtles. Dispersing turtles may move leeches to previously leech-free waters including tributaries, or disconnected ponds in the watershed.

The introduction of *P. parasitica* in this section of the Rogue River may have occurred within the past 20 y, as 4 y of turtle mark-recapture occurred in the early 2000s and no leeches were detected, despite over 200 turtle captures (Galea Wildlife Consulting, unpubl. reports). Two plausible modes of introduction of *P. parasitica* to the Rogue Wild and Scenic River are likely. Introductions could have been by transport via non-native turtles, such as *T. s. elegans,* which has been shown to host *Placobdella* leeches in other localities across the west (Moser et al. 2005; Chris Pearl, unpubl. data), or through human transport on various watercrafts or fishing equipment. Introduction and movement of other turtle species, especially *T. s. elegans*, has been responsible for other parasitic introductions to native turtle populations (Héritier et al. 2017) and may be a source for introductions of parasitic turtle leeches in the west (Moser et al. 2005). Introduced populations of *T. s. elegans* do occur elsewhere in the Rogue River Basin and even though we did not find this non-native turtle in our study reach, it is possible they evaded detection.

The Rogue Wild and Scenic River attracts both whitewater enthusiasts and anglers from around the country, so it is possible that inadvertent movement of *P. parasitica* could be associated with recreational boating and/or fishing. Jet boats are used by commercial ventures that go to Grave Creek from upstream near Grants Pass, or from downriver from Gold Beach up through the lower portion of the study area to Paradise, downstream of The Narrows. Jet boats are a possible vector as water contained in the engine compartment or elsewhere could harbor leeches from another water source if jet boats are transported from eastern states to the Rogue River for competition or recreation. Hall (1922) reported that *P. parasitica* can survive long periods out of water and can lose up to 70% of their body weight and still survive. This capability makes the possibility of the leeches being transported by boats plausible. Additionally, leeches could be moved from one portion of the river to another by repeated shuttles of rafts for white-water adventures.

Non-native species introductions, often referred to as biological invasions, have become so pervasive globally that the topic has become a stand-alone branch of ecological and biological research with entire books and scientific journals focusing on this subject (Mooney and Hobbs 2000; Lockwood et al. 2007; Meshaka et al. 2022). The impacts of introduced parasite species on native hosts and their habitats can be profound (species extinction) or more subtle (decreased vigor or evolutionary pressure). Effects of species introductions are documented in countless examples and circumstances, from predation and direct competition for resources (Bury and Luckenbach 1976; Cadi and Joly 2004) to alteration of habitat conditions (Crooks 2002), fire regimes (Pellant 1996; Brooks et al. 2004), trophic cascades (Ellis et al. 2011), decreased fitness (Koop et al. 2011), and transmission of parasites to native species (Peeler et al. 2011; Héritier et al. 2017).

Leeches are known to transmit bacteria, protozoa, herpes-like viruses, and haemogregarine parasites to turtles (Frank 1981; Paperna 1989; Siddall and Desser 2001). Experimentally, Siddall and Desser (1992, 2001) have shown that *Placobdella ornata* (NCN; likely now considered to be *P. rugosa*, NCN) can transfer the flagellate protozoan parasite *Trypanosoma cheysemydis* to *C. serpentina* and the haemoprotozoan parasite *Haemogregarina balli* between the Midland Painted Turtle (*Chrysemys picta marginata*) and *C. serpentina*. The prevalence of haemogregarine blood parasites have been shown to be higher in turtle species that are more prone to leech parasitism even when multiple host species are available, including bottom-dwelling species and the larger of the two sexes in turtle species with strong sexual dimorphism (Davis and Sterrett 2011). Héritier et al. (2017) found that the introduction of non-native turtles could impact native turtles by spreading novel parasites to naive turtle populations. It has been suggested that the introduction of exotic parasites could explain population declines of *A. marmorata* following transmission of viruses or mycoplasmas (Hays et al. 1999), and in the related European Pond Turtle (*Emys orbicularis*) following transmission of spirorchiids (Iglesias et al. 2015). *Emys orbicularis* infected with haemogregarine blood parasites had instances of severe shell necrosis on the plastron and carapace as well as massive skin hemorrhages (Özvegy et al. 2015).

