Hiding in Plain Sight: Genetic Confirmation of Putative Louisiana Fatmucket Lampsilis hydiana (Mollusca: Unionidae) in Illinois

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REGULAR ARTICLE

HIDING IN PLAIN SIGHT: GENETIC CONFIRMATION OF PUTATIVE LOUISIANA FATMUCKET *LAMPSILIS HYDIANA* (MOLLUSCA: UNIONIDAE) IN ILLINOIS

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ABSTRACT

Understanding the status and distribution of species is fundamental for conservation. However, recent genetic work has challenged the known distributions of some unionid taxa. The recognized range of the Louisiana Fatmucket *Lampsilis hydiana* spans watersheds from east Texas northward to southern Arkansas and eastward to western Mississippi. Specimens with morphological similarities to *L. hydiana* have been observed in Illinois and were presumed to be Fatmucket *Lampsilis siliquoidea* based on known distributions of *Lampsilis* species in Illinois. We examined specimens from Illinois and completed comparative genetic analyses using the mitochondrial genes *cox1* and *nad1* for species resembling *L. siliquoidea*. Our results show two morphologically similar, yet genetically distinct, species in Illinois. One of these species was genetically similar to *L. siliquoidea*, and one of these species showed little-to-no genetic difference from topotypic *L. hydiana*. The confirmation of *L. hydiana* populations within Illinois is significant for documenting the faunal diversity of the state. The varying degree of phenotypic separation confirms the need for further morphological research within *Lampsilis*, as well as genetic research throughout the updated known range of *L. hydiana*.

KEY WORDS: Fatmucket, Louisiana Fatmucket, Illinois, *Lampsilis hydiana*, *Lampsilis siliquoidea*

INTRODUCTION

Accurate knowledge of the status and distribution of biota is fundamental for proper conservation of natural resources. Diversity is significant within unionid mollusks in the Mississippi basin (van der Schalie and van der Schalie 1950; Johnson 1980; Turner et al. 2000), yet an incomplete understanding of the genetic structure of many taxa (e.g., Campbell et al. 2005, Graf and Cummings 2007) leads to uncertainty regarding species distributions. Illinois has a diverse, well-documented freshwater mussel fauna that historically consisted of more than 80 species of Unionidae and one species of Margaritiferidae (Baker 1906, 1912; Parmalee 1967; Cummings and Mayer 1997; Tiemann et al. 2007). Range updates, such as discovering Bankclimber *Plectomerus dombeyanus* (Valenciennes, 1827) in Illinois in 2012, have been documented through sporadic or systematic surveys (Tiemann et al. 2007, 2013). Publication of such findings is valuable to regional conservation efforts, because federal and state agency conservation plans can apply only to species that are known to be present.

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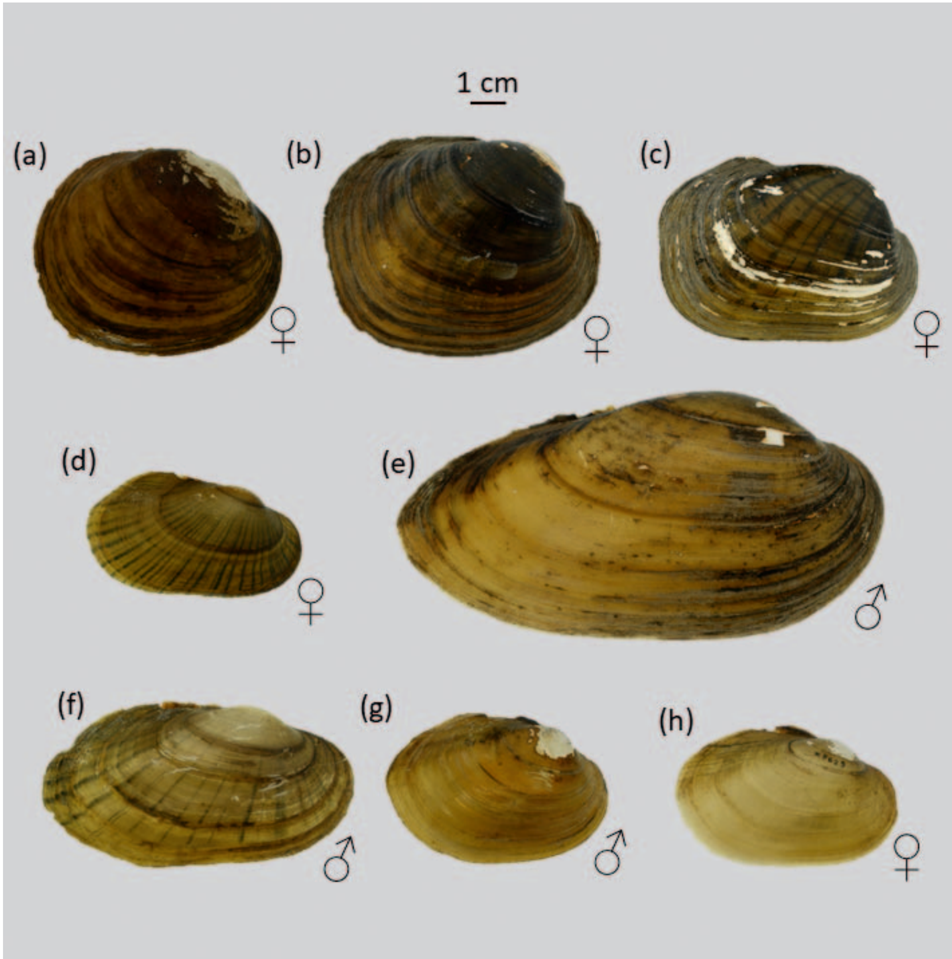

Figure 1. Example of variation in morphology of *Lampsilis* species included in our analyses: INHS Mollusk Collection Catalog Number, locality details, state. Sex noted by ♀ (female) or ♂ (male) and was determined by external shell morphology. (a) *Lampsilis abrupta* INHS 21521, Ohio; (b) *Lampsilis higginsii* INHS 30606, Mississippi River, Dubuque County, Iowa; (c) *Lampsilis hydiana* INHS 87783 Boeuf River, Richland Parish, Louisiana; (d) *Lampsilis radiata* INHS 38141, Yates County, New York; (e) *Lampsilis sietmani* INHS 32502, Illinois River, Pike County, Illinois; (f) *Lampsilis siliquoidea* INHS 41996, Mackinaw River, McLean County, Illinois; (g) *Lampsilis straminea* INHS 22926, Black Warrior River, Jefferson County, Alabama; (h) *Lampsilis virescens* INHS 21586, Paint Rock River, Alabama.

More than 20 species of *Lampsilis* are currently recognized in North America (Williams et al. 2017; FMCS 2019), and seven of those have been documented in Illinois by live material or shell (Tiemann et al. 2007). This diverse genus ranges across eastern and central North America and has shell morphology that varies from ovate—like Pink Mucket *Lampsilis abrupta* (Say, 1831)—to elongate and terete—like the newly described Canary Kingshell *Lampsilis sietmani* Keogh and Simons 2019 (Keogh and Simons 2019; Fig. 1). Fatmucket *Lampsilis siliquoidea* (Barnes, 1823) is one of the most widespread unionids in the world and has stable populations across most of its range. It occurs widely in the Mississippi and Great Lakes basins and is commonly encountered in Illinois rivers (Tiemann et al. 2007; Watters et al. 2009). Louisiana Fatmucket *Lampsilis hydiana* (Lea, 1838) (Fig. 1c)—a species previously reported from eastern Texas, Oklahoma, and Arkansas and east to Alabama (Burch 1975; Howells et al. 1996)—has a similar morphology to *L. siliquoidea* (Fig. 1f), but *L. hydiana* has never been genetically confirmed to exist in Illinois. Neither *L. hydiana* nor *L. siliquoidea* is of conservation concern in Illinois or at the federal level.

Lampsilis hydiana is described as having an elliptical, rayed, somewhat inflated shell and is distinguished from *L. siliquoidea* by a pearlier nacre, an umbo that is anterior, and an overall smaller average total length (Lea 1838). However, these two species have been considered indistinguishable at times (Vaughn et al. 1996) or as synonyms (Call 1895), which has led to uncertainty regarding their distributions. Based on literature reports and museum shell records, these species presumably co-occur in several drainages, such as the Big Black and Yazoo rivers in Mississippi (Jones et al. 2005). Additionally, specimens from Arkansas initially identified as *L. hydiana* included three genetically distinct groups that represented *L. hydiana* and two additional undescribed species (Harris et al. 2009). These divisions were supported by a shape

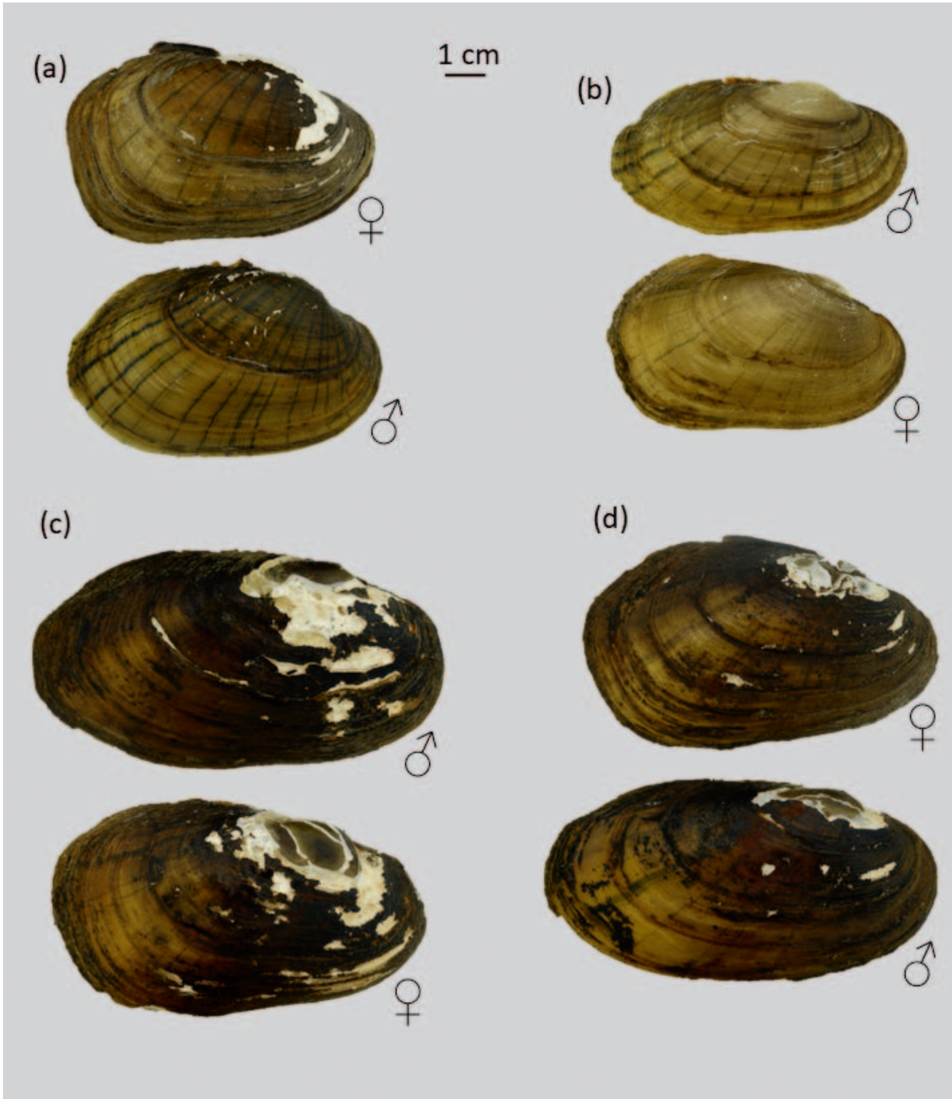

Figure 2. Representative images of some individuals of Illinois-collected *Lampsilis* included in our analyses (other images at https://doi.org/10.13012/B2IDB-5609050_V1): INHS Mollusk Collection Catalog Number (lower specimen number is arranged on top of each pair of images), locality details, and predetermined phenotype and confirmed genotype. Sex noted by ♀ (female) or ♂ (male) and was determined by external shell morphology. (a) INHS 45463-2 and 45463-3, Skillet Fork, Wayne County *Lampsilis hydiana* phenotype and *L. hydiana* genotype; (b) INHS 41996-1 and 41996-2, Mackinaw River, McLean County, Illinois, *Lampsilis siliquoidea* phenotype and *L. siliquoidea* genotype; (c) INHS 86787-5 and 86787-6 Lusk Creek, Pope County, *L. siliquoidea* phenotype and *L. hydiana* genotype; (d) INHS 45615-2 and 45615-9 Lusk Creek, Pope County, *L. siliquoidea* phenotype and *L. siliquoidea* genotype.

analysis, though there was some overlap in morphology (Harris et al. 2004; Harris et al. 2009). Thus, the range extent of *L. hydiana* remains unknown, and morphological characteristics to distinguish among *L. siliquoidea*, *L. hydiana*, and other similarly shaped *Lampsilis* species are lacking.

