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Source: Freshwater Mollusk Biology and Conservation, 25(1) : 37-53

Published By: Freshwater Mollusk Conservation Society

URL: https://doi.org/10.31931/fmbc-d-21-00007

Freshwater Mollusk Biology and Conservation 25:37–53, 2022

DOI:10.31931/fmbc-d-21-00007

REGULAR ARTICLE

UTILITY OF SHELL-VALVE OUTLINES FOR DISTINGUISHING AMONG FOUR LAMPSILINE MUSSEL SPECIES (BIVALVIA: UNIONIDAE) IN THE GREAT LAKES REGION

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ABSTRACT

Four freshwater mussel species from the tribe Lampsilini found in the Laurentian Great Lakes region—*Lampsilis fasciola* (Wavy-rayed Lampmussel), *Lampsilis cardium* (Plain Pocketbook), *Ortmanniana ligamentina* (Mucket), and *Lampsilis siliquoidea* (Fatmucket)—have similar and variable shell morphologies that make some specimens difficult to identify in the field. Identification is further confounded by sexual dimorphism in three of the four species. We used landmark-based morphometric analyses of shell shape in conjunction with DNA barcoding to quantify shell-shape differences between the species. We collected specimens ($N = 388$) from Great Lakes tributaries in Michigan, USA, and Ontario, Canada. We photographed each specimen and made an initial identification in the field. We then took a tissue biopsy or swab from 248 of the specimens, sequenced a fragment of the mitochondrial cytochrome c oxidase subunit 1 (COI) gene, and confirmed identifications by comparing our sequences with sequences for all four species accessioned in GenBank. On the photographs, we digitized 21 two-dimensional landmarks along the shell margin and used multivariate methods to evaluate the correspondence of shell shape to our COI-confirmed species identifications and sex determinations. Principal-components analysis and linear-discriminant analysis of shell shape correctly identified only 77.8% of specimens to species and 72.2% to species and sex. Sex determination was particularly confounded by the similar shapes of female *L. fasciola* and female *L. cardium* specimens. This study demonstrates the limitations of using only two-dimensional valve shape in differentiating among some mussel species.

KEY WORDS: geometric morphometrics, DNA barcoding, species at risk

INTRODUCTION

Early classifications of freshwater mussel species in North America were often based almost solely on descriptions of shell morphology (Haag 2012). Even today, species are usually identified by shell characteristics. However, these identifications can be inaccurate due to wide intraspecific variation in shell characters. Genetic and morphometric techniques can improve the ability to differentiate among mussel species with similar and overlapping shell characteristics (Beauchamp et al. 2020; Beyett et al. 2020; Willsie et al. 2020).

In the Laurentian Great Lakes region, four lampsiline mussel species can be difficult to differentiate based on external shell features: *Lampsilis fasciola* (Rafinesque 1820), Wavy-rayed Lampmussel; *Lampsilis cardium* (Rafinesque 1820), Plain Pocketbook; *Ortmanniana ligamentina* (Lamarck

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Table 1. Site locations of *Lampsilis fasciola*, *Lampsilis cardium*, *Ortmanniana ligamentina*, and *Lampsilis siliquoidea* and the number of field-identified and cytochrome c oxidase subunit 1 (COI)–confirmed specimens. Numbers represent the total number collected from the site, and, in parentheses, the number of specimens that had COI sequences generated.

			L. fasciola		*L. cardium*		*O. ligamentina*	*L. siliquoidea*	
Site (River)	Latitude	Longitude	Female	Male	Female	Male	—	Female	Male
Maitland River, Ontario	43.7719	−81.3092	—*	—*	22 (22)	—*	—*	37 (35)	—*
Belle River, Michigan	42.7745	−82.5510	—*	—*	—*	—*	—*	2 (2)	4 (4)
EBWF St. Joseph River, Michigan	41.7814	−84.6507	—*	—*	1 (0)	—*	—*	1 (1)	4 (4)
Salt River, Michigan	43.7053	−84.4878	—	—	3 (3)	—*	2 (2)	1 (1)	1 (1)
River Raisin, Michigan	42.1767	−84.0922	19 (19)	22 (22)	27 (20)	55 (20)	—*	—*	—*
Grand River, Michigan	42.9855	−84.9455	—	—	26 (18)	14 (13)	6 (6)	—*	—*
Chippewa River, Michigan	43.6045	−84.2906	—	—	—*	—*	80 (20)	—*	—*
Maple River at Elsie, Michigan	43.0902	−84.4053	—	—	1 (0)	5 (0)	1 (0)	13 (13)	40 (20)
Maple River at Maple Rapids, Michigan	43.1089	−84.6940	—	—	—*	—*	—*	2 (2)	—*

*Present in the river, but not found or collected at the sites.

1819) (= *Actinonaias ligamentina*), Mucket; and *Lampsilis siliquoidea* (Barnes 1823), Fatmucket. At sites where these species co-occur, identification can be challenging even for experts (Cummings and Mayer 1992). In the three *Lampsilis* species, identification is further confounded by sexual dimorphism (Watters et al. 2009; Mulcrone and Rathbun 2018). Sex determination based on shell characters also can have a high degree of error (Hess et al. 2018).

Accurate species and sex determination is important for many reasons. For example, *Lampsilis fasciola* is a species of special concern in Canada (COSEWIC 2010) and is threatened in Ontario and Michigan (OMNRF 2021; MNFI 2020). Confusion between *L. fasciola* and more common lampsiline species could result in an inaccurate assessment of its status. If the more common *L. cardium*, *O. ligamentina*, and *L. siliquoidea* are misidentified as *L. fasciola*, the latter species' distribution and abundance may be overestimated, resulting in a potential loss of protection needed to ensure its persistence. Lampsiline species are often used for laboratory studies including studies on the impacts of invasive species and toxicological studies (e.g., Wang et al. 2011; Gilroy et al. 2014; Larson et al. 2016; Waller and Bartsch 2018; Gillis et al. 2021). Improper identification of test organisms may lead to misinterpretations of laboratory results and can lead to improper management recommendations (Shea et al. 2011).

DNA barcoding (Hebert et al. 2003) has become an important tool for species identification. Partial mitochondrial cytochrome c oxidase subunit 1 (COI) gene sequences are frequently used as diagnostic barcode markers for many unionid species (e.g., Inoue et al. 2013, 2014; Beauchamp et al. 2020; Beyett et al. 2020; Willsie et al. 2020). The large and growing number of unionid COI sequences accessioned in GenBank serve as references to improve identifications.

Geometric morphometric analysis also can be a useful tool for species identification. Landmark-based analyses allow for quantification of mollusk shell shape while removing the effects of size, position, and rotation. The resulting shape data can be analyzed using traditional multivariate statistics to detect differences among individuals or a priori groups (Webster and Sheets 2010). Recent studies combining DNA barcoding and geometric morphometric analysis have been used to distinguish between morphologically similar species (Beauchamp et al. 2020; Beyett et al. 2020; Willsie et al. 2020).

We tested the utility of geometric morphometric analyses of shell shape in conjunction with DNA barcoding to differentiate between *L. fasciola*, *L. cardium*, *O. ligamentina*, and *L. siliqouidea*. Our specific objectives were (1) to assess whether two-dimensional geometric morphometric techniques can differentiate accurately among species and sexes, and, if so, (2) to establish diagnostic and quantifiable morphological characters for distinguishing among species and sexes.

METHODS

Field Collections

We collected 388 specimens of the four target species from eight rivers in Ontario and Michigan (Table 1). As we were seeking only to differentiate among species and sexes, we did not investigate intraspecific variation within and among source populations (i.e., environmental influences of shape variation), although this could be an interesting avenue for further study. We attempted to collect a minimum of 20 individuals of each species and sex (for dimorphic species) at each site, but this was not always possible. Field identifications and sex determinations were made by the field team upon collection. Mussel identification experience of field team members ranged from novice (<1 yr of experience), to intermediate (2 to 10 yr), to advanced (>10 yr). Species identifications in the field were made based on shell morphology, beak structure, and shell coloration using a consensus approach. Sex determination was made based on the degree of shell inflation and expansion of the posterior portion of the shell; more inflated or expanded shells are characteristic of females. We photographed the left valve of each specimen. Photographs were later reviewed by the authors with advanced identification experience, and some field identifications or sex determinations were revised based on those reviews prior to analyses. We took mantle tissue biopsies (Berg et al. 1995) from a subset of individuals for each species except for *L. fasciola*; because of its protected status, we took less invasive swab samples from the foot and visceral mass (Henley et al. 2006). We obtained usable COI sequences from a total of 248 specimens. We preserved tissue biopsies in 95% ethanol and swabs were preserved in a lysis buffer (Sambrook et al. 1989). We measured shell length, width, height, and hinge length of every specimen using Vernier calipers (Appendix 1). After processing, all specimens were returned to the river alive.

