

Key-PA

Bogan
1993

WORKSHOP ON FRESHWATER BIVALVES OF PENNSYLVANIA

Presented by

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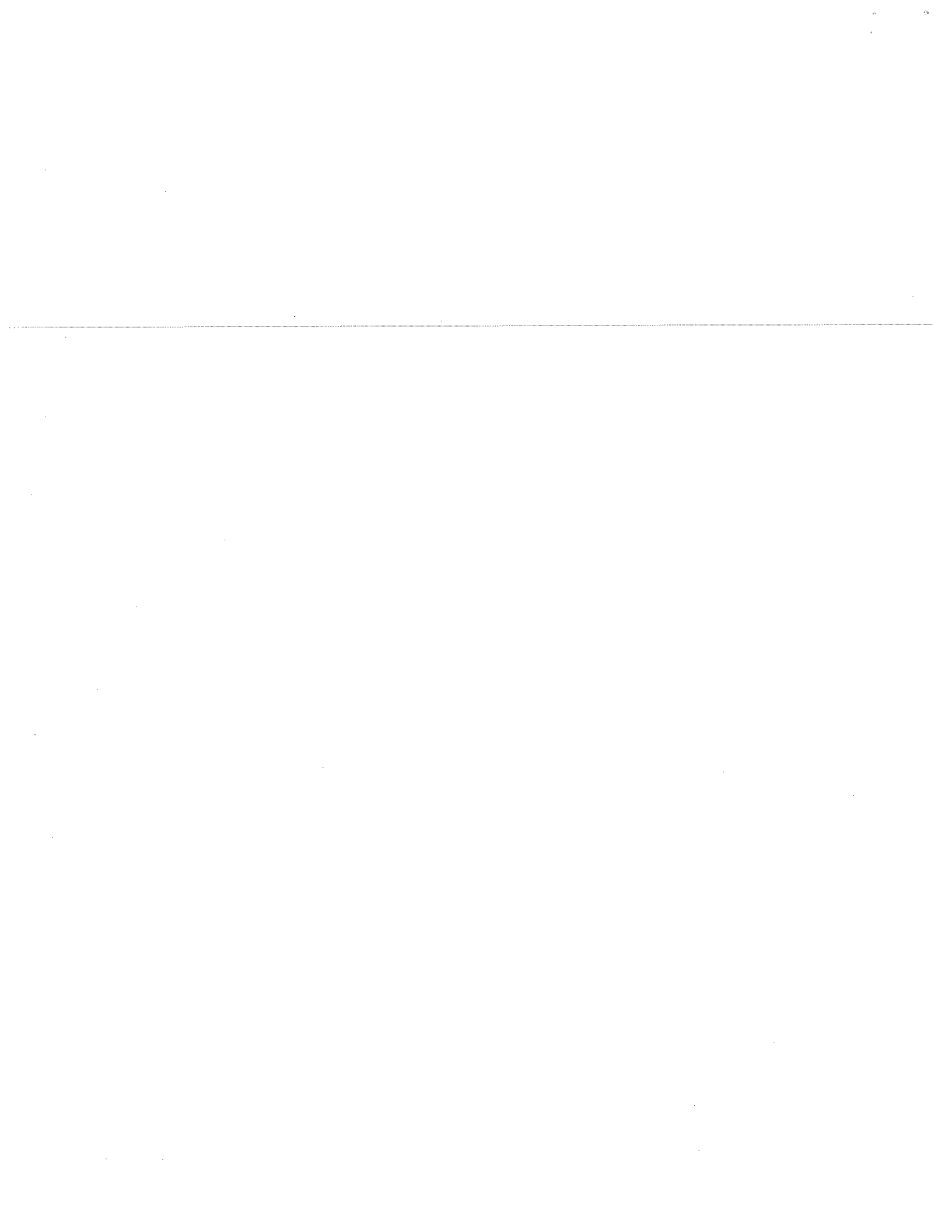
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Carnegie Museum of Natural History
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Pittsburgh, PA

