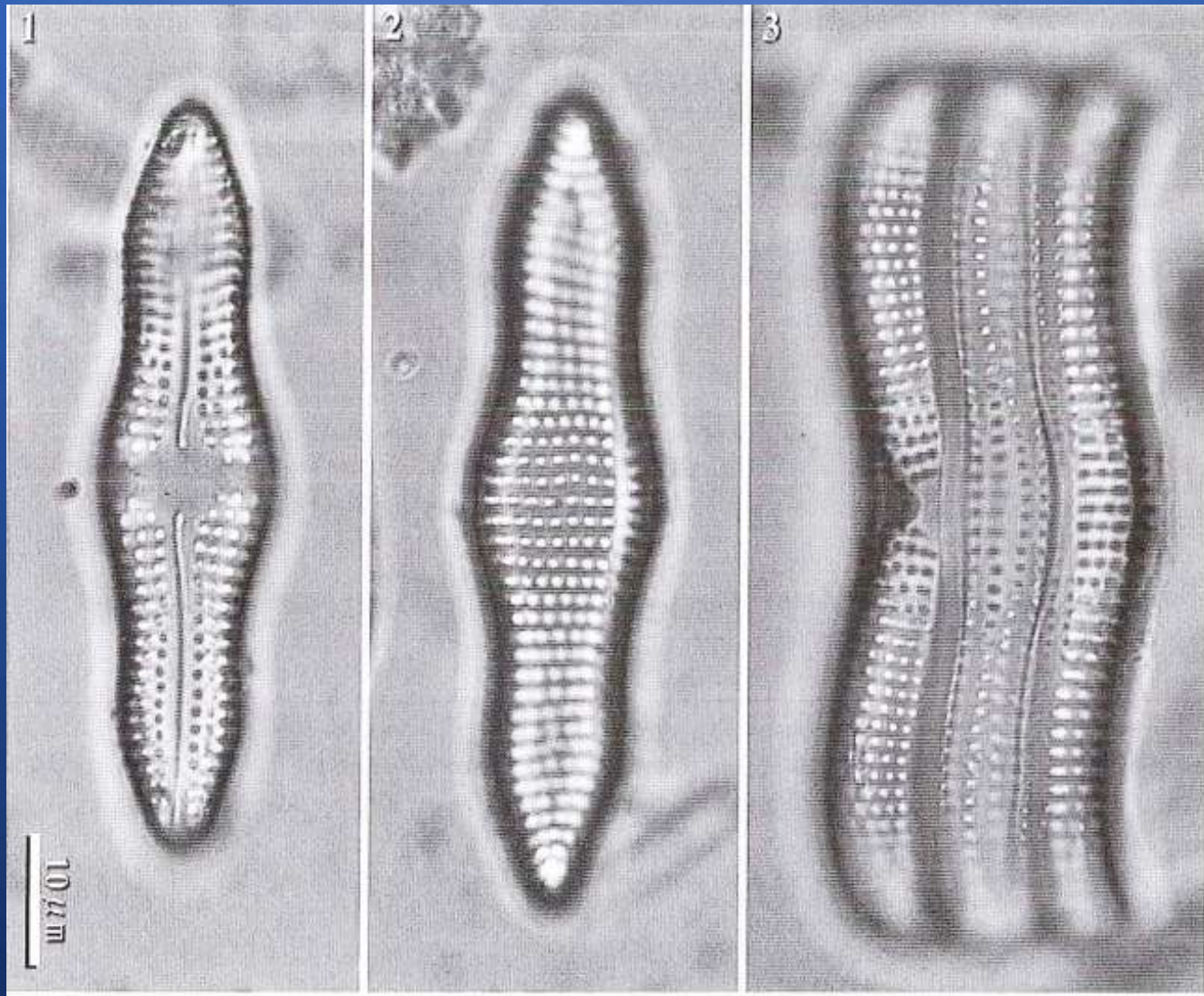


Систематика ахнантоидных
диатомовых:
изменения последних десятилетий

Литературная курсовая работа

Выполнила:
Цеплик Наталья Денисовна
Научный руководитель:
Чудаев Дмитрий Алексеевич

Ахнантоидные диатомовые



Achnanthes smithiana (Grev.) Toyoda et D.M. Williams
из Toyoda, Williams, 2005

Цели работы

- Проследить развитие систематики ахнантоидных диатомовых с конца XX века и до настоящего времени
- Выявить, на основании каких признаков осуществлялось выделение новых таксонов
- Рассмотреть, как изменилось положение ахнантоидных родов в системе диатомовых водорослей за последние десятилетия
- Сделать обзор данных по молекулярной филогенетике группы

Новые роды ахнантоидных диатомовых и критерии их выделения

18239-и

BIBLIOTHECA DIATOMOLOGICA

BAND 18

ACHNANTHES

eine Monographie der Gattung

mit Definition der Gattung *Cocconeis*
und Nachträgen zu den Naviculaceae

VON

H. LANGE-BERTALOT & K. KRAMMER

mit 2590 Figuren auf 100 Tafeln



J. CRAMER

in der Gebrüder Borntraeger Verlagsbuchhandlung

BERLIN · STUTTGART 1989

В конце XX века род *Achnanthes* s.l. был большим гетерогенным комплексом. Виды входили в него по признаку гетеровальварности панциря.