DNA Barcoding

A Qiagen Blood and Tissue kit (Qiagen, Inc., Germantown, MD, USA) was used to extract DNA from the tissue and swab samples collected in the field. Extraction success and relative quality of genomic data were assessed by electrophoresing 2-μL amplicons of the extracted DNA on a 1.5% agarose gel. Polymerase chain reaction was used to amplify a 600-bp COI fragment using primers and amplification conditions described in Campbell et al. (2008). Amplification success and relative quality were assessed by electrophoresing 2 μL of amplicons (stained with SYBR green) on a 1.5% agarose gel. Amplicons were purified using exonuclease I and shrimp alkaline phosphates (EXOSAP). The EXOSAP solution was made using 78 μL double distilled H_2O, 2 μL exonuclease I, and 20 μL shrimp alkaline phosphates. To denature any remaining primers and enzymes, 1.5 μL of EXOSAP solution was added to each sample, which were then incubated at 37°C for 40 min and 80°C for 20 min. Once purified, amplicons were shipped to Eton Biosciences (San Diego, CA, USA) for Sanger sequencing. Generated sequences were compared to COI sequences for all four species in the GenBank database using BLAST (http://blast.ncbi.nlm.nih.gov/Blast.cgi; accessed November 20, 2020). The BLAST result with the highest percentage of identity was chosen as the most likely species and used as the confirmed identification for the sample.

Geometric Morphometrics

We digitized shell photographs of all 388 individuals using the MakeFan application in IMP8 (Sheets 2014). We placed homologous (Type I) anchor landmarks at the peak of the umbo and the posterior edge of the hinge ligament. We established a 40-ray fan anchored at the midpoint between landmarks 1 and 2; 19 additional (Type II) landmarks were located at equidistant points where fan rays intersected the shell margin (Fig. 1). Photographs of the left valves are available on MorphoBank (https://morphobank.org, Project Code 3918, accession nos. M738948–M739052).

Data Analysis

We obtained shape variables from our landmark configurations of COI-confirmed individuals using a generalized Procrustes analysis (Rohlf and Slice 1990). We performed two Procrustes analyses of variance (ANOVAs) (Goodall 1991) in the R package *geomorph* 4.0 (Adams et al. 2021): one to test for significant shape differences between the four species and the second to test for significant shape differences using species identity, sex, and the interaction between species and sex. Our sum-of-squared Procrustes distances were used as the measure of sum-of-squares (SS), with the observed SS evaluated through residual randomization permutation (Collyer and Adams 2018, 2021). Additionally, *geomorph* uses *z*-score centering and log-transformation to ensure that statistics are normally distributed. We determined significance at $\alpha = 0.05$.

We performed a principal components analysis (PCA) on the Procrustes-transformed landmark dataset. A broken-stick model was used to determine the number of dimensions to retain for further analyses (Jackson 1993). We subsequently used PCA–linear discriminant analysis (LDA) and Bayesian clustering to test the utility of shell shape in identifying specimens to species and sex. In a PCA-LDA, the dimensionality of the data is reduced through an initial PCA to preserve variance, remove collinearity, and reduce overfitting in the subsequent LDA of the components (Quinn and Keough 2002). We used PAST 4 (Hammer et al. 2001) to generate principal components from our Procrustes shape variables. We then performed an LDA in PAST on the components using the COI-confirmed species identities and used the jackknifed confusion matrix to compare COI identifications with those predicted by shape. We repeated the LDA using the COI identities by sex as groups and used the jackknifed confusion matrix to assess successful discrimination.

For Bayesian model-based clustering independent of a priori classification, we used the R package mclust 5.4.5 (Scrucca et al. 2016). We generated Bayesian information criteria (BIC) values for competing clustering models and chose the model with the highest BIC score (mclust reports BIC multiplied by −1). We created a model with four clusters (representing the four species) and a model with seven clusters (species and sex where applicable). We assessed the method by calculating classification errors as the percentage of incorrect group assignment relative to the COI species identification. We also calculated incorrect group assignment relative to the COI identities by sex.

RESULTS AND DISCUSSION

BLAST analysis identified 41 *L. fasciola*, 96 *L. cardium*, 28 *O. ligamentina*, and 83 *L. siliquoidea* (Appendix 1). We recovered 16 unique haplotypes from the 248 COI sequences generated: two *L. fasciola* (GenBank accession nos. MW753043–MW753044), eight *L. cardium* (GenBank accession nos. MW752863–MW752870, one *O. ligamentina* (GenBank accession no. MW752989), and five *L. siliquoidea*

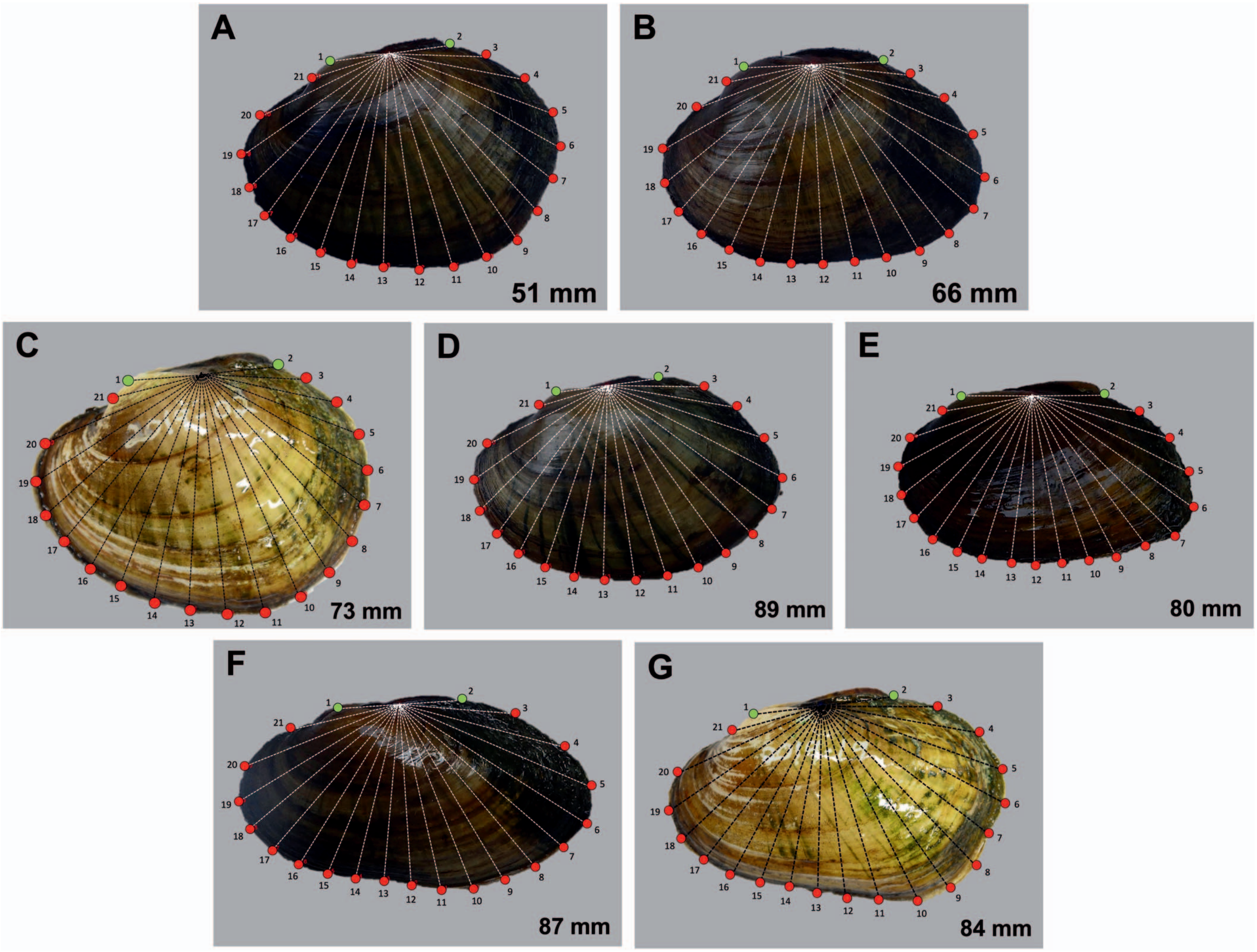

Figure 1. Examples of a fan and 21 landmarks superimposed on the left valve using the MakeFan application in IMP8 software. Type I landmarks are represented by the green points. Type II landmarks along the edge of the shell are represented by the red points. Shell specimens are (A) female and (B) male *Lampsilis fasciola*, (C) female and (D) male *Lampsilis cardium*, (E) *Ortmanniana ligamentina*, and (F) male and (G) female *Lampsilis siliquoidea*.