Certain specimens in several southern Illinois watersheds morphologically resemble *L. hydiana* (Fig. 2), though collection localities are well outside the published range of this species (Fig. 3). These specimens were typically identified as *L. siliquoidea*, despite morphologic resemblance to *L. hydiana*. The objective of our study was to determine taxonomic placement of the specimens that morphologically resemble *L. hydiana* to gain a better understanding of the distribution of *L. siliquoidea* and related species in Illinois.

METHODS

Mantle tissues of putative *L. hydiana* and *L. siliquoidea* from Illinois ($n = 83$ specimens from 25 sites) were collected from fresh, frozen, or ethanol-preserved individuals, used for DNA extraction, and catalogued in the Illinois Natural History Survey (INHS) Mollusk Collection, Champaign, Illinois (Appendix 1). Specimens came from the Big Muddy, Cache, Embarras, Kaskaskia, Little Wabash, Little Vermilion, Mackinaw, Sangamon, and Skillet Fork drainages and direct

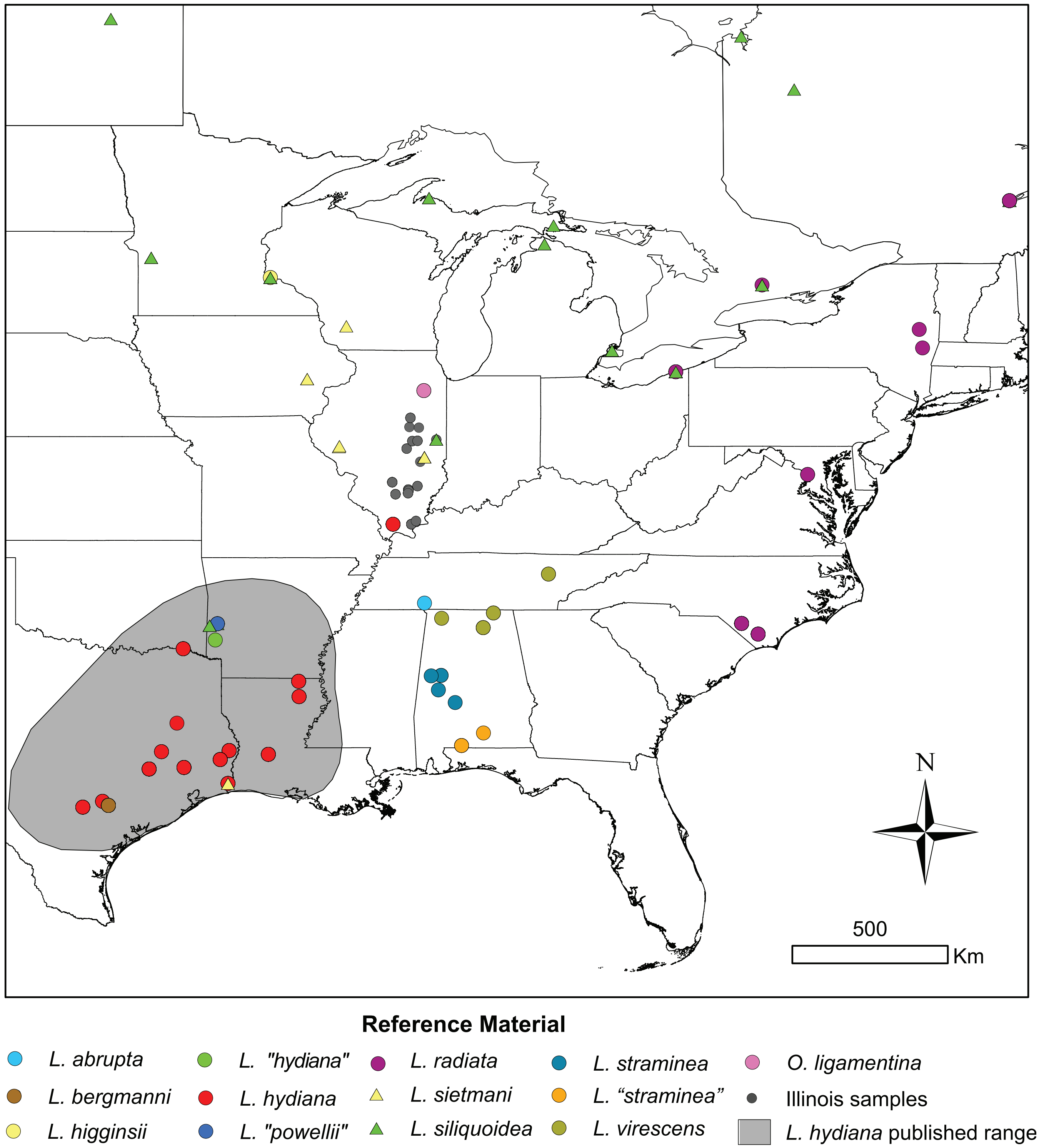

Figure 3. Approximate locations of reference materials used for this study. The previously published range for *Lampsilis hydiana* was adapted from Burch (1975) and Howells et al. (1996).

tributaries to the Ohio River (Big Grande Pierre, Lusk, and Rose creeks); images of external and internal valves of each specimen were made available via the Illinois Data Bank (https://doi.org/10.13012/B2IDB-5609050_V1). Initial species identifications were made from external shell morphology of each specimen prior to genetic analysis. Those that were more inflated, had a pearlier nacre, and had a shorter average total length in mature individuals were identified as putative *L. hydiana* ($n = 46$; Fig. 2a), while specimens that were more compressed, had a duller nacre, and had a longer average total length in mature individuals were identified as *L. siliquoidea* ($n = 37$; Fig. 2b). Most of the putative *L. hydiana* were from specimens collected from the southern half of Illinois. Specimens used in this study were collected as part of other research projects, primarily during a statewide mussel survey for Illinois from 2009 to 2012. Funding constraints or curated tissue quality prevented us from using all available tissue samples from putative *L. hydiana* or *L. siliquoidea* in Illinois. Four *L. hydiana* specimens were collected from the Boeuf River, Louisiana, to provide comparative material (INHS 87783). In addition, comparative sequences were obtained from GenBank (Appendix 2).

DNA was extracted from approximately 2 mm × 2 mm mantle and muscle biopsies using the MagMAX–96 DNA Multi-Sample Kit (ThermoFisher Scientific, Waltham, MA, USA) according to the manufacturer's instructions, except samples were eluted in 40 μl of elution buffer 1 and 2 instead of 100 μl. Polymerase chain reactions (PCR) and primers for *cox1* and *nad1* DNA amplification followed Campbell and Lydeard (2012). PCR products were sequenced on a Life Technologies 3730xl DNA Analyzer (Applied Biosystems, University of Illinois Chicago Genome Research Core). The *cox1* region was 660 base pairs long, and the *nad1* region was 834 bases long (including 30 bases of *tRNA-Leu*). Not all reads clearly resolved all bases, however, and unreadable bases were entered as unknowns. Sequences were aligned using BioEdit (Hall 1999). The sequence alignments are available at the Illinois Data Bank (https://doi.org/10.13012/B2IDB-5609050_V1).

The relationships between species currently assigned to *Lampsilis* are not well resolved (Keogh and Simons 2019). To determine appropriate comparison taxa for our specimens, we performed preliminary phylogenetic analyses (details below) of all available *cox1* and *nad1* sequences for species currently assigned to *Lampsilis* (based on Williams et al. 2017), along with representatives of other genera in the tribe Lampsilini. These supported a clade of morphologically similar taxa that included *L. siliquoidea* and *L. hydiana*, along with Guadalupe Fatmucket *Lampsilis bergmanni* Inoue & Randklev, 2020, Arkansas Fatmucket *Lampsilis powellii* (Lea, 1852), Eastern Lampmussel *Lampsilis radiata* (Gmelin, 1791), *L. sietmani*, Rough Fatmucket *Lampsilis straminea* (Conrad, 1834), and Alabama Lampmussel *Lampsilis virescens* (Lea, 1858). In turn, this *siliquoidea* clade was most closely related to a clade that included Mucket *Ortmanniana ligamentina* (Lamarck, 1819), *L. abrupta*, and Higgins Eye *Lampsilis higginsii* (Lea, 1857), consistent with previous findings (Porto-Hannes et al. 2019; Inoue et al. 2020). Nomenclature follows Williams et al. (2017), with updates from recent works for *O. ligamentina* (Pfeiffer et al. 2019; Graf and Cummings 2021). As noted by Keogh and Simons (2019), confident assessment of the phylogenetic relationships of *Lampsilis* species within Lampsilini will require extensive sampling. Our goal was to find appropriate taxa for comparison with our *L. siliquoidea*–like and *L. hydiana*–like populations from Illinois, and we did not pursue the general phylogeny further. Based on these preliminary results, we included all available *cox1* and *nad1* sequences from the *siliquoidea* clade in our detailed analyses and used the *ligamentina* clade as the outgroup. The sequence identified as *L. powellii* in GenBank was treated as *L. hydiana* in our analyses (MF326971). Walters et al. (2021) also found this sequence to be *L. hydiana*, whereas true *L. powellii* was nearest to *L. siliquoidea*. A few sequences currently listed as *L. radiata* in GenBank (*cox1*: HQ153601, HQ153602, HQ153605; *nad1*: HQ153683, HQ153684, HQ153687, and HQ153691) were found to represent the "Cryptic *Lampsilis* sp." of McCartney et al. (2016). Those sequences did not place in the *siliquoidea* clade based on McCartney et al. (2016) and our preliminary analyses, thus we excluded them from the present analyses. Percent differences and number of base-pair differences were calculated for all sequences from the *siliquoidea* clade using PAUP*4.0a167 (Swofford 2002). Because many individuals had only one gene or the other sequenced, *cox1* and *nad1* were compared separately in these analyses. These calculations omit bases with uncertainty (e.g., A versus N is not counted as a difference, nor is that position counted in the total number of bases for calculating percentage). We used the program ABGD (Puillandre et al. 2012) to test the differentiation between species in the *siliquoidea* clade. To test the cutoff for different divisions, the number of steps was increased to 20 and relative gap width decreased to one; other settings used the default values.