May 6-7, 1993



Figures of
general shapes
& Beak sculpture

Casmeigan Subv...
NOT in Key for Ohio

Freshwater Bivalves of Pennsylvania

- comment
- NOT confuse with
concentric Annuals
Add to diagram
19
Wing

KEY TO THE FRESHWATER BIVALVES OF PENNSYLVANIA

- 1 a. shell with a very sharp posterior ridge, shaped like a marine mussel, *Mytilus*, generally less than 30 millimeters, and attached to a hard substrate with byssal threads (fig. 4) *Dreissena polymorpha*
- b. animal without byssal threads attaching adult animal to substrate, with or without teeth but not with above shape 2
- 2 (1b) a. valves with cardinal teeth and two sets of lateral teeth 3
- b. valves with one set of lateral teeth and pseudocardinal teeth or without teeth (Margaritiferidae, Unionidae) 4
- 3 (2a) a. valves with serrated lateral teeth (fig. 5) *Corbicula fluminea*
- b. valves with smooth lateral teeth Sphaeriidae
- 4 (2b) a. specimens from the Ohio, Genesee or Lake Erie basins 5
- b. specimens from the Delaware, Susquehanna or Potomac River basins 51
- 5 (4a) a. surface covered with pustules, knobs, or ridges 6
- b. surface smooth, without pustules or ridges 17
- 6 (4a) a. surface with pustules or knobs, only 1 or a few extending on to or over the beaks 7
- b. surface with ^{Large} pustules or knobs, a few to many extending onto or over the beaks 12
- c. surface partially covered with ridges or flutings 16
- 7 (6a) a. Curve of side of valve evenly rounded, without a sulcus or median depression 8
- b. curve of side of valve interrupted by a median sulcus or depression, many small tubercles or pustules mostly anterior to the sulcus (fig. 62) *Quadrula quadrula*
- 8 (7a) a. nacre white 9
- b. nacre purple, beak cavity deep and narrow, pustules rather small covering the posterior two-thirds of the shell (fig. 18) *Cyclonaias tuberculata*
- 9 (8a) a. surface with 2 or 3, elongated knobs arranged in a single vertical row on the center of the disc of the shell (fig. 46) *Obliquaria reflexa*
- b. surface with several to many tubercles or pustules covering half to nearly all of the valve . 10
- 10 (9b) a. shell rounded, nearly covered with pustules, uniformly brownish 11
- b. shell rounded, nearly covered with pustules, yellowish with dark green rays, beak cavity shallow, shell strongly inflated, posterior ridge high (fig. 19) *Cyprogenia stegaria*
- 11 (10a) a. beak cavity deep, shell moderately inflated, posterior ridge rounded, typically broad green strip from umbo down to the center of the disc (fig. 61) *Quadrula pustulosa*
- b. beak cavity shallow and open, shell moderately inflated, epidermis evenly brown, no rays, nacre white to pink (fig. 50) *Plethobasus cooperianus*

5
E. tonalsoni
Magane
could
go to 6b

Casmeigan
complanata
of the
beaks

moderately
deep see pg 40

- 12 (6b) a. pustules, tubercles or knobs numerous and scattered over the surface of the shell (fig. 66) *Tritogonia verrucosa*
- b. pustules or knobs not scattered but arranged mostly in a diagonal row 13
- 13 (12b) a. tubercles few in number, forming pronounced knobs on the angular poster^{ior} ridge 14
- b. tubercles or pustules numerous, broad, low and arranged in a diagonal row from umbo to posterior ventral margin 15
- 14 (13a) a. tubercles few, forming a row of large knobs on the angular posterior ridge with a few smaller pustules anterior to the ridge, shell squarish (fig. 60) *Quadrula metanevra*
- b. tubercles few, appearing as low, rounded knobs along posterior ridge; shell elongated, thick, rhomboid (fig. 59) *Quadrula cylindrica*
- 15 (13b) a. shell elongate-ovate, posterior end sharply pointed; umbones inflated, epidermis a uniform waxy yellow (fig. 51) *Plethobasus cyphus*
- b. shell rounded, posterior end blunt, epidermis dull yellow or green (fig. 25) *Epioblasma torulosa*
- 16 (6c) a. surface with large diagonal ridges or flutings, lateral teeth typical and well developed (fig. 12) *Amblema plicata*
- b. surface of posterior margin only with ridges or flutings, shell compressed laterally, lateral teeth represented by a thickening of the hinge (fig. 39) *Lasmigona costata*
- 17 (5^b) a. hinge with well-developed pseudocardinal and lateral teeth 24
- b. hinge with either lateral or pseudocardinal teeth, or both, missing or poorly developed ... 18
- 18 (17b) a. hinge edentulous and without thickening, shell often thin and fragile 19
- b. hinge with thickening or developed pseudocardinal teeth 21
- 19 (18a) a. beak sculpture consisting of distinct double-looped ridges 20
- b. beak sculpture consisting of subconcentric bars diagonal to the hinge line, shell thin, long-elliptical, somewhat inflated; posterior end pointed (fig. 17) *Anodontoides ferussacianus*
- 20 (19a) a. shell nearly ovate and slightly thickened, umbones prominent often inflated shell, epidermis greenish, yellowish or brownish, nacre white, often washed with salmon or pink (fig. 14) *Pyganodon [=Anodonta] grandis*
- b. shell very thin, no umbonal swelling and not rising above hinge line, hinge line perfectly straight, very minute beak sculpture; epidermis bright green with rays (fig. 15) *Utterbackia [=Anodonta] imbecillis*
- 21 (18b) a. hinge without distinct lateral teeth, but with pseudocardinal teeth well developed 23
- b. hinge with distinct but fine lateral teeth or hinge line thickened 22