(GenBank accession nos. MW752895–MW752899). Overall, field identifications were 92.3% accurate when compared to the COI identifications. The most frequently misidentified specimens in the field were *L. cardium* and *L. siliquoidea* from the Maitland River, Ontario, with 73.6% correct identification; six *L. cardium* were mistaken for *L. siliquoidea* and nine *L. siliquoidea* were mistaken for *L. cardium*. A possible reason for the misidentification of these two species in the Maitland River is that there were instances when the shape of the shell or mantle lure morphology indicated one species (i.e., inflation and truncation of the shell and lure type typical of *L. cardium*), but the beak sculpture indicated another (i.e., 6–12 bars typical of *L. siliquoidea*, as opposed to 4–5 elevated ridges for *L. cardium*; Mulcrone and Rathbun 2018).

Procrustes ANOVA based on the transformed shape variables revealed significant differences in shape among the COI-confirmed species ($F = 8.569$, $P < 0.001$). ANOVA using both COI-confirmed species and field- and photo-assigned sex also showed significant differences between species and sexes ($F_{1,2} = 1.824$, $P = 0.027$). Pairwise post-hoc residual randomization permutation procedures (RRPP; 1,000 permutations) tests revealed significant differences between these six (of 42) pairs: male *L. cardium* and male *L. siliquoidea* ($P = 0.037$), male *L. cardium* and male *L. fasciola* ($P = 0.016$), male *L. cardium* and male *L. siliquoidea* ($P = 0.001$), male *L. fasciola* and male *L. siliquoidea* ($P = 0.001$), female and male *L. siliquoidea* ($P = 0.001$), and male *L. siliquoidea* and *O. ligamentina* ($P = 0.034$).

The first two principal components explained 90.5% of the total variation in valve shape (Fig. 2). However, there was considerable overlap among females of all *Lampsilis* species and between male *L. cardium* and male *L. fasciola*. Male *L. siliquoidea* and *O. ligamentina* had limited overlap, corresponding to the results of the ANOVA.

The PCA-LDA had 77.8% mean accuracy (73.1% to 83.1%) in assigning specimens to the correct species (Table 2)

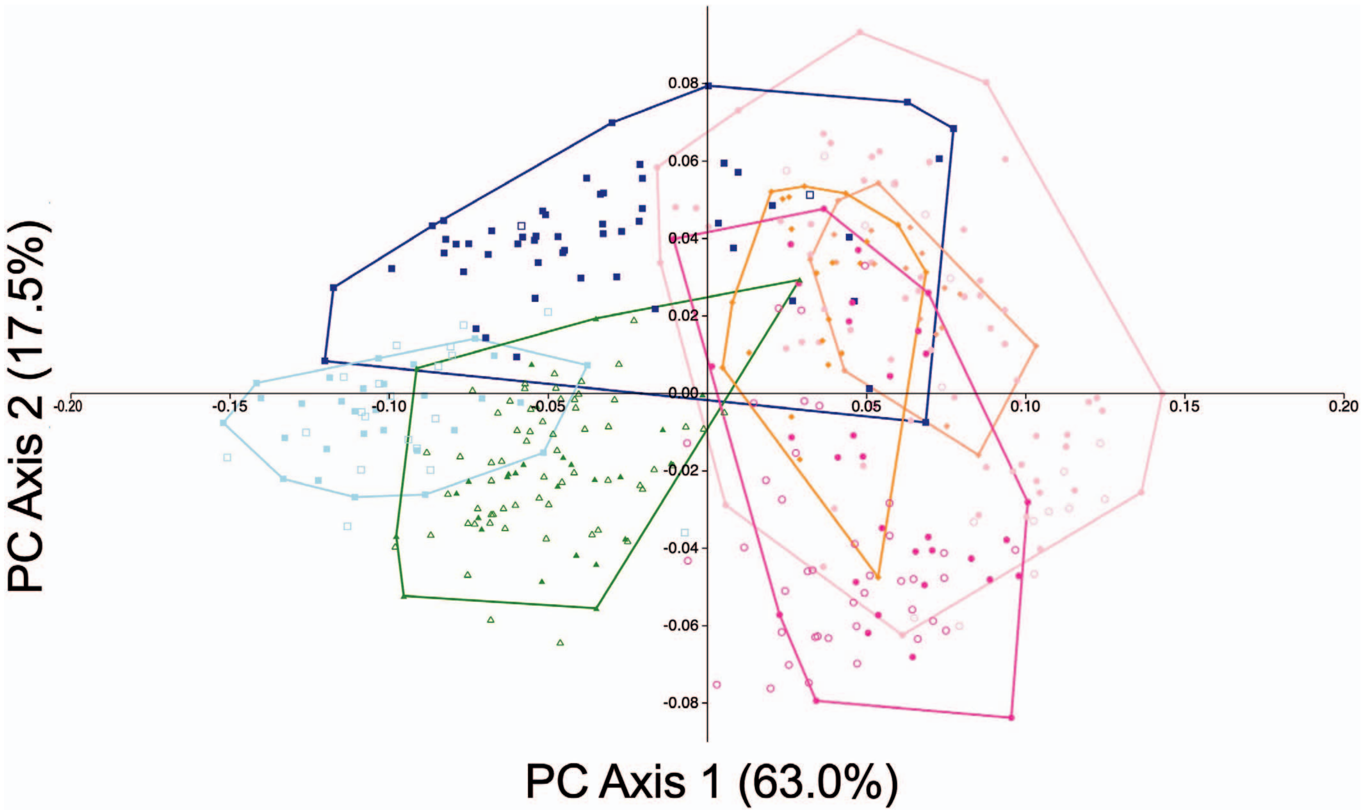

Figure 2. Principal component analysis (PCA) of 21 Procrustes-transformed landmark points from female (squares) and male (circles) *Lampsilis fasciola* (orange/salmon), *Lampsilis cardium* (pink shades), *Lampsilis siliquoidea* (blue shades), and *Ortmanniana ligamentina* (green). Filled symbols represent specimens with cytochrome c oxidase subunit 1–confirmed identifications. Open symbols represent specimens that only have morphological data and were assigned to a group using the PCA–linear discriminant analysis model. Numbers in parentheses on each axis indicate the percentage of variation explained.

and 72.1% (57.1% to 93.1%) mean accuracy in assigning specimens to the correct species and sex (Table 3). The species with the highest accuracy in the PCA-LDA model was *L. siliquoidea* (83.1%), but all four species were generally similar. Groups with the highest accuracy in the PCA-LDA model were male *L. siliquoidea* (93.1%) and *O. ligamentina* (82.1%) (Table 3). Groups with the lowest accuracy were female *L. cardium* (57.1%) and female *L. fasciola* (68.4%), each of which was usually misidentified as the other species. Female *L. cardium* were misidentified as female *L. fasciola* 19.0% of the time, and female *L. fasciola* were misidentified as female *L. cardium* 21.0% of the time. Similar to the field identifications, the Maitland River samples had the highest error rates for the LDA model: 20 out of 57 (35.1%) Maitland specimens of *L. cardium* and *L. siliquoidea* were misidentified by shell morphometrics. Thirteen out of these 20 specimens were a result of misidentifying *L. cardium* as *L. siliquoidea*. Of the remaining 122 genetically confirmed *L. cardium* and *L. siliquoidea* specimens (from all rivers), only three *L. siliquoidea* and 14 *L. cardium* (13.9%) were misidentified in

Table 2. Jackknifed confusion matrix of the four lampsiline species to the assignments based on results of the linear discriminant analysis of the principal components of 21 Procrustes-transformed landmark points. Darkened cells represent specimens that were correctly assigned by the linear discriminant analysis (LDA).

	LDA Assignment					
Genetic Assignment	***L. cardium***	***L. siliquoidea***	***O. ligamentina***	***L. fasciola***	**Total**	**% Correct**
L. cardium	73	5	4	14	96	76.0
L. siliquoidea	9	69	3	2	83	83.1
O. ligamentina	1	2	21	4	28	75.0
L. fasciola	10	0	1	30	41	73.1
Total	93	76	29	50	248	

Table 3. Jackknifed confusion matrix of the four lampsiline species and sexes to the assignments based on results of the linear discriminant analysis of the principal components of 21 Procrustes-transformed landmark points. Darkened cells represent specimens that were correctly assigned by the linear discriminant analysis (LDA).