For phylogenetic analyses, we used both parsimony and Bayesian approaches and included all individuals with data for both *nad1* and *cox1*. We concatenated the two genes, omitting the *tRNA-Leu* region. *Lampsilis sietmani* and *L. abrupta* had no *nad1* data available, but we included representative *cox1* sequences. In the ABGD analysis, one published *cox1* sequence identified as *L. hydiana* (EF033270, from the Cossatot River in Arkansas), the Escambia River *L. straminea* (four sequences), and the Neches River sequence of *L. sietmani* (two individuals with identical sequences) were somewhat divergent from the other sampled individuals, so they were also included despite having only *cox1* data available. If two individuals had the same haplotype for both *cox1* and *nad1*, that combined haplotype was included only once in the phylogenetic analyses. Maximum parsimony and "Group present/Contradicted" (GC) bootstrap analysis (Goloboff et al. 2003) in the computer program TNT 1.5 (Goloboff and Catalano 2016) used all the "new technology" search options. Parsimony analysis used 500 random addition replicates, and the bootstrap analysis used 500 bootstrap replicates, each with 10 random addition replicates. Bayesian analyses used 10,000,000 generations with 10 runs, each with eight chains. We used PAUP* to test data partitions, setting the codon positions as data blocks. Using likelihood criteria and the "greedy" heuristic, the AICc criterion supported a GTR+I model for *cox1* positions 1 and 3 and *nad1* position 2, GTR for *cox1* position 2 and *nad1* position 3, and GTR+G for *nad1* position 1. MrBayes 3.2.7 was used for Bayesian analyses (Ronquist et al. 2012). Each codon position was treated as a separate partition. The parameters revmat, shape, pinvar, and statefreq were all unlinked. Convergence was determined by examining the standard deviation of split frequencies and confirming that they were under 0.01 (Ronquist et al. 2011), as well as by examination of the ESS values and trace plot in Tracer 1.7.1 (Rambaut et al. 2018). Tracer showed all ESS values well over 200, and the trace plot did not show any anomalies, so the standard 25% burn-in was used. We used PAUP* to calculate a majority-rule consensus of the Bayesian trees to obtain posterior probabilities, which facilitated outputting the tree as a graphic. Additionally, haplotype networks were constructed for *L. siliquoidea* and *L. hydiana* using median joining in PopART (Leigh and Bryant 2015).

RESULTS

The genetic results indicate that the *L. siliquoidea* and putative *L. hydiana* specimens from Illinois represent two distinct but closely related *Lampsilis* species. Sequences obtained for this study are available in GenBank (accession numbers MH560712-MH560762, MH560764-MH560777, MH588322-MH588394, MT537705-MT537725; Appendices 1, 2). Parsimony and Bayesian methods produced nearly identical results, with no differences in the affinities of the Illinois specimens. Parsimony analyses produced 319 trees of length 545 (as counted by TNT, which collapses polytomies, making a much smaller number of trees than PAUP*). In the Bayesian analysis, the standard deviation of split frequencies reached 0.01 after 1,735,000 generations. *Lampsilis hydiana* and *L. siliquoidea* were not sister taxa, but instead placed on different branches within the larger *siliquoidea* clade (Fig. 4). *Lampsilis siliquoidea* and *L. radiata* are sister taxa with relatively low genetic divergence, while *L. hydiana* is sister to *L. bergmanni*.

Sequences for *L. hydiana* versus *L. siliquoidea* had an average of 5.67% difference between them in *cox1* and 7.43% in *nad1*, similar to most other interspecies differences within the clade (Table 1). In contrast, the average differences within *L. hydiana* and within *L. siliquoidea* for both genes were under 0.5%, with some Illinois specimens sharing haplotypes with specimens from elsewhere. In particular, identical haplotypes were found in some Illinois specimens and some of the topotypic *L. hydiana* specimens sampled in this study (Appendix 2, Figs. 5, 6). Likewise, the haplotype networks show much larger differences between *L. hydiana* and *L. siliquoidea* than within them. In ABGD for *cox1*, all partitions with gap priors between 0.0183 and 0.00162 separated the Illinois specimens (along with many from other states) into two groups, corresponding to *L. hydiana* and *L. siliquoidea*. No partitions supported any further division of *L. hydiana* or *L. siliquoidea*, except for recognizing the Cossatot River, Arkansas "*L. hydiana*" as distinct for priors of 0.00886 or less in the initial partition and 0.0144 or less in the recursive partition. The species most difficult to distinguish from *L. hydiana* were *L. bergmanni* and Mobile Basin *L. straminea*, which separated only at gap priors of 0.00428 or less, whereas *L. siliquoidea* and *L. radiata* were separated at gap priors of 0.0546 or less. Gap priors of 0.00127 or less split up individual variation, which produced 116 groups. For *nad1*, partitions with gap priors between 0.0183 and 0.00264 separated *L. hydiana* and *L. siliquoidea* without dividing either one. Again, separation between *L. hydiana* and *L. bergmanni* or *L. straminea* was less clear, requiring gap priors of 0.00207 or less, which also began to split off divergent sequences within *L. hydiana*. Separation of *L. siliquoidea* from *L. radiata* was supported with the recursive partition at a gap prior of 0.0183 or less and the initial partition at a gap prior of 0.0144 or less. Intermediate gap priors generally agreed with currently recognized species, though some currently recognized species were divided into more than one group, especially if there was a geographic gap in the sampling (such as *L. sietmani* from Texas versus the upper Mississippi drainage).

Our results support the presence of *L. hydiana* in the Big Muddy, Cache, Embarras, Kaskaskia, Sangamon, Ohio, and Little Wabash drainages of Illinois (Fig. 7). Most drainages that we examined contained only *L. siliquoidea* or *L. hydiana*; however, both *L. siliquoidea* and *L. hydiana* were confirmed in the Sangamon River basin and in Horse, Big Grande Pierre, and Lusk creeks. Our morphological identifications matched the genetic confirmation in most cases (72 of 83 individuals were identified correctly; Appendix 1). Ten specimens that were determined morphologically to be *L. siliquoidea* were genetically confirmed as *L. hydiana*, and one specimen that was determined morphologically to be *L. hydiana* was genetically confirmed as *L. siliquoidea*. Three of four sites where these mismatches occurred had both *L. hydiana* and *L. siliquoidea* genotypes present (Big Grande Pierre Creek, Lusk Creek, and Horse Creek; Fig. 2c, 2d). The only individual sequenced from Salt Creek (of two total specimens from the Sangamon River drainage) was genetically confirmed as *L. hydiana* but was determined morphologically to be *L. siliquoidea*.

DISCUSSION

We used genetic analyses to confirm the presence of *L. hydiana* in Illinois. This genetic confirmation supports the species determinations by Anson A. Hinkley and Frank C. Baker more than a century ago (Illinois Natural History Survey, Prairie Research Institute 2021 [INHS Collections Data], referenced via previous identification field), that were made prior to the availability of genetic tools. It is unclear why *L. hydiana* was never included on Illinois species lists even though shells were deposited in the INHS Mollusk Collection bearing this identification. Regardless, we now have genetic support that the range of *L. hydiana* extends to latitude 40.1° N in the Sangamon River drainage, which is well north of the previously published range limit of latitude 34.6° N (Burch 1975; Howells et al. 1996; Inoue et al. 2020). While historical literature proclaimed the morphological differences between *L. hydiana* and *L. siliquoidea* to be "very clear cut" (Isley 1924),

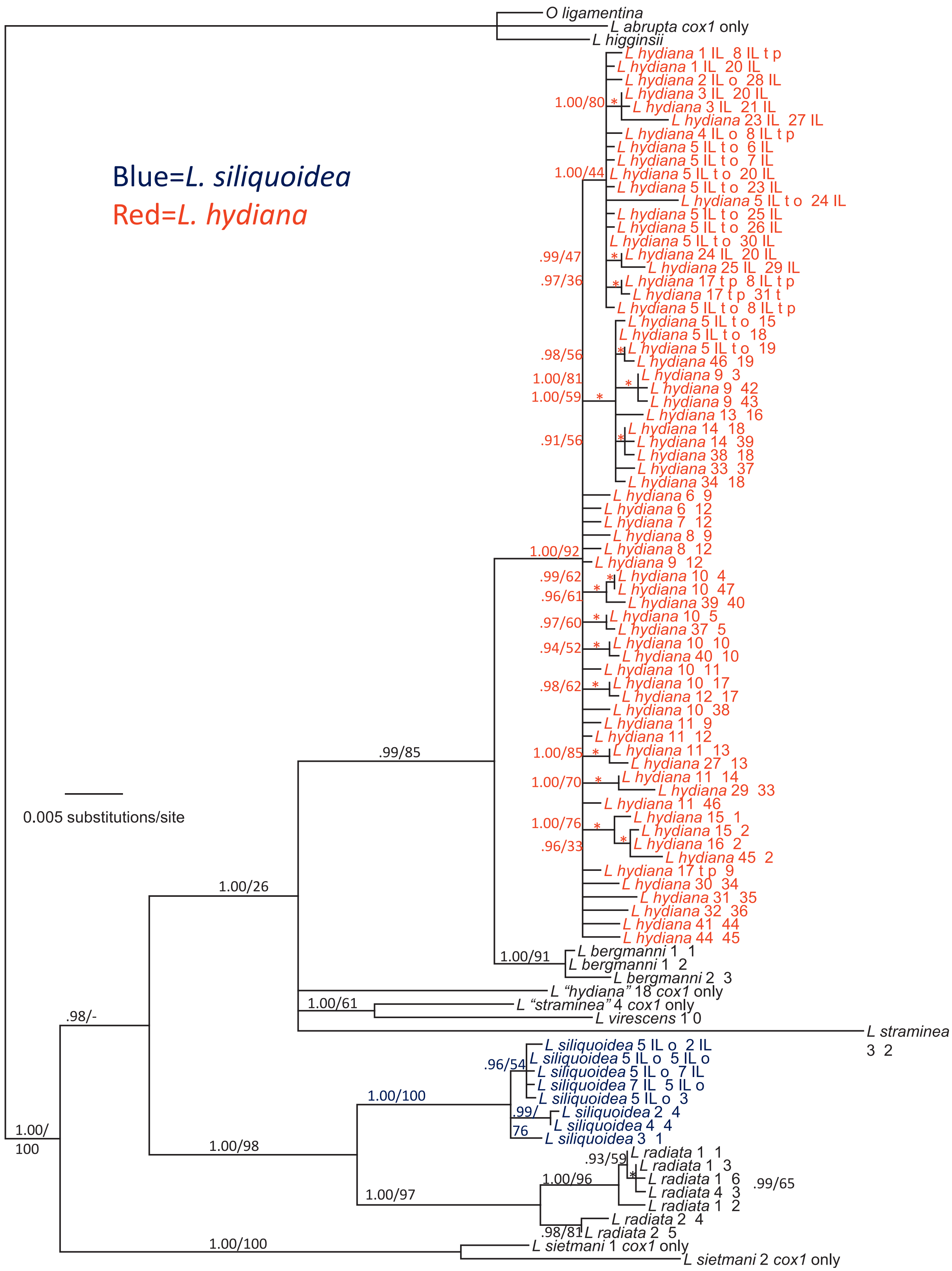

Figure 4. Phylogram of the Bayesian majority-rule consensus tree. Numbers on branches are Bayesian posterior probability/bootstrap GC percentage, - indicates under 50% bootstrap support; * denotes branches that did not have room for labeling the probabilities directly on the branch. Numbers after a name indicate *cox1* haplotype, followed by *nad1* haplotype (see Appendix 2). Letters after a name indicate a new sequence from Illinois, topotype *Lampsilis hydiana* (t), the sequence identified as *Lampsilis powellii* (p), or haplotypes found in other published sequences and in new ones from Illinois (o). *L.* "*hydiana*" indicates the divergent Cossatot River sequence, and *L.* "*straminea*" indicates the Escambia River population.

Table 1. Average, minimum, and maximum percent difference and number of base-pair differences in *cox1* and *nad1*.

