IDENTIFICATION KEY FOR HOLOCENE LACUSTRINE ARCELLACEAN (THECAMOEBIAN) TAXA

Arun Kumar and Andrew P. Dalby

ABSTRACT

Arcellaceans (thecamoebians), predominantly freshwater protozoans, have been studied for over a century. However, in the last ten years their usefulness as paleoenvironmental indicators has become better understood because researchers have recognized that certain morphotypes (strains) prefer distinct microenvironments. Unfortunately, the monoclonal nature and simple morphology of the group has led to considerable taxonomic confusion, threatening their utility in paleolimnological research. This key was created to help new researchers studying the group, and to standardize the taxonomy.

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KEY WORDS: thecamoebian(s), arcellacean(s) Holocene, identification key

INTRODUCTION

Arcellaceans (thecamoebians) are clonal, predominantly freshwater protozoans, although they can also occur in brackish water environments and moist soils (Medioli and Scott 1983). They can be found in a wide range of geographic settings, ranging from tropical to arctic latitudes (Nair and Mukherjee 1968; Green 1975; Dallimore et al. 1997). These organisms have an amoebid sarcodine cell with pseudopods and a simple sac-like test, either flattened or rounded with an aperture located on or near the tapered end, or a beret-shaped test with an invaginated aperture on the ventral side which is more or less flattened. A substantial amount of morphological variability has been observed among these two broad groups.

A few forms like Lagenodifflugia and Pontigulasia appear to have a second chamber consisting of an enlarged collar separated from the rest of the test by a distinct constriction (Medioli and Scott 1988; Medioli et al. 1990). Tests are either secreted (autogenous), or agglutinated (xenogenous) with sand particles or diatom frustules (xenosomes) in autogenous cement. Autogenous tests are usually smooth, proteinaceous, sometimes made of siliceous platelets (idiosomes), or rarely calcareous. (See Medioli et al. 1990, for a review of fossil arcellaceans).

Arcellacean tests do not demonstrate a high degree of morphological diversity, but important taxonomic characteristics include (Asioli et al. 1996): presence or absence of spines; nature and shape of xenosomes and idiosomes; shape and composition of tests; and morphological
features associated with the apertures, such as diaphragms, collars, lobes, and teeth.

Test size can vary between 50 to 300 um or even greater, thus it is of no taxonomic importance as it is determined at the time of fission by the volume of cytoplasm available in the parent test (Medioli and Scott 1983). Cytoplasmic volume is in turn probably controlled by the availability of food in the period preceding reproduction (Medioli et al. 1990).

It has long been known that various arcellacean species preferentially inhabit specific environments. Recent research has determined that some infrasubspecific variants (strains) are particularly sensitive to environmental variations (Asioli et al. 1996; Patterson et al. 1996; Reinhardt et al. 1997). In particular, arcellaceans have proven to be useful tools in assessing remediation rates within industrially polluted settings (Asioli et al. 1996; Patterson et al. 1996; Reinhardt et al. 1997).

Unfortunately, the subtle criteria used to differentiate the rather simple arcellacean morphologies, and confusion over the proliferation of taxonomic names during the last hundred years has limited their utility (Medioli and Scott 1983). In this paper, we present a taxonomic key designed to:

1. illustrate the various morphologies that we find useful in paleolimnological research and;

2. provide an arcellacean identification guide for future researchers engaged in paleolimnological research.

Taxa illustrated in this key are from Crosswise and Peterson lakes, near Cobalt, Ontario; Swan Lake, north of Toronto, Ontario; Lake Erie, Ontario; and Lake Orta, northern Italy. Exact sample locations are provided with individual illustrations.
<table>
<thead>
<tr>
<th>Key Position: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1a.</strong> Test circular, hemispherical to ovoid; made of proteinaceous matter and agglutinated grains. <strong>Proceed to 2</strong></td>
</tr>
<tr>
<td><strong>1b.</strong> Test ovoid, pyriform, elongate to acuminate; made of agglutinated mineral grains or diatom frustules. <strong>Proceed to 7</strong></td>
</tr>
</tbody>
</table>
2 a. Test circular in dorso-ventral view, plano-convex to hemispherical in lateral view, made of proteinaceous matter, surface smooth or punctate; aperture central, large and circular.