	LDA Assignment								
	L. fasciola		*L. cardium*		*O. ligamentina*	*L. siliquoidea*			
Genetic Assignment	**Female**	**Male**	**Female**	**Male**	**–**	**Male**	**Female**	**Total**	**% Correct**
L. fasciola Female	13	2	4	0	0	0	0	19	68.4
L. fasciola Male	3	17	0	2	0	0	0	22	77.3
L. cardium Female	12	2	36	6	2	0	5	63	57.1
L. cardium Male	3	4	2	24	0	0	0	33	72.7
O. ligamentina	0	2	0	2	23	1	0	28	82.1
L. siliquoidea Male	0	0	0	0	2	27	0	29	93.1
L. siliquoidea Female	1	0	10	0	1	3	39	54	72.2
Total	34	27	34	34	28	31	44	248	

the morphometric model. Most of these misidentifications were *L. cardium* being mistaken for *L. fasciola* (10 of 17). A possible reason for lower accuracy in the LDA model compared to field identification accuracy is that the model only accounts for the two-dimensional shape of the specimen. Other characters, such as color, ray pattern, beak sculpture, overall size and three-dimensional attributes (e.g., shell inflation), are important characters that are also taken into consideration when making field identifications (Mulcrone and Rathbun 2018).

For the three species with distinct sexual dimorphism, males of each species were more accurately assigned by LDA to the correct species and sex than females (Table 3). Overall, 81.0% of males were assigned correctly in the LDA model compared to only 64.7% of females. The greater similarity of females across species could result from convergence of female shape necessary to accommodate the greatly swollen

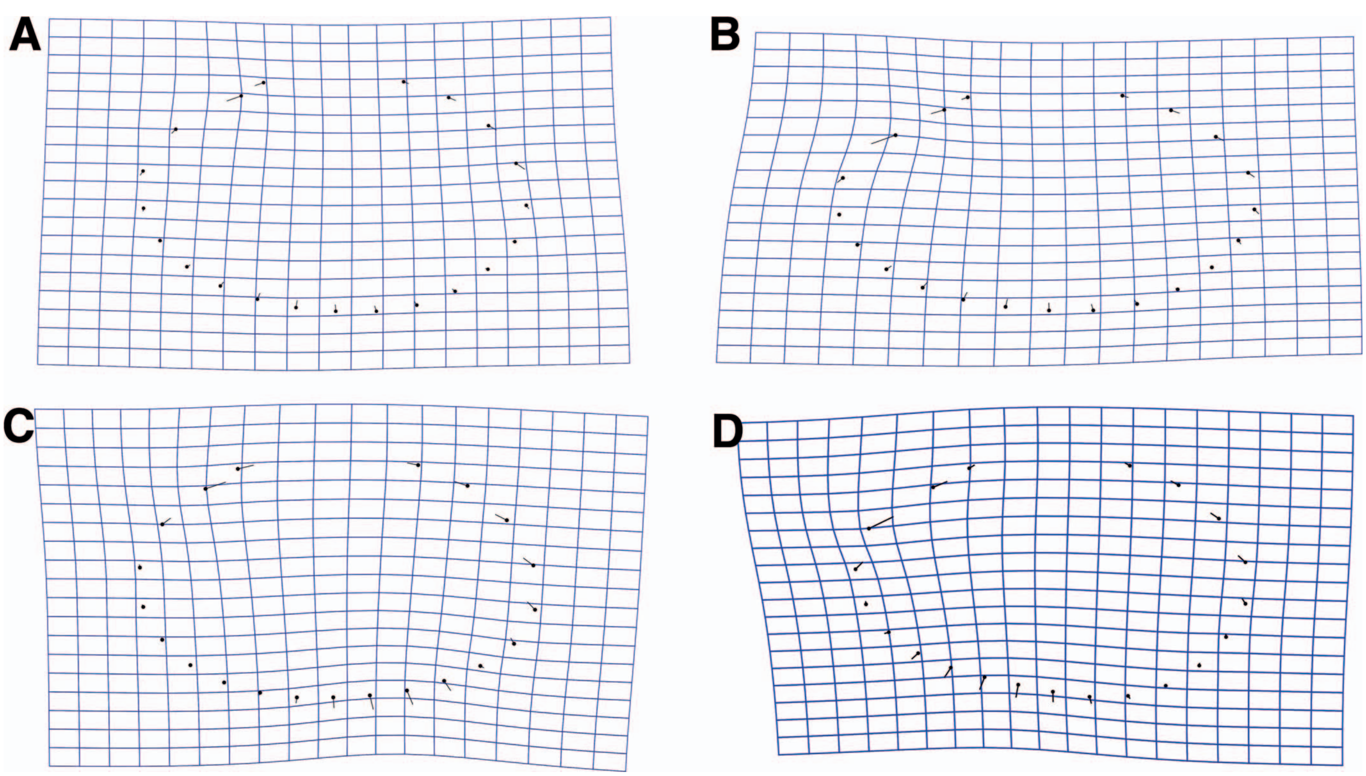

Figure 3. Deformation grids of two-dimensional shell shape showing difference between the combined mean shape of all specimens and the mean shape of: (A) *Lampsilis fasciola*, (B) *Lampsilis cardium*, (C) *Ortmanniana ligamentina*, and (D) *Lampsilis siliquoidea*.

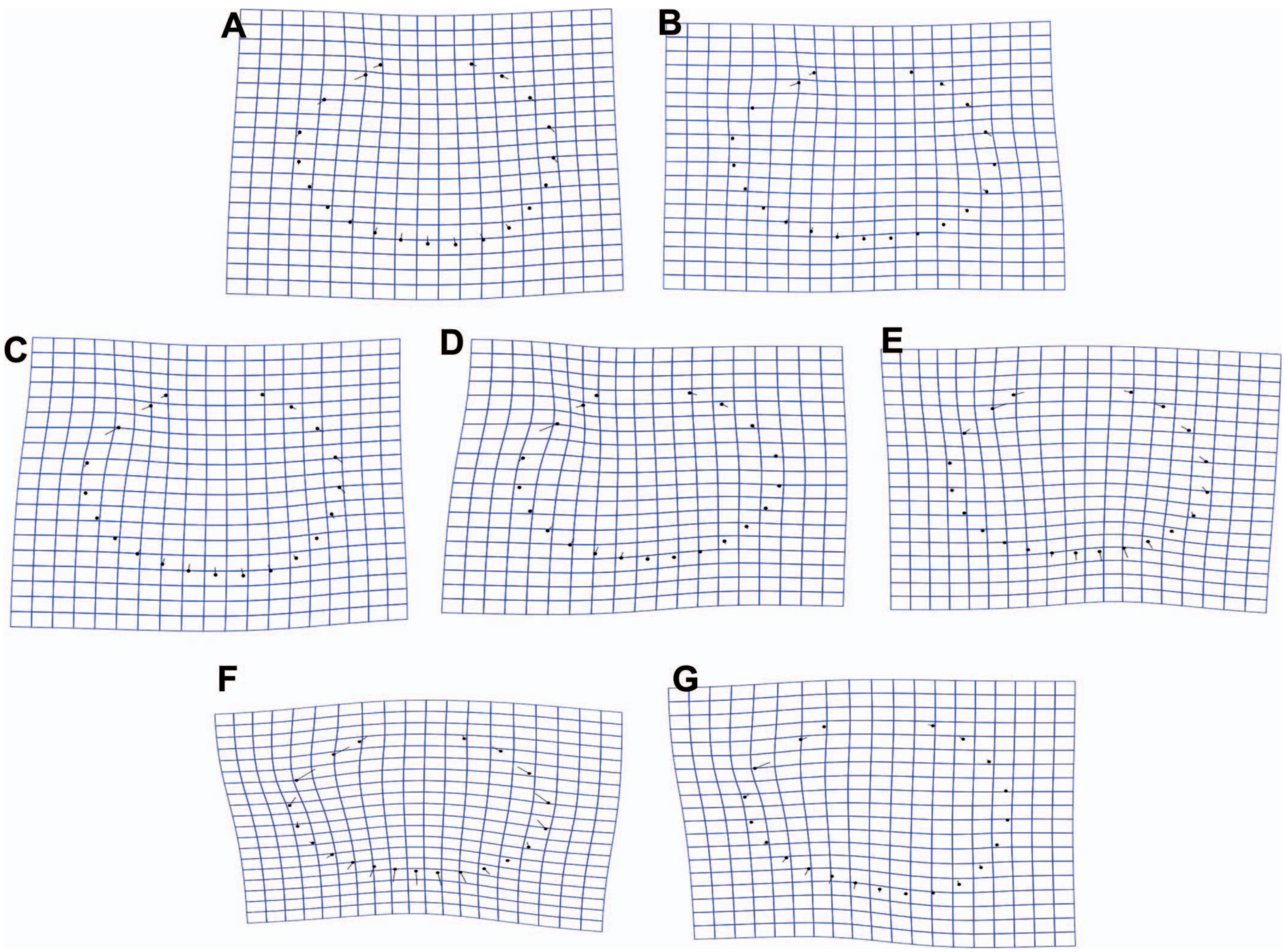

Figure 4. Deformation grids of two-dimensional shell shape showing difference between the combined mean shape of all specimens and the mean shape of: (A) female and (B) male *Lampsilis fasciola*, (C) female and (D) male *Lampsilis cardium*, (E) *Ortmanniana ligamentina*, and (F) male and (G) female *Lampsilis siliquoidea*.

gills of gravid females (Haag 2012, Zieritz and Aldridge 2011, Hewitt et al. 2021).

