CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Twenty-eighth meeting of the Animals Committee
Tel Aviv (Israel), 30 August-3 September 2015

Interpretation and implementation of the Convention

Species trade and conservation

Periodic Review of species included in Appendices I and II [Resolution Conf. 14.8 (Rev. CoP16)]

PERIODIC REVIEW OF *EPIOBLASMA SAMPSONII* (LEA, 1861)

1. This document has been submitted by the United States of America.[1]

2. At the 27th meeting of the Animals Committee (Veracruz, April 2014), the United States of America committed to the evaluation of *Epioblasma sampsonii* as part of the periodic review of the species included in the CITES Appendices.

3. This species is extinct, but formerly occurred in four States of the United States of America (Illinois, Indiana, Ohio, and Kentucky). During our review, we also consulted with species experts and State wildlife officials. Substantive comments were incorporated into this review.

[1] *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

DRAFT PROPOSAL TO AMEND THE APPENDICES
(in accordance with Annex 6 to Resolution Conf. 9.24 (Rev. CoP16), as amended)

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Seventeenth meeting of the Conference of the Parties
Cape Town (South Africa), XX–XX --- 2016

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CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Delist the extinct Wabash riffleshell *Epioblasma sampsonii* (also known as Sampson's naiad, Sampson's pearlymussel, or Sampson's riffleshell) from Appendix I in accordance with the Resolution Conf. 9.24 (Rev. CoP16). The species does not meet the biological criteria (Annex 1) or trade criteria (Annex 5) for Appendix I. The precautionary measures referred to in Annex 4 A1 and D are not considered to be required for this proposal. Paragraph 1A requires species listed on Appendix I to be first transferred to Appendix II so that the impact of any trade can be monitored. The United States considers that it is not necessary to first transfer the species to Appendix II as it is extinct, trade was not the cause of extinction, and it is never likely to be in trade. Paragraph D states that species regarded as possibly extinct should not be deleted from Appendix I if they may be affected by trade in the event of their rediscovery. Retaining the species on Appendix I with the annotation of 'possibly extinct' is not warranted because in the unlikely event of its rediscovery it will not be affected by trade.

[Note: This proposal may be modified taking into account the recommendations of the Extinct or Possibly Extinct Working Group.]

B. Proponent

[Blank]

C. Supporting statement

1. Taxonomy

1.1 Class: Mollusca/Bivalvia

1.2 Order: Unionoida

1.3 Family: Unionidae

1.4 Genus, species or subspecies, including author and year: *Epioblasma sampsonii* (I. Lea, 1861)

1.5 Scientific synonyms: *Dysnomia sampsoni* (I. Lea, 1861)

[See Graf and Cummings (2013) for a taxonomic history and additional synonyms.]

1.6	Common names:	English:	Sampson's pearlymussel, Sampson's naiad, Sampson's riffleshell, Wabash riffleshell
		French:	None
		Spanish:	None
		Local names:	See above
1.7	Code numbers:	None	

2. Overview

When the original CITES text was adopted in 1973, about 30 taxa of freshwater mussels were included in the Appendices (CITES 1977). Most of those taxa were U.S. endemics. Of these, most of the 25 taxa listed in Appendix I were also included as Endangered in the (U.S.) Endangered Species Act of 1973, as amended (ESA or Act; Service 2014b). While individual species circumstances varied, this categorization as Endangered reflected the negative impacts of commercial harvests for buttons during the 19th and 20th centuries, as well as the consequences of dams, sedimentation and pollution, and more recently exotic species. *Epioblasma sampsonii* in and of itself was included in this suite of species while probably extinct and without having to meet strict listing criteria agreed soon thereafter as Resolution Conf. 1.1 ("Berne Criteria") and most recently agreed as Resolution Conf. 9.24 (Rev. CoP16) on *Criteria for amendment of Appendices I and II* (CITES 2013). The current proposal seeks to address those issues raised initially in 1994 under the Ten-Year-Review process during the 9th Conference of the Parties (CoP9) and later during the Periodic Review of the Appendices (CITES 2011).