It is widely assumed that spillover of alien parasites to native host species can severely impact naive populations (Romeo et al. 2021), which is the circumstance in our study area with introduced leeches parasitizing naive *A. marmorata*. Although we found no significant difference in the mean volumetric body condition index between adult *A. marmorata* with and without leeches, the mean volumetric body condition index may not be the best indicator for assessing health impacts. For example, in Italy, spillover of the North American nematode *Strongyloides robustus* from introduced North American Grey Squirrels (*Sciurus carolinensis*) to native Red Squirrels (*Sciurus vulgaris*) had no apparent negative effect on the body mass or reproductive success of *S. vulgaris* but the intensity of infection with the alien helminth parasite reduced the survival of both male and female *S. vulgaris* (Romeo et al. 2021).

The potential health impacts of leech introductions on the only native turtle in southwestern Oregon could represent an emerging threat to this imperiled species. Invasion of parasitic turtle leeches in the Rogue River warrants investigation into the source of the introduction as well as monitoring for potential health and population effects for native turtles in the west. The prevalence of *P. parasitica* leeches on *A. marmorata* on the Rogue River in 2019 and 2021 is concerning based on our experience working with this turtle in a number of regions throughout the range of the species. Additional research is needed to confirm if our finding of slightly lower body condition in turtles with leeches reflects an impact on turtle health and if this has population-level implications. We urge researchers and biologists working with *A. marmorata* throughout its range to be vigilant in looking for leeches hidden upon turtles at each capture and document the observations. It could be as simple as if leeches are present or not or it could involve collection of voucher specimens for additional study. Such observations could document an invasion by parasitic leeches that may be already underway. Surveillance monitoring for leeches is a good start but determining whether *P. parasitica* presents a health or population impact on *A. marmorata* or if this leech serves as a vector to spread blood pathogens within *A. marmorata* populations is important. These two efforts are the first steps towards assessing the threat these leeches may pose to the conservation of this imperiled turtle.

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Jason M. Reilly, a native of southwestern Oregon, USA, started his career in wildlife management working with the U.S. Forest Service Rogue River - Siskiyou National Forest before spending over 20 y with the Medford District of the U.S. Bureau of Land Management. Jason received a B.S. in Wildlife Biology from Humboldt State University (Cal Poly), Arcata, California, USA. His research interests include Northwestern Pond Turtle biology, genetic diversity in western plethodontid salamanders, and the distribution of rare and uncommon butterfly species across Oregon. (Photographed by Matt Stuber).

Don T. Ashton is a Herpetologist and Aquatic Ecologist who earned a B.S. in Biodiversity and an M.A. in Biology from Humboldt State University, Arcata, California, USA. For three decades, his research in government, academic, and private sectors has focused on river restoration to support ecosystem function and inform land use and resource management decisions with a focus on Northwestern Pond Turtle and Foothill Yellow-legged Frog (*Rana boylii*) conservation. (Photographed by Don Ashton).

Jim P. Holley has a Bachelors' degree in Anthropology (1999) from Rutgers University, New Brunswick, New Jersey, USA, and a Master's of Environmental Management from Portland State University, Oregon, USA (2021). He has worked with many species of herpetofauna in the Pacific Northwest of the USA since 2008, specifically studying distribution and limiting factors of native turtles and Northern Red-legged Frogs (*Rana aurora*). Jim currently manages river operations with associated fish and wildlife considerations as a Hydro Duty Scheduler for the Bonneville Power Administration. (Photographed by Jason Reilly).

Max Cantu McClarnon received his B.S. in Biology from the University of Southern Oregon in Ashland, Oregon, USA, in 2021. His research interests include population structure, ecology, and conservation of Pacific Northwest (USA) herpetofauna. He has participated in a number of mark-recapture studies on Northwestern Pond Turtles within northern California and southern Oregon. Currently he works for the U.S. Geological Survey on projects focused on Oregon Spotted Frog (*Rana pretiosa*) population monitoring and conservation. (Photographed by Don Ashton).

William E. Moser is a Supervisory Museum Specialist and Collection Manager in the Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA. He received his B.S. from the University of Nebraska – Lincoln, USA, and a M.S. from the University of Toronto, Ontario, Canada. He has broad interests in the natural history and taxonomy of leeches, especially the Family Glossiphoniidae. (Photographed by Christine Moser).

Anna J. Phillips is a Research Zoologist and Curator of Clitellata and parasitic worms in the Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA. She received her B.S. from Appalachian State University (Boone, North Carolina, USA) and her Ph.D. from The City University of New York (New York, USA). Her research interests include biodiversity, systematics, phylogeny, and evolutionary history of parasitic worms, with emphasis on leeches and tapeworms. (Photographed by Paul Fetters).