Using Bayesian clustering, a four-cluster model (model = VEI, BIC = 2,807.75, log-likelihood = 1,461.72) and a seven-cluster model (model = EII, BIC = 2,785.30, log-likelihood = 1,469.78) were created and assessed to determine how they performed in assigning specimens to groups based on their Procrustes valve shapes. The arbitrary groups created by Bayesian clustering were agnostic to the four COI-confirmed species groups and seven COI-confirmed species + sex groups, but performed similarly (79.0% for four groups, 77.8% for seven groups) to the PCA-LDA assignments. The agnostic Bayesian groupings performed similarly to the confirmed groupings, suggesting that patterns of intra- and interspecific variation in the four lampsilines are not necessarily as diagnostic as previously thought and thus require additional characters for species diagnosis (e.g., Mulcrone and Rathbun 2018 and other field identification guides).

The thin-plate splines show that the generalized mean shape across sexes of *L. fasciola* and *L. cardium* is more rounded, whereas the mean shape of *L. siliquoidea* and *O. ligamentina* is more elongate (Fig. 3). Thin-plate splines also show the truncated and rounded posterior end characteristic of females of the three species with distinct sexual dimorphism (Fig. 4A, C, and G). These shape characteristics match descriptions of the species found in field guides (e.g., Mulcrone and Rathbun 2018).

In contrast to other studies that showed the utility of landmark-based morphometric analysis for species identification (Inoue et al. 2014; Beauchamp et al. 2020; Beyett et al. 2020; Willsie et al. 2020), our results show that this method is of limited utility for these four lampsiline species. Landmark-based morphometric analysis could help improve field identifications of *O. ligamentina* and *L. siliquoidea* because it was somewhat useful for differentiating these two species from the other two species we studied. However, the high degree of overlap in shell shape among other species, particularly female *L. siliquoidea* and female *L. cardium*, limits the utility of morphometric traits for identification. Improvements to the model could be made by incorporating an assessment of shell variation among different watersheds. Local variation in water chemistry, hydrology, and other factors can influence shell shape, and two distinct shell morphologies of *L. fasciola* have been described (Watters et al. 2009).

Using two-dimensional landmarks to assess variation in valve shape to differentiate among four species of lampsiline mussels examined in this study has limited utility. Differentiating among more than two species and species with sexual dimorphism was problematic and had error rates between 20% and 30%. In addition to two-dimensional valve shape, we recommend exploring methods for including three-dimensional landmarks that reflect shell inflation. A DNA barcoding–calibrated morphometric key also could be used to examine differences among the closely related species *L. cardium*, *Lampsilis ovata* (Say 1817), *Lampsilis cariosa* (Say 1817), and *Lampsilis ornata* (Conrad 1835), including potential hybrids of *L. cardium* and *L. ovata* (Hewitt et al. 2019) and *L. siliquoidea* and *Lampsilis radiata* (Rafinesque 1820) (supposedly restricted to the Lake Ontario, St. Lawrence, and Atlantic Coast drainages; Krebs et al. 2013, Porto-Hannes et al. 2021). Improving the ability to correctly differentiate among species using nongenetic techniques remains important for field biologists. Misidentifications could result in inaccurate population estimates and biases in field surveys, which could in turn mislead conservation and management strategies (Shea et al. 2011).

ACKNOWLEDGMENTS

Funding for this project came from Fisheries and Oceans Canada and the Central Michigan University (CMU) Office of Research and Graduate Studies Summer Scholars Program. Specimens from Michigan were collected using scientific collection and threatened and endangered species permits issued by the Michigan Department of Natural Resources. Ontario specimens were collected under Canadian Species at Risk permit 19-PCAA-0036. We thank everyone who assisted in field collections and laboratory work including Nichelle VanTassel, Shay Keretz, Dylan Powell, Emmett Smrcka, and Julia Willsie (CMU Biology Department) as well as Dr. Patty Gillis and staff from Environment and Climate Change Canada and Fisheries and Oceans Canada. The paper is contribution 164 of the CMU Institute for Great Lakes Research.

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Appendix 1. Length, height, width, and hinge-length measurements and field, cytochrome c oxidase subunit 1, and (jackknifed) morphometric identifications for all specimens collected.

Sample code	L (mm)	H (mm)	W (mm)	HL (mm)	Field species ID	Field sex ID	COI ID	PCA-LDA assignment: species	PCA-LDA assignment: species + sex
MLR-01	75.0	52.7	37.3	—	*Lampsilis siliquoidea*	Female	*Lampsilis cardium*	*Lampsilis fasciola*	*L. fasciola* female
MLR-02	72.5	57.5	35.5	—	*L. cardium*	Female	*L. cardium*	*Ortmanniana ligamentina*	*L. cardium* female
MLR-03	98.4	68.3	46.1	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-04	98.1	62.7	42.0	—	unknown	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-05	90.0	61.1	41.1	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-06	91.0	62.5	42.8	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. cardium* female
MLR-07	88.8	58.9	41.2	—	*L. siliquoidea*	Female	*L. cardium*	*L. cardium*	*L. fasciola* female
MLR-08	90.2	61.0	38.7	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-09	82.2	51.3	32.2	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* female
MLR-10	80.4	56.0	34.0	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* female
MLR-11	87.6	60.8	37.7	—	*L. siliquoidea*	Female	*L. cardium*	*L. siliquoidea*	*L. siliquoidea* female
MLR-12	85.0	52.0	31.4	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-13	86.0	55.3	31.5	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-14	78.7	50.1	31.3	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-15	82.3	53.3	32.2	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-16	83.0	54.7	33.6	—	*L. siliquoidea*	Female	*L. cardium*	*L. siliquoidea*	*L. siliquoidea* female
MLR-17	89.2	59.4	38.4	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. fasciola*	*L. siliquoidea* female
MLR-18	85.7	58.3	35.1	—	*L. siliquoidea*	Female	*L. cardium*	*L. siliquoidea*	*L. siliquoidea* female
MLR-19	83.6	52.5	34.1	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-20	76.4	49.6	26.0	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-21	88.8	53.1	30.3	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-22	80.5	49.8	29.6	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-23	80.6	34.4	54.4	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-24	76.1	32.0	49.0	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-25	75.5	26.6	49.9	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-26	85.5	34.1	52.7	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-27	106.6	78.8	51.1	—	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
MLR-28	82.5	57.6	35.5	—	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
MLR-29	81.7	57.7	35.7	—	*L. cardium*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. fasciola* female
MLR-30	92.1	65.5	47.4	—	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
MLR-31	75.6	55.5	39.3	—	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
MLR-32	89.9	60.8	41.6	—	*L. cardium*	Female	*L. cardium*	*L. siliquoidea*	*L. cardium* female
MLR-33	81.0	57.1	34.7	—	*L. cardium*	Female	*L. siliquoidea*	*L. cardium*	*L. cardium* female
MLR-34	83.6	53.6	36.4	—	*L. cardium*	Female	*L. cardium*	*L. siliquoidea*	*L. siliquoidea* female
MLR-35	90.1	57.8	44.9	—	*L. cardium*	Female	*L. siliquoidea*	*L. cardium*	*L. cardium* female
MLR-36	76.1	45.8	33.6	—	shape-FM, lure-PB	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-37	83.3	59.2	38.9	—	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
MLR-38	98.1	66.0	46.9	—	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
MLR-39	99.2	65.0	50.0	—	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
MLR-40	98.0	61.4	48.1	—	*L. cardium*	Female	*L. siliquoidea*	*L. cardium*	*L. cardium* female
MLR-41	89.4	56.3	43.4	—	*L. cardium*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. cardium* female
MLR-42	92.1	65.8	44.7	—	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. fasciola* female
MLR-43	74.4	49.6	28.6	—	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
MLR-44	79.0	53.3	31.2	—	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
MLR-45	98.6	66.8	50.6	—	*L. cardium*	Female	*L. siliquoidea*	*L. cardium*	*L. cardium* female
MLR-46	92.7	62.9	45.1	—	*L. cardium*	Female	*L. siliquoidea*	*L. cardium*	*L. cardium* female

Appendix 1, continued.