Lasmigona
compressed
is thin
with
developed
stress
necessary
tooth

- 22 (21b)
 - a. hinge with well-developed, slight lateral teeth, pseudocardinal teeth compressed, elevated (fig. 38) *Lasmigona compressa*
 - b. left valve with small interdental tooth, giving the appearance of three pseudocardinal teeth, shell more or less compressed and subrhomboid in outline, epidermis dark green with numerous green rays or brown, adult shell less than 65 mm long, posterior ridge rounded (fig. 40) *Lasmigona subviridis*
 - c. hinge line thickened, pseudocardinal teeth are small tubular thickenings, beak sculpture 3-4 heavy bars, shell moderately thick, inflated, somewhat rhomboid, nacre usually salmon or pinkish in umbonal area (fig. 64) *Strophitus undulatus*
 - d. pseudocardinal teeth reduced or absent, lateral teeth absent, nacre has a purple color in the area under the umbo and in the very shallow beak cavity (fig. 29) *Hemistena lata*
- 23 (21a)
 - a. pseudocardinal teeth irregular tubercular swellings; lateral teeth represented by elevated ridges; shell greatly compressed, alate, nacre white (fig. 37) *Lasmigona complanata*
 - b. pseudocardinal teeth compressed in right valve or tubercular swelling in left valve, lateral teeth are only a thickening of the hinge line, epidermis greenish or yellowish with many green rays, steep posterior slope, fine radial ridges on posterior slope (fig. 8) *Alasmidonta marginata*
 - c. single compressed pseudocardinal tooth in each valve, lateral teeth absent, posterior ridge low and rounded, shell elongate, shell length less than 35 mm (fig. 63) *Simpsonaias ambigua*
- 24 (17a)
 - a. shell alate, compressed, usually thin 25
 - b. shell not alate, usually solid, flattened to moderately inflated 26
- 25 (24a)
 - a. pseudocardinal teeth thin, usually sharp but weak not ragged, alate wing forming a straight line with the umbones, epidermis dull, yellowish to yellowish brown (fig. 41) *Leptodea fragilis*
 - b. pseudocardinal teeth thick, strong, slightly ragged, epidermis greenish or blackish, nacre usually salmon to deep purple (fig. 57) *Potamilus alatus*
- 26 (24b)
 - a. epidermis light brown to black, adults with or without obscure rays, faintly rayed when young 27
 - b. epidermis yellowish, greenish or rarely brown; smooth or polished; rays if present, usually distinct 36
- 27 (26a)
 - a. teeth usually distinct, massive, interdendum narrow or absent, shell solid, adult shell more than 48 mm 29
 - b. teeth and hinge line usually slight, although distinct; interdendum absent; adult shell not over 48 mm in length, beak sculpture consisting of 5-6 distinct subconcentric loops; epidermis thick, usually dark gray or brown, shell elliptical, nacre white (fig. 65) *Toxolasma parvus*
 - c. teeth and hinge line distinct; interdendum absent; adult shell elongate more than 48 mm in length 28
- 28 (27c)
 - a. beak sculpture consisting of 5-6 delicate ridges, shell drawn up in the middle; epidermis dull, dark brown to black, nacre white, posterior ridge prominent, posterior end of shell subangular (fig. 43) *Ligumia nasuta*
 - b. beak sculpture consisting of 3-4 indistinct bars; posterior end pointed; epidermis dark green to black with faint, lighter green rays; nacre white suffused with pink in young, purple or salmon in adults (fig. 44) *Ligumia recta*

well developed in *Pedicularia*

NOT MASSIVE in *E-dilatata*

- orolen

- 29 (27a) a. shell elongate or rhomboid, thick, massive; beak cavity shallow, nacre purple 30
- b. shell squarish or nearly round, solid; beak cavity pronounced; nacre white or pinkish . . . 31
- 30 (29a) a. shell elongated, thick, compressed; beak sculpture consisting of 4-5 well developed parallel loops; epidermis dark green to black nacre usually purple (fig. 23) *Elliptio dilatata*
- b. shell more or less rhomboid, thick, solid; beak sculpture consisting of 2-3 coarse ridges (in young) epidermis reddish-brown to black, nacre salmon to purple (fig. 22) *Elliptio crassidens*
- 31 (29b) a. shell almost circular in outline 32
- b. shell squarish to trapezoidal in outline 33
- c. shell outline in shape of isosceles or very oblique triangle with beaks very anterior 35
- 32 (31a) a. shell almost circular, thick, umbones elevated and turned forward, epidermis yellowish brown to dark brown to black, interrupted green rays on the umbo and dorsal part of the disc, nacre white, beak cavity deep and somewhat compressed (fig. 28) *Fusconaia subrotunda*
- b. shell almost circular, thick, umbones elevated, epidermis dark brown to black, no green rays on the umbo, beak cavity open and very shallow nacre white to pink (fig. 53) *Pleurobema sintoxia*
- 33 (31b) a. shell squarish, umbones depressed or elevated, near center of dorsal margin, epidermis glossy, light to dark yellowish brown, wide shallow depression on disc of valve, posterior ridge moderately angled, beak cavity deep (fig. 27) *Fusconaia flava*
- b. shell squarish, umbones elevated, broad shallow sulcus on the disc of the valve, beak cavity shallow 34
- 34 (33b) a. shell squarish in outline, ventral margin somewhat curved, anterior margin rounded, posterior ridge low but distinct, epidermis tawny brown to reddish brown or black in old individuals (fig. 54) *Pleurobema cordatum*
- b. shell short, squarish to subtriangular, inflated, beaks full, very high, epidermis cloth like, anterior end strongly and obliquely truncated (fig. 55) *Pleurobema plenum*
- 35 (31c) a. shell elongate triangular, beaks high and turned forward and very anterior, inflated, anterior end truncated or rounded, ventral margin straight to curved (fig. 52) *Pleurobema clava*
- b. shell in shape of scalene or right triangle, beaks high and full, placed at the extreme anterior end of shell, nacre white to pink (fig. 56) *Pleurobema rubrum*
A nacre color white
- 36 (26b) a. posterior ridge usually sharply angled; shell squarish to truncated 37
- b. posterior ridge absent or moderately angled, shell rounded, elongated or squarish 40
- 37 (36a) a. umbo greatly depressed, epidermis yellowish with rows of squarish or elongated spots, shell compressed, interdentum wide (fig. 20) *Ellipsaria lineolata*
- b. umbo not greatly depressed, epidermis with straight lines or broken rays, interdentum small or absent 38
- 38 (37b) a. rays forming V-shaped markings, shell inflated, solid, adult shell not over 60 mm in length, interdentum absent (fig. 26) *Epioblasma triquetra*
- b. rays composed mainly of straight lines 39