	Intraspecific	To *hydiana*	To *siliquoidea*
cox1			
L. bergmanni	0.08% (0.00–0.33)	1.74% (1.18–2.74)	5.21% (4.19–6.12)
	0.55 bp (0–2)	11.18 bp (7–18)	32.86 bp (22–37)
L. hydiana	0.32% (0.00–1.98)	0.32% (0.00–1.98)	5.67% (4.38–7.29)
	2.02 bp (0–13)	2.02 bp (0–13)	35.63 bp (20–43)
"*L. hydiana*"	n/a	3.48% (3.09–4.45)	5.35% (4.80–6.00)
	n/a	20.19 bp (14–26)	31.00 bp (25–34)
L. radiata	0.63% (0.00–1.53)	5.37% (4.04–7.07)	2.23% (1.39–3.03)
	3.42 bp (0–8)	31.64 bp (16–42)	13.11 bp (8–19)
L. sietmani	0.66% (0.00–2.60)	6.46% (5.88–8.16)	7.17% (6.46–8.45)
	4.23 bp (0–16)	41.20 bp (26–53)	45.43 bp (34–52)
L. siliquoidea	0.46% (0.00–1.74)	5.67% (4.38–7.29)	0.46% (0.00–1.74)
	2.89 bp (0–11)	35.63 bp (20–43)	2.89 bp (0–11)
L. straminea	0.46% (0.16–0.69)	2.08% (1.55–3.53)	5.60% (4.44–6.24)
	2.67 bp (1–4)	12.64 bp (8–23)	33.74 bp (23–39)
"*L. straminea*"	0.39% (0.16–0.63)	3.08% (2.50–4.10)	5.72% (4.83–6.50)
	2.50 bp (1–4)	19.56 bp (16–27)	35.64 bp (25–40)
L. virescens	0.87% (0.00–2.01)	4.66% (3.35–6.89)	7.42% (5.91–9.17)
	3.52 bp (0–8)	22.64 bp (16–31)	36.05 bp (29–44)
	Illinois intraspecific	Topotype *hydiana*	Other conspecific specimens
L. hydiana Illinois	0.16% (0.00–1.52)	0.20% (0.00–1.23)	0.30% (0.00–1.98)
	1.06 bp (0–10)	1.30 bp (0–8)	1.91 bp (0–13)
L. siliquoidea Illinois	0.01% (0.00–0.15)	n/a	0.41% (0.00–1.41)
	0.42 bp (0–4)	n/a	2.66 bp (0–9)
	Intraspecific	To *hydiana*	To *siliquoidea*
nad1			
L. bergmanni	0.21% (0.00–0.70)	1.70% (0.67–3.10)	7.50% (6.19–8.39)
	1.22 bp (0–4)	9.92 bp (2–17)	43.16 bp (23–49)
L. hydiana	0.63% (0.00–2.36)	0.63% (0.00–2.36)	7.43% (5.34–8.86)
	3.73 bp (0–15)	3.73 bp (0–15)	47.68 bp (16–61)
L. radiata	0.60% (0.00–1.66)	6.76% (5.37–8.66)	4.91% (3.43–5.71)
	4.30 bp (0–12)	41.49 bp (21–61)	32.52 bp (13–39)
L. siliquoidea	0.31% (0.00–0.96)	7.43% (5.34–8.86)	0.31% (0.00–0.96)
	2.06 bp (0–7)	47.68 bp (16–61)	2.06 bp (0–7)
L. straminea	11.70% (11.70–11.70)	6.95% (1.26–12.30)	10.12% (7.13–12.39)
	57 bp (57 bp)	38.17 bp (3–66)	56.12 bp (25–72 bp)
L. virescens	n/a	5.62% (4.17–6.76)	5.55% (5.10–6.24)
	n/a	37.42 bp (16–42)	40.43 bp (22–44)
	Illinois intraspecific	Topotype *hydiana*	Other conspecific specimens
L. hydiana Illinois	0.12% (0.00–1.45)	0.20% (0.00–1.45)	0.87% (0.00–2.36)
	0.98 bp (0–11)	1.63 bp (0–11)	5.14 bp (0–15 bp)
L. siliquoidea Illinois	0.20% (0.00–0.84)	n/a	0.43% (0.00–0.96)
	1.65 bp (0–7)	n/a	2.65 bp (0–7)

n/a = not applicable (either only a single sequence was available or irrelevant [*Lampsilis siliquoidea* were not compared with topotypic *Lampsilis hydiana* separately from other *hydiana*]). Number of base-pair differences is affected by including short published sequences.

we obviously did not find that to be the case for all the individuals analyzed. At sites where both *L. hydiana* and *L. siliquoidea* genotypes were present, we were unable to separate these individuals using only shell morphology (Fig. 2c, 2d). A more detailed morphological analysis may reveal additional characters that we did not consider, such as quantifying height to length ratio or measuring shell thickness (Keogh and Simons 2019). We recognize that our study's

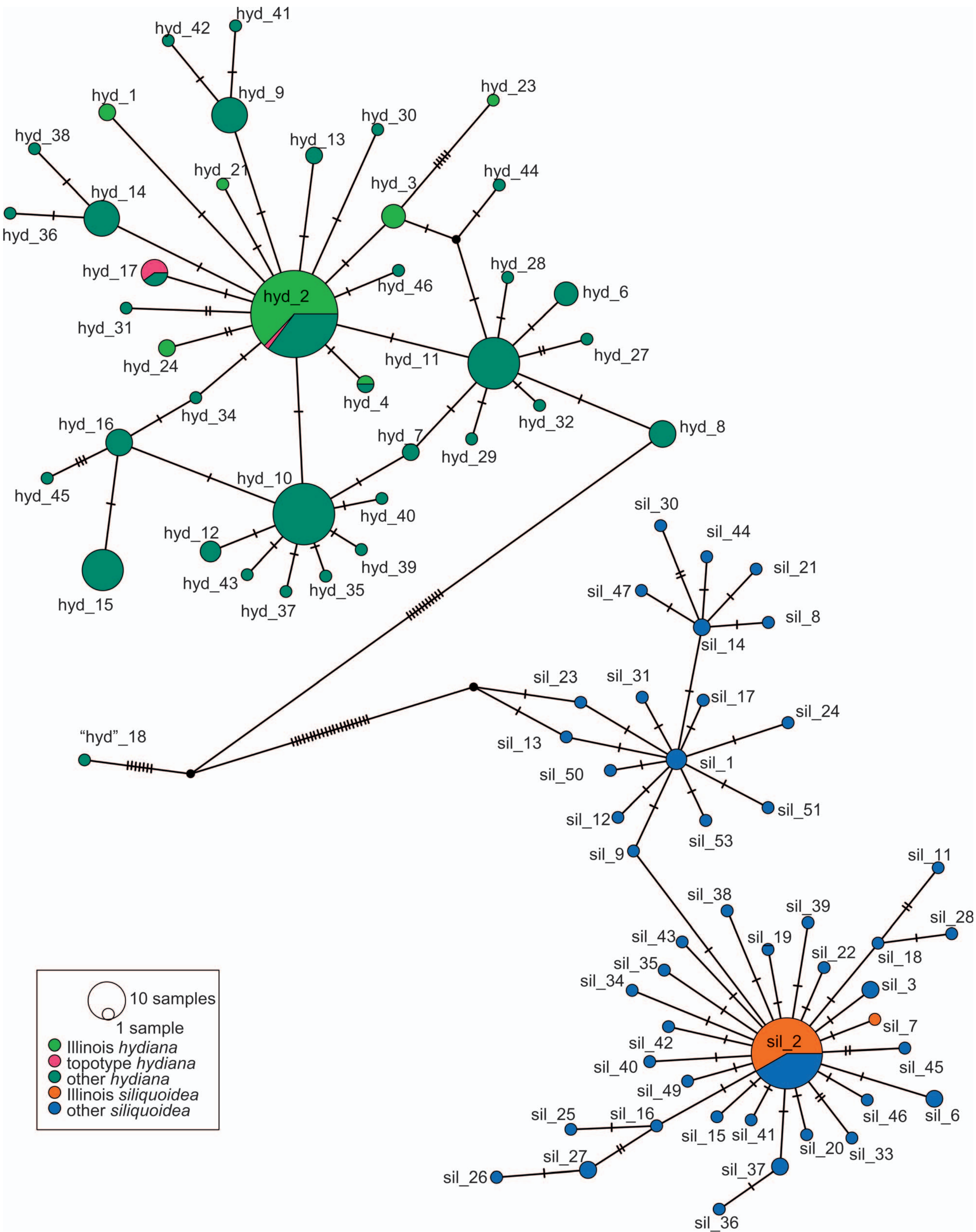

Figure 5. Haplotype network for *cox1* data. Numbers are the haplotype number (Appendices 1, 2). Bars on connecting lines indicate the number of base-pair differences between specimens; size of circles indicates the number of individuals with that haplotype.

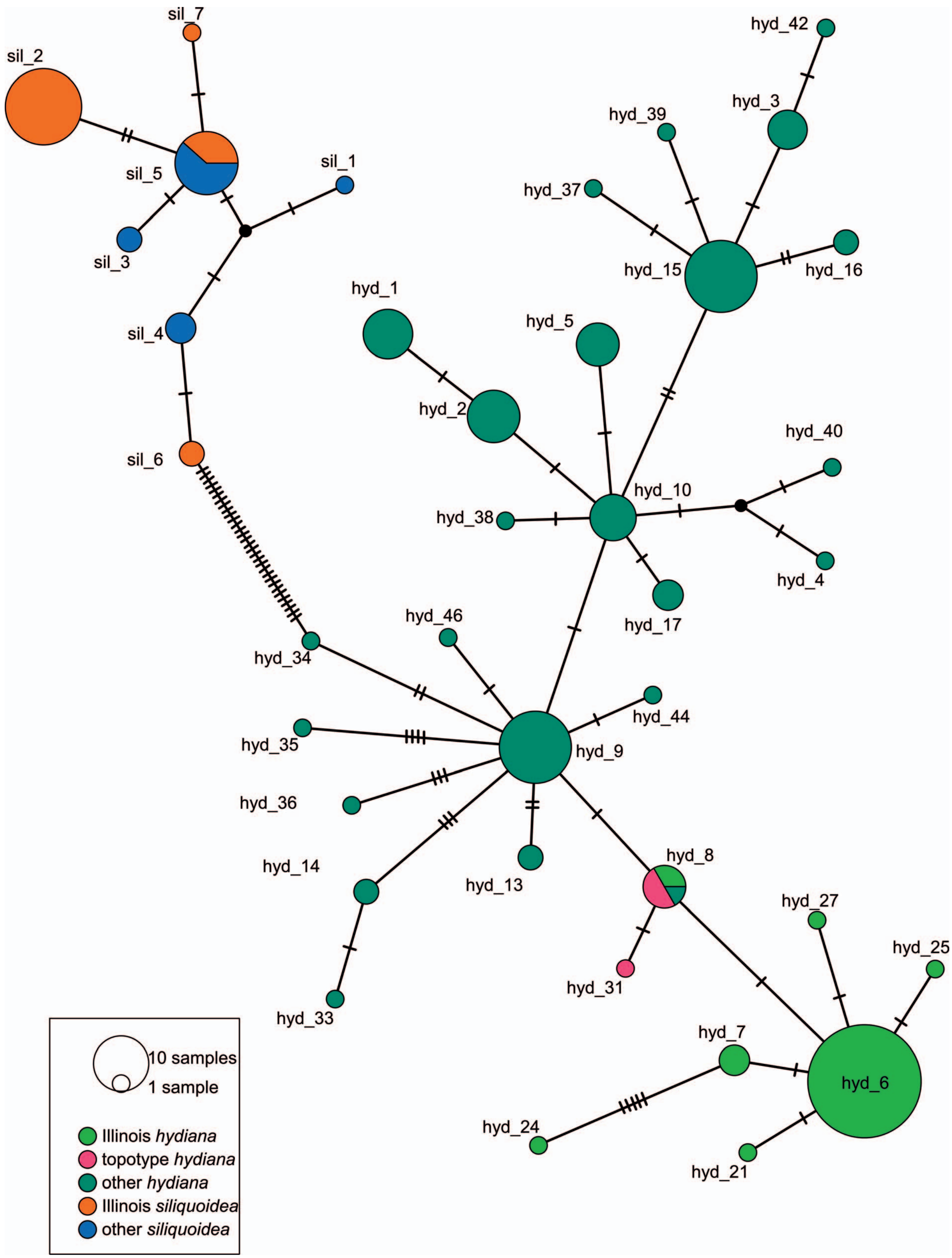

Figure 6. Haplotype network for *nad1* data. Numbers are the haplotype number (Appendices 1, 2). Bars on connecting lines indicate the number of base-pair differences between specimens; size of circles indicates the number of individuals with that haplotype.