E. sampsonii, a freshwater mussel, has not been observed in the wild in approximately 100 years and is considered among species experts to be extinct. Described in 1861, *E. sampsonii* was known from the lower Ohio River drainage of the States of Illinois, Indiana, Ohio, and Kentucky, in the east-central portion of the United States, including the following rivers and their tributaries: Wabash River, White River, Ohio River, Kentucky River, and Green River. Our knowledge of the species is based on a small quantity of museum specimens obtained primarily at archaeological sites, and little is known about the biology or ecology of the taxon. Conservation threats to *E. sampsonii* and *Epioblasma* in general are poorly known, but species experts suggest that the construction of dams in the Ohio, Cumberland, and Tennessee River Basins drove *E. sampsonii* to extinction. The subsequent deterioration of water quality associated with the increase in human activities adjacent to rivers and streams likely only played a very minor role in the extinction of the species. *E. sampsonii* was harvested for human consumption by Native Americans beginning at least 10,000 years ago. During the late 1800s, *E. sampsonii* was also subject to generic commercial harvests of mussels for buttons and pearls, but this does not appear to have been a significant conservation threat. There is no current national utilization or domestic or international trade in the extinct taxon. Given that the extinction of *E. sampsonii* predates the modern era of wildlife research and conservation, there are no legal instruments or species management activities that specifically address this taxon other than the CITES Appendix I listing. In the unlikely event that *E. sampsonii* were rediscovered, there is no indication that trade would be a conservation threat or even occur. If necessary, *E. sampsonii* could be included on State or Federal lists of protected species. CITES protective measures are no longer needed for this species

3. Species characteristics

E. sampsonii is a North American freshwater mussel (Family Unionidae; Figure 1; formerly Family Unionoidae) and is extinct (Service 1984). This large family of mussels includes about 887 species (Graf and Cummings 2014). Unionidae are long-lived (10–90 years), highly fecund, and exhibit very low juvenile survivorship, but high adult survivorship (Mehlhop and Vaughn 1994:72). The genus *Epioblasma* includes about 25–30 species, several of which are extinct or in need of taxonomic/nomenclatural revision (Barnhart and Neves 2005; Buhay et al. 2002:389 & 385; Zanatta and Murphy 2008). Other than descriptive compilations based on museum specimens (e.g., Johnson 1978:205–206), little is known about the biology or ecology of *E. sampsonii*. The *Epioblasma* are among the genera of freshwater mussels most sensitive to anthropogenic disturbance and are frequently used as indicators to characterize the biological integrity of surface waters (Grabarkiewicz and Davis 2008:36). Except for the original species description (Lea 1861), and numerous findings or regional accounts that the species is extinct or was not observed during a particular field survey, there are no published scientific studies about the biology, ecology, behavior, or conservation status this species.

Note: There is no CITES standard reference for the Class Mollusca. According to several published taxonomic lists, however, there are about 25–30 taxa of *Epioblasma* (a North American endemic; Canada and United States). According to the current version of the CITES Appendices (CITES 2015; UNEP 2015),

there are 11 taxa of CITES-listed *Epioblasma*. Of these, four taxa (*E. sampsonii*, *E. torulosa gubernaculum*, *E. torulosa torulosa*, and *E. turgidula*) are extinct. Furthermore, of the 11 CITES-listed taxa of *Epioblasma*, nomenclatural issues have been raised about the validity of 3–4 taxa (*E. curtsii*, *E. sulcata*, *E. sulcata perobliqua*, and *E. walkeri*; ITIS 2015).

