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A brief history of the freshwater mussels (Unionoidea) of the Housatonic River system

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by

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The freshwater mussels, colloquially called "clams", and historically and variously known as the freshwater najades (also spelled naiades) and pearly mussels, are the largest and most conspicuous of all the freshwater mollusks. They are placed taxonomically in the molluscan order Unionoidea and within the business of studying freshwater mussels are often called the "Unios". All freshwater mussels share a single ominous problem, a gradual and clearly perceptible decline in their distribution and abundance. The development of an industrial society has resulted in the ravaging of many great inland waterways and the major river systems. In east and central North America, where the greatest number of species live, rivers and streams have been altered by dams and channel digging and polluted by septic and industrial waste.

In southern New England, including the states Massachusetts, Connecticut, and Rhode Island, the decline of mussel populations did not become apparent until the 1980's. The region historically contained at least 12 species. Interestingly, an additional species, Lasmigona compressa Lea, may have once lived in the upper Hoosic River, A Hudson River system tributary that drains a portion of the Taconic Mountains in southern New England. This species currently survives in Hoosic River tributaries in New York and its extension into Massachusetts would have represented the only occurrence of an Interior Basin species of freshwater mussel in southern New England. If formerly in Massachusetts, L. compressa would have become the region's first extirpated freshwater mussel species.

Alasmidonta heterodon and Lampsilis cariosa have just about vanished from their former habitats in southern New England. Although once common in the Connecticut River below the Turners Falls fall line, as evidenced by large museum lots, and also

present but probably never common in the Housatonic River, the species has nearly succumbed to a century of insult. It is known to survive in the Connecticut River in Northampton, Massachusetts and in an artificial environment, an Eighteenth Century age power canal system built by Irish immigrants in the city of Holyoke, Massachusetts; an irony when considering that it was human activity that made its former natural habitat inhospitable.

An early enthusiast, James H. Linsley, of Connecticut Mollusca was busy amassing a collection of local shells, both marine and freshwater. He was a pastor in Baptist churches in Milford and Stratford after helping establish the first Baptist church in New Haven. Educated at Yale, Linsley pursued collecting natural history objects but unfortunately his death precluded an anticipated catalog. The Yale Natural History Society published his list posthumously (Linsley, 1845) and a short while later Gould (1848) provided descriptions of those species Linsley believed to be new to science. Among the descriptions provided by Gould were three freshwater bivalves, two in the family Unionidae and one in the family Sphaeriidae. One of the freshwater mussels was Anodonta housatonica from the lower Housatonic River. Anodonta housatonica was eventually synonymized with Anodonta implicata (Simpson, 1900; Johnson, 1970), a common species found in the larger rivers of southern New England. Based on current taxonomic usage and distributional data, Linsley (1845) recorded 12 species of freshwater mussels (Unionoidea) from Connecticut (Table 2). Later, Jacot (1923) made collections in drainages around Monroe, Connecticut, including a section of the Housatonic River that flows through the town and crossed by the "Zoar bridge." At this locality he found five species of unionids (Table 3) but remarked that recent construction of a dam at the site

had eliminated at least the mussel fauna. In the Housatonic River basin, Smith (1982) listed a few collections from source tributaries of the upper most portions the drainage. Specimens collected during the surveys discussed above, plus private collections made over the 60 years, have been deposited into regional museums including the American Museum of Natural History in New York, the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, the National Museum of Natural History, Washington, D.C., and the Museum of Zoology, University of Massachusetts, Amherst, Massachusetts.

Historically, therefore, about 11 or 12 species of freshwater mussels lived in the Housatonic River system. The exact number is uncertain because certain localities in the historical literature are unclear or species that should occur in the system have not been reported in the published literature. One example is Lampsilis radiata, a species formerly common throughout New England but never previously reported form the Housatonic River. Recent surveys have turned up the species in the Housatonic River in Connecticut but one must wonder why they were not observed before. It is unquestionably on the decline in southern New England and should be listed for protection. Another species whose history in the Housatonic River is unclear is Margaritifera margaritiera. This species has certain habitat requirements that would preclude its presence in the Housatonic River system, the most significant its preference for slightly acidic (natural) waters. The Housatonic River and many of its tributaries originate in Ordovician limestones and the water generally has a slightly basic pH. However, Linsley (see Table) listed this species from the "Trumbull River," presumably in southwestern Connecticut. Currently, no such river is recognized in the Connecticut Water Supply Drainage atlas and it remains

uncertain if the river mentioned by Linsley occurs in the Housatonic River system. Until recently this unresolved record represented the only possibilty for a Housatonic River drainage population of M. margaritifera. However, as of late 1998, a very small population of M. margaritifera was discovered in Konkapot Brook, Stockbridge, Massachusetts. Several species of mussels have fared far less fortunately. Among the 11 or 12 species that once lived in the Housatonic River and its tributaries, four have disappeared. These four are A. heterodon, A. varicosa, L. cariosa, and "L." ochracea. All four are at various levels of endangerment in southern New England and two are considered to be nearly extinct. In fact, these four species were gone from the Housatonic River by the end of the 19th Century, there being no records of their occurrence after Linsley's collections were made.