see figures

- 39 (38b) a. rays composed of greenish straight lines, shell inflated, posterior ridge sharply angled, interdentum small (fig. 68) *Truncilla truncata*
- b. rays supplemented by zigzag or wavy irregular lines, shell moderately compressed, adult shell not over 48 mm in length, posterior ridge moderately angled, no interdentum (fig. 67) *Truncilla donaciformis*
- 40 (36b) a. shell ovate, oblong or rhomboid, solid to thick, heavy, moderately inflated. 41
- b. shell oblong, lanceolate or globose, thin to heavy, compressed to inflated 44
- 41 (40a) a. shell evenly ovate to elliptical, umbones very broad, pseudocardinal teeth heavy, parallel with lateral teeth, beak cavity shallow, epidermis yellowish brown, glossy (fig. 47) *Obovaria olivaria*
- b. shell round or rhomboid 42
- 42 (41b) a. shell round, moderately inflated solid, umbones placed centrally on hinge line, epidermis dark yellow to brown, lighter on posterior slope (fig. 49) *Obovaria subrotunda*
- b. shell oval, squarish to rhomboid, thick 43
- 43 (42b) a. epidermis a dull yellow, usually unmarked or with indistinct rays, shell thick, heavy nacre white tinged with pink or salmon (fig. 30) *Lampsilis abrupta*
- b. epidermis dark reddish brown, shell thick heavy, beaks turned over the anterior end, nacre deep purple inside of the pallial line, outside of the pallial line, white (fig. 48) *Obovaria retusa*
- 44 (40b) a. epidermis light yellow, yellowish green or yellowish tan usually glossy, shell oblong or globose 45
- b. epidermis dull, ^{or glossy} dark yellow to yellowish brown, shell usually elliptical, a little to moderately inflated 48
- 45 (44a) a. shell somewhat ovate moderately inflated, posterior end pointed, beak sculpture consisting of a series of 6-8 distinct double-looped bars, epidermis yellow to yellowish brown, marked with dark green rays of varying widths (fig. 36) *Lampsilis siliquoidea*
- b. shell oblong, moderately inflated to globose, beak sculpture absent or consisting of 4-5 coarse loops 46
- 46 (45b) a. shell moderately ovate, elliptical inflated, solid, epidermis yellowish to olive-green, marked with numerous, narrow, wavy dark green rays (fig. 33) *Lampsilis fasciola*
- b. shell strongly inflated, often globose, thin when young, large and solid when old 47
- 47 (46b) a. epidermis shiny, yellow to yellowish-brown usually marked with distinct dark green rays, sometimes indistinct in old shells, shell globose, almost as high as long, posterior ridge rounded (fig. 31) *Lampsilis cardium*
- b. epidermis dull, yellow to olive brown, rays usually few, indistinct and located on umbonal area, posterior ridge producing a sharp angle (fig. 34) *Lampsilis ovata*
- 48 (44b) a. beak sculpture consisting of 4-6 fine, usually distinct bars, shell moderately inflated, small, usually less than 75 mm long 49
- b. beak sculpture consisting of a few, delicate indistinct bars, usually worn off except in very young shells, shell compressed or inflated 50

all the 2, 1, 2
maybe
at 75 mm

Beak
sculpture
of young
what
then?