3.1 Distribution

E. sampsonii was known from the lower Ohio River drainage of Illinois, Indiana, Ohio, and Kentucky, in the east-central portion of the United States (Figure 2; Graf and Cummings 2013; Wen-lung Wu 1999; Clarke 1983:28; Strayer 2006:276; Turgeon et al. 1988:316). The common name Wabash riffleshell is based on a geographic distribution that included the Wabash River and its tributaries in south-eastern Illinois and central and southern Indiana. Only a few collecting sites are known with geographical certainty

3.2 Habitat

E. sampsonii occupied several freshwater rivers. While some of these rivers were shallow, slow-moving, and small- to medium-sized, others were large (200–300 m wide; NatureServe Explorer 2014, 2015). The technical term for this type of habitat is riffle or shoal (Stansbery 1970:20). The adjacent vegetation at that time was comprised of native prairies and riparian habitat. While *E. sampsonii* was still extant, human settlements in that area were small and widely dispersed. Until the early 1800s, the Wabash River and surrounding area likely was relatively unpolluted.

3.3 Biological characteristics

The biology of *E. sampsonii* and other Unionoidae is poorly known (Bogan 1993:605; Buhay et al. 2002:385). It should be noted, however, that young mussel larvae (known as glochidia) are parasitic for a few weeks on fishes and that some *Epioblasma* use small benthic fishes such as darters (e.g., *Etheostoma* spp.) and sculpins (e.g., *Cottus specus*) as hosts (Service 2014f). Cummings (1991) provides an excellent summary of the natural history of mussels in the State of Illinois, as do Gordon and Layzer (1989) for the Cumberland River in Tennessee.

3.4 Morphological characteristics

According to Wen-lung Wu (1999:22): “Shell solid, inflated, subquadrate or trapezoid, inequilateral with high full beaks, whose sculpture is feeble and corrugated; lunule wide but small; posterior ridge low, narrowly rounded, placed near the dorsal line; median ridge rounded, rarely showing vestiges of knobs. Surface rather smooth, usually with a concentric constriction at the rest marks. Epidermis straw color or yellow-green with numerous green rays, silky; teeth solid; pseudocardinals triangular, laterals double in each valve.”

Specimen example (Figure 1): Shell length = 31.3 mm; Shell height = 25.1 mm; and Shell breadth = 20.8 mm. Other specimens with larger shell lengths (of up to 41 mm) have also been reported (Stanbery 1970:16–17).

3.5 Role of the species in its ecosystem

E. sampsonii, like all mussels, removed organic matter from the water and purified the rivers and streams where it occurred (Haag 2012:42–43). The deposition of this material provided benefits to other organisms. Mussels in general also disturb the substrate and benefit other taxa by burrowing into river and stream bottoms. Through the decomposition of shells they also serve as an important source of calcium. They are also consumed as food by several species of fishes, turtles, birds, and mammals. Juvenile mussels are also consumed by many invertebrates.

4. Status and trends

4.1 Habitat trends

Beginning with the construction of dams and canals in the 1800s, habitat quality of *E. sampsonii* began to deteriorate as these structures impeded the movement of fish and the mussel larvae that were attached to the gills of these fish. These structures in several areas also negatively affected

water quality and flow patterns to the extent that *E. sampsonii* probably could not survive or disperse (Gammon 1998; Service 2014d).

4.2 Population size

No data available. According to Clarke (1983), *E. sampsonii* was relatively common in the Wabash River, but likely rare elsewhere. Given the limited number of collections outside of the Wabash River drainage, *E. sampsonii* likely was generally rare in modern times (B. Butler, in litt.).

4.3 Population structure

No data available.

4.4 Population trends

Based on analyses of shell middens, *E. sampsonii* was consumed by Native Americans beginning at least 10,000 years ago (Haag 2012:292). Continent-wide with one exception (Apalachicola ebonyshell, *Reginaia apalachicola*), there is no evidence of mussel species extinctions associated with prehistoric human use of these taxa. Changes in mussel assemblages (relative abundance), however, have been documented at the generic level for *Epioblasma* beginning about 5000 years ago and accelerating significantly about 1000 years ago. This depletion corresponds with human disturbance adjacent to the rivers and streams, including the practice of maize agriculture (Haag 2012:318–324; Peacock et al. 2005:549).