There has been some confusion as to where exactly these species lived in the Housatonic River and if what taxa Linsley collected were actually these species. Fortunately, Linsley's specimens of nearly all of these species exist. The United States National Museum contains parts of the Linsley collection, and among the collection are L. cariosa, "L." ochracea and A. heterodon from the Housatonic River (Fig. 1). Examination of these specimens has help clarify some confusion as to where exactly in the river Linsley found them. For many years it was assumed that Linsley collected most of this material in the vicinity of Kent, Connecticut (e.g. Johnson, 1947). This assumption probably originated when Linsley's collection was incorporated into the Isaac Lea collection at the National Museum and either he or someone in the institution came to the conclusion that Linsley worked in the southern Litchfield County region of Connecticut. A study (Smith, 1994) of the prosobranch gastropods of the lower Housatonic River that attempted to correlate existing species with those reported by Linsley (1845) revealed that many of

Linsley's specimens were collected in the vicinity of Corum, presumably a village in the town of Shelton, much farther downstream on the Housatonic River than Kent. Examination of the National Museum bivalves sheds additional light on the matter. Although the labels accompanying the specimens indicates Kent as the locality, there is writing on the inside of a few valves of L. cariosa and "L." ochracea stating "Stratford" or "near Stratford". This would place the original collection localities nearer Shelton than Kent and thus well downstream in the river and in the tidal zone (Fig. 2). There are no indications associated with the A. heterodon specimens other than Housatonic River, either on the label or on the shells. Thus the actual locality within the river of the these specimens remains unknown.

In light of the destruction of the Housatonic River by industrial growth it is amazing that mussel species survive. As recent studies attest, populations of several species of freshwater mussels survive in the basin a. d some species range as far upstream as Pittsfield. Beyond the investigations of Smith (1982, unpub.), surveys conducted recently by private individuals, Northeast Utilities personnel in areas near power producing dams in Connecticut, and Woodlot Alternatives' scientists in Massachusetts, six species (Table 4) are known to persist in the Housatonic River system, five within the river itself. Although the populations of these species are small and a few possibly relict, all five species may be able to recover under ideal conditions. Two species, A. undulata and S. undulatus, survive in the river throughout much of its length (Fig. 2) and extend into the Massachusetts section as far upstream as Pittsfield and Great Barrington, respectively.

The future might see a change in the representation of freshwater bivalve moolusks in the Housatonic River system. Evidence provided by a single dead shell in Stockbridge Bowl, which drains to the Housatonic River, of Corbicula fluminea, the asian clam, suggests that this species may be present in the system. It is well established in the lower Connecticut River where it has become the dominant mollusk. Another other alien species now present in the Housatonic River drainage is the dreaded zebra mussel, Dreissena polymorpha. It and its sibling, the quagga mussel, Dreissena bugensis, both in the bivalve family Dreissenidae have become established in North America. Until recently, neither species was known to occur in southern New England, however, in late 1998, a population of D. polymorpha was discovered in East Twin Lake, Salisbury, Connecticut, which drains to the Housatonic River. An exotic relative of these two plagues on North America fresh waters, the dark falsemussel, Mytilopsis leucophaeata (Conrad), already resides in southern New England (Smith and Boss, 1996) but probably does not pose the degree of threat exhibited by Dreissena spp.

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Table 1. Species of freshwater mussels (Unionoidea) currently listed under various categories of threat in Connecticut and Massachusetts.

Species	endangered	threatened	special concern
Alasmidonta heterodon[1]	X (CT, MA)		
Alasmidonta undulata			X (MA)
Alasmidonta varicosa	X (CT, MA)		
Ligumia nasuta			X (CT, MA)
Ligumia ochracea			X (CT, MA)
Lampsilis cariosa	X (MA)		X (CT)[2]
Margaritifera margaritifera			X (CT)
Strophitus undulatus			X (MA)

[1] Also federally listed as endangered.
[2] Considered extirpated, if found alive then would transfer to endangered.