SEE Figure 2-1

2 b. Test with or without spines, agglutinated with mineral grains, aperture sub-terminal or occasionally central, circular or oval, invaginated.

Proceed to 3

FIGURE 2-1

Arcella vulgaris Ehrenberg 1830
Arcella vulgaris EHRENBERG 1830, p. 40, pl. 1, fig. 6
Arcella vulgaris Ehrenberg REINHARDT et al. 1997, pl. 1, fig. 3
Remarks: Distinguished from Centropyxis aculeata "discoides" by having no agglutinated particles whatsoever, thus the test is hyaline and transparent. Specimen from Crosswise Lake, near Cobalt, Ontario.
### Key Position: 3

<table>
<thead>
<tr>
<th>3a. Test ventrally depressed, almost circular dorso-ventrally, anterior angle varies between 15-40 degrees, posterior slope ill-defined or practically absent. Height/length ratio is low (0.4 - 0.5).</th>
<th>3b. Test less depressed on ventral side than in 3a, elliptical in dorsal view. Anterior angle varies between 45-60 degrees and posterior angle well defined. Height/length ratio high (0.5 - 1.1).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proceed to 4</strong></td>
<td><strong>Proceed to 5</strong></td>
</tr>
<tr>
<td>Key Position: 4</td>
<td>Back to (3a)</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>4 a.</strong> Test with 1 to 8 spines on postero-lateral margin.</td>
<td><strong>4 b.</strong> Test &quot;doughnut&quot; shaped, without spines.</td>
</tr>
<tr>
<td><strong>SEE Figure 4 -1</strong></td>
<td><strong>SEE Figure 4 -2</strong></td>
</tr>
</tbody>
</table>

**FIGURE 4 -1**

*Centropyxis aculeata* Ehrenberg 1832
"aculeata"

Arcella aculeata *EHRENBERG 1832*, p. 91
Arcella aculeata "aculeata" *REINHARDT et al. 1997*, pl. 1, fig. 1
Remarks: Distinguished from *Centropyxis aculeata* "discoides" by having spines. It should be noted that on some specimens these spines have broken off, but the stubs at the bases of the spines remain.
Specimen from Crosswise Lake, near Cobalt, Ontario.

![Image](image1)

**FIGURE 4 -2**

*Centropyxis aculeata* Ehrenberg 1832
"discoides"

Arcella discoides *EHRENBERG 1843*, p. 139
Arcella discoides Ehrenberg, *EHRENBERG 1872*, p. 259, pl. 3, fig. 1
Arcella discoides Ehrenberg, *LEIDY 1879*, p. 173, pl. 28, figs. 14-38
Centropyxis aculeata var. discoides *PENARD 1890*, p. 150, pl. 5, figs. 38-41
Centropyxis discoides Penard [sic], *OGDEN and HEDLEY 1980*, p. 54, pl. 16, figs. a-e
*Centropyxis aculeata" discoides* *REINHARDT et al. 1997*, pl. 1, fig. 2
Specimen from Crosswise Lake, near Cobalt, Ontario.

![Image](image2)
Key Position: 5

5 a. Apertural lip thickened and at an angle of 45-60 degrees with respect to the test; spines absent.

SEE Figure 5-1

5 b. Apertural lip thickened and at an angle of 45-60 degrees with respect to the test; spines present.

Proceed to 6

FIGURE 5-1

*Centropyxis constricta* (Ehrenberg 1843) "aerophila"

*Centropyxis aerophila* **DEFLANDRE 1929**

*Centropyxis aerophila* Deflandre **OGDEN and HEDLEY 1980**, p. 48-49

*Cucurbitella* [sic.] *constricta* **REINHARDT et al. 1997**, pl. 1, fig. 6

Specimen from Peterson Lake, near Cobalt, Ontario.
6 a. Test less flattened than 6b with generally 3 or less spines on fundus, but may have more.