Based on interviews with mussel harvesters, *E. sampsonii* was last observed in the wild in the early 1900s (Clarke 1983:28). Functional extinction likely occurred during the 1930s–1940s (Haag 2012:333). The primary causes of extinction likely were the indirect effects of fragmentation due to habitat destruction caused by dams on large rivers in the region. The last known occurrence was in the Wabash River in south-eastern Illinois and central and southern Indiana.

E. sampsonii has been reported as extinct or not present at a particular site (locally extirpated) by numerous researchers, including the following: Bogan 2006:380; Bogan and Parmalee 1983; Burr et al. 2004; Clarke 1983:28; Cummings 1991:436; Cummings and Berlocher 1990:87; Cummings and Mayer 1992:170–171; Cummings et al. 1988:17–18; Cummings et al. 1992:122–123; Fisher 2006:105 & 107; Gordon and Layzer 1989; Haag 2009:119; Haag 2012:333; Illinois Endangered Species Protection Board 2011; Illinois Natural History Survey (Prairie Research Institute) 2014; Indiana Department of Natural Resources 2009, 2013; Indiana Natural Heritage Data Center 2013a,b,c; Kentucky State Nature Preserves Commission 1996,2000,2011,2012; Mankowski et al. 2012; Neves and Ahlstedt 2001:68; Neves et al. 1997:54; Page et al. 1992; Post 1991:469; Rawlins 2007:191; Schanzle and Cummings 1991; Schanzle et al. 2004; Schwartz 1999:86; Shasteen et al. 2012a,b; St. Joseph River Watershed Iniative 2006 [Appendix B Page F]; Stansbery 1970:20; State of Illinois 2005; State of Indiana 2006; State of Kentucky 2013a,b; Strayer 2006; Thompson 2004; Tiemann 2005; Turgeon et al. 1998:316; U.S. Army Corps of Engineers 2011:47–49; Service 2013a,2014a,c,d,e; Upper Wabash River Basin Commission 2014a:46; and Watters et al. 2009:89.

4.5 Geographic trends

E. sampsonii was endemic to the lower Ohio River drainage and likely was rare outside of the Wabash River drainage when initially described (Lea 1861; Cicerello and Schuster 2003; Clarke 1983). There is no suggestion in the literature that the species occurred in other river drainages or that the geographic range of this mussel had expanded or contracted, but widespread mussel surveys were not implemented until the 1970s.

5. Threats

Conservation threats to *E. sampsonii* and *Epioblasma* in general are poorly known, but international trade in the context of CITES does not appear to have been a factor. Rather, a deterioration of water quality associated with the construction of dams on large rivers that negatively affected mussel dispersal likely contributed to the decline of the species (Strayer 2006; Williams et al. 1993). During a study of fish in the Wabash River, for example, Gerking (1945; cited by Gammon 1998:231) attributed a decline in darter (a small fish; *Etheostoma* spp.; Family Centrarchidae) abundance to increased siltation from soil erosion, as well as the influence of city sewage, cannery waste, coal mine drainage, paper mill waster, and dairy-

products waste on local rivers and streams. These threats may also have negatively impacted *E. sampsonii* (Cole 2009:62; Gammon 1998:179–185 & 231–235). North American freshwater mussels, including *Epioblasma* spp. and possibly *E. sampsonii* were also harvested commercially for the button trade (beginning in the 1850s) and pearls (late 1800s; Barnhart and Neves 2005; Haag 2012:288–315). The magnitude of this trade, however, is not known. More recently, mussels in general have been threatened throughout their range by dams and stream channelization, habitat destruction, stream fragmentation and erosion (Haag 2012:316–390). Given these threats, it is likely that 25% or more of the North American mussel fauna will be extinct within about 20–25 years (Haag 2009:127).