Krammer, Lange-Bertalot, 1989

F.E.ROUND, R.M.CRAWFORD, D.G.MANN

the diatoms

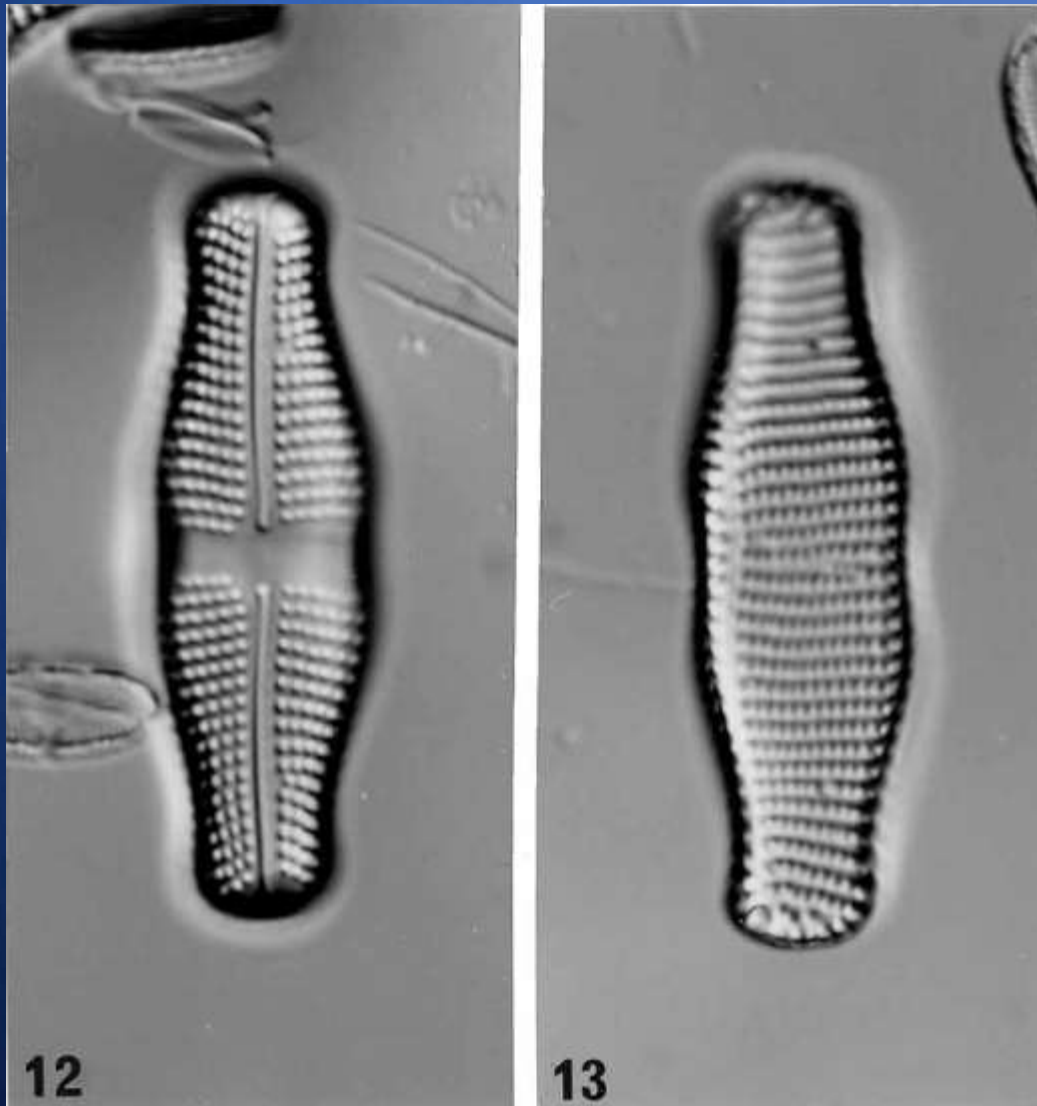
BIOLOGY & MORPHOLOGY OF THE GENERA



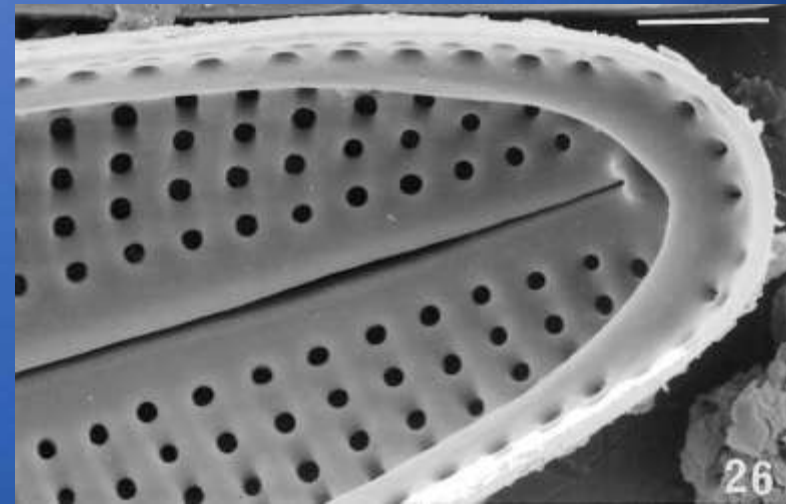
Round et al, 1990

- *Achnanthes* Bory
- *Achnantheidium* Kützing
- *Eucoconeis* Cleve

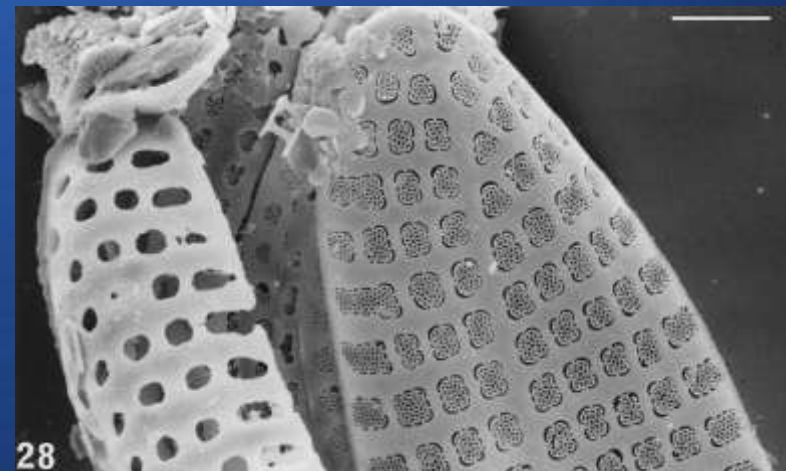
Achnanthes Bory, 1822



A. coarctata (Brébisson ex W.Smith) Grunow

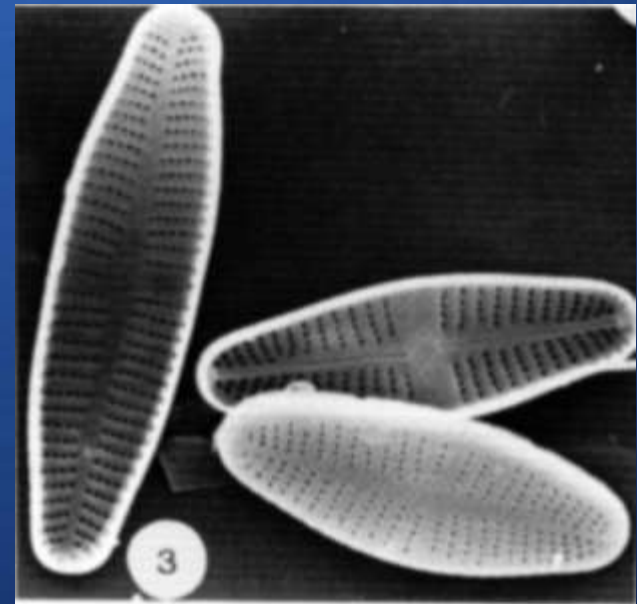
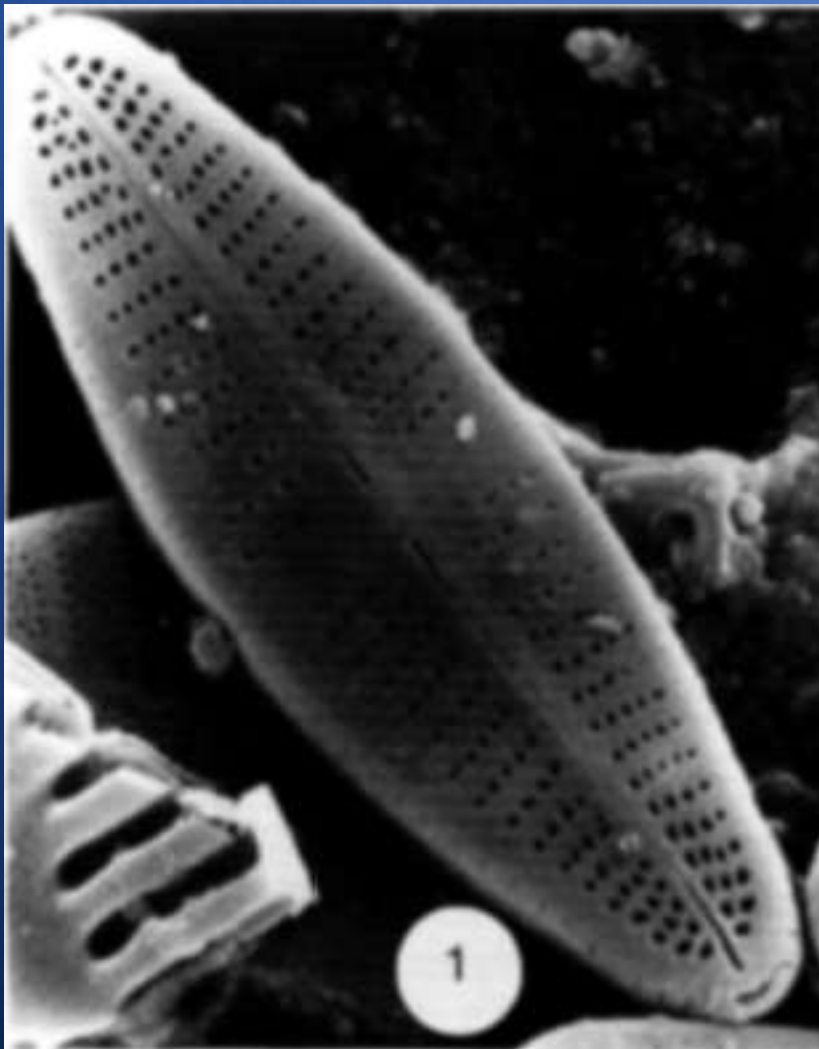


A. coarctata (Brébisson ex W.Smith) Grunow



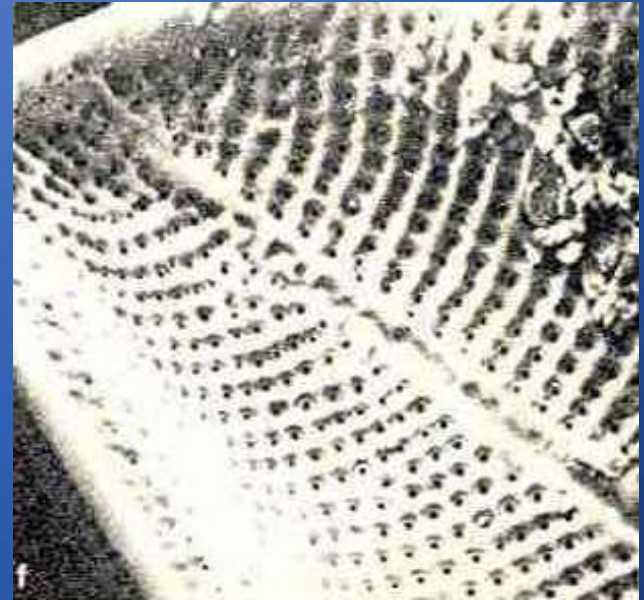
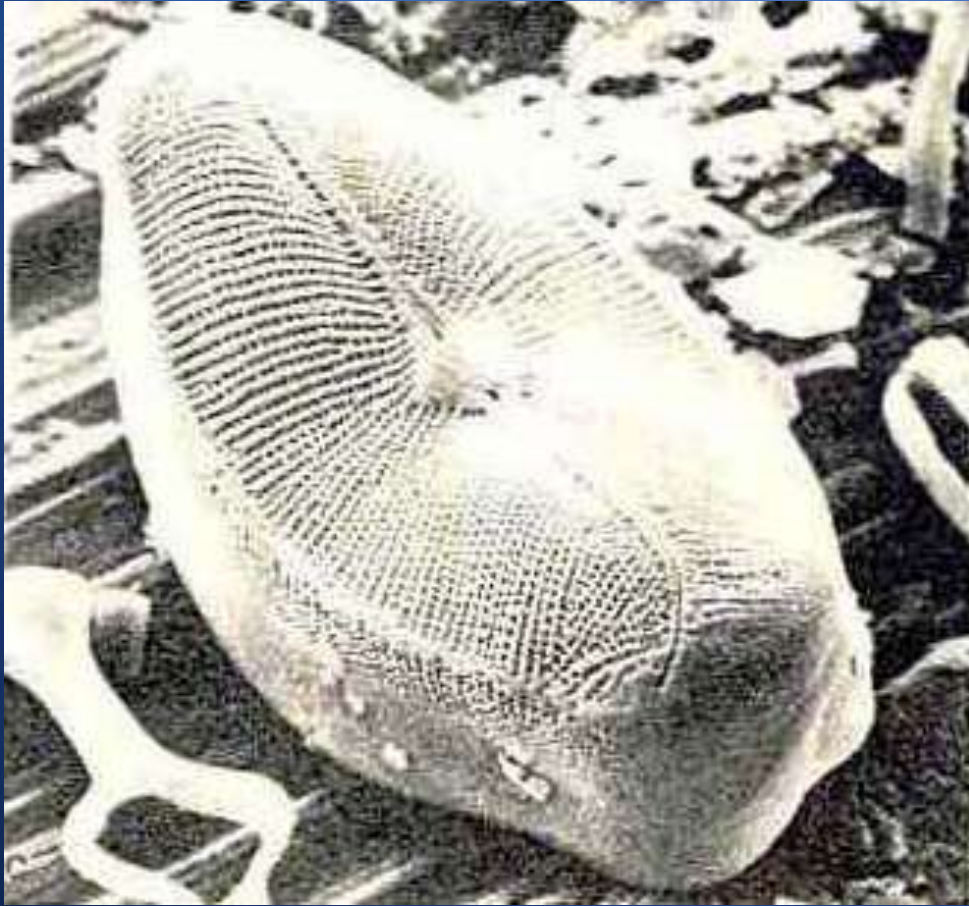
A. groenlandica (Cleve) Grunow

Achnantheidium Kützing, 1844



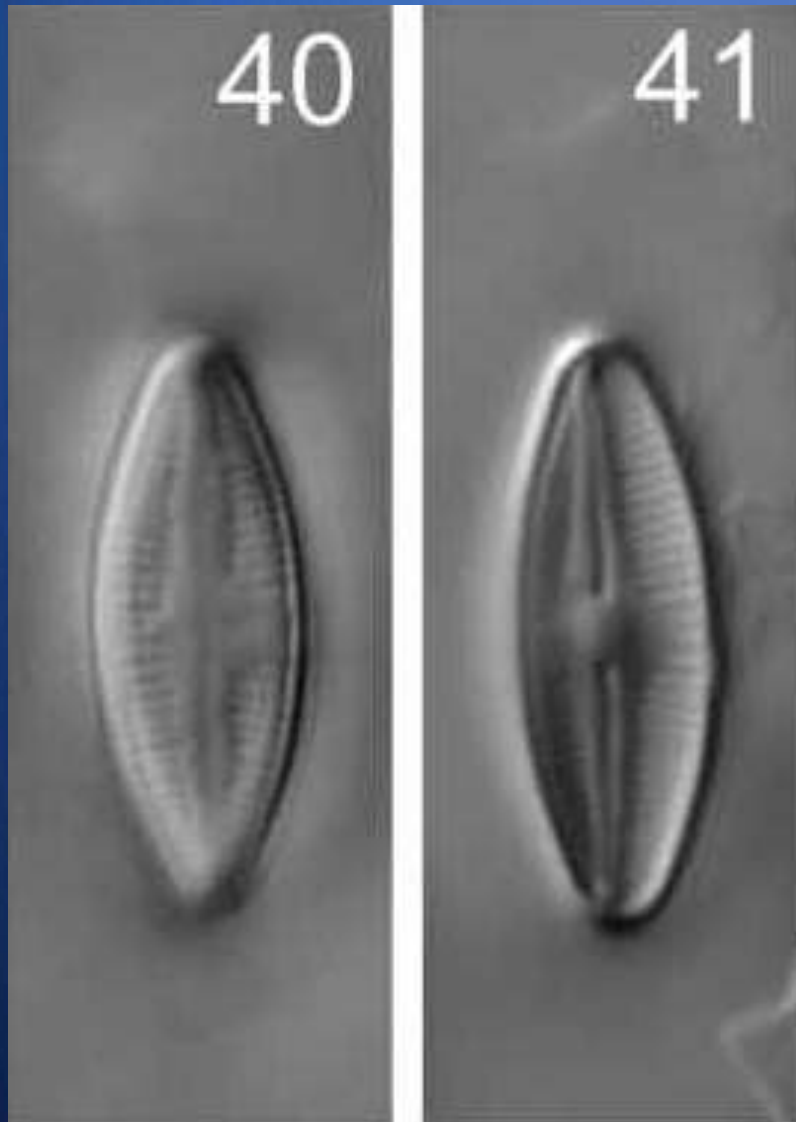
A. minutissimum (Kützing) Czarnecki из Round,
Bukhtiyarova, 1996