SEE Figure 6 -1

6 b. Test more flattened than 6a with 4 or more spines on fundus.

SEE Figure 6 -2

FIGURE 6 -1

Centropyxis constricta (Ehrenberg 1843) "constricta"
Arcella constricta EHRENBERG 1843, p. 410, pl. 4, fig. 35, pl. 5, fig. 1
Centropyxis constricta "constricta" REINHARDT et al. 1997, pl. 1, fig. 4
Specimen from Crosswise Lake, near Cobalt, Ontario.

FIGURE 6 -2

Centropyxis constricta (Ehrenberg 1843) "spinosa"
Centropyxis spinosa CASH in CASH and HOPKINSON 1905, p. 135, text figs. 26 a-c, pl. 16, fig. 15
Centropyxis spinosa Cash, OGDEN and HEDLEY 1980, p. 62, pl. 20, figs. a-d
Centropyxis constricta "spinosa" REINHARDT et al. 1997, pl. 1, fig. 5
Specimen from Peterson Lake, near Cobalt, Ontario.
<table>
<thead>
<tr>
<th>Key Position: 7</th>
<th>Back to (1b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7 a.</strong> Test globular and somewhat laterally compressed; aperture terminal, oval, linear or circular.</td>
<td><strong>7 b.</strong> Test pyriform, acuminate or ovoid, aperture terminal, circular or lobed.</td>
</tr>
<tr>
<td><strong>Proceed to 8</strong></td>
<td><strong>Proceed to 10</strong></td>
</tr>
<tr>
<td>Key Position: 8</td>
<td>Back to (7a)</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>8 a.</strong> Test comprised of curved siliceous rods, with neck.</td>
<td><strong>8 b.</strong> Test made of siliceous plates, without neck.</td>
</tr>
</tbody>
</table>

SEE Figure 8-1

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**FIGURE 8-1**

*Lesquereusia spiralis* (Ehrenberg 1840)

*Diffugia spiralis* [EHRENBERG 1840], p. 199

*Diffugia spiralis* Ehrenberg [EHRENBERG 1872], p. 274, pl. 3, figs. 25-27 *Lesquereusia spiralis* (Ehrenberg) [PATTERSON, MacKINNON, SCOTT, and MEDIOLI 1985], p. 135, pl. 2, figs. 9, 12

*Lesquereusia spiralis* (Ehrenberg) [REINHARDT et al. 1997], pl. 1, fig. 9

Specimen from Peterson Lake, near Cobalt, Ontario.
<table>
<thead>
<tr>
<th>Key Position: 9</th>
<th>Back to (8b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9 a.</strong> Aperture elliptical without collar.</td>
<td><strong>9 b.</strong> Aperture oval with thin collar.</td>
</tr>
</tbody>
</table>

**SEE Figure 9 -1**

*FIGURE 9 -1*

*Heliopera sphagni* (Leidy 1874)
Diffugia sphagni [LEIDY 1874], p. 157
Heliopera sphagni (Leidy) [MEDIOLI and SCOTT 1983], p. 37-38, pl. 6, figs. 15-18
Specimen from Lake Erie, Ontario.

**FIGURE 9 -2**

*Nebella collaris* Ehrenberg 1848
Nebella collaris Ehrenberg [OGDEN and HEDLEY 1980], p. 94-95
Specimen from Crosswise Lake, near Cobalt, Ontario.
10 a. Test with a distinct constriction at the base of the neck.

SEE Figure 10-1.

10 b. Test without constriction at the base of the neck.

Proceed to 11

FIGURE 10-1

*Pontigulasia compressa* (Carter 1864)

*Diff lugia compressa* CARTER, p. 22, pl. 1, figs. 5-6

*Pontigulasia compressa* (Carter) MEDIOLI and SCOTT 1983, p. 35-36, pl. 6, figs. 5-14

Specimen from Swan Lake, north of Toronto, Ontario.
11 a. Aperture lip thin, crenulated, terminal, circular, surrounded by a 3- or 4-lobed collar.