6. Utilization and trade

6.1 National utilization

There is no current national utilization of the extinct *E. sampsonii.* The taxon previously was harvested for human consumption by Native Americans beginning at least 10,000 years ago. *E. sampsonii* was also subject to commercial harvests for buttons and pearls (Haag 2012). Highly regulated commercial harvests of other mussel taxa are permitted in about 13 States, including Kentucky and Tennessee (State of Kentucky 2013c; TWRA 2011; Neves 1999:471).

6.2 Legal trade

There is no reported CITES trade in *E. sampsonii*. Earlier versions of the UNEP-WCMC database suggested imports of *Epioblasma walkeri* and *E. torulosa rangiana* in 1995, 2003, and 2009 (UNEP WCMC 2014). We were able to confirm that these were data coding or reporting errors. These errors have been reported to UNEP-WCMC (M. Albert, U.S. CITES Management Authority, in litt. January 26, 2015). A single specimen of 1 shell of *Epioblasma torulosa rangiana* was seized prior to export by U.S. officials.

There is no legal domestic trade in either *E. sampsonii* (extinct) or *Epioblasma* spp. (extinct or federally-regulated) in the United States; Service 2014a,b,f).

6.3 Parts and derivatives in trade

Trade in parts and derivatives of *E. sampsonii* has not been clearly documented or quantified. Based on historical records, however, we know that domestic trade in *Epioblasma* spp. included the meat, shells (for buttons), and pearls (Haag 2012). The dearth of modern records, however, suggests that *E. sampsonii* probably was not involved in the mother of pearl trade (B. Butler, in litt.).

6.4 Illegal trade

There are no reports of illegal domestic or international trade in *E. sampsonii* or *Epioblasma* spp. currently in the context of commercial pearl harvests. Beginning in about 1985, however, there were extensive illegal harvests of other commercial mussel species such as *Amblema plicata*, *Megalonaias nervosa*, and *Quadrula quadrula* (non-CITES species) in the Tennessee River water (to the south of the Wabash River watershed; Haag 2012:310–315). Over time, law enforcement officials arrested and fined numerous individuals for these violations of State and Federal laws.

6.5 Actual or potential trade impacts

If extant, the impacts of any trade on the extinct *E. sampsonii* likely would be severe.

7. Legal instruments

7.1 National

E. sampsonii was listed as Endangered under the Endangered Species Act of 1973, as amended (Service 1976). Based on subsequent information indicating that the species is extinct, *E. sampsonii* was delisted in 1984 (Service 1984). The taxon is no longer a federally-protected species under the ESA (Service 2012,2013b).

Given that it is extinct, *E. sampsonii* is not listed as a protected species in any State where it formerly occurred (Illinois, Indiana, Ohio, and Kentucky). Some States, however, publish lists of extinct or

extirpated species, including *E. sampsonii*, that do not serve a regulatory purpose (e.g., Indiana and Kentucky).

7.2 International

[Does not apply.]

8. Species management

8.1 Management measures

Given that *E. sampsonii* is extinct, the species is not actively managed in the United States of America by either State or Federal agencies.

8.2 Population monitoring

Given that *E. sampsonii* is extinct, populations are not actively monitored in the United States of America by either State or Federal agencies.

8.3 Control measures

8.3.1 International

(i) CITES Appendix I (01/07/1975; UNEP 2014). There are no current quotas or suspensions in place for this species.

(ii) EU Wildlife Trade Regulations: Annex A [10/08/2013; Commission Reg. (EU) No 750/2013 of 29 July 2013]. There are no current suspensions or opinions for this species.

(iii) According to the IUCN Red List of Threatened Species, *E. sampsonii* is extinct (ver. 2.3; Bogan 2000). Although not a formal international control measure, many governments use the Red List as a guideline for the development of protected species lists

8.3.2 Domestic

United States of America: *E. sampsonii* was formerly classified as Endangered under the Endangered Species Act of 1973, as amended (Service 1976). It was delisted from the Endangered Species Act in 1984 (Service 1984) because it is extinct.