Eucocconeis Cleve, 1912

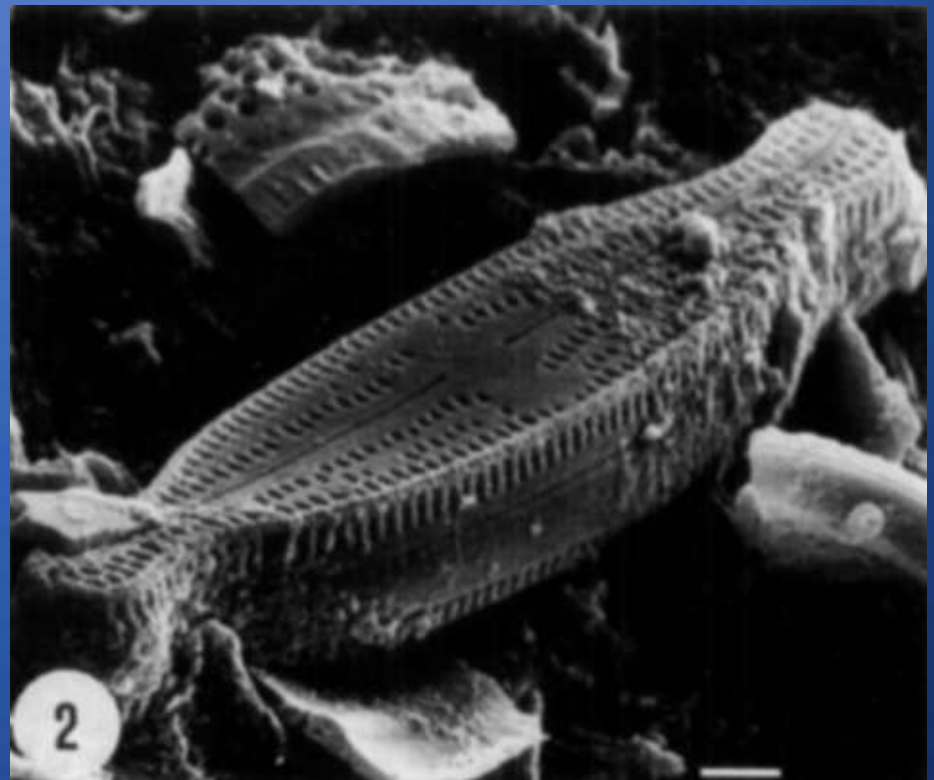


Φoto: Round et al, 1990

Nupela Vyverman & Compère, 1991



N. frezelii Potapova
из Potapova, 2011

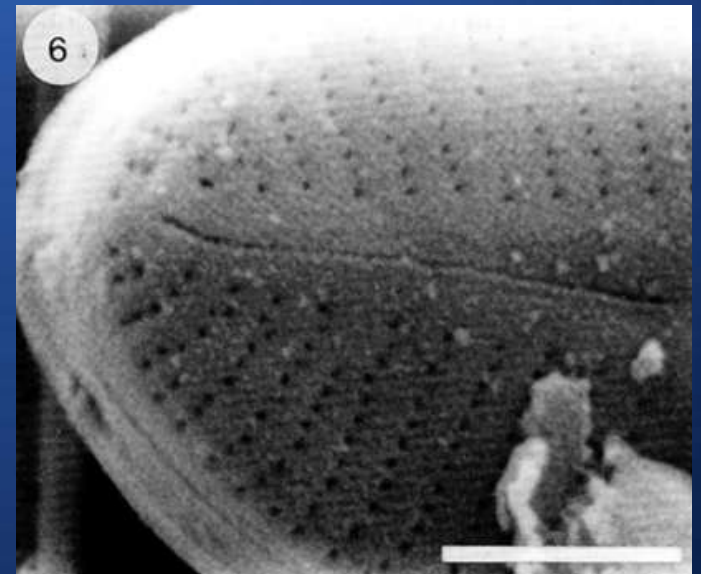
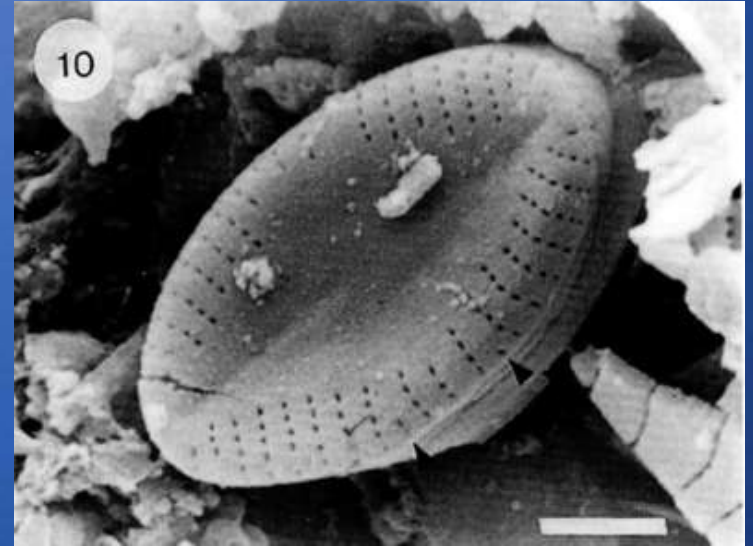
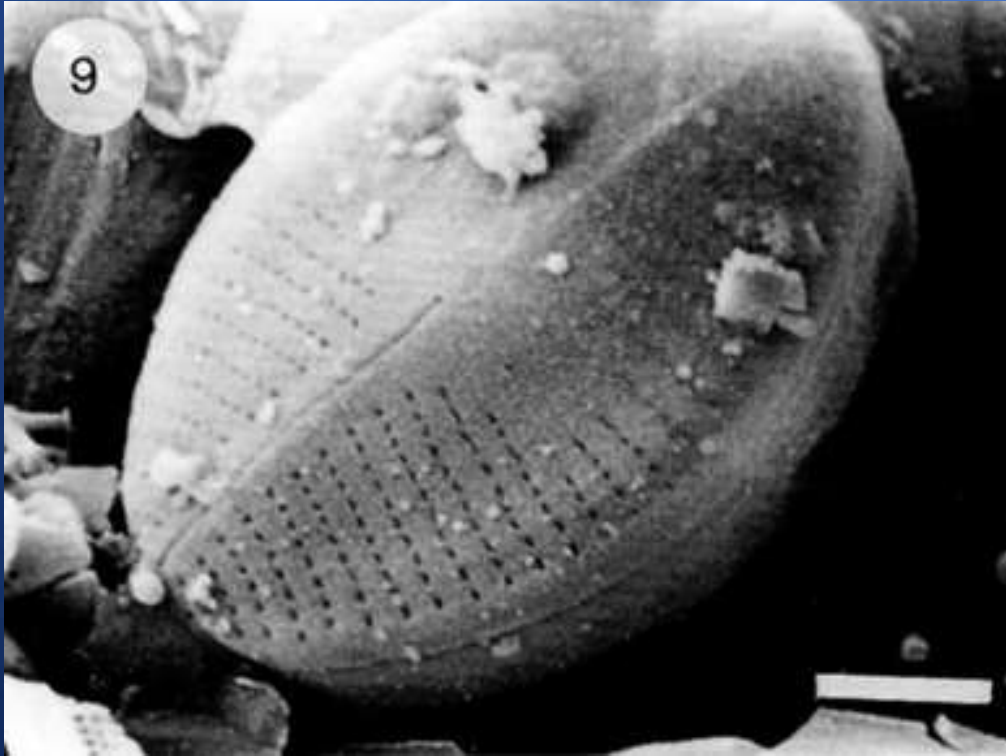


N. giluwensis Vyverman & Compère
из Vyverman, Compère, 1991



N. poconoensis (Patrick) Potapova
из Potapova, 2011

Psammothidium Bukhtiyarova & Round, 1996



P. marginulatum (Grunow) Bukhtiyarova & Round
из Bukhtiyarova, Round, 1996

**FOUR NEW GENERA BASED ON *ACHNANTHES*
(*ACHNANTHIDIUM*) TOGETHER WITH
A RE-DEFINITION OF *ACHNANTHIDIUM***

F. E. Round

*School of Biological Sciences, Department of Botany,
University of Bristol, Bristol BS8 1UG, England*

Ludmila Bukhtiyarova*

*N. G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine,
2, Tereshchenkovskaya st., Kiev-4, GSP, 252601, Ukraine*

The genus *Achnantheidium* comprises a collection of monoraphid species common in freshwaters and less so in marine habitats, though the latter are relatively uninvestigated as far as this genus is concerned. We propose that *Achnantheidium* be confined to the taxa around *A. minutissima*. Some of the remaining taxa are transferred to four new genera, *Planothidium*, *Rossithidium*, *Karayevia* and *Kolbesia*. This still leaves a large number of species to be re-allocated and these, for the moment, will have to be left as *Achnantheidium sensu lato*.

INTRODUCTION

Whilst studying samples of freshwater epipsammic diatoms it became quite clear that the genus *Achnantheidium* (Round *et al.* 1990) based on the listing of this genus in the *Index Nominum Genericorum* (see Ross & Sims in Round *et al.* 1990, p. 682) was simply impossible to characterise at the generic level on the detail of the valve morphology. The only single unifying feature was the araphid/raphid heterovalvy but that itself is merely a feature of the higher order Achnanthes. *Achnantheidium* is based on *A. microcephalum* Kütz. and this and some related species are the only ones which we believe should be included in *Achnantheidium*. Following the establishment of *Psammothidium* Bukht. & Round (Bukhtiyarova & Round 1996), our ecological studies could not be published using names which were unacceptable within a restricted concept of *Achnantheidium*. Thus since *Achnantheidium sensu lato* does not cover all other "achnantheid" taxa it is necessary to re-define this genus and the name was fortunately applied to *A. microcephala* by Kützing (1844); the minute illustrations leave no doubt about the capitate species involved. From this basis a cluster of species belonging to *Achnantheidium* can be defined along the lines already suggested by Krammer & Lange-Bertalot (1991).

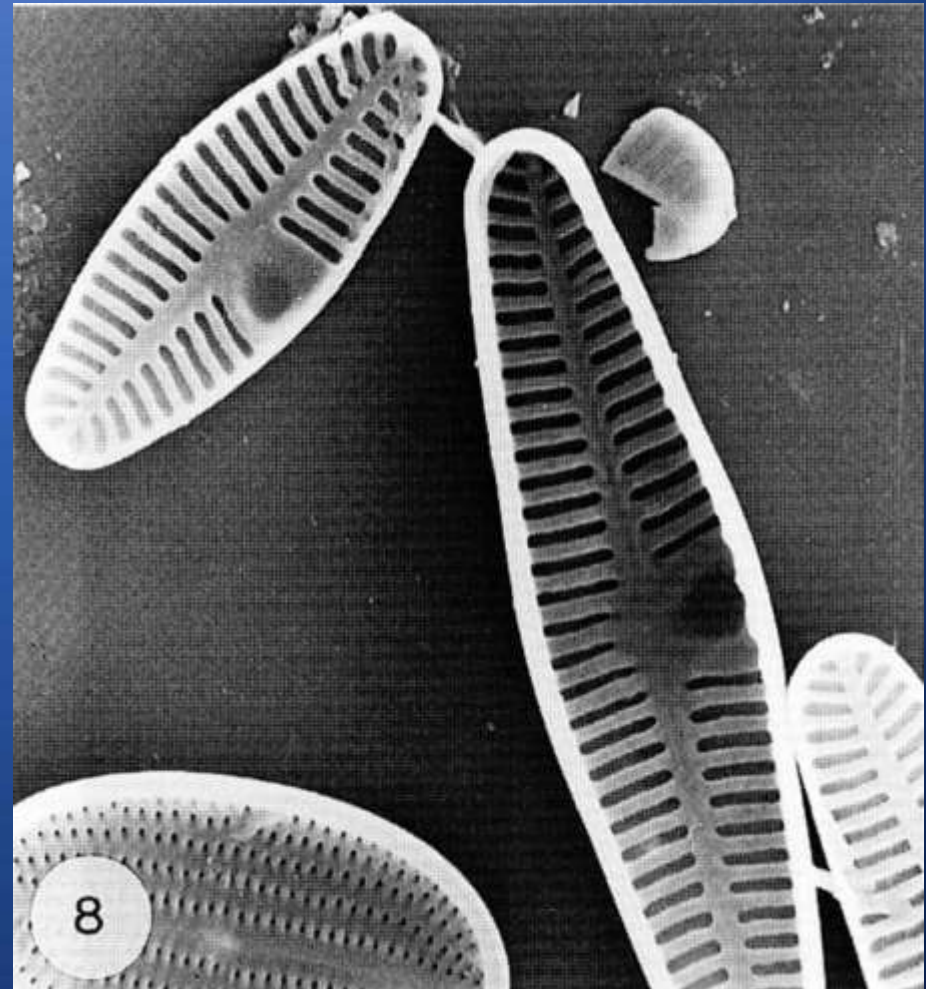
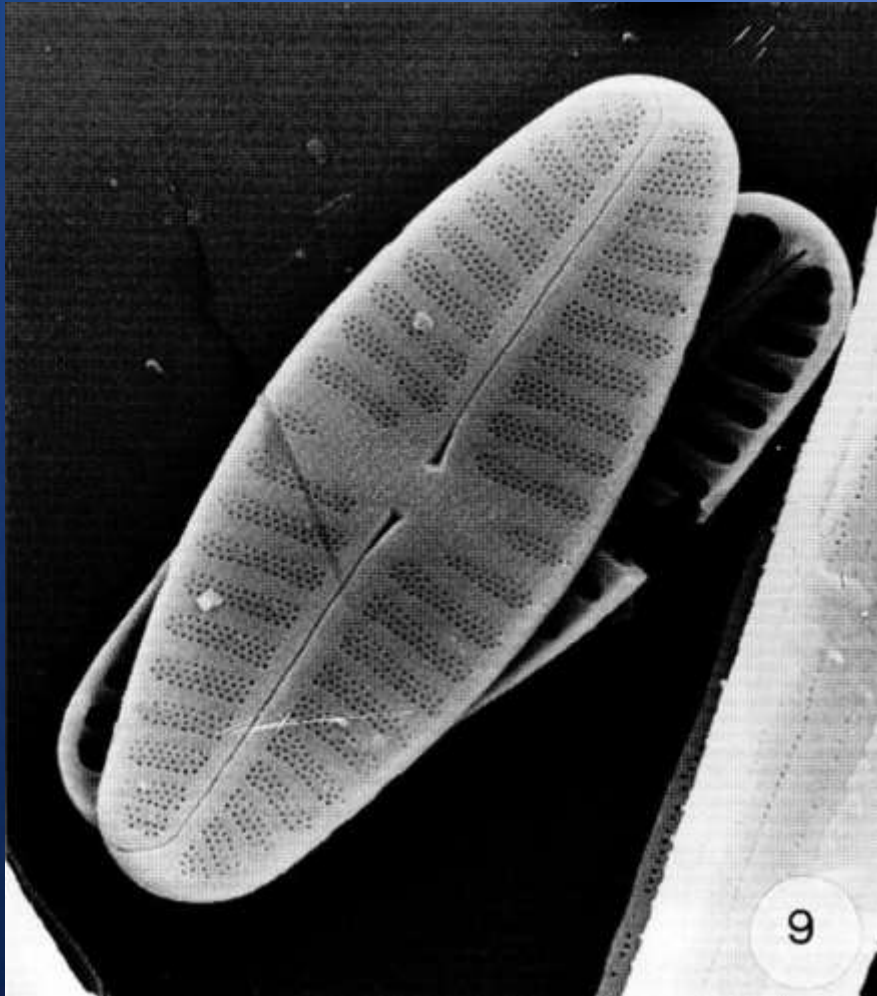
Kützing used *Achnanthes minutissima* Kütz. for a non-capitate taxon which was figured attached to the stalks of *Gomphonema germinatum* (= *Didymosphenia geminata* of modern works) – it

* Address for correspondence: 252005 Kiev-5, P.O. Box 513, Ukraine.