SEE Figure 11-1

11 b. Aperture terminal, circular or lobed.

Proceed to 12

FIGURE 11-1

*Cucurbitella tricuspis* (Carter 1856)

*Diffugia tricuspis* CARTER 1856, p. 221, fig. 80

*Cucurbitella tricuspis* (Carter) MEDIOLI, SCOTT, and ABBOTT, 1987, p. 42, pls. 1-4, text figs. 1, 4

*Cucurbitella tricuspis* (Carter) REINHARDT ET AL. 1997, pl. 1, fig. 7

Remarks: This species has a seasonally controlled irregularly shaped test, being larger and spherical during the benthic phase, and smaller and vase-shaped during the planktic phase. The crenulated aperture has a variable number of teeth ranging from three to twenty, depending on the number of teeth on the parent test (Medioli, personal commun., 1996).

Specimen from Peterson Lake, near Cobalt, Ontario.
### Key Position: 12

<table>
<thead>
<tr>
<th>12 a. Test elongated, pyriform, fundus bulbous and wide, with distinct tapering neck with a prominent constriction at its base.</th>
<th>12 b. Test ovoid, pyriform or acuminate, constriction at the base of the neck may or may not be present.</th>
</tr>
</thead>
<tbody>
<tr>
<td>See Figure 12-1</td>
<td>Proceed to 13</td>
</tr>
</tbody>
</table>

### FIGURE 12-1

*Lagenodiffugia vas* (Leidy 1874)

*Diffugia vas* **LEIDY 1874**, p. 155  
*Lagenodiffugia vas* (Leidy) **MEDIOLI and SCOTT 1983**, p. 33, pl. 2, figs. 18-23, 27, 28  
*Lagenodiffugia vas* (Leidy) **REINHARDT et al. 1997**, pl. 1, fig. 8

Specimen from Peterson Lake, near Cobalt, Ontario.
<table>
<thead>
<tr>
<th>Key Position: 13</th>
<th>Back to (12b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 a. Test elongated, fundus tapering, acuminate with one or more spines.</td>
<td>Proceed to 14</td>
</tr>
<tr>
<td>13 b. Test subspherical, ovoidal with or without spines.</td>
<td>Proceed to 16</td>
</tr>
<tr>
<td>Key Position: 14</td>
<td>Back to (13a)</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>14 a.</strong> Test almost biconical, narrowing towards aperture, widest at fundus with one or more spines.</td>
<td><strong>14 b.</strong> Test subcylindrical, fundus with single spine.</td>
</tr>
<tr>
<td><strong>SEE Figure 14-1</strong></td>
<td><strong>Proceed to 15</strong></td>
</tr>
</tbody>
</table>

**FIGURE 14-1**

*Difflugia protaeiformis* Lamarck 1816 "amphoralis"

*Difflugia protaeiformis* [Lamarck 1816](#), p. 95  
*Difflugia amphoralis* Hopkinson in [Cash and Hopkinson 1909](#), p. 43, pl. 21, fig. 13  
*Difflugia protaeiformis* "amphoralis" [Reinhardt et al. 1997](#), pl. 2, fig. 4

Remarks: Distinguished from *Difflugia protaeiformis* "claviformis" and *Difflugia protaeiformis* "acuminata" by having a prominent widening of the fundus at the aboral end.  
Specimen from Peterson Lake, near Cobalt, Ontario.

![Image of Difflugia protaeiformis](image)
15 a. Test made from coarse grains, opaque.

SEE Figure 15 -1

15 b. Test agglutinated with silt or fine sand-sized xenosomes, hyaline; may have a slight constriction in the anterior part.