- 49 (48a) a. shell elliptical, elongated, moderately inflated, epidermis yellowish or greenish-yellow, with straight, dark green rays, sharply defined, and often broken (fig. 70) *Villosa iris*
- b. epidermis shell olive-brown, covered with dark green rays, shell thick and small, less than 35 mm in length (fig. 69) *Villosa fabalis*
- 50 (48b) a. shell elliptical, thick, heavy, compressed, umbones depressed, interdentum wide, no beak cavity, epidermis light yellow to dark yellowish-brown, with a few wide dark green rays, often broken or interrupted. (fig. 58) *Ptychobranthus fasciolaris*
- b. shell broadly elliptical to ovate, moderately inflated to inflated, solid, both anterior and posterior ends rounded, interdentum narrow, epidermis yellow to yellowish-brown, distinct numerous dark green rays, typically straight (fig. 6) *Actinonaias ligamentina*
- 51 (4b) a. hinge teeth absent 52
- b. hinge teeth present 56
- 52 (51a) a. beaks not projecting above the hinge line (fig. 15) *Utterbackia [=Anodonta] imbecillis*
- b. beaks projecting above the hinge line 53
- 53 (52b) a. beak sculpture double looped 54
- b. beak sculpture concentric 55
- 54 (53a) a. nacre salmon or copper colored, shell prominently thickened along the anterior ventral margin below the pallial line (fig. 16) *Anodonta implicata*
- b. nacre bluish or white, shell uniformly thin, epidermis greenish (fig. 13) *Pyganodon [=Anodonta] cataracta*
- 55 (53b) a. beak sculpture coarse, nacre usually orange in the beak cavity, pseudocardinal teeth usually represented by a thickening near the beaks (fig. 64) *Strophitus undulatus*
- b. beak sculpture fine, nacre usually bluish white, pseudocardinal teeth absent (fig. 17) *Anodontooides ferussacianus*
- 56 (51b) a. lateral teeth well developed, functional and interlocking 60
- b. lateral teeth absent or reduced, neither functional nor interlocking 57
- 57 (56b) a. shell elongate and often arched, epidermis black, without color rays, lateral teeth entirely or almost absent, (fig. 45) restricted to cool headwater tributaries of the Schuylkill River *Margaritifera margaritifera*
- b. shell shape variable, epidermis usually with numerous fine rays, vestigial lateral teeth present 58
- 58 (57b) a. fine transverse ridges present on the posterior slope, pseudocardinal teeth reduced and elongate, with smooth surfaces 59
- b. transverse ridges on posterior slope absent, pseudocardinal teeth strong and triangular, with rough surfaces, shell small to medium size, triangular to ovate (fig. 10) *Alasmidonta undulata*

add
beaks

typically there is a orange wash in beak cavity

- 59 (58a) a. posterior ridge angular and prominent, shell truncate, color of posterior margin lighter than rest of shell (fig. 9) *Alasmidonta marginata susquehannae*
- b. posterior ridge rounded, shell rounded and usually less than 70mm long (fig. 11) *Alasmidonta varicosa*
- 60 (56a) a. right valve with two lateral teeth, rare (fig. 7) *Alasmidonta heterodon*
- b. right valve with one lateral tooth 61
- 61 (60b) a. height/length less than or equal to 0.48, posterior ridge prominent, posterior end of shell subangular; pseudocardinal teeth elongate, shell usually less than 110 mm in length (fig. 43) *Ligumia nasuta*
- b. height/length greater than 0.48 62
- 62 (61b) a. nacre purple 63
- b. nacre white or colored but not purple 64
- 63 (62a) a. shell subrhomboid with well-defined posterior ridge and slope, very common (fig. 21) *Elliptio complanata*
- b. shell elongate, rounded posterior ridge, posterior end bluntly rounded (fig. 24) *Elliptio fisheriana*
- 64 (62b) a. left valve with small interdental tooth, giving the appearance of three pseudocardinal teeth, shell more or less compressed and subrhomboid in outline, epidermis dark green with numerous green rays or brown, adult shell less than 65 mm long, posterior ridge rounded (fig. 40) *Lasmigona subviridis*
- b. left valve without interdental tooth, valve appears to have only two pseudocardinal teeth 65
- 65 (64b) a. adult shell usually less than 80 mm in length, and thin, hardly thicker anteriorly than posteriorly, epidermis dull yellow without rays or with fine rays all over the shell, (fig. 42) in or near tidewaters *Leptodea ochracea*
- b. adult shell often greater than 80 mm in length, much thicker anteriorly than posteriorly, may have obvious broad color rays 66
- 66 (65b) a. shell without green rays or with green rays restricted to the posterior slope (fig. 32) *Lampsilis cariosa*
- b. shell with rays all over the shell (may be obscured in old adults) height/length less than 0.60 in males and in most females, posterior ridge low and rounded, beaks not prominent (fig. 35) *Lampsilis radiata*

.5

C ———— < .48 .5

E. fisheriana some more iridescent but salmonish

Fedo ←

?? not work

Key to the Freshwater Bivalves of Pennsylvania

- proof
- show
- present

extracted and modified from Bogan (1992:19-25)