Round, Bukhtiyarova, 1996

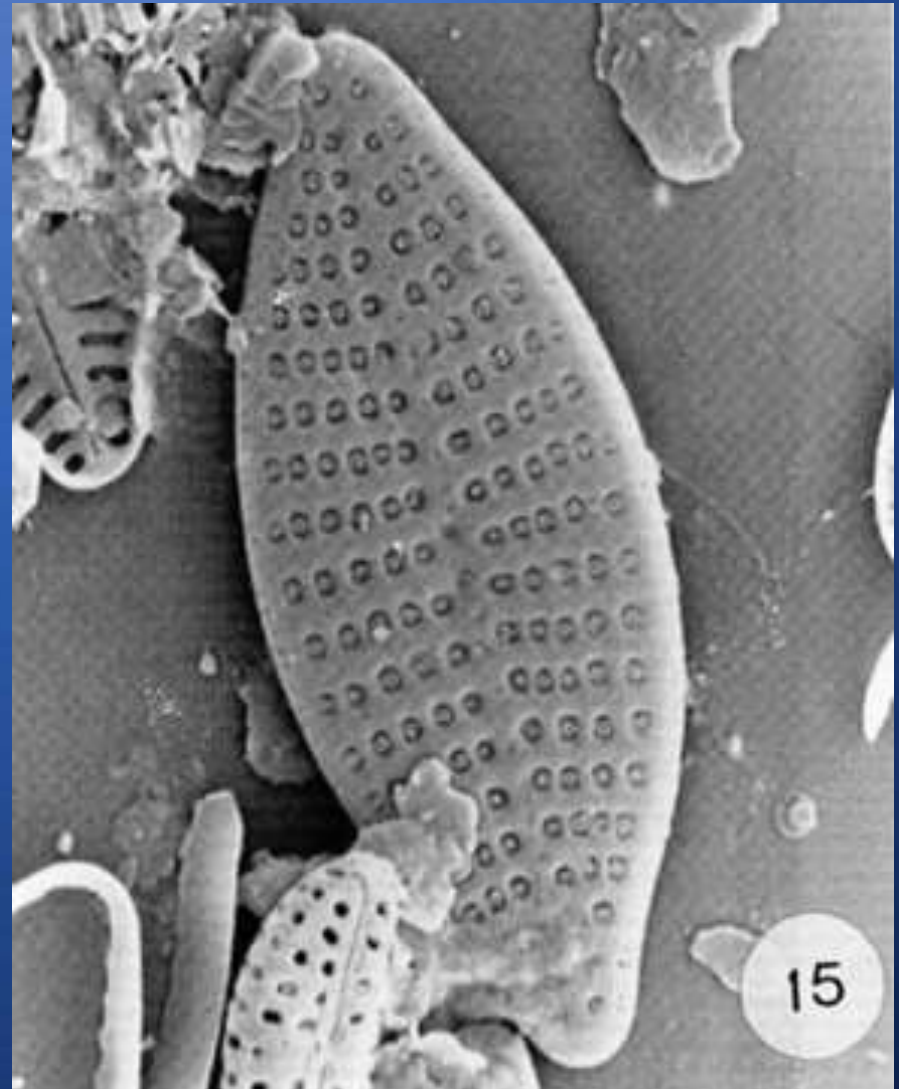
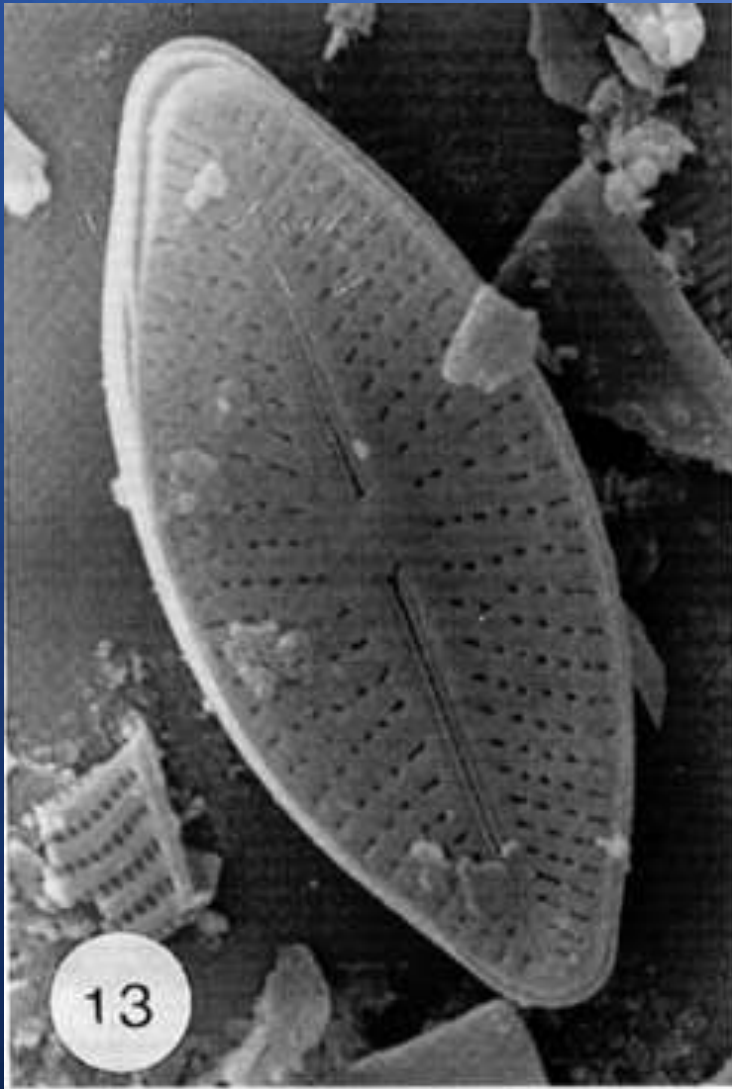
- *Planothidium* Round & Bukhtiyarova
- *Karayevia* Round & Bukhtiyarova
- *Kolbesia* Round & Bukhtiyarova
- *Rossithidium* Round & Bukhtiyarova

Planothidium Round & Bukhtiyarova, 1996
syn. *Achnantheiopsis* Lange-Bertalot, 1997



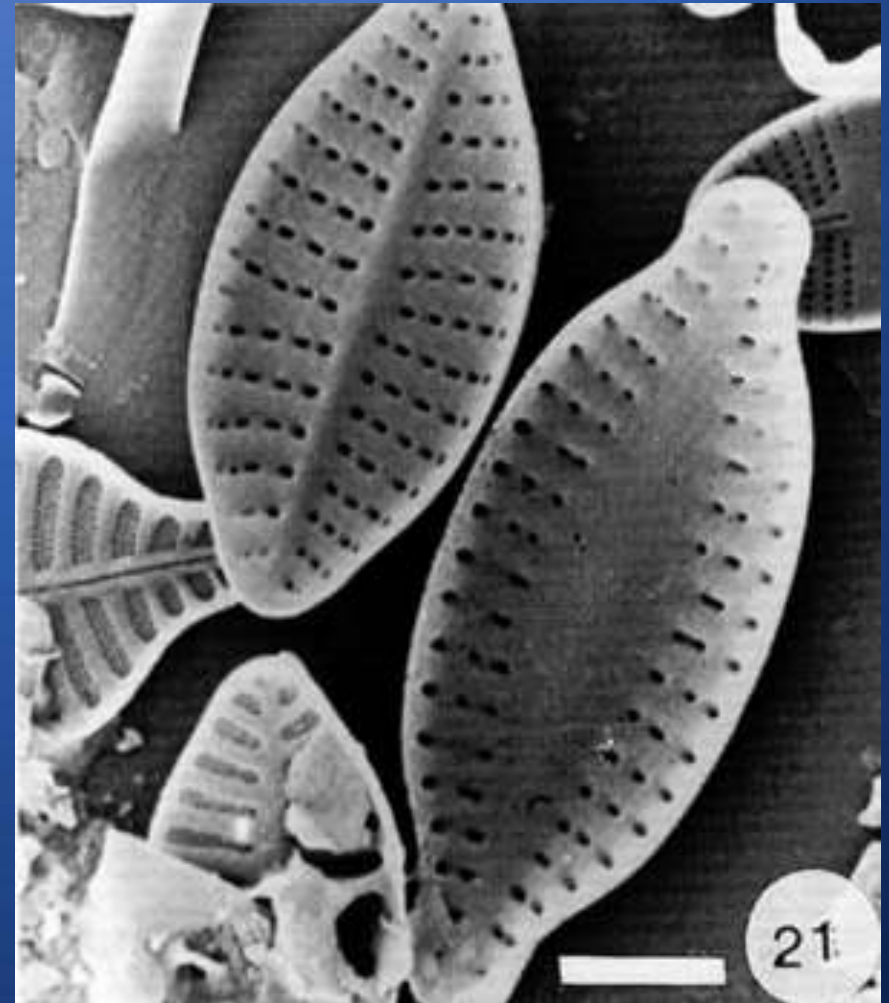
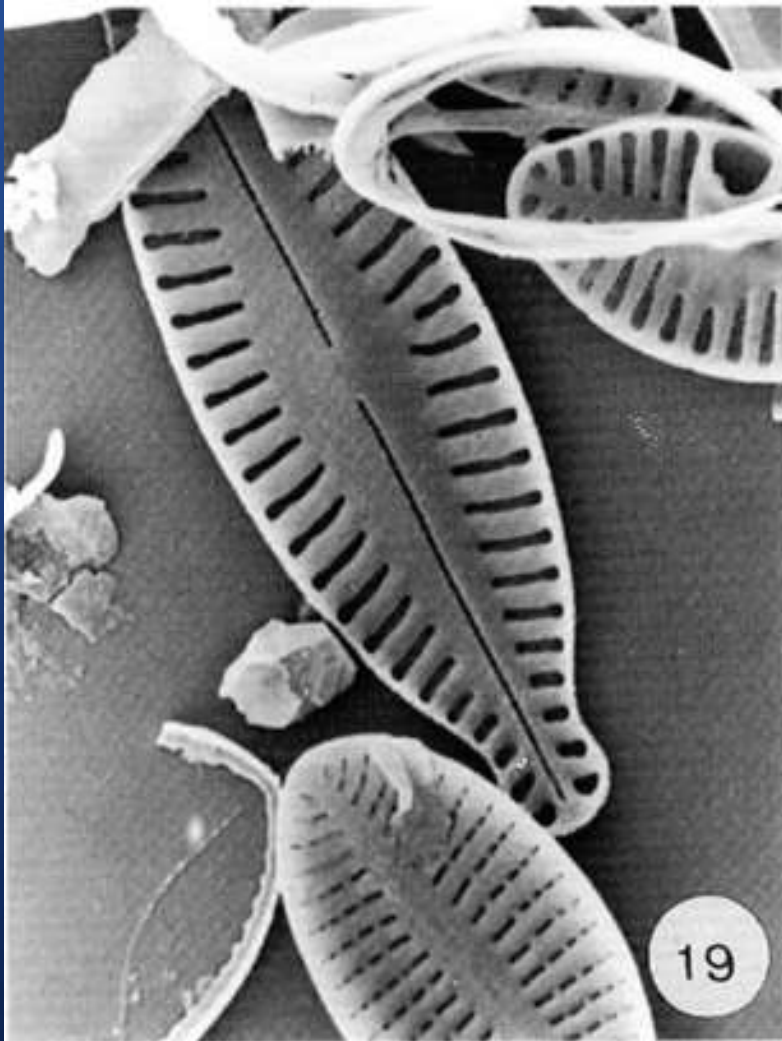
P. lanceolatum (Brébisson ex Kützing) Lange-Bertalot
из Round, Bukhtiyarova, 1996