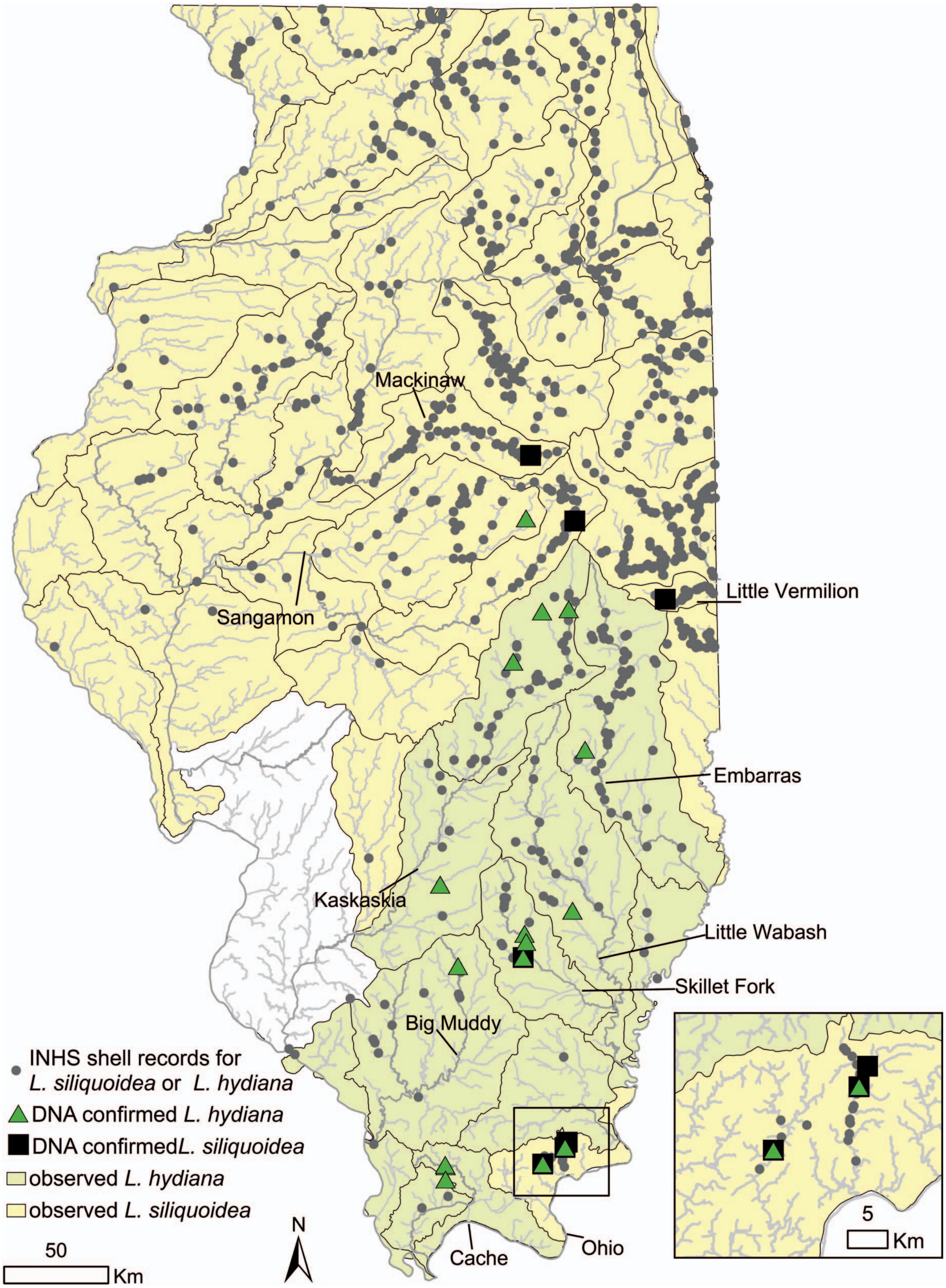

Figure 7. Locations of all shell records observed for *Lampsilis hydiana* and *Lampsilis siliquoidea* from Illinois in the INHS Mollusk Collection, Champaign, Illinois (gray closed circles), with genetic confirmation of *L. hydiana* (green triangles) and *L. siliquoidea* (black squares) plotted within each watershed, with pertinent rivers labeled. Watershed shading indicates species assignments based on observed external shell morphology prior to genetic analysis; green shading = shell characters match *L. hydiana* and yellow shading = shell characters match *L. siliquoidea*.

small sample size limits our understanding of the overall extent of *L. hydiana* in Illinois. Likewise, mitochondrial introgression, selective pressures, or incomplete lineage sorting (Doucet-Beaupré et al. 2012; Chong et al. 2016) could have produced anomalous genetic patterns. Additional nuclear molecular markers and a more detailed morphometric analysis of these populations may provide a clearer picture of relationships of *Lampsilis* populations in Illinois (Graf and Cummings 2006; Bogan and Roe 2008; Chong et al. 2016).

Our results suggest that *L. siliquoidea* and *L. hydiana* are closely related to each other but are not sister taxa. The sister taxon relationship between *L. siliquoidea* and *L. radiata* fits with previous classifications, as *L. siliquoidea* has been treated as a subspecies of *L. radiata* (Watters et al. 2009). Relationships between other members of the *siliquoidea* clade have not been discussed in detail, particularly as *L. sietmani* and *L. bergmanni* were described very recently. However, a relationship between *L. straminea*, *L. bergmanni*, and *L. hydiana* would not be surprising on biogeographic grounds, as their ranges adjoin each other.

Our discovery of both *L. hydiana* and *L. siliquoidea* in Illinois highlights the possibility of overlooked diversity elsewhere. Previous studies found some specimens identified as *L. hydiana* from the Arkansas and Red River systems in Arkansas were genetically distinct from topotypic *L. hydiana* (Turner et al. 2000; Lewter et al. 2003; Harris et al. 2004). A *cox1* sequence from one of those populations (Chapman et al. 2008; GenBank accession number EF033270) was divergent from true *L. hydiana* (Keogh and Simons 2019 and present analyses). Similarly, sequences in GenBank identified as *L. powellii* (from Breton et al. 2011 and Robicheau et al. 2018; GenBank accession numbers HM849075 and HM849218) matched topotypic *L. hydiana* (Walters et al. 2021 and present analyses). However, Harris et al. (2004) and Walters et al. (2021) found their sequences for *L. powellii* were closest to *L. siliquoidea*. *Lampsilis straminea* is reported to range from eastern Louisiana to central Florida, but data for *cox1* separated specimens from the Escambia drainage versus those from the Mobile basin; no other populations have been analyzed genetically. Thus, further analyses of the *siliquoidea* clade are likely to reveal additional new records. The recent descriptions of *L. sietmani* and *L. bergmanni* highlight the possibility of additional undescribed or incorrectly synonymized species in this group (Inoue et al. 2020; Keogh and Simons 2020).

Our analysis provides additional support showing that the *siliquoidea* clade is one of several distinct groups currently assigned to the genus *Lampsilis*, even though species in this clade are morphologically and genetically distinct from the type of the genus, Pocketbook *Lampsilis ovata* (Say, 1817). Other species seem to be genetically divergent from both the *siliquoidea* clade and from type *Lampsilis*, including Texas Fatmucket *Lampsilis bracteata* (Gould, 1855) (Harris et al. 2004; Porto-Hannes et al. 2019; Inoue et al. 2020), the cryptic *Lampsilis* sp. of McCartney et al. (2016), and the clade of Northern Brokenray *Lampsilis brittsi* Simpson, 1900, Arkansas Brokenray *Lampsilis reeveiana* (Lea, 1852), and Speckled Pocketbook *Lampsilis streckeri* Frierson, 1927 (Harris et al. 2004). One other species recognized in *Lampsilis*, Neosho Mucket *Lampsilis rafinesqueana* Frierson, 1927, has not yet been analyzed genetically but has an unusual combination of anatomical and shell features (Harris et al. 2004). As Keogh and Simons (2019) pointed out, a thorough analysis of Lampsilini will be necessary to determine the correct placement of these taxa.

Accurate species delineation is critical to developing sound conservation strategies for freshwater mussels, particularly because many species of conservation concern are managed or closely monitored at the state level. At press time, three *Lampsilis* species are endangered in Illinois: *L. abrupta* and *L. higginsii* are federally protected, while Wavyrayed Lampmussel *Lampsilis fasciola* Rafinesque, 1820 is listed only at the state level. Other common, widespread *Lampsilis* species, such as Plain Pocketbook *Lampsilis cardium* (Rafinesque, 1820) and *L. siliquoidea*, are often used by local and state authorities for propagation and augmentation following habitat restoration efforts. Our analysis emphasizes the need for managers to follow best practices during augmentation and reintroduction activities to avoid cross-basin contamination, as hidden diversity may be present even in common, presumably well-understood species (McMurray and Roe 2017; Inoue et al. 2020).

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Appendix 1. Illinois specimens and sequences used in analysis, haplotype number for reference to Figures 4–6, GenBank accession number, INHS catalog number, approximate waterbody location, and our preliminary putative identification based on external shell characteristics.

Species	Gene	Haplotype	GenBank accession no.	INHS catalog no.	Waterbody	Putative species
L. hydiana	*nad1*	22	*MT537714	INHS 35065-1	Cache River	*L. hydiana*
L. hydiana	*cox1*	5	*MT537719	INHS 35065-3	Cache River	*L. hydiana*
L. hydiana	*nad1*	23	*MT537715	INHS 35065-3	Cache River	*L. hydiana*
L. hydiana	*nad1*	24	*MT537716	INHS 35065-4	Cache River	*L. hydiana*
L. hydiana	*cox1*	5	*MT537720	INHS 35065-4	Cache River	*L. hydiana*
L. hydiana	*cox1*	21	*MT537721	INHS 39742-1	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*cox1*	3	*MT537717	INHS 39742-4	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	20	*MT537705	INHS 39742-4	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*cox1*	3	*MT537718	INHS 39742-5	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	21	*MT537706	INHS 39742-5	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*cox1*	5	*MH560721	INHS 86789-1	Big Grande Pierre Creek	*L. siliquoidea*
L. hydiana	*nad1*	25	*MH588328	INHS 86789-1	Big Grande Pierre Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560723	INHS 86789-2	Big Grande Pierre Creek	*L. siliquoidea*
L. hydiana	*nad1*	20	*MH588329	INHS 86789-2	Big Grande Pierre Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560732	INHS 45495-1	Big Muddy River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588336	INHS 45495-1	Big Muddy River	*L. hydiana*
L. hydiana	*cox1*	5	*MH560715	INHS 45495-2	Big Muddy River	*L. hydiana*
L. hydiana	*nad1*	6	*MH588324	INHS 45495-2	Big Muddy River	*L. hydiana*
L. hydiana	*cox1*	5	*MH560716	INHS 45495-3	Big Muddy River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588325	INHS 45495-3	Big Muddy River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588326	INHS 45495-4	Big Muddy River	*L. hydiana*
L. hydiana	*cox1*	5	*MH560717	INHS 45495-5	Big Muddy River	*L. hydiana*
L. hydiana	*nad1*	6	*MH588327	INHS 45495-5	Big Muddy River	*L. hydiana*
L. hydiana	*cox1*	4	*MH560739	INHS 45455-1	Bradshaw Creek	*L. hydiana*
L. hydiana	*nad1*	8	*MH588344	INHS 45455-1	Bradshaw Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588345	INHS 45455-2	Bradshaw Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588346	INHS 45455-3	Bradshaw Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560740	INHS 45460-1	Brush Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588347	INHS 45460-1	Brush Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560741	INHS 45460-2	Brush Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588348	INHS 45460-2	Brush Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560742	INHS 45460-3	Brush Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588349	INHS 45460-3	Brush Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560743	INHS 45460-4	Brush Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588350	INHS 45460-4	Brush Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560744	INHS 45460-5	Brush Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588351	INHS 45460-5	Brush Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560751	INHS 45482-1	Cypress Creek	*L. hydiana*
L. hydiana	*nad1*	7	*MH588361	INHS 45482-1	Cypress Creek	*L. hydiana*
L. hydiana	*cox1*	25	*MH560752	INHS 45482-2	Cypress Creek	*L. hydiana*
L. hydiana	*nad1*	29	*MH588362	INHS 45482-2	Cypress Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560753	INHS 45490-1	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588363	INHS 45490-1	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*cox1*	3	*MH560754	INHS 45490-2	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588364	INHS 45490-2	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*cox1*	5	*MH560755	INHS 45490-3	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588365	INHS 45490-3	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588366	INHS 45490-4	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588367	INHS 45490-5	East Fork Kaskaskia River	*L. hydiana*
L. hydiana	*cox1*	5	*MH560713	INHS 45491-1	Elm River	*L. hydiana*

Appendix 1, continued.

