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NAS - Nonindigenous Aquatic Species

Actinocyclus normanii fo. subsalsa
(diatom)
Algae
Exotic to United States

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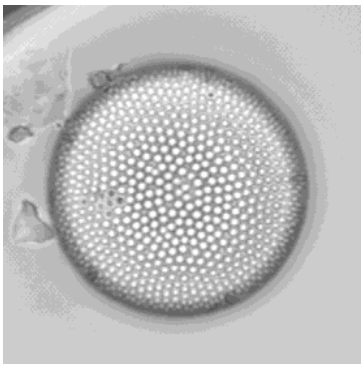

Gene Stoermer

Actinocyclus normanii fo. subsalsa (Juhlin-Dannfelt) Hustedt, 1957

Common name: diatom

Taxonomy: available through ITIS

Identification: This diatom is relatively large and silicified. It contains many small disc-shaped chloroplasts. Valves exhibit patterns of radiating parallel roles of areolae. Areolae on the valves are larger than those on the mantle. In general there should be 4–8 marginal processes and a small marginal pseudonodulus. One valve is more convex in the middle and the other is more concave in the middle. Both are circular. There are usually prominent labiate processes on the mantle. In the Great Lakes, this species can occur as single cells, pairs of cells, or colonies of up to 10 cells (Belcher and Swale 1979; Hasle 1977; Liukkonen et al. 1997; Sala 1997; Pappas and Ungelbach 2002).

The valves range in diameter from 16–47.5 µm (Hasle 1977; Belcher and Swale 1979; Ferrario et al. 1989; Gomez 1991; Liukkonen et al. 1997; Sala 1997).

Size: Valves = 16–47.5 µm

Native Range: *A. normanii fo. subsalsa* is considered native to the coasts of Germany and Norway, the Baltic Sea, the Caspian Sea, and some freshwater regions in Germany (Mills et al. 1993). However, it was first described from the Baltic Sea and could originally be a marine or brackish water species (Liukkonen et al. 1997).

Interactive maps: Continental US, Alaska, Hawaii, Caribbean Point Distribution Maps

Nonindigenous Occurrences: This taxon is considered to be an invading species in the Laurentian Great Lakes (Hasle 1977, Mills et al. 1993). *A. normanii fo. subsalsa* likely arrived in Lake Ontario in 1938. The exact date has been determined from sediment samples from that lake. It also occurs in Lake Michigan, Lake Erie, and Lake Huron (Stoermer et al. 1985; Mills et al. 1993) and has been reported in Lake Superior (EPA, 2008).

Ecology *A. normanii fo. subsalsa* is a planktonic, mesothermal, alkalibiontic species preferring waters with a pH above 7. It typically occurs in fresh to brackish water in tidal systems, estuaries, and other water bodies. It may occur in oligohaline to eutrophic waters although it is often more indicative of eutrophied, polluted sites as well as regions of high conductivity where magnesium and calcium concentrations are elevated. It is known to spread from brackish to freshwater sites if the latter experience increases in salinity or nutrients. *A. normanii fo. subsalsa* is better able to tolerate freshwater than *A. normanii var. normanii*, which is more typical of marine and brackish habitats (Hustedt 1957).

A. normanii fo. subsalsa in the Great Lakes occurs at a maximum abundance around 20ºC. It may be limited by light in some environments but is generally considered well adapted to fluctuating light levels and turbulent vertical mixing. Although this species is heavily silicified, it is also adapted well to avoiding or tolerating silica limitations.

It has the ability to produce resting cells. *A. normanii fo. subsalsa* often blooms in summer and fall. It typically occurs in shallow bays and nearshore regions of the Great Lakes (Hasle 1977; Stoermer et al. 1985, 1993; Ferrario et al. 1989; Sticko-Goad et al. 1989; Gomez 1991; Rehbehn et al. 1993; Liukkonen et al. 1997; Sala 1997; Stachura and Witkowski 1997; Hughes et al. 2000; Teubner 2000; Pappas and Ungelbach 2002; Mercado 2003)

Hohn (1969) identified this taxon as Coscinodiscus radiatus in Lake Erie and reported it was most abundant in August and September while it was absent in the colder months of the year. Its late summer pulse first appeared in 1964 in the western basin of Lake Erie. It appears to be common in eutrophic waters (Mills et al. 1993), Green Bay (Stoermer and Yang 1969), Saginaw Bay (Stoermer and Theriot 1983) but uncommon in the offshore waters of Lake Ontario (Stoermer et al. 1974).
Means of Introduction: *A. normanii fo. subsalsa* was very likely introduced in ballast water to the Great Lakes.

Status: Established where recorded.

Impact of Introduction:
A) Realized: Unknown.

B) Potential: Edlund et al. (2000) point out that Stoermer et al. (1985) analyzed lake cores from Lake Ontario which recorded the appearance of exotic *Stephanodiscus binderanus* and *A. normanii fo. subsalsa* simultaneous with the local extirpations of species such as *S. transilvanicus, Cyclotella comta, C. michiganiana, C. ocellata*, and *C. stelligera*. It is possible that competition between the introduced and local species could have contributed at least in part to the extirpations of the latter. Moreover, Edlund et al. (2000) point out that Theriot and Stoermer (1985) recorded very high blue-green algae growth in Saginaw Bay, Lake Huron, associated with the presence of *A. normanii fo. subsalsa*. This species has the potential to deplete silica concentrations very quickly (although it is also well adapted to tolerating low silica availability). Depleting silica can promote the growth of blue-green algae, which does not require it for growth.

Remarks: Hustedt (1957) erected two forms, *Actinocyclus normanii fo. normanii* and *Actinocyclus normanii fo. subsalsa*, based primarily on ecology and size. According to Hasle (1977) no substantial differences were observed between *A. normanii fo. normanii* and *A. normanii fo. subsalsa* aside from size and ecology so there appears to be no taxonomic reason to keep the forms separate; however she suggested for ecological perspectives the two forms may have some meaning and did not propose combining the taxa.

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Other Resources:

Great Lakes Diatoms

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