Karayevia Round & Bukhtiyarova, 1996



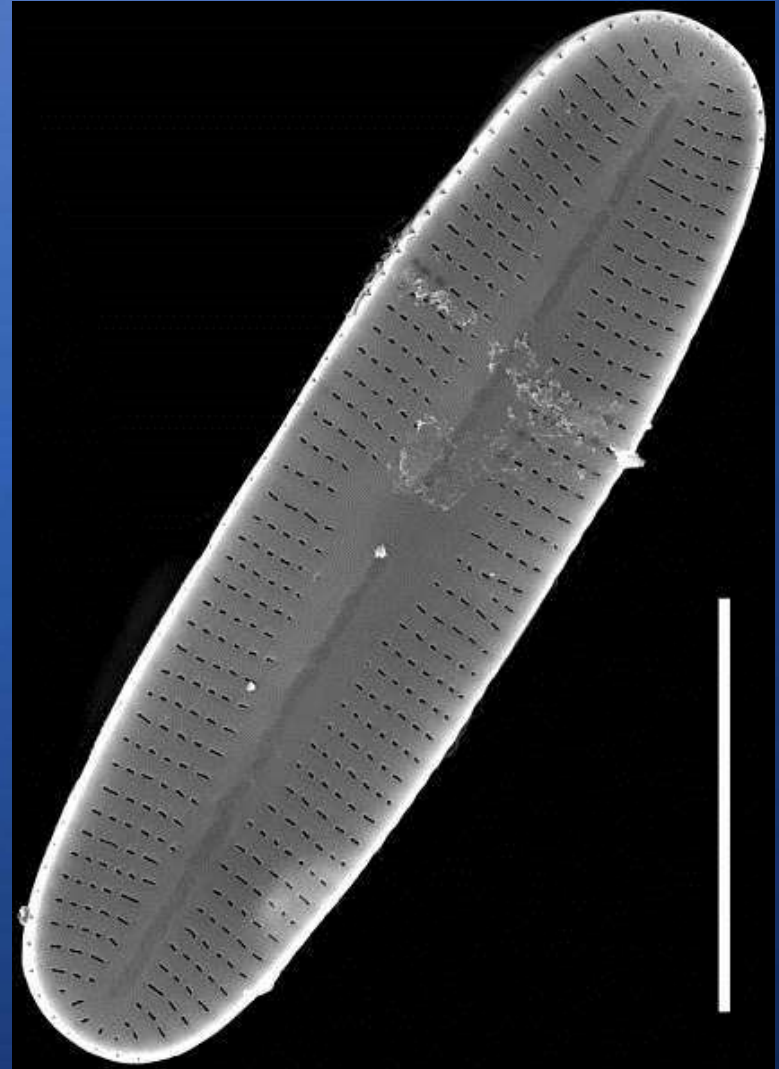
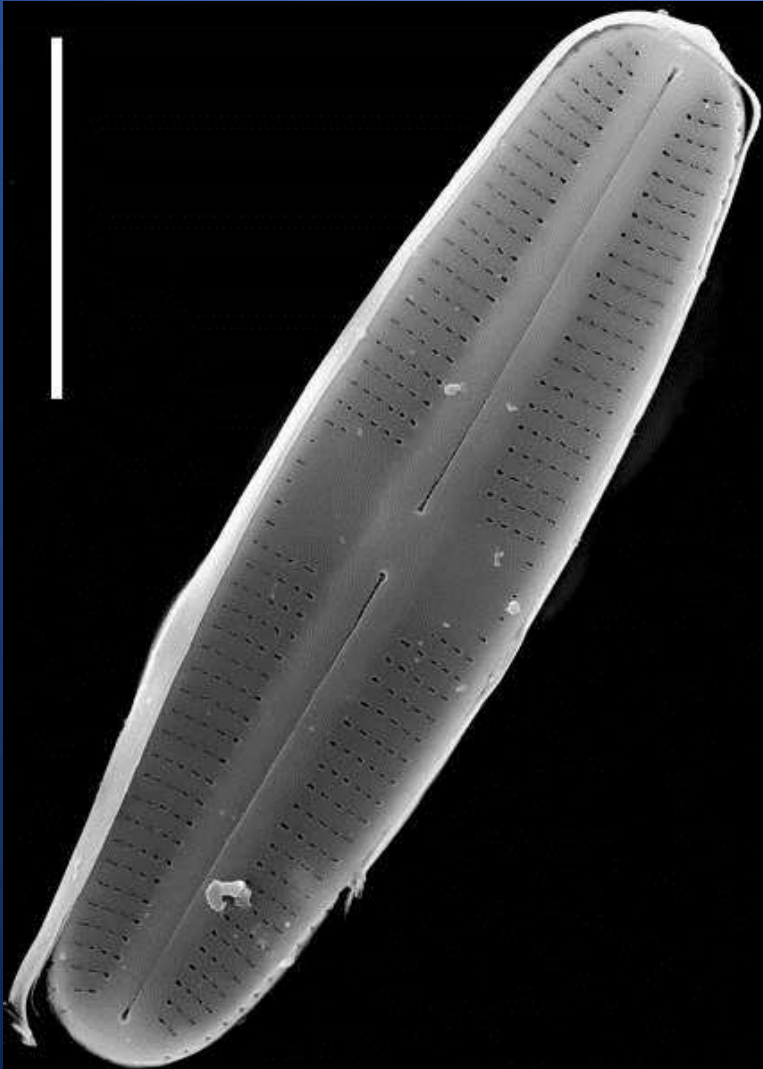
K. clevei (Grunow) Round
из Round, Bukhtiyarova, 1996

Kolbesia Round & Bukhtiyarova, 1996



K. kolbei (Hustedt) Round & Bukhtiyarova
из Round, Bukhtiyarova, 1996

Rossithidium Round & L. Bukhtiyarova, 1996



R. petersenii (Hustedt) Round & Bukhtiyarova
из westerndiatoms.colorado.edu

**A NEW MONORAPHID DIATOM GENUS (*POGONEIS*)
FROM BAHRAIN AND THE TRANSFER OF
PREVIOUSLY DESCRIBED SPECIES *A. HUNGARICA*
AND *A. TAENIATA* TO NEW GENERA**

F. E. Round & P. W. Basson

*School of Biological Sciences, University of Bristol,
Bristol BS8 1UG, England*

A new monoraphid genus (*Pogoneis*) is described from a sample of epiphyton growing on the red alga *Sarconema filiforme*. Its relationship to other achnantheid species was studied and two of these also proved to require allocation to new genera. *Achnanthes hungarica* was therefore transferred to *Lemnicola* nov. gen. and the marine taxon *A. taeniata* to *Pauliella taeniata* nov. gen.

INTRODUCTION

In samples collected for a study of diatoms around the island of Bahrain (Arabian Gulf), an unusual monoraphid taxon was observed in which, apart from the normal occurrence of raphid and araphid valves, there was further noticeable heterovalvy – the raphid valve having distinctly upturned apices, rather like the prow of a ship, and the araphid valve apices being curved downwards. In addition, the bend about the transapical axis which is common in many *Achnanthes* and *Achnantheidium* species is absent in the new taxon.

Using valve shape as a good criterion of specific affinity the only obvious “achnantheid” species which may have shown a close relationship with the form collected in Bahrain were *Achnanthes hungarica* and *A. taeniata*. Hence these were re-investigated and they proved to have little in common with the Bahrain taxon and nothing in common with the newly defined taxa in papers by Bukhtiyarova & Round (1996) and Round & Bukhtiyarova (1996). They have therefore been allocated to new genera.

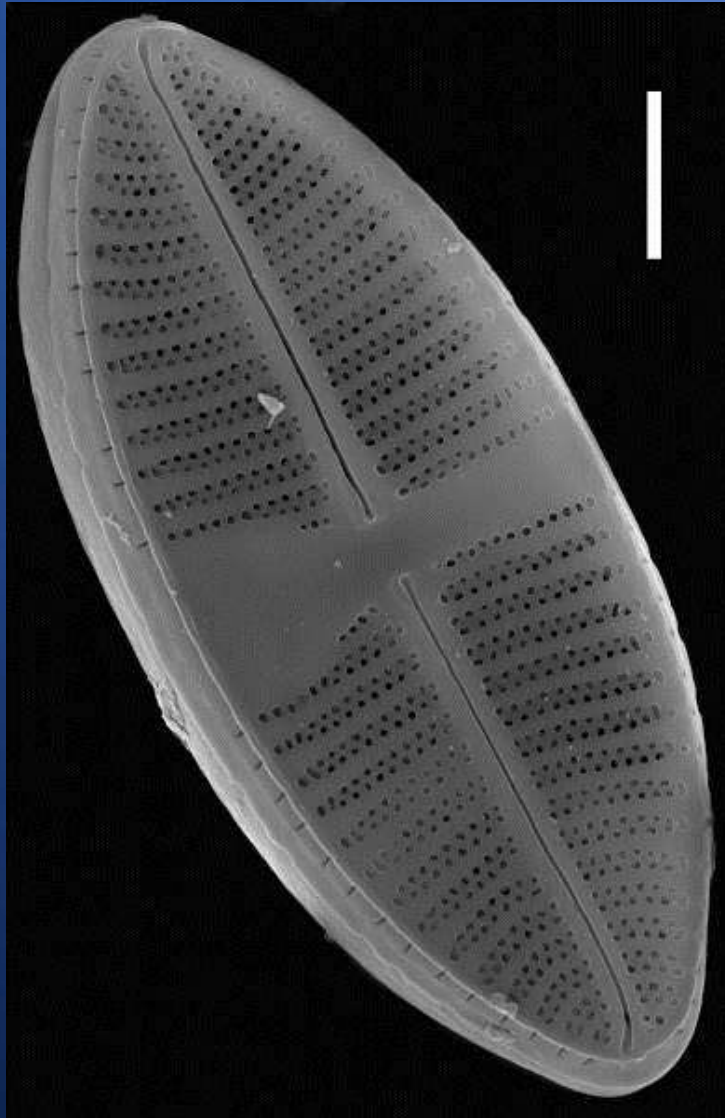
MATERIAL AND METHODS

Samples of the red alga *Sarconema filiforme* (Sonder) Kylin from the lower intertidal on the southwest side of Tubli Bay, Bahrain and samples of the floating freshwater *Lemna minor* from drainage ditches south of Bristol were collected. A cleaned sample of *A. taeniata* from the Baltic was kindly supplied by Dr P. Snoeijs. Small subsamples of the plants were treated with saturated potassium permanganate followed by the addition of concentrated hydrochloric acid and heating to 70°C. After repeated rinsing with distilled water and centrifugation, samples were dried onto

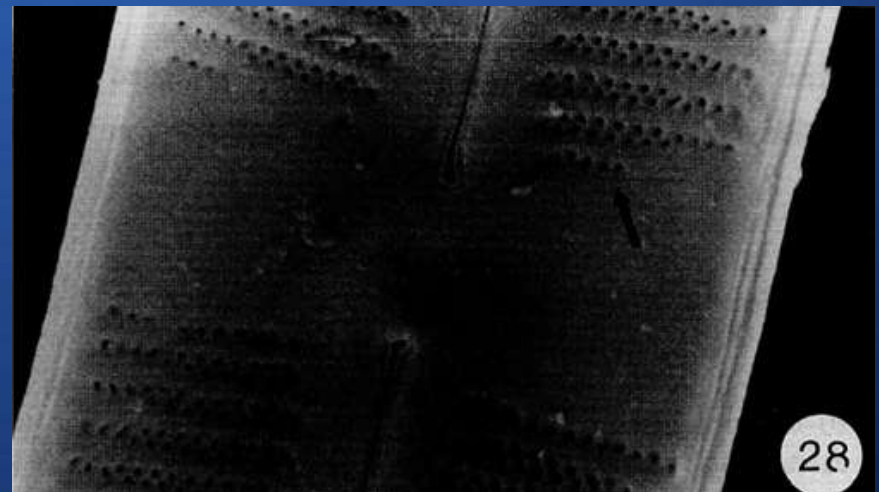
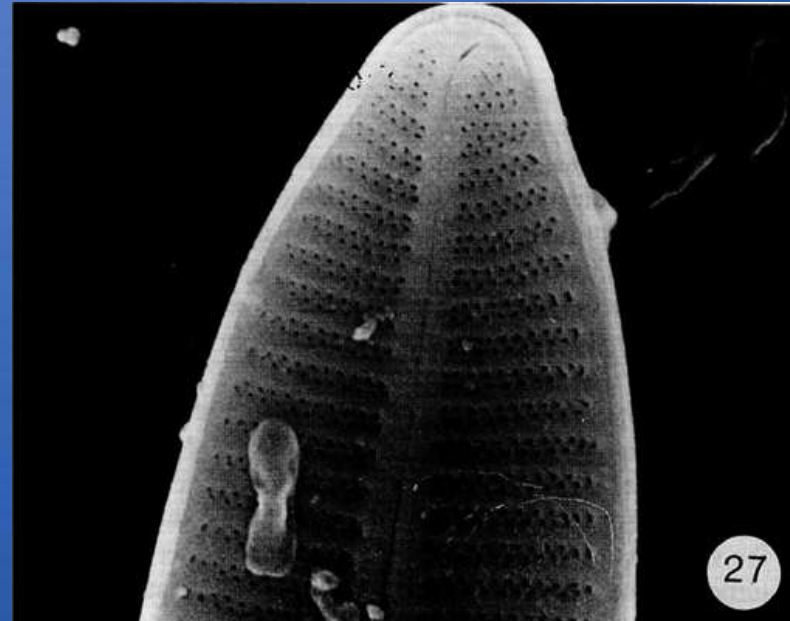
Round, Basson, 1997

- *Lemnicola* Round & Basson
- *Pauliella* Round & Basson
- *Pogoneis* Round & Basson