SEE Figure 15 -2

**FIGURE 15 -1**

*Diffugia protaeiformis* Lamarck 1816

"claviformis"

*Diffugia protaeiformis* [LAMARCK 1816, p. 95]
*Diffugia pyriformis* var. *claviformis* [PENARD 1899, p. 25, pl. 2, figs. 12-14]
*Diffugia claviformis* [OGDEN and HEDLEY 1980, p. 126, pl. 52, figs. a-d]
*Diffugia proteiformis"* [sic.] [ASIOLI et al. 1996, p. 250, pl. 2, fig. 1 a-b]

Remarks: Distinguished from *Diffugia protaeiformis"* ["proteiformis"] by having a thicker wall, which appears opaque under a light microscope.
Specimen from Peterson Lake, near Cobalt, Ontario.

**FIGURE 15 -2**

*Diffugia protaeiformis* Lamarck 1816

"acuminata"

*Diffugia protaeiformis* [LAMARCK 1816, p. 95]
*Diffugia acuminata* [EHRENBERG 1830, p. 95]
*Diffugia acuminata* Ehrenberg 1830, [OGDEN and HEDLEY 1980, p. 118, pl. 4, figs. a-c]
*Diffugia acuminata* Ehrenberg 1830, [SCOTT and MEDIOLI 1983, p. 818, fig. 9d]

Remarks: Distinguished from *Diffugia protaeiformis"* ["claviformis"] by having a thinner wall which appears transparent under a light microscope.
Specimen from Crosswise Lake, near Cobalt, Ontario.
<table>
<thead>
<tr>
<th>Key Position: 16</th>
<th>Back to (13b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 a. Test laterally compressed with 2 to 3 short spines.</td>
<td>19 b. Test not compressed laterally.</td>
</tr>
</tbody>
</table>

**FIGURE 16-1**

*Difflugia bidens* Penard 1902  
*Difflugia bidens* **PENARD 1902**, p. 264, figs. 1-8  
*Difflugia bidens* Penard **MEDIOLI and SCOTT 1983**, p. 21-22, pl. 1, figs. 1-5  
Specimen from Swan Lake, north of Toronto, Ontario.

![Difflugia bidens](image)  
50 µm
17 a. Fundus with 1 to 10 short spines; aperture circular, crenulated by 6 to 20 indentations forming thin collar.

SEE Figure 17-1

17 b. Fundus without spines; aperture without crenulations.

Proceed to 18

FIGURE 17-1

_Difflugia corona_ Wallich 1864
_Difflugia protaeiformis_ (sic) Ehrenberg subsp. _D. globularis_ (Dujardin) var. _D. corona_ WALLICH 1864, p. 244, pl. 15, fig. 4a-c, pl. 16, figs. 19, 20
_Difflugia corona_ Wallich 1864 ARCHER 1866, p. 186
_Difflugia corona_ Wallich REINHARDT et al. 1997, pl. 2, fig. 1
Specimen from Peterson Lake, near Cobalt, Ontario.
18 a. Test with 1 to 8 large ribs running from middle of the test to the fundus and may extend to form blunt spines or tubercles.

SEE Figure 18-1

18 b. Test without large ribs.

Proceed to 19

FIGURE 18-1

*Difflugia fragosa* Hempel 1898

*Difflugia fragosa* Hempel [HEMPEL 1898](#), p. 320, figs. 1-2

*Difflugia fragosa* Hempel [MEDIOLI and SCOTT 1983](#), p. 22-24, pl. 1, figs. 21-27

Specimen from Lake Erie, Ontario.
<table>
<thead>
<tr>
<th>Key Position: 19</th>
<th>Back to (18b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>19 a.</strong> Test amphora- or cauldron-shaped, aperture circular with distinct collar.</td>
<td><strong>19 b.</strong> Test flask-shaped, sphaeroidal to ellipsoidal, aperture circular to subcircular without collar.</td>
</tr>
<tr>
<td><strong>Proceed to 20</strong></td>
<td><strong>Proceed to 23</strong></td>
</tr>
</tbody>
</table>
20 a. Test broader than long, fundus conical, a constriction forms a broad collar under the wide aperture.