Table 2. Species of freshwater mussels (Unionoidea) found by Linsley (1845) in the Housatonic River system Connecticut, listed as they appeared, and their current nomenclature.[1]

Linsley (1845)	Current
Unio cariosus, Say	Lampsilis cariosa (Say)
Unio complanatus, Solander, sp., Lea, and a variety finely rayed	Elliptio complanata (Lightfoot)
Unio heterodon, Lea	Alasmidonta heterodon (Lea)
Unio ochraceus, Say	"Lampsilis" ochracea (Say)[2]
Alasmodonta arcuata, Barnes	Margaritifera margaritifera (Linn.)
Alasmodonta marginata, Say	Alasmidonta varicosa (Lamarck)[3]
Alasmodonta undulata, Say	Alasmidonta undulata (Say)
Anodonta fluviatilis, Dillwyn, sp., Lea	Pyganodon cataracta (Say)
Anodonta Housatonica, Nobis (Gould, 1848)	Anodonta implicata Say
Anodonta marginata, Say	Pyganodon cataracta Say
Anodonta undulata, Say.	Strophitus undulatus (Say)

[1] Nomenclature follows Johnson (1970).
[2] Correct genus being determined (Smith, in press).
[3] Alasmidonta marginata *senso stricto* does not occur in New England and all early New England records of this species have been assigned to A. varicosa.

Table 3. Species of freshwater bivalve mollusks found by Jacot (1923) in the Housatonic River and their modern nomenclature.[1]

Jacot (1923)	Current
Unio complanatus (Dillwyn)	Elliptio complanata (Lightfoot)
Alasmidonta marginata (Say)	Alasmidonta varicosa (Lamarck)
Alasmidonta undulata (Say)	Alasmidonta undulata (Say)
Anodonta cataracta Say	Anodonta cataracta Say
Strophitus edentulus (Say)	Strophitus undulatus (Say)

[1] Nomenclature follows Johnson (1970) for unionoid mussels, Burch (1975) for veneroid clams.

Table 4. Species of freshwater mussels known to persist in the Housatonic River basin.

	Connecticut	Massachusetts
Alasmidonta undulata	✓	✓
Elliptio complanata	✓	✓
Lampsilis radiata	✓	
Margaritifera margaritifera		✓[1]
Pyganodon cataracta	✓	✓
Strophitus undulatus	✓	✓

[1] Reported only from Konkapot Brook, Stockbridge.