Species	Gene	Haplotype	GenBank accession no.	INHS catalog no.	Waterbody	Putative species
L. hydiana	*nad1*	20	*MH588322	INHS 45491-1	Elm River	*L. hydiana*
L. hydiana	*cox1*	1	*MH560714	INHS 45491-2	Elm River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588323	INHS 45491-2	Elm River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588352	INHS 45462-1	Horse Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560745	INHS 45462-2	Horse Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588353	INHS 45462-2	Horse Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560746	INHS 45462-3	Horse Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588354	INHS 45462-3	Horse Creek	*L. hydiana*
L. hydiana	*cox1*	24	*MH560747	INHS 45462-4	Horse Creek	*L. hydiana*
L. hydiana	*nad1*	20	*MH588355	INHS 45462-4	Horse Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560735	INHS 45449-1	Lake Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588339	INHS 45449-1	Lake Fork Kaskaskia River	*L. hydiana*
L. hydiana	*cox1*	1	*MH560736	INHS 45449-3	Lake Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	8	*MH588340	INHS 45449-3	Lake Fork Kaskaskia River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588341	INHS 45449-4	Lake Fork Kaskaskia River	*L. hydiana*
L. hydiana	*cox1*	5	*MH560724	INHS 86787-1	Lusk Creek	*L. siliquoidea*
L. hydiana	*nad1*	30	*MH588376	INHS 86787-1	Lusk Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560725	INHS 86787-2	Lusk Creek	*L. siliquoidea*
L. hydiana	*nad1*	20	*MH588330	INHS 86787-2	Lusk Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560727	INHS 86787-3	Lusk Creek	*L. siliquoidea*
L. hydiana	*nad1*	7	*MH588331	INHS 86787-3	Lusk Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560728	INHS 86787-4	Lusk Creek	*L. siliquoidea*
L. hydiana	*nad1*	26	*MH588332	INHS 86787-4	Lusk Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560729	INHS 86787-5	Lusk Creek	*L. siliquoidea*
L. hydiana	*nad1*	7	*MH588333	INHS 86787-5	Lusk Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560730	INHS 86787-6	Lusk Creek	*L. siliquoidea*
L. hydiana	*nad1*	20	*MH588334	INHS 86787-6	Lusk Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560731	INHS 86787-7	Lusk Creek	*L. siliquoidea*
L. hydiana	*nad1*	20	*MH588335	INHS 86787-7	Lusk Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560718	INHS 22361	Muddy Creek	*L. hydiana*
L. hydiana	*cox1*	5	*MH560719	INHS 35459	Salt Creek	*L. siliquoidea*
L. hydiana	*cox1*	5	*MH560748	INHS 45463-1	Skillet Fork	*L. hydiana*
L. hydiana	*nad1*	20	*MH588356	INHS 45463-1	Skillet Fork	*L. hydiana*
L. hydiana	*nad1*	20	*MH588357	INHS 45463-2	Skillet Fork	*L. hydiana*
L. hydiana	*cox1*	5	*MH560749	INHS 45463-3	Skillet Fork	*L. hydiana*
L. hydiana	*nad1*	20	*MH588358	INHS 45463-3	Skillet Fork	*L. hydiana*
L. hydiana	*nad1*	20	*MH588359	INHS 45463-4	Skillet Fork	*L. hydiana*
L. hydiana	*cox1*	2	*MH560750	INHS 45463-5	Skillet Fork	*L. hydiana*
L. hydiana	*nad1*	28	*MH588360	INHS 45463-5	Skillet Fork	*L. hydiana*
L. hydiana	*cox1*	5	*MH560737	INHS 45453-3	Twomile Slough	*L. hydiana*
L. hydiana	*nad1*	20	*MH588342	INHS 45453-3	Twomile Slough	*L. hydiana*
L. hydiana	*cox1*	5	*MH560738	INHS 45453-4	Twomile Slough	*L. hydiana*
L. hydiana	*nad1*	20	*MH588343	INHS 45453-4	Twomile Slough	*L. hydiana*
L. hydiana	*cox1*	23	*MH560734	INHS 45443	West Okaw River	*L. hydiana*
L. hydiana	*nad1*	27	*MH588338	INHS 45443	West Okaw River	*L. hydiana*
L. hydiana	*cox1*	3	*MH560733	INHS 45447	West Okaw River	*L. hydiana*
L. hydiana	*nad1*	20	*MH588337	INHS 45447	West Okaw River	*L. hydiana*
L. siliquoidea	*nad1*	6	*MT537712	INHS 35786-1	Little Vermilion River	*L. siliquoidea*
L. siliquoidea	*nad1*	6	*MT537713	INHS 35786-4	Little Vermilion River	*L. siliquoidea*
L. siliquoidea	*nad1*	5	*MT537707	INHS 41996-1	Mackinaw River	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MT537722	INHS 41996-2	Mackinaw River	*L. siliquoidea*

Appendix 1, continued.

Species	Gene	Haplotype	GenBank accession no.	INHS catalog no.	Waterbody	Putative species
L. siliquoidea	*nad1*	5	*MT537708	INHS 41996-2	Mackinaw River	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MT537723	INHS 41996-3	Mackinaw River	*L. siliquoidea*
L. siliquoidea	*nad1*	5	*MT537709	INHS 41996-3	Mackinaw River	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MT537724	INHS 41996-4	Mackinaw River	*L. siliquoidea*
L. siliquoidea	*nad1*	7	*MT537710	INHS 41996-4	Mackinaw River	*L. siliquoidea*
L. siliquoidea	*cox1*	7	*MT537725	INHS 41996-5	Mackinaw River	*L. siliquoidea*
L. siliquoidea	*nad1*	5	*MT537711	INHS 41996-5	Mackinaw River	*L. siliquoidea*
L. siliquoidea	*nad1*	5	*MH588388	INHS 35558	Big Ditch	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560756	INHS 45613-1	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588368	INHS 45613-1	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588375	INHS 45613-10	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560757	INHS 45613-3	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588369	INHS 45613-3	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560758	INHS 45613-4	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588370	INHS 45613-4	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560759	INHS 45613-5	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588371	INHS 45613-5	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560760	INHS 45613-6	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588372	INHS 45613-6	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560761	INHS 45613-8	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588373	INHS 45613-8	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560762	INHS 45613-9	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588374	INHS 45613-9	Big Grande Pierre Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588386	INHS 86788	Horse Creek	*L. hydiana*
L. siliquoidea	*cox1*	5	*MH560769	INHS 45615-10	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588382	INHS 45615-10	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560770	INHS 45615-12	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588383	INHS 45615-12	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560771	INHS 45615-13	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588384	INHS 45615-13	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560772	INHS 45615-18	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588385	INHS 45615-18	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560773	INHS 45615-19	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560764	INHS 45615-2	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588377	INHS 45615-2	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560765	INHS 45615-3	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588378	INHS 45615-3	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560766	INHS 45615-4	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588379	INHS 45615-4	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560767	INHS 45615-6	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588380	INHS 45615-6	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560768	INHS 45615-9	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588381	INHS 45615-9	Lusk Creek	*L. siliquoidea*
L. siliquoidea	*cox1*	5	*MH560774	INHS 45471-1	Rose Creek	*L. siliquoidea*
L. siliquoidea	*nad1*	2	*MH588387	INHS 45471-1	Rose Creek	*L. siliquoidea*

*Newly generated sequences.

Appendix 2. Additional sequences used in analysis, with haplotype reference number (see Figs. 4–6), GenBank accession number, specimen identification, and approximate waterbody location.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. abrupta	*cox1*		*MH560776	UAUC3531	Tennessee River, Diamond Island	New
L. bergmanni	*nad1*	2	MK672463	UGUA01	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672464	UGUA02	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672465	UGUA03	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672466	UGUA04	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672467	UGUA05	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672468	UGUA07	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672469	UGUA08	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672470	UGUA09	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672471	UGUA10	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672472	UGUA11	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672473	UGUA12	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672474	UGUA13	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672475	UGUA14	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672476	UGUA15	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672477	UGUA16	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672478	UGUA17	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672479	UGUA18	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672480	UGUA19	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672481	UGUA20	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	3	MK672482	UGUA21	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672483	UGUA22	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672484	UGUA23	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672485	UGUA24	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672486	UGUA25	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672487	UGUA26	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	3	MK672488	UGUA27	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672489	UGUA28	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672490	UGUA29	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	3	MK672491	UGUA30	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672492	UGUA31	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672493	UGUA32	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672494	UGUA33	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	3	MK672495	UGUA34	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672496	UGUA35	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	2	MK672497	UGUA36	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	1	MK672498	UGUA37	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	3	MK672499	UGUA39	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*nad1*	3	MK672500	UGUA40	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672718	UGUA01	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672719	UGUA02	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672720	UGUA03	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672721	UGUA04	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672722	UGUA05	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672723	UGUA07	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672724	UGUA08	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672725	UGUA09	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672726	UGUA10	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672727	UGUA11	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672728	UGUA12	Guadalupe River drainage	Inoue et al. 2020

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. bergmanni	*cox1*	1	MK672729	UGUA13	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672730	UGUA14	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672731	UGUA15	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672732	UGUA16	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672733	UGUA17	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672734	UGUA18	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672735	UGUA19	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672736	UGUA20	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	2	MK672737	UGUA21	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672738	UGUA22	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672739	UGUA23	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672740	UGUA24	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672741	UGUA25	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672742	UGUA26	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	2	MK672743	UGUA27	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672744	UGUA28	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672745	UGUA29	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	2	MK672746	UGUA30	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672747	UGUA31	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672748	UGUA32	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672749	UGUA33	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	2	MK672750	UGUA34	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672751	UGUA35	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672752	UGUA36	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	1	MK672753	UGUA37	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	2	MK672754	UGUA39	Guadalupe River drainage	Inoue et al. 2020
L. bergmanni	*cox1*	2	MK672755	UGUA40	Guadalupe River drainage	Inoue et al. 2020
L. higginsii	*nad1*		EF213061		Upper Mississippi drainage	Zanatta and Murphy 2006 Unpublished
L. higginsii	*cox1*		GU085287	1	Upper Mississippi drainage	Boyer et al. 2011
L. "*hydiana*"	*cox1*	18	EF033270	H1230	Cossatot River, Red River, Arkansas	Chapman et al. 2008
L. hydiana	*cox1*	17	*MH560720	INHS 87783-2	Boeuf River	New
L. hydiana	*nad1*	31	*MH588389	INHS 87783-1	Boeuf River	New
L. hydiana	*nad1*	8	*MH588390	INHS 87783-2	Boeuf River	New
L. hydiana	*nad1*	8	*MH588391	INHS 87783-3	Boeuf River	New
L. hydiana	*nad1*	8	*MH588392	INHS 87783-4	Boeuf River	New
L. hydiana	*nad1*	12	MK672437	BRA01	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	9	MK672438	BRA02	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672439	BRA03	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	9	MK672440	BRA04	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672441	BRA05	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672442	BRA06	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672443	BRA07	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	9	MK672444	BRA08	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672445	BRA09	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	46	MK672446	BRA10	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	9	MK672447	BRA11	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672448	BRA12	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672449	BRA13	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672450	BRA14	Brazos River drainage	Inoue et al. 2020