Workbook for the Workshop on Freshwater Bivalves of Pennsylvania

Arthur E. Bogan

January 8, 1993



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- 1 a. shell with a very sharp posterior ridge, shaped like a marine mussel, *Mytilus*, generally less than 30 millimeters, and attached to a hard substrate with byssal threads (fig. 4) *Dreissena polymorpha*
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- 11 (10a) a. beak cavity deep, shell moderately inflated, posterior ridge rounded, typically broad green strip from umbo down to the center of the disc (fig. 61) *Quadrula pustulosa*
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 *Tritogonia verrucosa*
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- 14 (13a) a. tubercles few, forming a row of large knobs on the angular posterior ridge with a few smaller pustules anterior to the ridge, shell squarish (fig. 60) *Quadrula metanevra*
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 b. shell very thin, no umbonal swelling and not rising above hinge line, hinge line perfectly straight, very minute beak sculpture; epidermis bright green with rays (fig. 15)
 *Utterbackia [=Anodonta] imbecillis*
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- 22 (21b) a. hinge with well-developed, slight lateral teeth, pseudocardinal teeth compressed, elevated (fig. 38)
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- b. left valve with small interdental tooth, giving the appearance of three pseudocardinal teeth, shell more or less compressed and subrhomboid in outline, epidermis dark green with numerous green rays or brown, adult shell less than 65 mm long, posterior ridge rounded (fig. 40)
 *Lasmigona subviridis*
- c. hinge line thickened, pseudocardinal teeth are small tubular thickenings, beak sculpture 3-4 heavy bars, shell moderately thick, inflated, somewhat rhomboid, nacre usually salmon or pinkish in umbonal area (fig. 64) *Strophitus undulatus*
- d. pseudocardinal teeth reduced or absent, lateral teeth absent, nacre has a purple color in the area under the umbo and in the very shallow beak cavity (fig. 29) *Hemistena lata*
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- b. pseudocardinal teeth compressed in right valve or tubercular swelling in left valve, lateral teeth are only a thickening of the hinge line, epidermis greenish or yellowish with many green rays, steep posterior slope, fine radial ridges on posterior slope (fig. 8) *Alasmidonta marginata*
- c. single compressed pseudocardinal tooth in each valve, lateral teeth absent, posterior ridge low and rounded, shell elongate, shell length less than 35 mm (fig. 63) *Simpsonaias ambigua*
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- b. teeth and hinge line usually slight, although distinct; interdentum absent; adult shell not over 48 mm in length, beak sculpture consisting of 5-6 distinct subconcentric loops; epidermis thick, usually dark gray or brown, shell elliptical, nacre white (fig. 65) *Toxolasma parvus*
- c. teeth and hinge line distinct; interdentum absent; adult shell elongate more than 48 mm in length
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- 28 (27c) a. beak sculpture consisting of 5-6 delicate ridges, shell drawn up in the middle; epidermis dull, dark brown to black, nacre white, posterior ridge prominent, posterior end of shell subangular (fig. 43)
 *Ligumia nasuta*
- b. beak sculpture consisting of 3-4 indistinct bars; posterior end pointed; epidermis dark green to black with faint, lighter green rays; nacre white suffused with pink in young, purple or salmon in adults (fig. 44) *Ligumia recta*

29 (27a)	a. shell elongate or rhomboid, thick, massive; beak cavity shallow, nacre purple	30
	b. shell squarish or nearly round, solid; beak cavity pronounced; nacre white or pinkish	31
30 (29a)	a. shell elongated, thick, compressed; beak sculpture consisting of 4-5 well developed parallel loops; epidermis dark green to black nacre usually purple (fig. 23)	<i>Elliptio dilatata</i>
	b. shell more or less rhomboid, thick, solid; beak sculpture consisting of 2-3 coarse ridges (in young) epidermis reddish-brown to black, nacre salmon to purple (fig. 22)	<i>Elliptio crassidens</i>
31 (29b)	a. shell almost circular in outline	32
	b. shell squarish to trapezoidal in outline	33
	c. shell outline in shape of isosceles or very oblique triangle with beaks very anterior	35
32 (31a)	a. shell almost circular, thick, umbones elevated and turned forward, epidermis yellowish brown to dark brown to black, interrupted green rays on the umbo and dorsal part of the disc, nacre white, beak cavity deep and somewhat compressed (fig. 28)	<i>Fusconaia subrotunda</i>
	b. shell almost circular, thick, umbones elevated, beak cavity very shallow, epidermis dark brown to black, no green rays on the umbo, beak cavity very open and shallow nacre white to pink (fig. 53)	<i>Pleurobema coccineum</i>
33 (31b)	a. shell squarish, umbones depressed or elevated, near center of dorsal margin, epidermis glossy, light to dark yellowish brown, wide shallow depression on disc of valve, posterior ridge moderately angled, beak cavity deep (fig. 27)	<i>Fusconaia flava</i>
	b. shell squarish, umbones elevated, broad shallow sulcus on the disc of the valve, beak cavity shallow	34
34 (33b)	a. shell squarish in outline, ventral margin somewhat curved, anterior margin rounded, posterior ridge low but distinct, epidermis tawny brown to reddish brown or black in old individuals (fig. 54)	<i>Pleurobema cordatum</i>
	b. shell short, squarish to subtriangular, inflated, beaks full, very high, epidermis cloth like, anterior end strongly and obliquely truncated (fig. 55)	<i>Pleurobema plenum</i>
35 (31c)	a. shell elongate triangular, beaks high and turned forward and very anterior, inflated, anterior end truncated or rounded, ventral margin straight to curved (fig. 52)	<i>Pleurobema clava</i>
	b. shell in shape of scalene or right triangle, beaks high and full, placed at the extreme anterior end of shell, nacre white to pink (fig. 56)	<i>Pleurobema rubrum</i>
36 (26b)	a. posterior ridge usually sharply angled; shell squarish to truncated	37
	b. posterior ridge absent or moderately angled, shell rounded, elongated or squarish	40
37 (36a)	a. umbo greatly depressed, epidermis yellowish with rows of squarish or elongated spots, shell compressed, interdentum wide (fig. 20)	<i>Ellipsaria lineolata</i>
	b. umbo not greatly depressed, epidermis with straight lines or broken rays, interdentum small or absent	38
38 (37b)	a. rays forming V-shaped markings, shell inflated, solid, adult shell not over 60 mm in length, interdentum absent (fig. 26)	<i>Epioblasma triquetra</i>
	b. rays composed mainly of straight lines	39