**SEE Figure 20-1**

20 b. Test spheroidal, fundus rounded to acuminate, short neck attached to recurved or straight collar.

**FIGURE 20-1**

*Diffugia bacilliarum* Perty 1849  
*Diffugia bacilliarum* **PERTY 1849**, p. 27  
*Diffugia bacilliarum* Perty **MEDIOLI and SCOTT 1983**, p. 20-21, pl. 5, figs. 16-19, pl. 6, figs. 1-4  
Specimen from Lake Erie, Ontario.
Key Position: 21

21 a. Aperture very small with expanded flanged collar of variable width.

SEE Figure 21-1

21 b. Aperture wide, collar of variable shapes and sizes.

Proceed to 22

FIGURE 21-1

_Diffugia urens_ Patterson et al. 1985
_Diffugia urens_ PATTERSON et al. 1985, p. 130, pl. 3, figs. 5-14
Specimen from Midway Lake, Nova Scotia.
### Key Position: 22

<table>
<thead>
<tr>
<th>22 a.</th>
<th>Test sphaeroidal to ovoidal.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>SEE Figure 22 -1</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>22 b.</th>
<th>Test elongate.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>SEE Figure 22 -2</strong></td>
</tr>
</tbody>
</table>

### FIGURE 22 -1

*Diffugia urceolata* Carter 1864
"urceolata"

*Diffugia urceolata* [Carter 1864](#), p. 27, pl. 1, fig. 7

*Diffugia urceolata* Carter [REINHARDT et al. 1997](#), pl. 2, fig. 2b

Specimen from Peterson Lake, near Cobalt, Ontario.

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### FIGURE 22 -2

*Diffugia urceolata* Carter 1864
"elongata"

*Diffugia elongata* [PENARD 1905](#), p. 33, fig. on p. 34

*Diffugia urceolata* Carter [REINHARDT et al. 1997](#), p. 2, fig. 2a

Specimen from Peterson Lake, near Cobalt, Ontario.
23 a. Test spheroidal to ellipsoidal; oral pole truncated by a large circular aperture.

SEE Figure 23-1

23 b. Test of variable shape, pyriform to flask shaped, with or without neck, aperture circular, small or large.

Proceed to 24

FIGURE 23-1

*Diffugia globula* (Ehrenberg 1848)
*Arcella globulus* EHRENBERG 1848, p. 379
*Diffugia globulus* (Ehrenberg) MEDOLI and SCOTT 1983, p. 24-25, pl. 5, figs. 1-15
Remarks: We have modified the specific term *globula* (formerly *globulus*) to agree in gender with the generic term.
Specimen from Crosswise Lake, near Cobalt, Ontario.
24 a. Test ovoid with rounded fundus, aperture large and circular.

SEE Figure 24-1

24 b. Test elongate, flask-shaped, aperture circular, large or small.

Proceed to 25

FIGURE 24-1

*Difflugia oblonga* Ehrenberg 1832 "glans"
*Difflugia glans* PENARD 1902
*Difflugia oblonga"glans"* REINHARDT et al. 1997, pl. 2, fig. 7
Specimen from Crosswise Lake, near Cobalt, Ontario.
<table>
<thead>
<tr>
<th>Key Position: 25</th>
<th>Back to (24b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 a. Aperture with crenulations.</td>
<td>Proceed to 26</td>
</tr>
<tr>
<td>25 b. Aperture without crenulations.</td>
<td>Proceed to 27</td>
</tr>
</tbody>
</table>
26 a. Test elongate; aperture circular without lip.

SEE Figure 26 -1

26 b. Test flask-shaped, aperture small with 5 to 6 crenulations.

SEE Figure 26 -2

**FIGURE 26 -1**

*Difflugia oblonga* Ehrenberg 1832

*Difflugia lanceolata* [Penard 1890](p. 145, pl. 4, figs. 59-60)

*Difflugia lanceolata* Penard, [Ogden and Hedley 1980](p. 140, pl. 59, figs. a-d)

*Difflugia oblonga* "lanceolata" [Reinhardt et al. 1997](pl. 2, fig. 6)

Specimen from Crosswise Lake, near Cobalt, Ontario.