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. hydiana	*nad1*	12	MK672451	BRA15	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672685	BRA01	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	8	MK672686	BRA02	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	6	MK672687	BRA03	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672688	BRA04	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	7	MK672689	BRA05	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	8	MK672690	BRA06	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672691	BRA07	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	6	MK672692	BRA08	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	8	MK672693	BRA09	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672694	BRA10	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672695	BRA11	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	6	MK672696	BRA12	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	8	MK672697	BRA13	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	8	MK672698	BRA14	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	6	MK672699	BRA15	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672700	BRA16	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672701	BRA17	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672702	BRA18	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672703	BRA19	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672704	BRA20	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672705	BRA21	Brazos River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672706	BRA22	Brazos River drainage	Inoue et al. 2020
L. hydiana	*nad1*	37	MK672388	CAL01	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*nad1*	11	MK672389	CAL02	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*nad1*	38	MK672390	CAL08	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*nad1*	10	MK672391	CAL09	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*nad1*	11	MK672392	CAL15	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*nad1*	11	MK672393	CAL16	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*nad1*	11	MK672394	CAL19	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*nad1*	11	MK672395	CAL20	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	33	MK672611	CAL01	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672612	CAL02	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672613	CAL08	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672614	CAL09	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672615	CAL15	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672616	CAL16	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672617	CAL19	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672618	CAL20	Calcasieu River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK226685	012TS	Guadalupe River drainage	Porto-Hannes et al. 2019
L. hydiana	*cox1*	16	MK226686	013TS	Guadalupe River drainage	Porto-Hannes et al. 2019
L. hydiana	*cox1*	16	MK226687	016TS	Guadalupe River drainage	Porto-Hannes et al. 2019
L. hydiana	*nad1*	2	MK226704	016TS	Guadalupe River drainage	Porto-Hannes et al. 2019
L. hydiana	*nad1*	1	MK226709	012TS	Guadalupe River drainage	Porto-Hannes et al. 2019
L. hydiana	*nad1*	1	MK672452	GUA06	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*nad1*	1	MK672453	GUA16	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*nad1*	1	MK672454	GUA17	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*nad1*	1	MK672455	GUA18	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*nad1*	1	MK672456	GUA19	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672707	GUA06	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672708	GUA16	Guadalupe River drainage	Inoue et al. 2020

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. hydiana	*cox1*	15	MK672709	GUA17	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672710	GUA18	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672711	GUA19	Guadalupe River drainage	Inoue et al. 2020
L. hydiana	*nad1*	3	MG030352		Neches River drainage	Marshall et al. 2018
L. hydiana	*cox1*	9	MK226688	138TS	Neches River drainage	Porto-Hannes et al. 2019
L. hydiana	*cox1*	10	MK226689	159TS	Neches River drainage	Porto-Hannes et al. 2019
L. hydiana	*cox1*	10	MK226690	200TS	Neches River drainage	Porto-Hannes et al. 2019
L. hydiana	*cox1*	10	MK226691	214TS	Neches River drainage	Porto-Hannes et al. 2019
L. hydiana	*nad1*	5	MK226705	214TS	Neches River drainage	Porto-Hannes et al. 2019
L. hydiana	*nad1*	47	MK226706	159TS	Neches River drainage	Porto-Hannes et al. 2019
L. hydiana	*nad1*	4	MK226707	200TS	Neches River drainage	Porto-Hannes et al. 2019
L. hydiana	*nad1*	3	MK226708	138TS	Neches River drainage	Porto-Hannes et al. 2019
L. hydiana	*nad1*	3	MK672411	NEC10	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	5	MK672412	NEC11	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672413	NEC12	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	17	MK672414	NEC13	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	40	MK672415	NEC14	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	10	MK672416	NEC15	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	5	MK672417	NEC16	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	12	MK672418	NEC17	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	5	MK672419	NEC18	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	5	MK672420	NEC19	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	42	MK672421	NEC20	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	5	MK672422	NEC21	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	43	MK672423	NEC22	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	44	MK672424	NEC23	Neches River drainage	Inoue et al. 2020
L. hydiana	*nad1*	3	MK672425	NEC24	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	12	MK672641	NEC01	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672642	NEC03	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672643	NEC06	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672644	NEC07	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672645	NEC09	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	9	MK672646	NEC10	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	37	MK672647	NEC11	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	38	MK672648	NEC12	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	12	MK672649	NEC13	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	39	MK672650	NEC14	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	40	MK672651	NEC15	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672652	NEC16	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	9	MK672653	NEC17	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672654	NEC18	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672655	NEC19	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	9	MK672656	NEC20	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672657	NEC21	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	9	MK672658	NEC22	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	41	MK672659	NEC23	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	9	MK672660	NEC24	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	42	MK672661	NEC25	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	9	MK672662	NEC26	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672663	NEC27	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672664	NEC29	Neches River drainage	Inoue et al. 2020

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. hydiana	*cox1*	43	MK672665	NEC30	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672666	NEC31	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672667	NEC32	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	9	MK672668	NEC33	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672669	NEC34	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672670	NEC35	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672671	NEC37	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672672	NEC38	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	9	MK672673	NEC40	Neches River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK391871	JFBM22432 1	Ohio River drainage	Keogh and Simons 2019
L. hydiana	*cox1*	5	MK391872	JFBM22432 2	Ohio River drainage	Keogh and Simons 2019
L. hydiana	*cox1*	5	MK391873	JFBM22432 3	Ohio River drainage	Keogh and Simons 2019
L. hydiana	*cox1*	5	MK391874	JFBM22432 4	Ohio River drainage	Keogh and Simons 2019
L. hydiana	*cox1*	4	MK391875	JFBM22432 5	Ohio River drainage	Keogh and Simons 2019
L. hydiana	*cox1*	5	MK391876	JFBM22432 6	Ohio River drainage	Keogh and Simons 2019
L. hydiana	*cox1*	5	MK391877	JFBM22432 7	Ohio River drainage	Keogh and Simons 2019
L. hydiana	*nad1*	9	MK672379	OUA01	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*nad1*	13	MK672380	OUA02	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*nad1*	13	MK672381	OUA03	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*cox1*	17	MK672596	OUA01	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672597	OUA02	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*cox1*	27	MK672598	OUA03	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672599	OUA04 IF01	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672600	OUA05 IF02	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*cox1*	7	MK672601	OUA06 VL01	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672602	OUA07 VL02	Ouachita River drainage	Inoue et al. 2020
L. hydiana	*nad1*	33	MK672382	RED04	Red River drainage	Inoue et al. 2020
L. hydiana	*nad1*	34	MK672383	RED06	Red River drainage	Inoue et al. 2020
L. hydiana	*nad1*	35	MK672384	RED07	Red River drainage	Inoue et al. 2020
L. hydiana	*nad1*	36	MK672385	RED08	Red River drainage	Inoue et al. 2020
L. hydiana	*nad1*	14	MK672386	RED09	Red River drainage	Inoue et al. 2020
L. hydiana	*nad1*	14	MK672387	RED10	Red River drainage	Inoue et al. 2020
L. hydiana	*cox1*	28	MK672603	RED02	Red River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672604	RED03	Red River drainage	Inoue et al. 2020
L. hydiana	*cox1*	29	MK672605	RED04	Red River drainage	Inoue et al. 2020
L. hydiana	*cox1*	30	MK672606	RED06	Red River drainage	Inoue et al. 2020
L. hydiana	*cox1*	31	MK672607	RED07	Red River drainage	Inoue et al. 2020
L. hydiana	*cox1*	32	MK672608	RED08	Red River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672609	RED09	Red River drainage	Inoue et al. 2020
L. hydiana	*cox1*	11	MK672610	RED10	Red River drainage	Inoue et al. 2020
L. hydiana	*nad1*	17	MK672396	SAB01	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672397	SAB02	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	15	MK672398	SAB03	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672399	SAB04	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672400	SAB05	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	16	MK672401	SAB06	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	16	MK672402	SAB07	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672403	SAB08	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	39	MK672404	SAB09	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672405	SAB10	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	17	MK672406	SAB11	Sabine River drainage	Inoue et al. 2020

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. hydiana	*nad1*	18	MK672407	SAB12	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672408	SAB13	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672409	SAB14	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	18	MK672410	SAB15	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	12	MK672619	SAB01	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672620	SAB02	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672621	SAB03	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672622	SAB04	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	34	MK672623	SAB05	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	13	MK672624	SAB06	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	13	MK672625	SAB07	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	14	MK672626	SAB08	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	14	MK672627	SAB09	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	14	MK672628	SAB10	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672629	SAB11	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	14	MK672630	SAB12	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	14	MK672631	SAB13	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	14	MK672632	SAB14	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	14	MK672633	SAB15	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	2	MK672634	SAB16	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	10	MK672635	SAB17	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	35	MK672636	SAB18	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	36	MK672637	SAB19	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672638	SAB23	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	14	MK672639	SAB24	Sabine River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672640	SAB25	Sabine River drainage	Inoue et al. 2020
L. hydiana	*nad1*	2	MK672457	SAN01	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*nad1*	1	MK672458	SAN02	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*nad1*	2	MK672459	SAN03	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*nad1*	2	MK672460	SAN04	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*nad1*	1	MK672461	SAN05	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*nad1*	2	MK672462	SAN06	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672712	SAN01	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672713	SAN02	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672714	SAN03	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672715	SAN04	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672716	SAN05	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*cox1*	15	MK672717	SAN06	San Antonio River drainage	Inoue et al. 2020
L. hydiana	*nad1*	2	MK672428	SJC01	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	19	MK672429	SJC05	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	19	MK672430	SJC06	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	2	MK672431	SJC07	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	19	MK672432	SJC08	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	19	MK672433	SJC09	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	19	MK672434	SJC10	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	15	MK672435	SJC11	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	2	MK672436	SJC12	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*cox1*	16	MK672676	SJC01	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672677	SJC05	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672678	SJC06	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*cox1*	16	MK672679	SJC07	San Jacinto River drainage	Inoue et al. 2020