Several other taxa of *Epioblasma* occur in the United States or Canada, and potentially could pose identification problems. Of the 25–30 *Epioblasma* species, all are either e federally-protected or extinct (Service 2014b).

8.4 Captive breeding and artificial propagation

None, as the species is extinct.

8.5 Habitat conservation

There are habitat conservation activities at the Federal and State level to improve mussel habitat. Since this species is already extinct, however, it will not benefit from these activities.

8.6 Safeguards

Given that *E. sampsonii* is extinct, the species is not protected at either the Federal or the State level. Mussel populations throughout the United States of America, however, are closely monitored and discoveries of any extant populations of *E. sampsonii* would immediately generate appropriate management actions.

9. Information on similar species

Worldwide, there are approximately 887 species of mussels in the Unionidae family (Graf and Cummings 2014). In North America, there are approximately 300 species. To a non-species expert, these species superficially may appear to be similar given their sizes, shapes, and coloration. Several recent guides suggest that many species of North American mussels are quite similar in appearance to one another (for example: Cummings and Mayer 1992; Graf and Cummings 2014; Klocek et al. 2008; Watters et al. 2009; and Williams et al. 2008). Of the Mollusca/Bivalvia, there are approximately 30 taxa of CITES-listed mussels (Mytiloida/Mytilidae and Unionoida/Unionoidae) and clams (Veneroida/Tridacnidae; CITES Appendices I, II and III; valid from 5 February 2015; CITES 2015).

10. Consultations

Earlier drafts of this document were shared with the following offices/species experts and their comments were incorporated into this text: Kelly Bibb (U.S. Fish and Wildlife Service, Atlanta, Georgia); Bob Butler (U.S. Fish and Wildlife Service, Asheville, North Carolina); Brant Fisher (Indiana Department of Natural Resources, Edinburgh, Indiana); Nathan Eckert (U.S. Fish and Wildlife Service, Genoa, Wisconsin); Wendell R. Haag (U.S. Forest Service, Frankfort, Kentucky); Jess Jones (U.S. Fish and Wildlife Service, Blacksburg, Virginia); and Leroy Koch (U.S. Fish and Wildlife Service, Frankfort, Kentucky). We gratefully acknowledge and appreciate their comments. We also extend our thanks to Wen-lung Wu for allowing us to use his photograph included here as Figure 1.

11. Additional remarks

11.1 In accordance with Annex 6 on *Format for proposals to amend the Appendices* of Resolution Conf. 9.24 (Rev. Cop16) *Criteria for amendment of Appendices I and II*, there are potential look-alike problems (criterion A of Annex 2b) between *E. sampsonii* and all other *Epioblasma* (about 25–30 species) in that the main differences between the species are size and geographic distribution.

11.2 The systematics and classification of Unionoidae are in a state of flux (Graf and Cummings 2007:1 of 24). For this reason, estimates of the number of taxa vary widely among species experts, as well as the nomenclature used (e.g., species level vs. subspecies level).

11.3 At CoP9, the United States introduced a suite of four proposals with regard to Unionidae (CoP9 Prop. T2-T3-T4-T5 (CITES 1996a). Given the nature and magnitude of the proposed changes, including a proposal to annotate *E. sampsonii* with p.e. (“probably extinct”), several Parties, as well as the Secretariat, objected to the measures (CITES 1996b,c). Eventually the measures were withdrawn (CITES 1996d).