Sample code	L (mm)	H (mm)	W (mm)	HL (mm)	Field species ID	Field sex ID	COI ID	PCA-LDA assignment: species	PCA-LDA assignment: species + sex
MLR-47	97.6	66.1	44.6	—	*L. cardium*	Female	*L. siliquoidea*	*L. cardium*	*L. cardium* female
MLR-48	92.5	62.3	37.7	—	*L. cardium*	Female	*L. siliquoidea*	*L. cardium*	*L. cardium* female
MLR-49	85.9	57.7	36.9	—	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
MLR-50	77.9	53.9	36.0	—	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
MLR-51	79.4	44.7	25.8	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-52	103.8	59.1	40.9	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* female
MLR-53	85.8	54.6	32.3	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. fasciola*	*L. cardium* female
MLR-54	87.2	58.3	37.5	—	*L. siliquoidea*	Female	*L. cardium*	*O. ligamentina*	*L. fasciola* female
MLR-55	77.3	47.7	32.3	—	*L. siliquoidea*	Female	—	*L. siliquoidea*	*L. siliquoidea* female
MLR-56	84.9	52.6	37.2	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MLR-57	82.3	51.3	33.5	—	*L. siliquoidea*	Female	*L. cardium*	*O. ligamentina*	*L. fasciola* female
MLR-58	77.2	48.5	32.5	—	*L. siliquoidea*	Female	—	*L. siliquoidea*	*L. siliquoidea* female
MLR-59	78.8	46.4	29.2	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. fasciola*	*L. siliquoidea* female
BRFM-01	—	—	—	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
BRFM-02	—	—	—	—	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
BRFM-03	—	—	—	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
BRFM-04	—	—	—	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
BRFM-05	—	—	—	—	*L. siliquoidea*	Male	*L. siliquoidea*	*L. fasciola*	*O. ligamentina*
BRFM-06	—	—	—	—	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAPLE-01	—	—	—	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* female
MAPLE-02	—	—	—	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
EBWF-01	—	—	—	—	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
EBWF-02	—	—	—	—	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
EBWF-03	—	—	—	—	*L. siliquoidea*	Male	*L. siliquoidea*	*L. fasciola*	*L. siliquoidea* male
EBWF-04	—	—	—	—	*L. siliquoidea*	Male	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* male
EBWF-05	—	—	—	—	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*O. ligamentina*
EBWF-06	—	—	—	—	*L. cardium*	Female	—	*L. cardium*	*L. cardium* female
SALT-01	85	45	29	30	*L. siliquoidea*	Male	*L. siliquoidea*	*L. fasciola*	*O. ligamentina*
SALT-02	54	29	20	18	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
SALT-03	94	53	31	44	*O. ligamentina*	—	*O. ligamentina*	*L. siliquoidea*	*O. ligamentina*
SALT-04	93	59	41	40	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. fasciola male*
SALT-05	101	66	43	46	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*O. ligamentina*
SALT-06	114	66	48	56	*L. cardium*	Male	*O. ligamentina*	*L. siliquoidea*	*O. ligamentina*
SALT-07	103	72	51	49	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
RR-01	51	33	21	26	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. fasciola* female
RR-02	47	33	22	28	*L. fasciola*	Female	*L. fasciola*	*O. ligamentina*	*L. fasciola* female
RR-03	49	32	22	27	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. fasciola* female
RR-04	45	35	20	24	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. fasciola* female
RR-05	56	42	31	34	*L. fasciola*	Female	*L. fasciola*	*L. fasciola*	*L. cardium* female
RR-06	39	25	16	21	*L. fasciola*	Female	*L. fasciola*	*L. siliquoidea*	*L. fasciola* female
RR-07	48	33	23	26	*L. fasciola*	Female	*L. fasciola*	*L. fasciola*	*L. fasciola* female
RR-08	40	28	17	18	*L. fasciola*	Female	*L. fasciola*	*L. fasciola*	*L. fasciola* female
RR-09	83	59	39	50	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. fasciola* female
RR-10	45	29	19	24	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. cardium* female
RR-11	66	43	29	31	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. fasciola* female
RR-12	38	24	25	17	*L. fasciola*	Female	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-13	46	31	21	22	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. fasciola* female
RR-14	54	39	27	30	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. cardium* female
RR-15	47	25	20	25	*L. fasciola*	Female	*L. fasciola*	*L. fasciola*	*L. fasciola* female
RR-16	40	26	16	19	*L. fasciola*	Female	*L. fasciola*	*L. fasciola*	*L. fasciola* female

Appendix 1, continued.

Sample code	L (mm)	H (mm)	W (mm)	HL (mm)	Field species ID	Field sex ID	COI ID	PCA-LDA assignment: species	PCA-LDA assignment: species + sex
RR-17	47	31	19	23	*L. fasciola*	Female	*L. fasciola*	*L. cardium*	*L. cardium* female
RR-18	52	33	21	28	*L. fasciola*	Female	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-19	61	37	29	27	*L. fasciola*	Male	*L. fasciola*	*O. ligamentina*	*L. fasciola* male
RR-20	47	31	19	22	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-21	47	32	21	18	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-22	46	30	19	19	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-23	57	38	24	23	*L. fasciola*	Male	*L. fasciola*	*L. cardium*	*L. fasciola* male
RR-24	43	28	18	17	*L. fasciola*	Female	*L. fasciola*	*L. fasciola*	*L. fasciola* female
RR-25	73	47	34	33	*L. fasciola*	Male	*L. fasciola*	*L. cardium*	*L. fasciola* male
RR-26	66	45	27	31	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-27	51	35	23	22	*L. fasciola*	Male	*L. fasciola*	*O. ligamentina*	*L. fasciola* male
RR-28	47	32	20	23	*L. fasciola*	Male	*L. fasciola*	*O. ligamentina*	*L. fasciola* male
RR-29	52	33	19	21	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-30	59	41	26	22	*L. fasciola*	Male	*L. fasciola*	*O. ligamentina*	*L. fasciola* male
RR-31	50	30	21	19	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-32	39	27	14	14	*L. fasciola*	Male	*L. fasciola*	*L. siliquoidea*	*L. fasciola* female
RR-33	43	29	18	17	*L. fasciola*	Male	*L. fasciola*	*O. ligamentina*	*L. fasciola* male
RR-34	39	27	17	14	*L. fasciola*	Male	*L. fasciola*	*O. ligamentina*	*L. fasciola* female
RR-35	53	32	21	23	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-36	66	46	27	27	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-37	60	40	24	24	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. cardium* male
RR-38	54	36	22	21	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-39	36	22	14	14	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-40	40	26	17	16	*L. fasciola*	Male	*L. fasciola*	*L. fasciola*	*L. fasciola* male
RR-41	39	25	16	14	*L. fasciola*	Male	*L. fasciola*	*O. ligamentina*	*L. fasciola* female
RR-42	109	81	51	40	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-43	98	67	39	28	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* male
RR-44	76	52	34	27	*L. cardium*	Female	*L. cardium*	*L. fasciola*	*L. cardium* female
RR-45	86	60	38	28	*L. cardium*	Female	*L. cardium*	*L. fasciola*	*L. fasciola* female
RR-46	99	69	45	33	*L. cardium*	Female	*L. cardium*	*L. fasciola*	*L. fasciola* female
RR-47	94	70	41	43	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
RR-48	114	80	50	46	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-49	94	66	38	35	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
RR-50	114	77	46	41	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-51	94	59	42	32	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* male
RR-52	119	82	56	47	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* male
RR-53	92	62	39	29	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* male
RR-54	108	71	44	38	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
RR-55	97	77	47	43	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-56	87	56	38	31	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-57	97	70	37	30	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-58	94	68	40	29	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-59	97	63	41	32	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-60	109	71	47	35	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* male
RR-61	108	68	51	38	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
RR-62	136	95	60	54	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-63	112	82	53	42	*L. cardium*	Female	—	*L. cardium*	*L. cardium* female
RR-64	100	67	42	30	*L. cardium*	Female	—	*L. cardium*	*L. cardium* female
RR-65	106	78	56	40	*L. cardium*	Female	—	*L. fasciola*	*L. cardium* female
RR-66	108	84	50	40	*L. cardium*	Female	—	*L. cardium*	*L. cardium* female

Appendix 1, continued.