Lemnicola Round & Basson, 1997

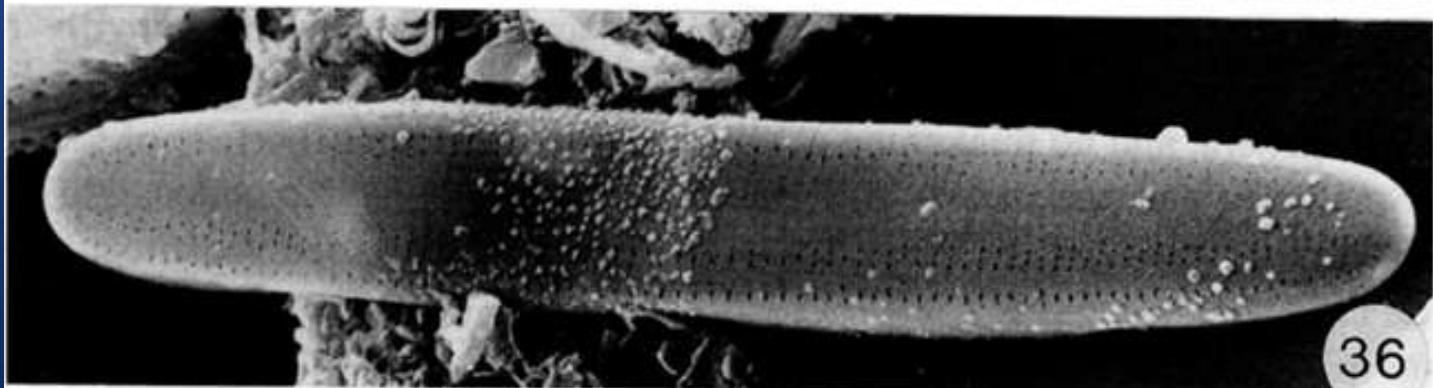
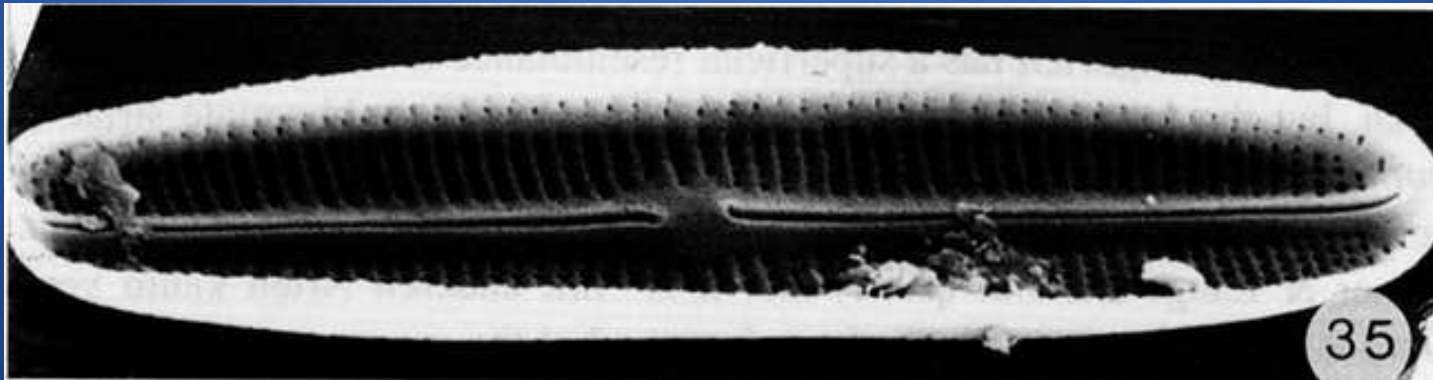
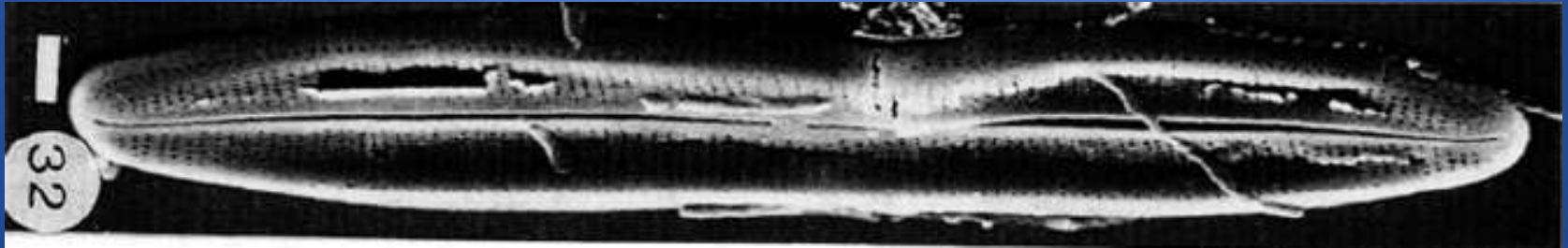


L. hungarica (Grunow) Round & Basson
из westerndiatoms.colorado.edu



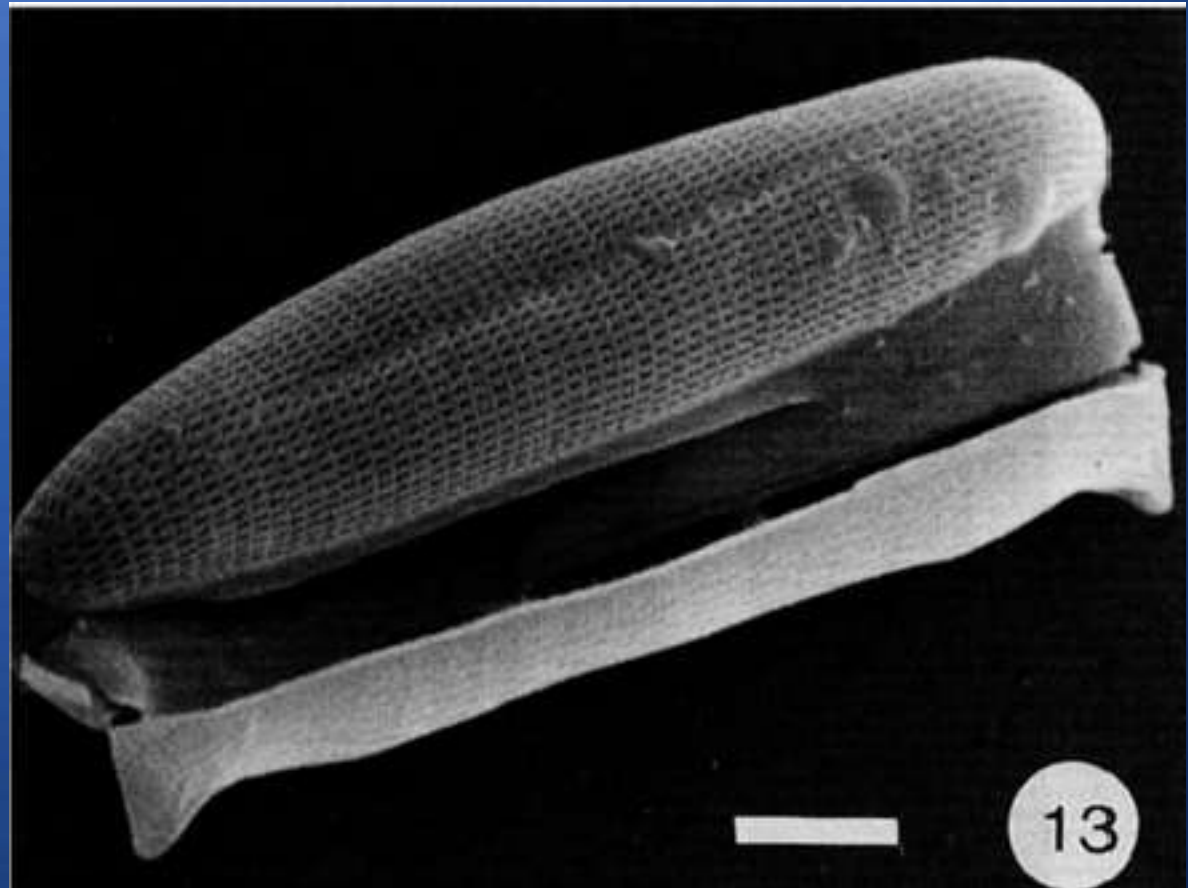
L. hungarica (Grunow) Round & Basson
из Round, Basson, 1997

Pauliella Round & Basson, 1997



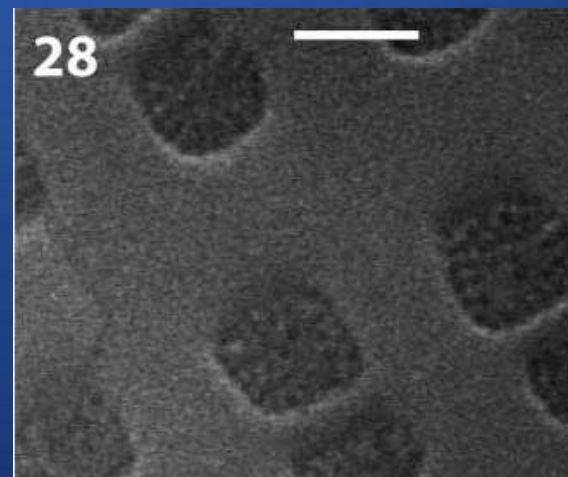
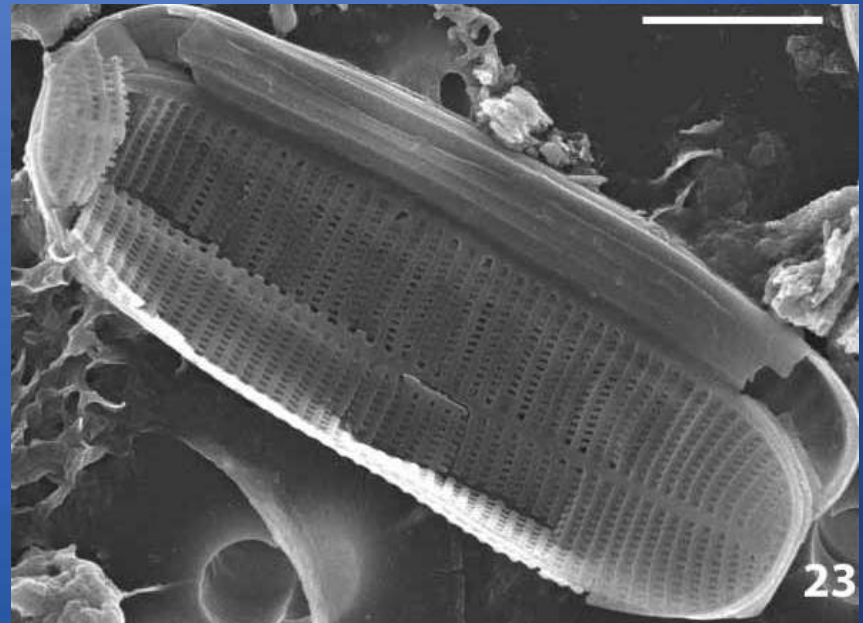
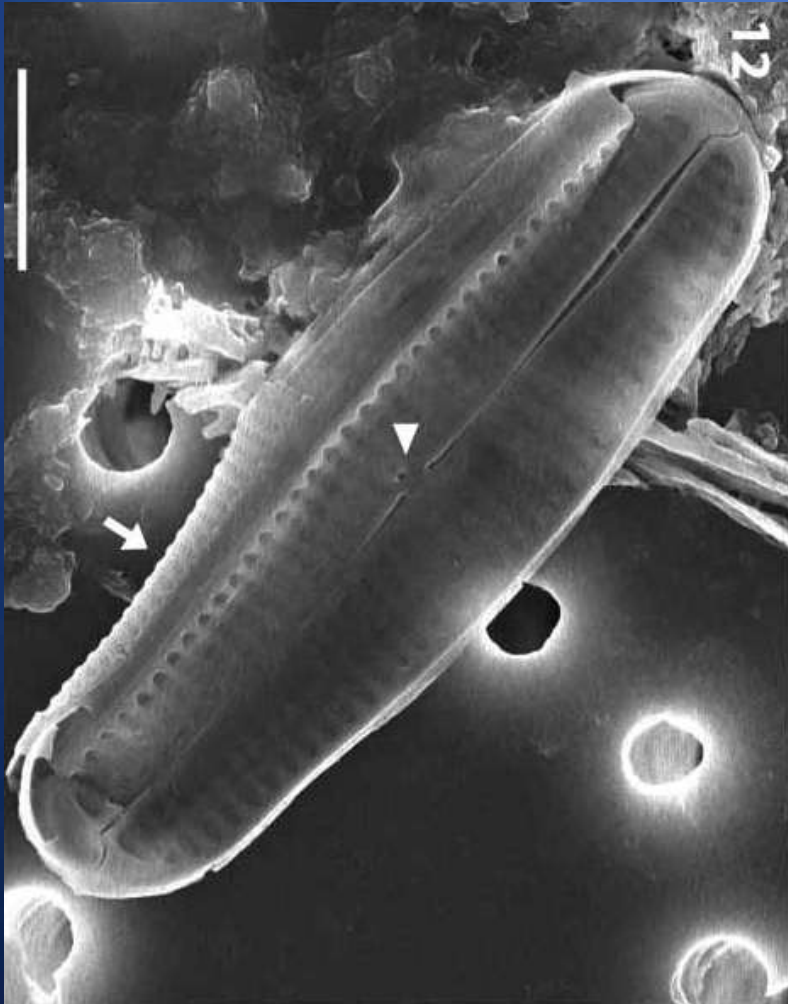
P. taeniata (Grunow) Round & Basson
из Round, Basson, 1997