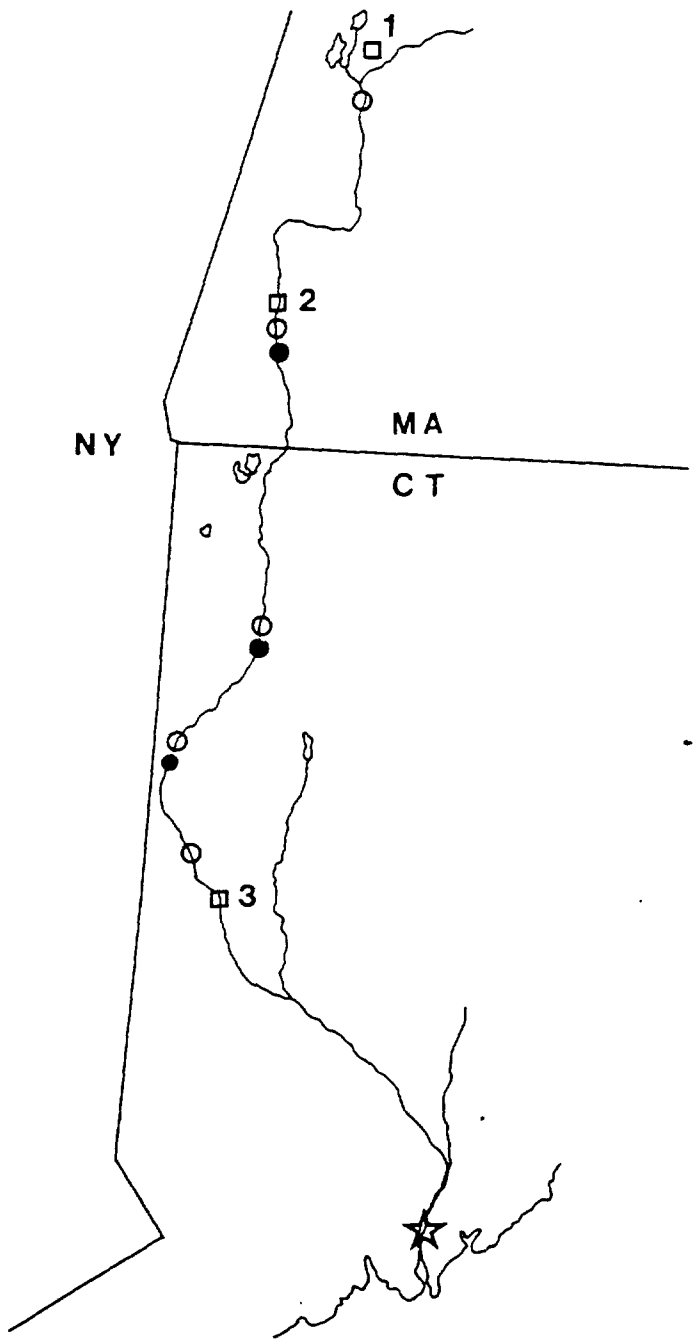

Figure 2. Map of the Housatonic River showing distribution of state (MA or CT) listed species. Numbered open squares correspond to (1) Pittsfield, (2) Great Barrington, (3) New Milford. Open circles, A. undulata; closed circles , S. undulatus; star, presumed locality of Linsley's collection of L. cariosa and "L." ochracea. The location of A. heterodon in the river can not be determined with existing data.

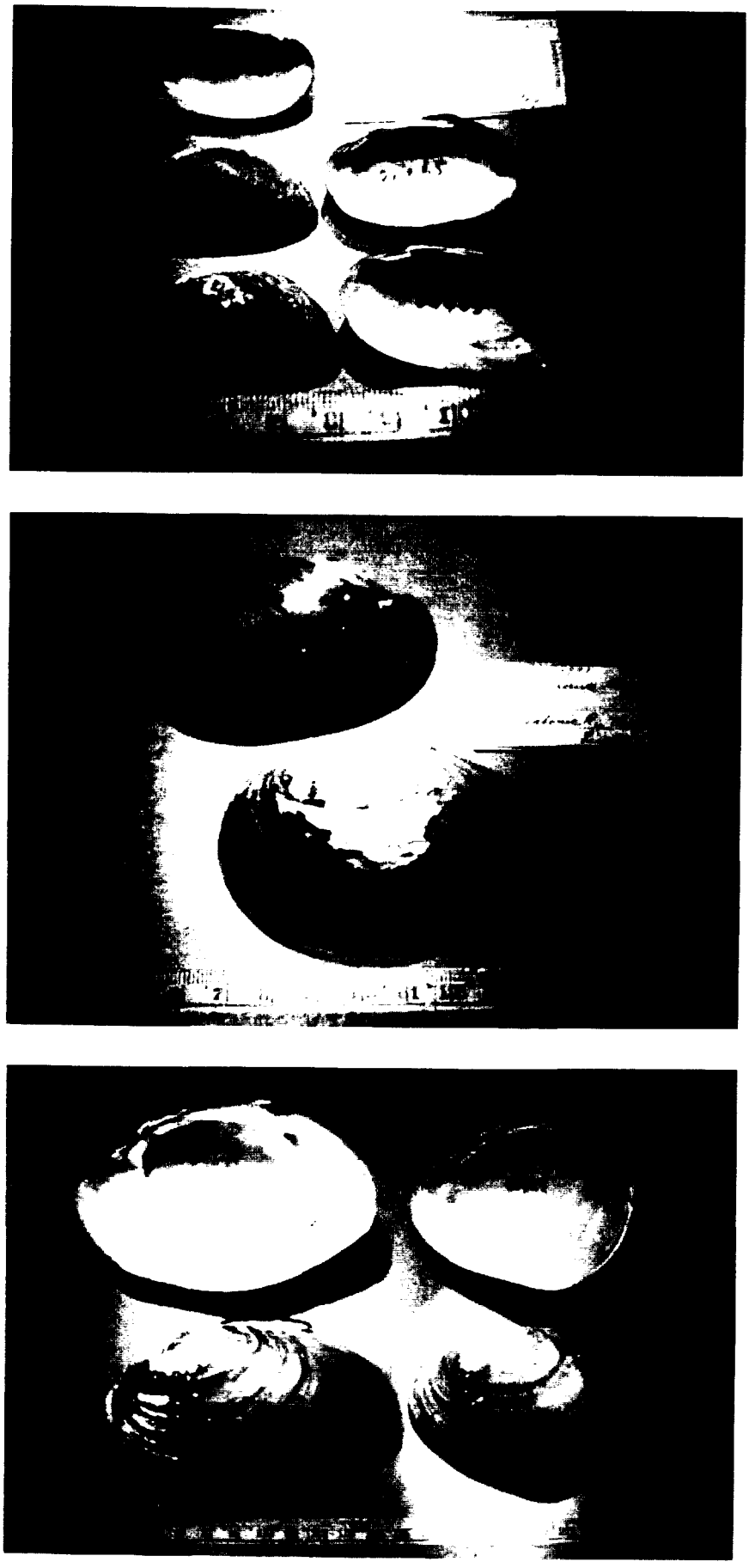

Figure 1. Top to bottom: Alasmidonta heterodon, "Lampsilis" ochracea, Lampsilis cariosa.