Sample code	L (mm)	H (mm)	W (mm)	HL (mm)	Field species ID	Field sex ID	COI ID	PCA-LDA assignment: species	PCA-LDA assignment: species + sex
RR-67	127	86	52	47	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-68	99	65	42	37	*L. cardium*	Female	—	*O. ligamentina*	*L. cardium* female
RR-69	121	76	50	44	*L. cardium*	Male	*L. cardium*	*L. siliquoidea*	*L. cardium* male
RR-70	116	72	52	39	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-71	142	89	61	58	*L. cardium*	Male	*L. cardium*	*O. ligamentina*	*L. cardium* male
RR-72	112	72	44	33	*L. cardium*	Male	*L. cardium*	*L. fasciola*	*L. cardium* male
RR-73	145	90	55	57	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-74	121	81	51	43	*L. cardium*	Male	*L. cardium*	*L. siliquoidea*	*L. cardium* male
RR-75	146	94	61	57	*L. cardium*	Male	*L. cardium*	*O. ligamentina*	*L. cardium* male
RR-76	89	59	34	28	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-77	89	54	31	25	*L. cardium*	Male	*L. cardium*	*L. fasciola*	*L. cardium* male
RR-78	147	94	59	62	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-79	123	75	50	44	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-80	115	71	50	41	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-81	135	82	58	49	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-82	141	92	59	52	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-83	114	77	48	39	*L. cardium*	Male	*L. cardium*	*L. fasciola*	*L. cardium* male
RR-84	112	69	43	34	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-85	104	63	43	37	*L. cardium*	Male	*L. cardium*	*L. siliquoidea*	*L. cardium* male
RR-86	106	70	42	30	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-87	118	76	52	39	*L. cardium*	Male	*L. cardium*	*O. ligamentina*	*L. cardium* male
RR-88	109	69	45	40	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
RR-89	128	82	53	46	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-90	124	78	52	44	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-91	135	83	53	52	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-92	105	66	37	40	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
RR-93	135	84	59	53	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-94	127	80	52	46	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-95	112	72	44	36	*L. cardium*	Male	—	*L. fasciola*	*L. cardium* male
RR-96	132	91	51	49	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-97	123	76	46	46	*L. cardium*	Male	—	*L. siliquoidea*	*L. cardium* male
RR-98	134	88	57	45	*L. cardium*	Male	—	*L. fasciola*	*L. cardium* male
RR-99	139	88	59	56	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-100	124	74	48	49	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-101	129	83	59	56	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-102	139	90	47	47	*L. cardium*	Male	—	*L. fasciola*	*L. cardium* male
RR-103	129	83	57	48	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-104	146	93	57	57	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
RR-105	137	85	49	54	*L. cardium*	Male	—	*L. siliquoidea*	*L. cardium* male
RR-106	130	80	54	52	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-107	125	76	46	40	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-108	133	82	50	50	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-109	136	85	51	49	*L. cardium*	Male	—	*L. fasciola*	*L. cardium* male
RR-110	137	89	60	50	*L. cardium*	Male	—	*L. siliquoidea*	*L. cardium* male
RR-111	130	87	53	47	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-112	127	82	52	51	*L. cardium*	Male	—	*L. fasciola*	*L. cardium* male
RR-113	135	86	59	48	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-114	135	85	57	53	*L. cardium*	Male	—	*L. fasciola*	*L. cardium* male
RR-115	124	77	50	40	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-116	119	74	50	37	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male

Appendix 1, continued.

Sample code	L (mm)	H (mm)	W (mm)	HL (mm)	Field species ID	Field sex ID	COI ID	PCA-LDA assignment: species	PCA-LDA assignment: species + sex
RR-117	141	86	52	56	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
RR-118	76	49	32	20	*L. cardium*	Male	—	*L. fasciola*	*L. cardium* male
RR-119	133	82	56	53	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
RR-120	125	84	52	47	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
RR-121	101	64	38	31	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
RR-122	39	23	16	8	*L. cardium*	Male	—	*L. fasciola*	*L. cardium* male
RR-123	118	72	51	43	*L. cardium*	Male	—	*L. cardium*	*L. cardium* male
GR-01	67	43	27	19	*L. cardium*	Male	*L. cardium*	*L. fasciola*	*L. fasciola* male
GR-02	112	74	49	36	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. fasciola* female
GR-03	93	64	42	28	*L. cardium*	Male	*L. cardium*	*L. fasciola*	*L. cardium* male
GR-04	49	31	23	15	*L. cardium*	Male	*L. cardium*	*L. fasciola*	*L. fasciola* male
GR-05	104	68	43	42	*L. cardium*	Male	*L. cardium*	*L. siliquoidea*	*L. cardium* male
GR-06	118	76	47	41	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
GR-07	120	78	55	39	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* female
GR-08	68	45	28	20	*L. cardium*	Male	*L. cardium*	*L. fasciola*	*L. fasciola* female
GR-09	114	75	48	37	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
GR-11	102	67	43	35	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* female
GR-12	95	61	35	28	*L. cardium*	Male	*L. cardium*	*O. ligamentina*	*L. fasciola* male
GR-13	75	42	23	28	*L. cardium*	Male	*O. ligamentina*	*L. siliquoidea*	*O. ligamentina*
GR-14	119	78	52	42	*L. cardium*	Male	*L. cardium*	*L. cardium*	*L. cardium* male
GR-15	97	62	40	30	*L. cardium*	Male	*L. cardium*	*L. siliquoidea*	*L. fasciola* female
GR-16	34	21	12	9	*L. cardium*	Male	—	*L. fasciola*	*L. fasciola* female
GR-17	109	81	56	45	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* female
GR-18	84	60	41	23	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. cardium* male
GR-19	87	61	46	25	*L. cardium*	Female	*L. cardium*	*L. siliquoidea*	*L. siliquoidea* female
GR-21	90	63	42	27	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
GR-22	71	49	32	18	*L. cardium*	Female	*L. cardium*	*L. fasciola*	*L. fasciola* male
GR-23	75	52	37	21	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*O. ligamentina*
GR-24	91	63	41	30	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
GR-25	96	67	44	31	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
GR-26	82	55	39	29	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
GR-27	115	82	59	41	*L. cardium*	Female	*L. cardium*	*O. ligamentina*	*L. fasciola* female
GR-28	71	46	31	21	*L. cardium*	Female	*L. cardium*	*L. fasciola*	*L. cardium* female
GR-29	102	70	46	39	*L. cardium*	Female	*L. cardium*	*L. siliquoidea*	*L. cardium* female
GR-30	75	49	34	17	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. fasciola* female
GR-31	93	64	41	32	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
GR-32	104	70	50	34	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. cardium* female
GR-33	82	54	36	23	*L. cardium*	Female	*L. cardium*	*L. cardium*	*L. fasciola* female
GR-34	93	66	43	38	*L. cardium*	Female	*L. cardium*	*L. siliquoidea*	*L. fasciola* female
GR-35	91	62	37	24	*L. cardium*	Female	*L. cardium*	*L. fasciola*	*L. fasciola* female
GR-37	65	45	29	14	*L. cardium*	Female	—	*O. ligamentina*	*L. cardium* female
GR-38	69	47	33	18	*L. cardium*	Female	—	*L. cardium*	*L. cardium* female
GR-39	79	52	35	24	*L. cardium*	Female	—	*L. siliquoidea*	*L. siliquoidea* female
GR-40	72	47	33	18	*L. cardium*	Female	—	*L. fasciola*	*L. cardium* female
GR-41	84	57	38	27	*L. cardium*	Female	—	*L. cardium*	*L. cardium* female
GR-42	60	39	26	15	*L. cardium*	Female	—	*L. fasciola*	*L. cardium* female
GR-43	66	45	31	16	*L. cardium*	Female	—	*L. siliquoidea*	*L. fasciola* female
GR-44	132	79	56	52	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
GR-45	139	86	52	68	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
GR-46	149	88	55	72	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*

Appendix 1, continued.