Pogoneis Round & Basson, 1997



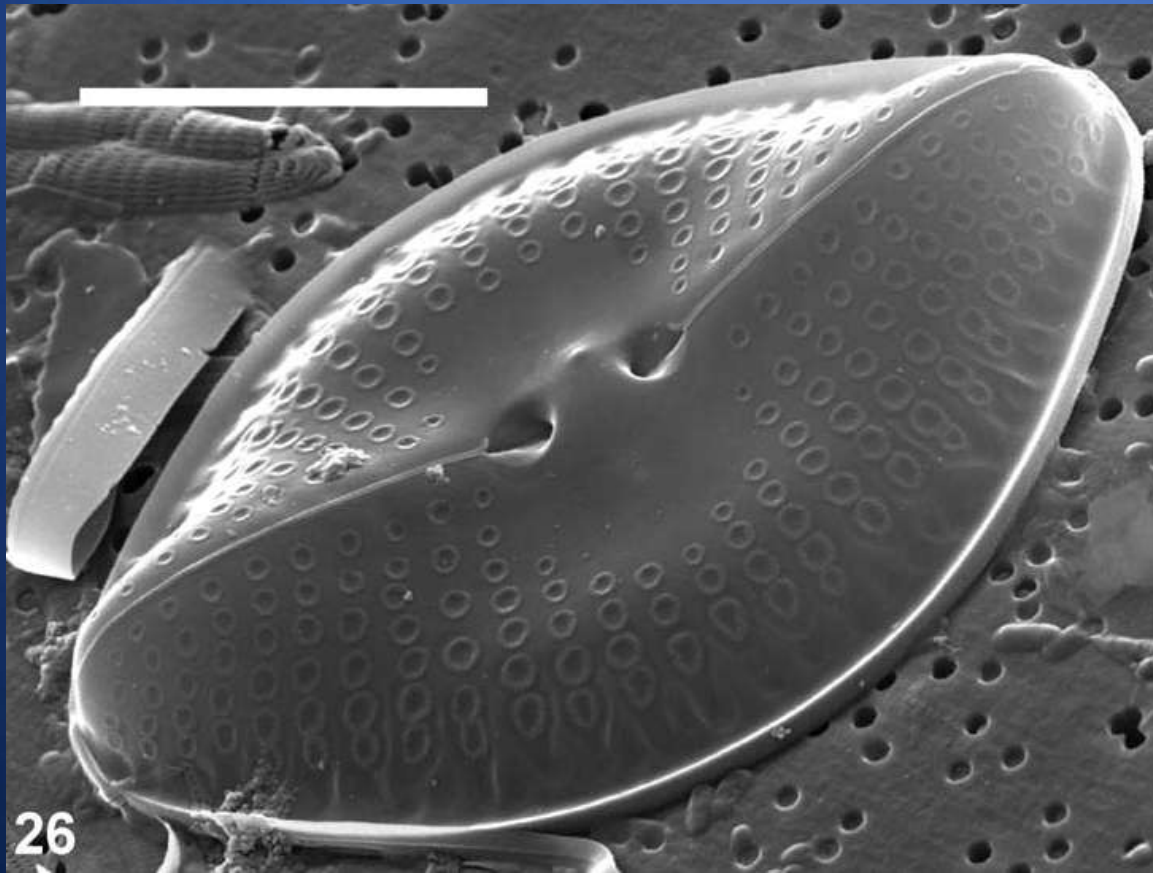
P. bahrainii Round & Basson
из Round, Basson, 1997

Astartiella Witkowski, Lange-Bertalot & Metzeltin, 1998

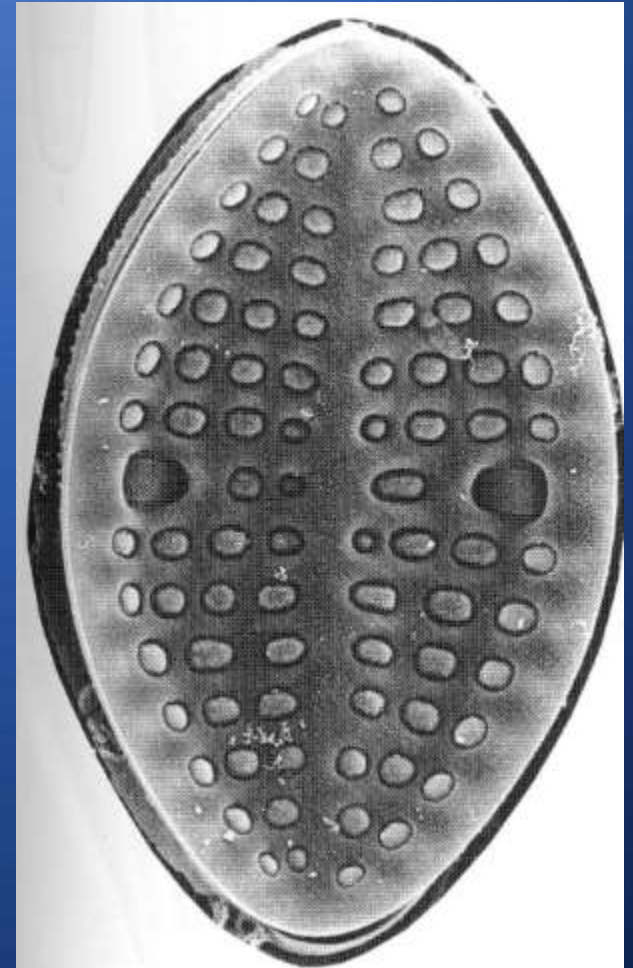


Astartiella societatis Riaux-Gobin, Witkowski & Romero
из Riaux-Gobin et al, 2013

Vikingea Witkowski, Lange-Bertalot & Metzeltin, 2000

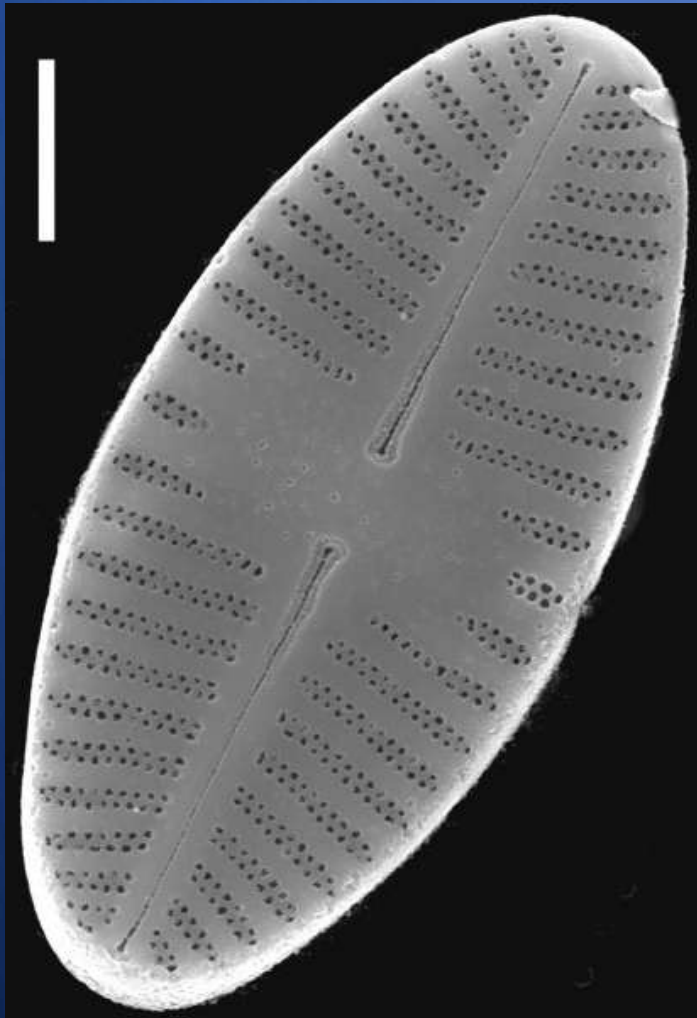


V. gibbocalyx (J.-J.Brun) Witkowski, Lange-Bertalot & Metzeltin
из Van der Vijver et al, 2009

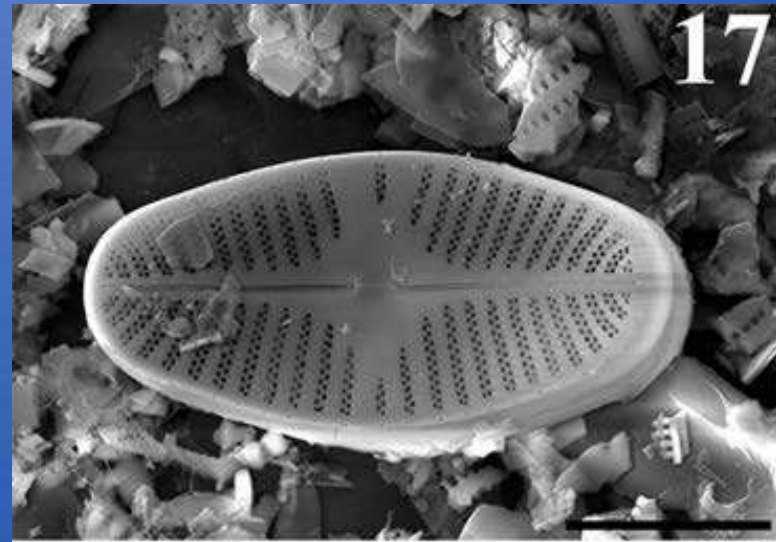


V. gibbocalyx (J.-J.Brun) Witkowski,
Lange-Bertalot & Metzeltin
из Witkowski et al, 2000

Platessa Lange-Bertalot, 2004

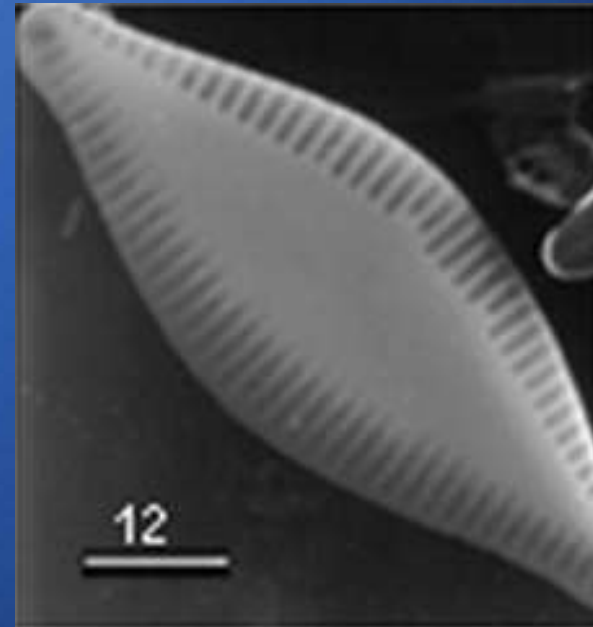
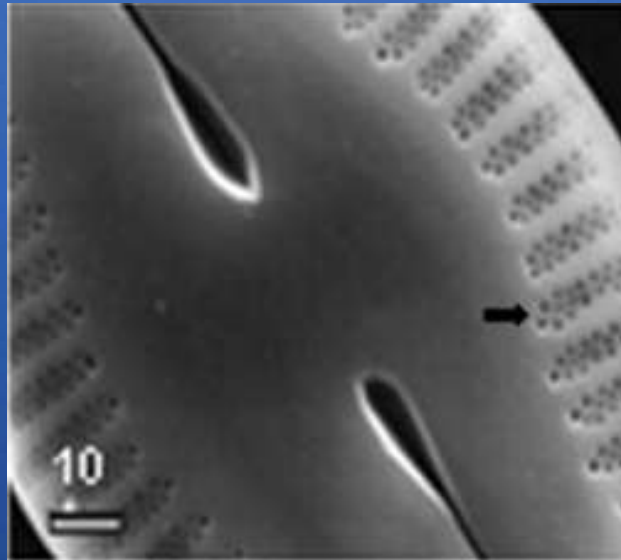
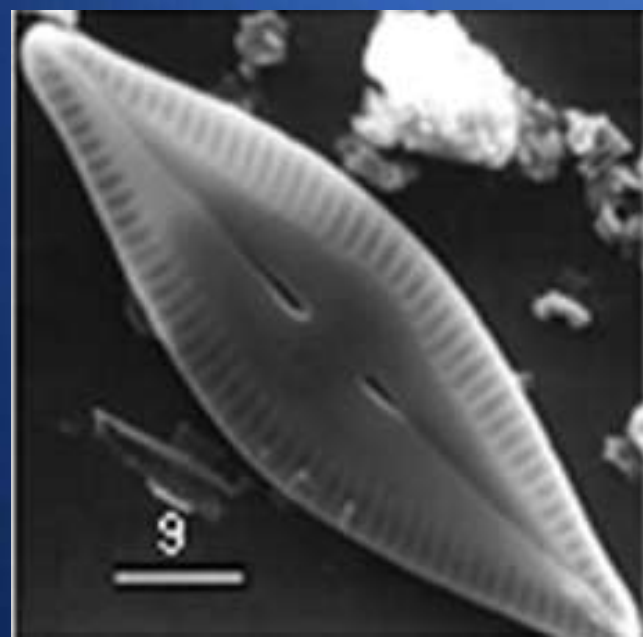