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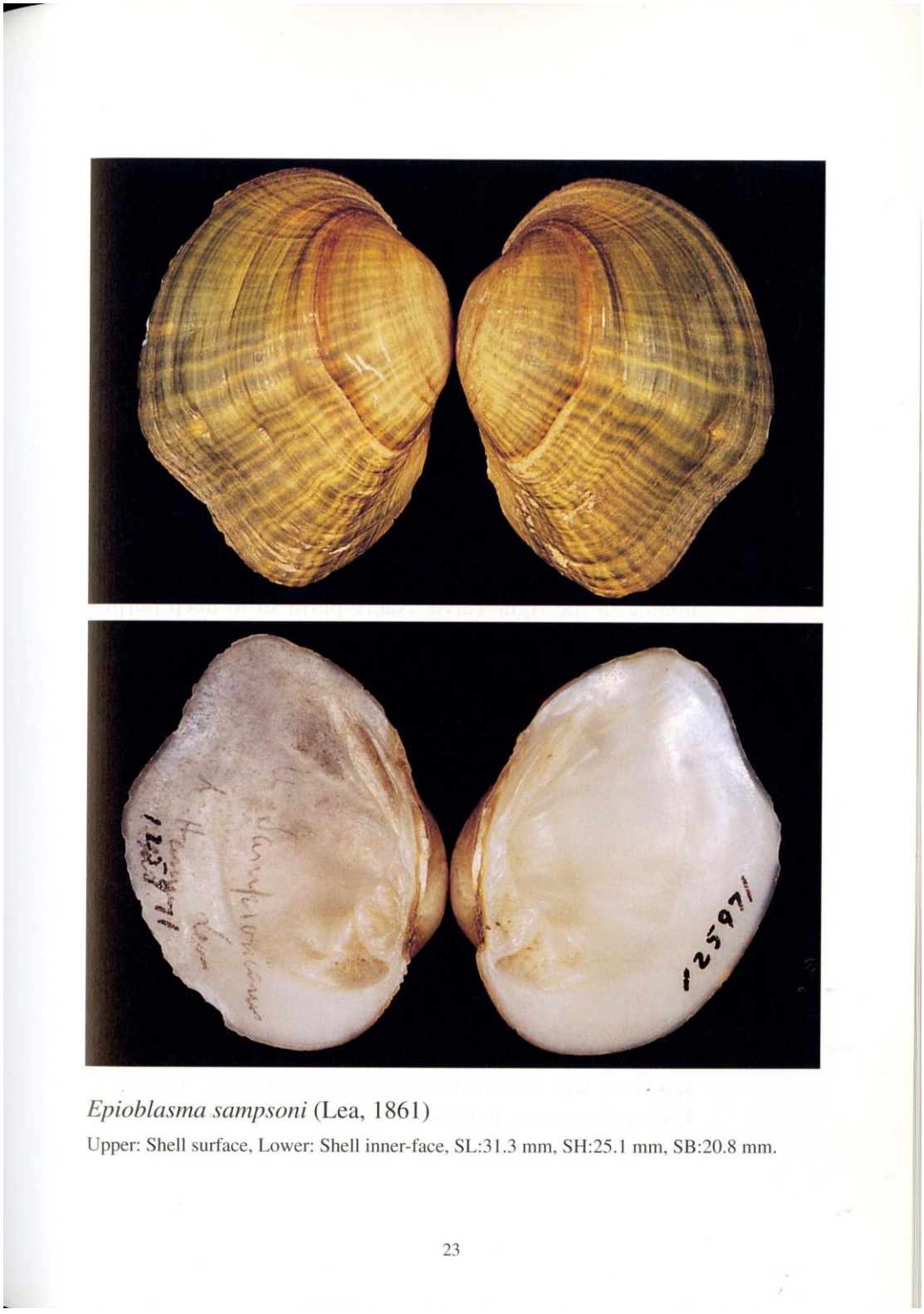

Epioblasma sampsoni (Lea, 1861)

Upper: Shell surface, Lower: Shell inner-face, SL:31.3 mm, SH:25.1 mm, SB:20.8 mm.

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Figure 1. Wabash Riffleshell *Epioblasma sampsonii* (male).
Source: Wen-lung Wu. 1999. Mollusks in CITES. Academia Sinica and Council of Agriculture. Pp. 22–23.
(Used with permission)

Figure 2. The geographic range of *Epioblasma sampsonii* consisted of the lower Ohio River drainage in the States of Illinois, Indiana, Ohio, and Kentucky.
Map source: www.freeworldmaps.net