Sample code	L (mm)	H (mm)	W (mm)	HL (mm)	Field species ID	Field sex ID	COI ID	PCA-LDA assignment: species	PCA-LDA assignment: species + sex
GR-47	137	83	51	63	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
GR-48	74	44	26	20	*O. ligamentina*	—	*O. ligamentina*	*L. cardium*	*L. cardium male*
CR-01	100	60	34	49	*O. ligamentina*	—	*O. ligamentina*	*L. cardium*	*O. ligamentina*
CR-02	115	68	44	56	*O. ligamentina*	—	*O. ligamentina*	*L. siliquoidea*	*O. ligamentina*
CR-03	107	61	35	46	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-04	101	60	37	50	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-05	116	67	45	58	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-06	83	50	31	34	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-07	109	60	39	52	*O. ligamentina*	—	*O. ligamentina*	*L. siliquoidea*	*L. siliquoidea* male
CR-08	107	62	38	53	*O. ligamentina*	—	*O. ligamentina*	*L. fasciola*	*O. ligamentina*
CR-09	102	61	37	48	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-10	104	64	39	50	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-11	102	65	37	46	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-12	125	73	42	60	*O. ligamentina*	—	*O. ligamentina*	*L. fasciola*	*O. ligamentina*
CR-13	100	59	37	42	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-14	94	54	34	40	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-15	108	68	43	49	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-16	107	64	37	48	*O. ligamentina*	—	*O. ligamentina*	*L. fasciola*	*L. fasciola* male
CR-17	55	36	15	26	*O. ligamentina*	—	*O. ligamentina*	*L. fasciola*	*L. fasciola* male
CR-18	100	61	35	45	*O. ligamentina*	—	*O. ligamentina*	*L. cardium*	*L. cardium male*
CR-19	94	56	32	42	*O. ligamentina*	—	*O. ligamentina*	*O. ligamentina*	*O. ligamentina*
CR-20	103	62	36	50	*O. ligamentina*	—	*O. ligamentina*	*L. fasciola*	*O. ligamentina*
CR-21	44	26	13	15	*O. ligamentina*	—	—	*L. fasciola*	*O. ligamentina*
CR-22	104	61	37	46	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-23	80	47	27	36	*O. ligamentina*	—	—	*L. fasciola*	*O. ligamentina*
CR-24	90	57	29	44	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-25	89	53	29	37	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-26	80	49	28	40	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-27	114	65	38	49	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-28	118	72	42	55	*O. ligamentina*	—	—	*L. siliquoidea*	*O. ligamentina*
CR-29	96	59	33	41	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-30	97	61	37	44	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-31	103	58	34	40	*O. ligamentina*	—	—	*L. cardium*	*O. ligamentina*
CR-32	106	63	36	46	*O. ligamentina*	—	—	*L. fasciola*	*O. ligamentina*
CR-33	97	57	30	45	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-34	95	57	31	40	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-35	100	59	35	45	*O. ligamentina*	—	—	*L. fasciola*	*O. ligamentina*
CR-36	105	67	34	54	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-37	82	54	27	42	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-38	125	69	41	59	*O. ligamentina*	—	—	*L. fasciola*	*O. ligamentina*
CR-39	114	66	44	50	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-40	95	61	32	45	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-41	89	55	34	37	*O. ligamentina*	—	—	*L. siliquoidea*	*O. ligamentina*
CR-42	93	56	32	40	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-43	98	59	34	50	*O. ligamentina*	—	—	*L. cardium*	*O. ligamentina*
CR-44	102	62	37	44	*O. ligamentina*	—	—	*L. siliquoidea*	*O. ligamentina*
CR-45	113	63	45	50	*O. ligamentina*	—	—	*O. ligamentina*	*L. siliquoidea* male
CR-46	111	68	43	53	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-47	111	63	43	38	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-48	85	55	28	36	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*

Appendix 1, continued.

Sample code	L (mm)	H (mm)	W (mm)	HL (mm)	Field species ID	Field sex ID	COI ID	PCA-LDA assignment: species	PCA-LDA assignment: species + sex
CR-49	99	59	35	47	*O. ligamentina*	—	—	*L. siliquoidea*	*O. ligamentina*
CR-50	87	57	30	42	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-51	100	59	36	47	*O. ligamentina*	—	—	*L. cardium*	*O. ligamentina*
CR-52	91	54	32	42	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-53	87	55	34	40	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-54	89	56	28	41	*O. ligamentina*	—	—	*L. cardium*	*O. ligamentina*
CR-55	101	61	36	45	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-56	127	79	48	59	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-57	97	58	34	49	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-58	98	59	34	47	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-59	85	51	27	37	*O. ligamentina*	—	—	*L. fasciola*	*O. ligamentina*
CR-60	97	60	35	48	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-61	105	65	35	41	*O. ligamentina*	—	—	*L. cardium*	*O. ligamentina*
CR-62	121	77	46	56	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-63	94	61	32	45	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-64	98	61	37	46	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-65	93	61	34	49	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-66	84	55	30	35	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-67	97	57	32	41	*O. ligamentina*	—	—	*L. fasciola*	*O. ligamentina*
CR-68	94	55	31	42	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-69	86	55	30	44	*O. ligamentina*	—	—	*L. cardium*	*O. ligamentina*
CR-70	79	50	27	32	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-71	85	55	30	37	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-72	90	52	30	42	*O. ligamentina*	—	—	*L. siliquoidea*	*L. siliquoidea* male
CR-73	104	68	37	51	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-74	90	52	30	42	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-75	113	68	41	62	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-76	136	77	51	62	*O. ligamentina*	—	—	*L. cardium*	*O. ligamentina*
CR-77	114	69	39	59	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-78	111	66	38	50	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-79	100	64	35	46	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
CR-80	98	57	34	52	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
MAP-01	104	55	31	39	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-02	102	49	33	36	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-03	105	50	33	36	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-04	109	56	39	38	*L. siliquoidea*	Male	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* male
MAP-05	86	43	27	30	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-06	130	61	46	52	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-07	87	43	26	25	*L. siliquoidea*	Male	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* male
MAP-08	95	48	30	27	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-09	102	55	35	37	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-10	99	51	34	38	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-11	112	55	37	38	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-12	113	58	39	41	*L. siliquoidea*	Male	*L. siliquoidea*	*O. ligamentina*	*L. siliquoidea* male
MAP-13	122	61	43	55	*L. siliquoidea*	Male	*L. siliquoidea*	*O. ligamentina*	*L. siliquoidea* male
MAP-14	91	47	31	30	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-15	95	45	30	33	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-16	121	61	47	44	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-17	107	56	37	35	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-18	93	45	31	34	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male

Appendix 1, continued.

Sample code	L (mm)	H (mm)	W (mm)	HL (mm)	Field species ID	Field sex ID	COI ID	PCA-LDA assignment: species	PCA-LDA assignment: species + sex
MAP-19	127	66	46	59	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-20	100	52	30	33	*L. siliquoidea*	Male	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-21	92	49	31	35	*L. siliquoidea*	Female	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* female
MAP-22	77	41	31	24	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MAP-23	99	56	40	34	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-24	88	49	34	30	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MAP-25	97	51	31	38	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MAP-26	73	42	27	25	*L. siliquoidea*	Female	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* female
MAP-27	85	41	30	30	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-28	114	62	50	42	*L. siliquoidea*	Female	*L. siliquoidea*	*L. cardium*	*L. siliquoidea* female
MAP-29	87	47	32	29	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* male
MAP-30	117	57	42	40	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MAP-31	75	42	27	21	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MAP-32	107	61	45	49	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MAP-33	97	51	42	40	*L. siliquoidea*	Female	*L. siliquoidea*	*L. siliquoidea*	*L. siliquoidea* female
MAP-34	90	45	31	30	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-35	110	60	40	35	*L. siliquoidea*	Male	—	*L. cardium*	*L. siliquoidea* male
MAP-36	114	57	44	39	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-37	67	36	22	18	*L. siliquoidea*	Male	—	*L. fasciola*	*L. siliquoidea* male
MAP-38	125	62	46	48	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-39	88	48	29	27	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-40	95	52	35	33	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-41	77	39	26	24	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-42	103	55	36	36	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-43	87	44	29	28	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-44	98	50	34	33	*L. siliquoidea*	Male	—	*L. cardium*	*L. siliquoidea* male
MAP-45	79	39	27	23	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-46	55	30	19	14	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-47	83	47	28	25	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-48	92	47	32	30	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-49	95	50	35	35	*L. siliquoidea*	Male	—	*O. ligamentina*	*L. siliquoidea* male
MAP-50	103	48	32	39	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-51	92	47	31	29	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-52	89	50	35	27	*L. siliquoidea*	Male	—	*L. fasciola*	*L. siliquoidea* male
MAP-53	87	48	32	32	*L. siliquoidea*	Male	—	*L. siliquoidea*	*L. siliquoidea* male
MAP-55	160	103	72	81	*O. ligamentina*	—	—	*O. ligamentina*	*O. ligamentina*
MAP-56	158	103	73	79	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
MAP-57	155	100	75	70	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
MAP-58	129	84	54	61	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
MAP-59	131	91	64	59	*L. cardium*	Male	—	*L. cardium*	*L. cardium* female
MAP-60	122	83	49	51	*L. cardium*	Male	—	*O. ligamentina*	*L. cardium* male
MAP-61	133	84	61	65	*L. cardium*	Male	—	*O. ligamentina*	*O. ligamentina*

L = length, W, width, H = height, COI = cytochrome c oxidase subunit 1, PCA-LDA = principal component analysis–linear discriminant analysis.