- 39 (38b) a. rays composed of greenish straight lines, shell inflated, posterior ridge sharply angled, interdentum small (fig. 68) *Truncilla truncata*
- b. rays supplemented by zigzag or wavy irregular lines, shell moderately compressed, adult shell not over 48 mm in length, posterior ridge moderately angled, no interdentum (fig. 67) *Truncilla donaciformis*
- 40 (36b) a. shell ovate, oblong or rhomboid, solid to thick, heavy, moderately inflated. 41
- b. shell oblong, lanceolate or globose, thin to heavy, compressed to inflated 44
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- 41 (40a) a. shell evenly ovate to elliptical, umbones very broad, pseudocardinal teeth heavy, parallel with lateral teeth, beak cavity shallow, epidermis yellowish brown, glossy (fig. 47) *Obovaria olivaria*
- b. shell round or rhomboid 42
- 42 (41b) a. shell round, moderately inflated solid, umbones placed centrally on hinge line, epidermis dark yellow to brown, lighter on posterior slope (fig. 49) *Obovaria subrotunda*
- b. shell oval, squarish to rhomboid, thick 43
- 43 (42b) a. epidermis a dull yellow, usually unmarked or with indistinct rays, shell thick, heavy nacre white tinged with pink or salmon (fig. 30) *Lampsilis abrupta*
- b. epidermis dark reddish brown, shell thick heavy, beaks turned over the anterior end, nacre deep purple inside of the pallial line, outside of the pallial line, white (fig. 48) *Obovaria retusa*
- 44 (40b) a. epidermis light yellow, yellowish green or yellowish tan usually glossy, shell oblong or globose 45
- b. epidermis dull, dark yellow to yellowish brown, shell usually elliptical, a little to moderately inflated 48
- 45 (44a) a. shell somewhat ovate moderately inflated, posterior end pointed, beak sculpture consisting of a series of 6-8 distinct double-looped bars, epidermis yellow to yellowish brown, marked with dark green rays of varying widths (fig. 36) *Lampsilis siliquoidea*
- b. shell oblong, moderately inflated to globose, beak sculpture absent or consisting of 4-5 coarse loops 46
- 46 (45b) a. shell moderately ovate, elliptical inflated, solid, epidermis yellowish to olive-green, marked with numerous, narrow, wavy dark green rays (fig. 33) *Lampsilis fasciola*
- b. shell strongly inflated, often globose, thin when young, large and solid when old 47
- 47 (46b) a. epidermis shiny, yellow to yellowish-brown usually marked with distinct dark green rays, sometimes indistinct in old shells, shell globose, almost as high as long, posterior ridge rounded (fig. 31) *Lampsilis cardium*
- b. epidermis dull, yellow to olive brown, rays usually few, indistinct and located on umbonal area, posterior ridge producing a sharp angle (fig. 34) *Lampsilis ovata*

- 48 (44b) a. beak sculpture consisting of 4-6 fine, usually distinct bars, shell moderately inflated, small, usually less than 75 mm long 49
- b. beak sculpture consisting of a few, delicate indistinct bars, usually worn off except in very young shells, shell compressed or inflated 50
- 49 (48a) a. shell elliptical, elongated, moderately inflated, epidermis yellowish or greenish-yellow, with straight, dark green rays, sharply defined, and often broken (fig. 70) *Villosa iris*
- b. epidermis shell olive-brown, covered with dark green rays, shell thick and small, less than 35 mm in length (fig. 69) *Villosa fabalis*
- 50 (48b) a. shell elliptical, thick, heavy, compressed, umbones depressed, interdentum wide, no beak cavity, epidermis light yellow to dark yellowish-brown, with a few wide dark green rays, often broken or interrupted. (fig. 58) *Ptychobranthus fasciolaris*
- b. shell broadly elliptical to ovate, moderately inflated to inflated, solid, both anterior and posterior ends rounded, epidermis yellow to yellowish-brown, distinct numerous dark green rays, typically straight (fig. 6) *Actinonaias ligamentina*
- 51 (4b) a. hinge teeth absent 52
- b. hinge teeth present 56
- 52 (51a) a. beaks not projecting above the hinge line (fig. 15) *Utterbackia [Anodonta] imbecillis*
- b. beaks projecting above the hinge line 53
- 53 (52b) a. beak sculpture double looped 54
- b. beak sculpture concentric 55
- 54 (53a) a. nacre salmon or copper colored, shell prominently thickened along the anterior ventral margin below the pallial line (fig. 16) *Anodonta implicata*
- b. nacre bluish or white, shell uniformly thin, epidermis greenish (fig. 13) *Pyganodon [Anodonta] cataracta*
- 55 (53b) a. beak sculpture coarse, nacre usually orange in the beak cavity, pseudocardinal teeth usually represented by a thickening near the beaks (fig. 64) *Strophitus undulatus*
- b. beak sculpture fine, nacre usually bluish white, pseudocardinal teeth absent (fig. 17) *Anodontoides ferussacianus*
- 56 (51b) a. lateral teeth well developed, functional and interlocking 60
- b. lateral teeth absent or reduced, neither functional nor interlocking 57
- 57 (56b) a. shell elongate and often arched, epidermis black, without color rays, lateral teeth entirely or almost absent, (fig. 45) restricted to cool headwater tributaries of the Schuylkill River *Margaritifera margaritifera*
- b. shell shape variable, epidermis usually with numerous fine rays, vestigial lateral teeth present 58