**FIGURE 26 -2**

*Difflugia oblonga* Ehrenberg 1832

*Difflugia pyriformis* var. *linearis* [Penard 1890](p. 137, pl. 3, figs. 42-44)

*Difflugia oblonga* "linearis" [Reinhardt et al. 1997](pl. 2, fig. 8)

Specimen from Peterson Lake, near Cobalt, Ontario.
### Key Position: 27

#### 27 a. Test flask-shaped with a spine on fundus.

SEE Figure 27-1

#### 27 b. Test flask-shaped without spine on fundus.

Proceed to 28

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**FIGURE 27-1**

_Difflugia oblonga_ Ehrenberg 1832 "spinosa"

_Difflugia oblonga" spinosa"_ [REINHARDT et al. 1997](#), pl. 2, fig. 11

Specimen from Crosswise Lake, near Cobalt, Ontario.

![Image of Difflugia oblonga](image_url)
Key Position: 28

28 a. Test made of course sand grains.

SEE Figure 28-1

28 b. Test made of predominantly fine mineral grains.

Proceed to 29

FIGURE 28a

*Diffugia oblonga* Ehrenberg 1832 "bryophila"

*Diffugia pyriformis* var. *bryophila* [Penard](1902), p. 221, text fig. 7

*Diffugia bryophila* Penard [sic], [Ogden and Ellison](1988), p. 234, pl. 1, figs. 1-3

*Diffugia oblonga* "bryophila" [Reinhardt et al.](1997), pl. 2, fig. 9

Specimen from Crosswise Lake, near Cobalt, Ontario.

![image of Diffugia oblonga](image-url)
29 a. Test oblong to elongate with a neck, fundus rounded.

SEE Figure 29 -1

29 b. Test elongated without neck, fundus almost subconical.

SEE Figure 29 -2

FIGURE 29 -1

*Difflugia oblonga* Ehrenberg 1832
"oblonga"
*Difflugia oblonga* EHRENBERG 1832, p. 90
*Difflugia oblonga* Ehrenberg OGDEN and HEDLEY 1980, p. 148, pl. 63, figs. a-c
*Difflugia oblonga* Ehrenberg HAMAN 1982, p. 367, Pl. 3, Figs. 19-25
*Difflugia oblonga* Ehrenberg SCOTT and MEDIOLI 1983, p. 818, figs. 9a-b
*Difflugia oblonga* "oblonga" REINHARDT et al. 1997, pl. 2, fig. 10

Specimen from Crosswise Lake, near Cobalt, Ontario.

FIGURE 29 -2

*Difflugia oblonga* Ehrenberg 1832
"tenuis"
*Difflugia pyriformis* var. *tenuis* PENARD 1890, p. 138, pl. 3, figs. 47-49
*Difflugia oblonga* "tenuis" REINHARDT et al. 1997, pl. 2, fig. 12

Specimen from Crosswise Lake, near Cobalt, Ontario.
REFERENCES


Leidy, J. 1874. Notice of some new fresh-water rhizopods. Proceedings of the Academy of Natural Sciences
of Philadelphia, series 3:77-79.


GLOSSARY

Acuminate - tapering to form a spine.
Agglutination - foreign particles bound together by cement into a test.
Aperture - opening of the test. It is standard procedure to figure the specimens aperture up.
Autogenous - a test secreted by the organism.
Frustule - diatom shell.
Fundus - the end of the test opposite the aperture (also called the aboral end).
Idiosomes - agglutinated foreign particles of the test made from other organic material.
Strain - infraspecific morphological variant.
Test - shell, or external hard part, of a protozoan.
Xenogenous test - test composed of agglutinated foreign particles.
Xenosome - agglutinated foreign particles of the test made from mineral grains.