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Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. hydiana	*cox1*	46	MK672680	SJC08	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672681	SJC09	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672682	SJC10	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*cox1*	5	MK672683	SJC11	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*cox1*	16	MK672684	SJC12	San Jacinto River drainage	Inoue et al. 2020
L. hydiana	*nad1*	45	MK672426	TRI05	Trinity River drainage	Inoue et al. 2020
L. hydiana	*nad1*	2	MK672427	TRI06	Trinity River drainage	Inoue et al. 2020
L. hydiana	*cox1*	44	MK672674	TRI05	Trinity River drainage	Inoue et al. 2020
L. hydiana	*cox1*	45	MK672675	TRI06	Trinity River drainage	Inoue et al. 2020
L. hydiana	*cox1*	17	*MH560712	INHS 87783-1	Boeuf River	New
L. hydiana	*cox1*	17	*MH560722	INHS 87783-3	Boeuf River	New
L. hydiana	*cox1*	5	*MH560726	INHS 87783-4	Boeuf River	New
L. hydiana	*cox1*	14	MH161354	UAUC3508	Neches River	Burlakova et al. 2019
L. "*powellii*"	*cox1*	17	MF326971	H2610	Ouachita River drainage	Robicheau et al. 2018
L. "*powellii*"	*nad1*	8	MF326971	H2610	Ouachita River drainage	Robicheau et al. 2018
L. "*powellii*"	*cox1*	17	HM849075	H2610	Ouachita River drainage	Breton et al. 2011
L. "*powellii*"	*nad1*	8	HM849218	H2610	Ouachita River drainage	Breton et al. 2011
L. radiata	*cox1*	3	MK226692	2	Hudson River	Porto-Hannes et al. 2019
L. radiata	*cox1*	3	MN432619	mH34	Hudson River drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	6	MN432616	mH31	Lake Ontario drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	1	HQ153594	COX67	Lake Waccamaw	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153595	COX68	Lake Waccamaw	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153596	COX69	Lake Waccamaw	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153597	COX70	Lake Waccamaw	McCartney et al. 2016
L. radiata	*cox1*	4	HQ153598	COX71	Lake Waccamaw	McCartney et al. 2016
L. radiata	*nad1*	2	HQ153676	NAD55	Lake Waccamaw	McCartney et al. 2016
L. radiata	*nad1*	3	HQ153677	NAD56	Lake Waccamaw	McCartney et al. 2016
L. radiata	*nad1*	3	HQ153678	NAD57	Lake Waccamaw	McCartney et al. 2016
L. radiata	*nad1*	3	HQ153679	NAD58	Lake Waccamaw	McCartney et al. 2016
L. radiata	*nad1*	3	HQ153680	NAD59	Lake Waccamaw	McCartney et al. 2016
L. radiata	*cox1*	19	MN432650	mH65	Potomac drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	20	MN432651	mH66	Potomac drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	7	MN432620	mH35	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	8	MN432621	mH36	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	9	MN432623	mH38	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	10	MN432624	mH39	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	11	MN432629	mH44	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	12	MN432631	mH46	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	13	MN432633	mH48	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	14	MN432634	mH49	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	15	MN432642	mH57	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	16	MN432644	mH59	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	17	MN432645	mH60	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*cox1*	18	MN432646	mH61	St. Lawrence drainage	Porto-Hannes et al. 2021
L. radiata	*nad1*	4	EF446098		Lake Erie drainage	Kneeland and Rhymer 2007
L. radiata	*cox1*	2	KC408769	H18	Lake Erie drainage	Krebs et al. 2013
L. radiata	*cox1*	21	KC408770	H19	Lake Erie drainage	Krebs et al. 2013
L. radiata	*cox1*	5	KC408771	H20	Lake Erie drainage	Krebs et al. 2013
L. radiata	*cox1*	1	HQ153599	COX72	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. radiata	*cox1*	2	HQ153600	COX73	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153603	COX76	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153604	COX77	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153606	COX79	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153607	COX80	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153608	COX81	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153609	COX82	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*cox1*	1	HQ153610	COX83	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	1	HQ153681	NAD60	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	5	HQ153682	NAD61	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	3	HQ153685	NAD64	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	2	HQ153686	NAD65	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	1	HQ153688	NAD67	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	1	HQ153689	NAD68	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	2	HQ153690	NAD69	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	6	HQ153692	NAD71	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. radiata	*nad1*	3	HQ153693	NAD72	Waccamaw, Yadkin/Pee Dee, Lumber rivers	McCartney et al. 2016
L. sietmani	*cox1*	2	MK391838	TAMUNRI8052 2	Neches River	Keogh and Simons 2019
L. sietmani	*cox1*	2	MK391839	TAMUNRI8052 3	Neches River	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391843	JFBM22438 1	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391844	JFBM22438 2	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391845	JFBM22438 3	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391846	JFBM22438 4	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391847	JFBM22438 5	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391848	JFBM22438 6	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391849	JFBM22438 7	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391850	JFBM22433	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391851	INHS 27760	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391853	INHS 32502	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	3	MK391856	JFBM22439	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	4	MK391857	JFBM22439 photo	Upper Mississippi drainage	Keogh and Simons 2019
L. sietmani	*cox1*	1	MK391858	WI River photo	Upper Mississippi drainage	Keogh and Simons 2019
L. siliquoidea	*cox1*	49	MN432647	mH62	Great Lakes drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	50	MN432648	mH63	Great Lakes drainage	Porto-Hannes et al. 2021

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. siliquoidea	*cox1*	1	MH012239	Fatmucket1	Lake Erie drainage	Metzger et al. 2018
L. siliquoidea	*cox1*	38	MN432628	mH43	Lake Huron drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	6	MN432617	mH32	Lake Michigan drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	31	MN432614	mH29	Lake Ontario drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	35	MN432625	mH40	Lake Ontario drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	42	MN432636	mH51	Lake Ontario drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	44	MN432638	mH53	Lake Ontario drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	45	MN432639	mH54	Lake St. Clair	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	51	MN432649	mH64	Lake St. Clair drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	43	MN432637	mH52	Lake Winnipeg drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	52	MN432652	mH67	Little Vermilion River, Illinois	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	53	MN432653	mH68	Little Vermilion River, Illinois	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	32	MN432615	mH30	Meramec drainage	Porto-Hannes et al. 2021
L. siliquoidea	*nad1*	5	MK672508	MS01	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*nad1*	5	MK672509	MS02	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*nad1*	5	MK672510	MS03	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*nad1*	5	MK672511	MS04	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*nad1*	3	MK672512	MS05	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*nad1*	5	MK672513	MS06	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*nad1*	3	MK672514	MS07	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*nad1*	5	MK672515	MS08	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	5	MK672774	MS01	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	5	MK672775	MS02	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	5	MK672776	MS03	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	5	MK672777	MS04	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	5	MK672778	MS05	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	5	MK672779	MS06	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	5	MK672780	MS07	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	5	MK672781	MS08	Mississippi drainage	Inoue et al. 2020
L. siliquoidea	*cox1*	36	MN432626	mH41	Mississippi drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	37	MN432627	mH42	Mississippi drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	34	MN432622	mH37	Nottaway drainage, Hudson Bay, Canada	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	3	MF326973	H2655	Red River drainage	Robicheau et al. 2018
L. siliquoidea	*nad1*	1	MF326973	H2655	Red River drainage	Robicheau et al. 2018
L. siliquoidea	*cox1*	41	MN432635	mH50	Rupert drainage, Hudson Bay, Canada	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	4	MK226693		St. Lawrence drainage	Porto-Hannes et al. 2019
L. siliquoidea	*nad1*	4	MK226710		St. Lawrence drainage	Porto-Hannes et al. 2019
L. siliquoidea	*cox1*	33	MN432618	mH33	St. Lawrence drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	39	MN432630	mH45	St. Lawrence drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	40	MN432632	mH47	St. Lawrence drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	46	MN432640	mH55	St. Lawrence drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	47	MN432641	mH56	St. Lawrence drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	48	MN432643	mH58	St. Lawrence drainage	Porto-Hannes et al. 2021
L. siliquoidea	*cox1*	2	MK391878	JFBM22440 1	Upper Mississippi drainage	Keogh and Simons 2019
L. siliquoidea	*cox1*	6	MK391879	JFBM22440 2	Upper Mississippi drainage	Keogh and Simons 2019
L. siliquoidea	*nad1*	4	AY094386	UAUC 882	Douglas Lake, Cheboygan County, Michigan	Buhay et al. 2002
L. siliquoidea	*cox1*	2	DQ494752	UAUC882	Douglas Lake, Cheboygan County, Michigan	Serb 2006

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. siliquoidea	*cox1*	1	AF156521	UMMZ 265709a	Huron River, Michigan	Graf and Ó Foighil 2000
L. siliquoidea	*cox1*	5	AF156522	UMMZ 265709b	Huron River, Michigan	Graf and Ó Foighil 2000
L. siliquoidea	*nad1*	4	AY158747	LSILIQ	Lake Erie drainage	Serb et al. 2003
L. siliquoidea	*cox1*	8	KC408744	H1	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	4	KC408745	H2	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	9	KC408746	H3	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	10	KC408747	H4	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	11	KC408748	H5	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	12	KC408749	H6	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	13	KC408750	H7	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	14	KC408751	H8	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	15	KC408752	H9	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	16	KC408753	H10	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	2	KC408756	H13	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	19	KC408757	H14	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	20	KC408758	H15	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	21	KC408759	H16	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	22	KC408760	H17	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	23	KC408761	H21	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	24	KC408762	H22	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	25	KC408763	H23	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	26	KC408764	H24	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	27	KC408765	H25	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	28	KC408766	H26	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	29	KC408767	H27	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	30	KC408768	H28	Lake Erie drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	3	HM849076	H2655	Red River drainage	Breton et al. 2011
L. siliquoidea	*nad1*	5	HM852926	BM20297	Upper Mississippi drainage	Boyer et al. 2011
L. siliquoidea	*nad1*	5	HM852927	BM19848	Upper Mississippi drainage	Boyer et al. 2011
L. siliquoidea	*cox1*	17	KC408754	H11	Upper Mississippi drainage	Krebs et al. 2013
L. siliquoidea	*cox1*	18	KC408755	H12	Upper Mississippi drainage	Krebs et al. 2013
L. "*straminea*"	*cox1*	4	MK391881	JFBM22424	Escambia River drainage	Keogh and Simons 2019
L. "*straminea*"	*cox1*	5	MK672782	ESC04	Escambia River drainage	Inoue et al. 2020
L. "*straminea*"	*cox1*	6	MK672783	ESC05	Escambia River drainage	Inoue et al. 2020
L. "*straminea*"	*cox1*	7	MK672784	ESC06	Escambia River drainage	Inoue et al. 2020
L. straminea	*cox1*	1	MK391880	JFBM22423	Alabama River drainage	Keogh and Simons 2019
L. straminea	*cox1*	1	MK391882	JFBM:22426	Tombigbee River drainage	Keogh and Simons 2019
L. straminea	*nad1*	2	*MH588393	UAM3543	32.674–87.765, Black Warrior River drainage	New
L. straminea	*cox1*	3	MH161355	UAUC 3543	Black Warrior River drainage	Burlakova et al. 2019
L. straminea	*nad1*	1	DQ445163	UAUC694	Black Warrior River, near Fosters, Alabama	Unpublished
L. straminea	*cox1*	2	EF033271	H1369	Not stated	Chapman et al. 2008
L. virescens	*cox1*	1	MK672787	Lvir TEN01	Tennessee River drainage	Inoue et al. 2020
L. virescens	*cox1*	1	*MH560775	AABC	Paint Rock River	Alabama Aquatic Biodiversity Center
L. virescens	*cox1*	1	JF326433		Tennessee River drainage	Campbell and Lydeard 2012
L. virescens	*nad1*		JF326443		Tennessee River drainage	Campbell and Lydeard 2012
L. virescens	*cox1*	1	JQ437390	PR 7106	Tennessee River drainage	Moyer and Díaz-Ferguson 2012
L. virescens	*cox1*	2	JQ437391	PR 7108	Tennessee River drainage	Moyer and Díaz-Ferguson 2012
L. virescens	*cox1*	3	JQ437392	1	Tennessee River drainage	Moyer and Díaz-Ferguson 2012

Appendix 2, continued.

Species	Gene	Haplotype	GenBank accession no.	Specimen ID	Waterbody	Reference
L. virescens	*cox1*	4	JQ437393	2	Tennessee River drainage	Moyer and Díaz-Ferguson 2012
Ortmanniana ligamentina	*cox1*		*MH560777	UAM241	Kankakee County, Illinois, Kankakee River	New
O. ligamentina	*nad1*		*MH588394	UAM241	Kankakee County, Illinois, Kankakee River	New

*Newly generated sequences.