- 58 (57b) a. fine transverse ridges present on the posterior slope, pseudocardinal teeth reduced and elongate, with smooth surfaces 59
- b. transverse ridges on posterior slope absent, pseudocardinal teeth strong and triangular, with rough surfaces, shell small to medium size, triangular to ovate (fig. 10) *Alasmidonta undulata*
- 59 (58a) a. posterior ridge angular and prominent, shell truncate, color of posterior margin lighter than rest of shell (fig. 9) *Alasmidonta marginata susquehannae*
- b. posterior ridge rounded, shell rounded and usually less than 70mm long (fig. 11)
 *Alasmidonta varicosa*
-
- 60 (56a) a. right valve with two lateral teeth, rare (fig. 7) *Alasmidonta heterodon*
- b. right valve with one lateral tooth 61
- 61 (60b) a. height/length less than or equal to 0.48, posterior ridge prominent, posterior end of shell subangular; pseudocardinal teeth elongate, shell usually less than 110 mm in length (fig. 43)
 *Ligumia nasuta*
- b. height/length greater than 0.48 62
- 62 (61b) a. nacre purple 63
- b. nacre white or colored but not purple 64
- 63 (62a) a. shell subrhomboid with well-defined posterior ridge and slope, very common (fig. 21)
 *Elliptio complanata*
- b. shell elongate, rounded posterior ridge, posterior end bluntly rounded (fig. 24)
 *Elliptio fisheriana*
- 64 (62b) a. left valve with interdental tooth, giving the appearance of three pseudocardinal teeth, shell more or less compressed and subrhomboid in outline, epidermis dark green with numerous green rays or brown, adult shell less than 65 mm long, interdental tooth small, posterior ridge rounded (fig. 40) *Lasmigona subviridis*
- b. left valve without interdental tooth, valve appears to have only two pseudocardinal teeth 65
- 65 (64b) a. adult shell usually less than 80 mm in length, and thin, hardly thicker anteriorly than posteriorly, epidermis dull yellow without rays or with fine rays all over the shell, (fig. 42) in or near tidewaters *Leptodea ochracea*
- b. adult shell often greater than 80 mm in length, much thicker anteriorly than posteriorly, may have obvious broad color rays 66
- 66 (65b) a. shell without green rays or with green rays restricted to the posterior slope (fig. 32)
 *Lampsilis cariosa*
- b. shell with rays all over the shell (may be obscured in old adults) height/length less than 0.60 in males and in most females, posterior ridge low and rounded, beaks not prominent (fig. 35)
 *Lampsilis radiata*

extracted from Bogan and Davis (1992)

Table 9. Summary of the freshwater bivalve fauna of the Allegheny River Basin.

Species	Main Channel	French Creek Basin	Other Tributaries	Headwaters & Tributaries
<i>Actinonaias ligamentina</i>	X	X	X	X
<i>Alasmidonta marginata</i>	X	X	X	X
<i>Amblema plicata</i>	X	X	X	-
<i>Anodonta grandis</i>	X	X	X	-
<i>Anodonta imbecillis</i>	X	X	X	-
<i>Anodontooides ferussacianus</i>	-	X	-	-
<i>Elliptio dilatata</i>	X	X	X	X
<i>Epioblasma torulosa rangiana</i>	X	X	-	-
<i>Epioblasma triquetra</i>	X	X	X	-
<i>Fusconaia flava</i> ¹	X	?	-	-
<i>Fusconaia subrotunda</i>	X	X	-	-
<i>Lampsilis cardium</i>	X	X	X	X
<i>Lampsilis fasciola</i>	X	X	X	X
<i>Lampsilis ovata</i>	X	X	X	-
<i>Lampsilis siliquoidea</i>	X	X	X	X
<i>Lasmigona complanata</i>	-	X	-	-
<i>Lasmigona compressa</i>	-	X	X	X
<i>Lasmigona costata</i>	X	X	X	X
<i>Ligumia nausta</i>	-	X	-	-
<i>Ligumia recta</i>	X	X	-	-
<i>Plethobasus cyphus</i>	X	-	-	-
<i>Pleurobema clava</i>	X	X	-	-
<i>Pleurobema coccineum</i>	X	X	X	X
<i>Ptychobranhus fasciolaris</i>	X	X	X	-
<i>Quadrula cylindrica</i>	-	X	-	-
<i>Strophitus undulatus</i>	X	X	X	X
<i>Villosa fabalis</i>	X	X	-	-
<i>Villosa iris</i>	X	X	X	-
Total number of taxa	23	27	17	10

Total number of taxa in the Basin - 28

¹ *Fusconaia flava* is found in Navigation Pool 5 and questionably in French Creek.