P. hustedtii (Krasske) Lange-Bertalot
из westerndiatoms.colorado.edu



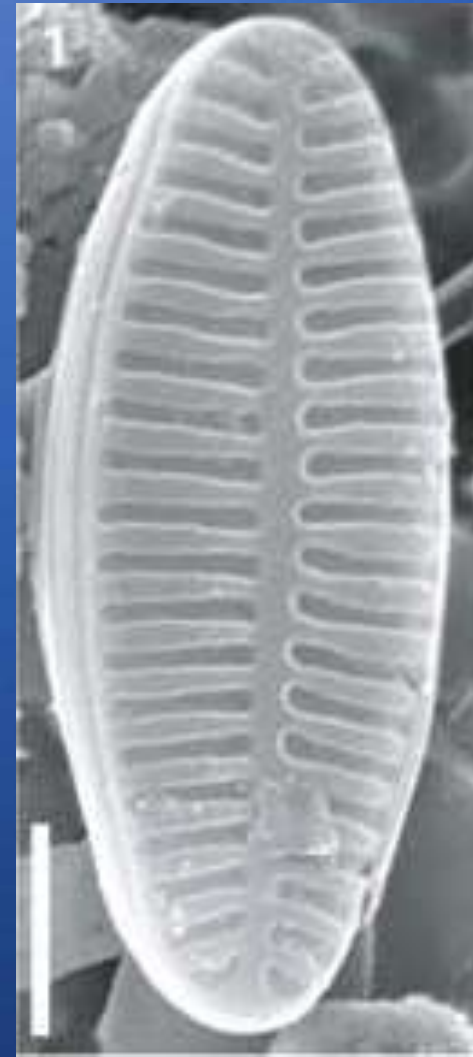
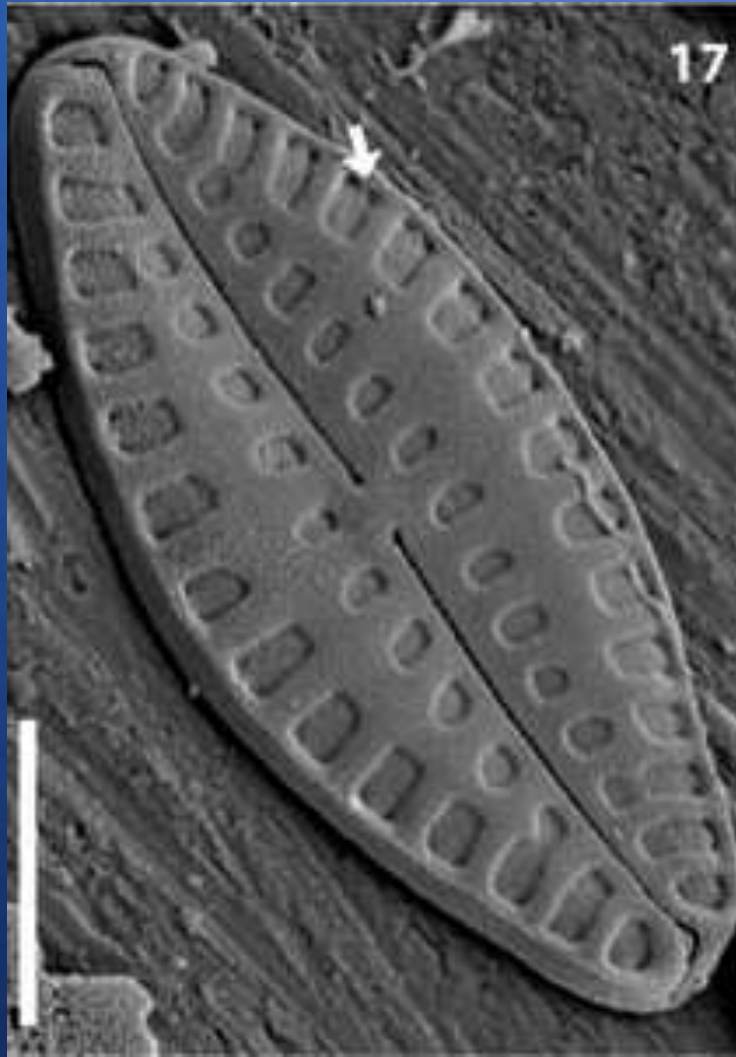
P. strelnikovae Enache, Potapova & Morales
из Enache et al, 2014

Haloroundia C.A.Díaz & N.I.Maidana, 2006



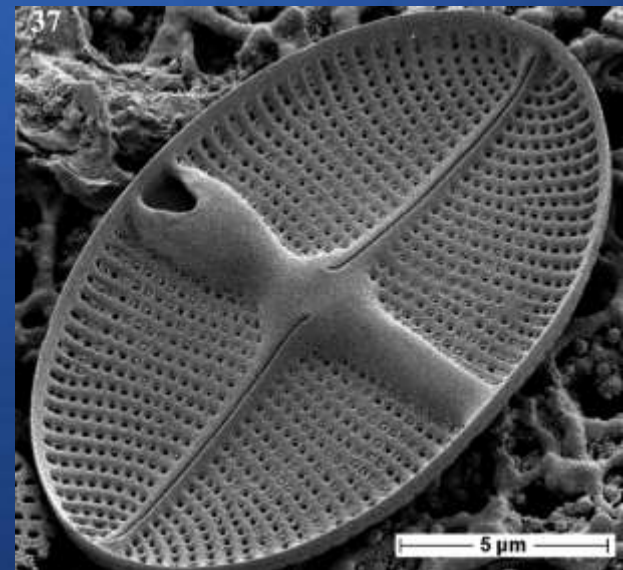
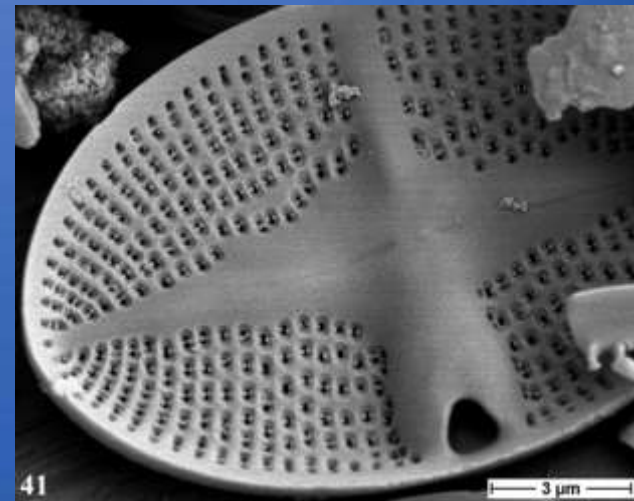
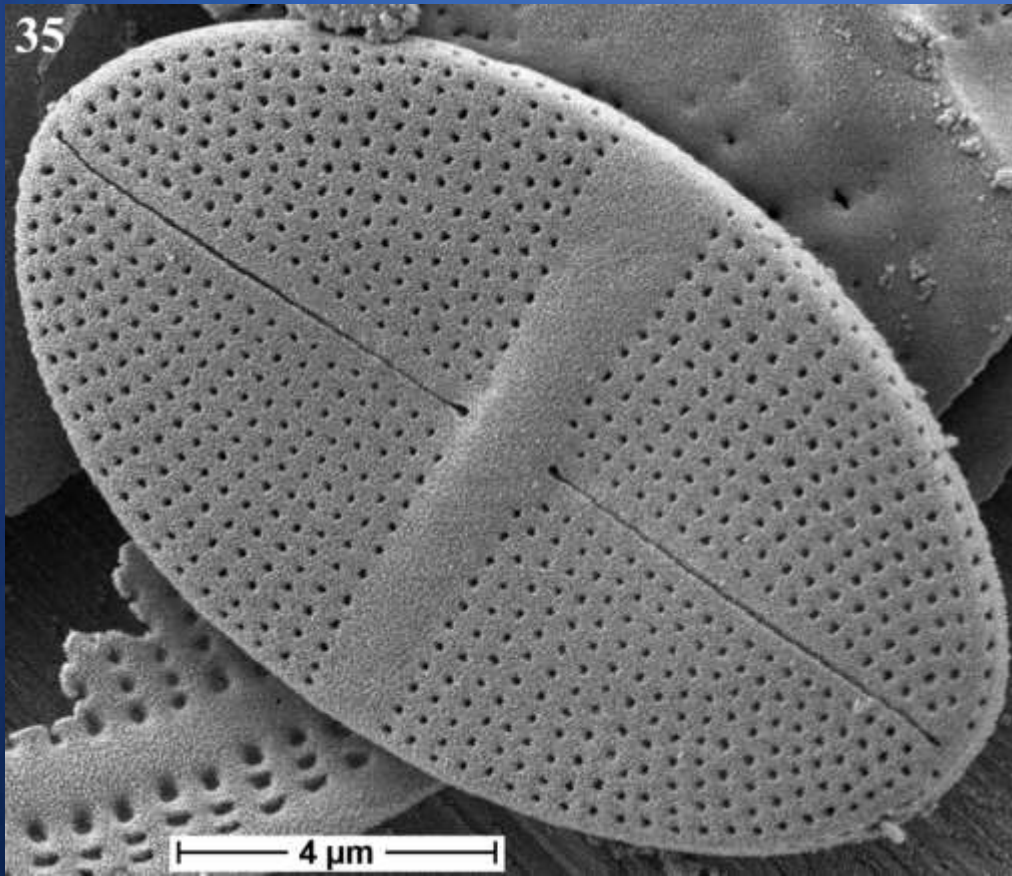
H. speciosa (Hustedt) Diaz & Maidana
из Diaz, Maidana, 2006

Scalariella C.Riaux-Gobin, 2012



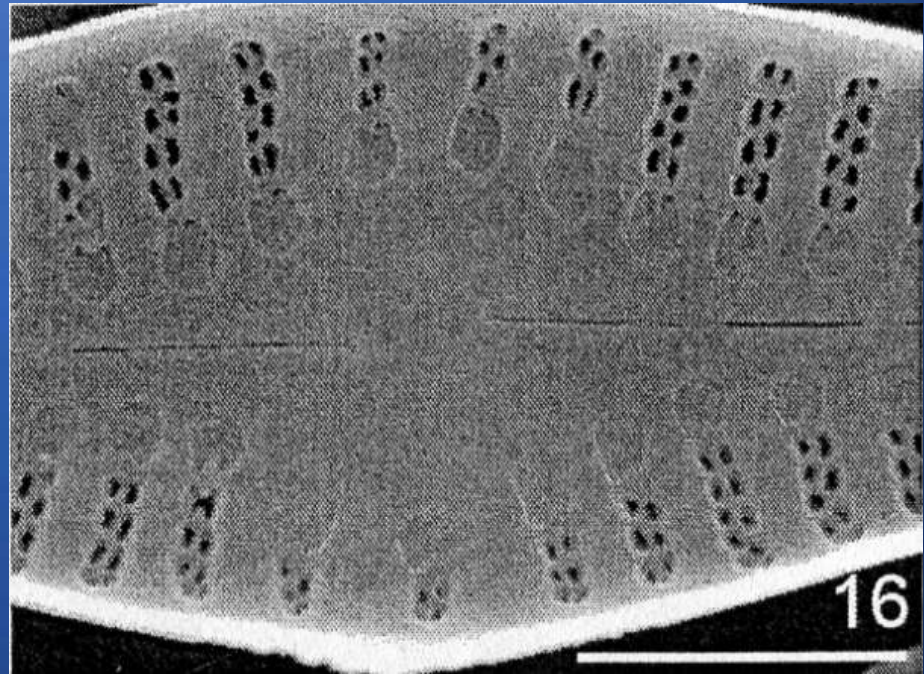
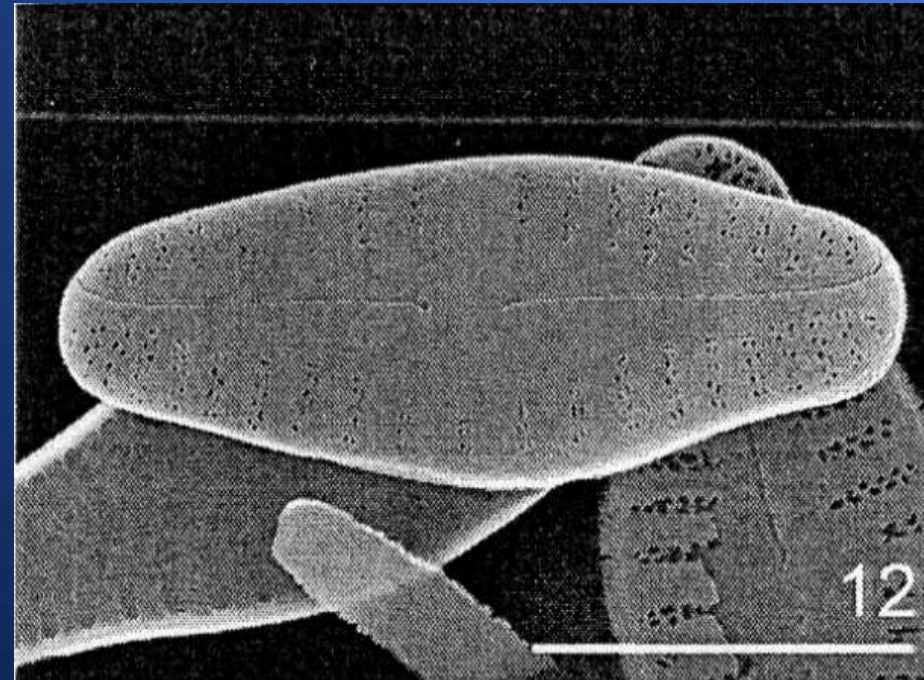
S. pseudofallacia (Witkowski, Metzeltin & Lange-Bertalot) Riaux-Gobin & Witkowski
из Riaux-Gobin et al, 2012

Gliwiczia Kulikovskiy, Lange-Bertalot & Witkowski, 2013



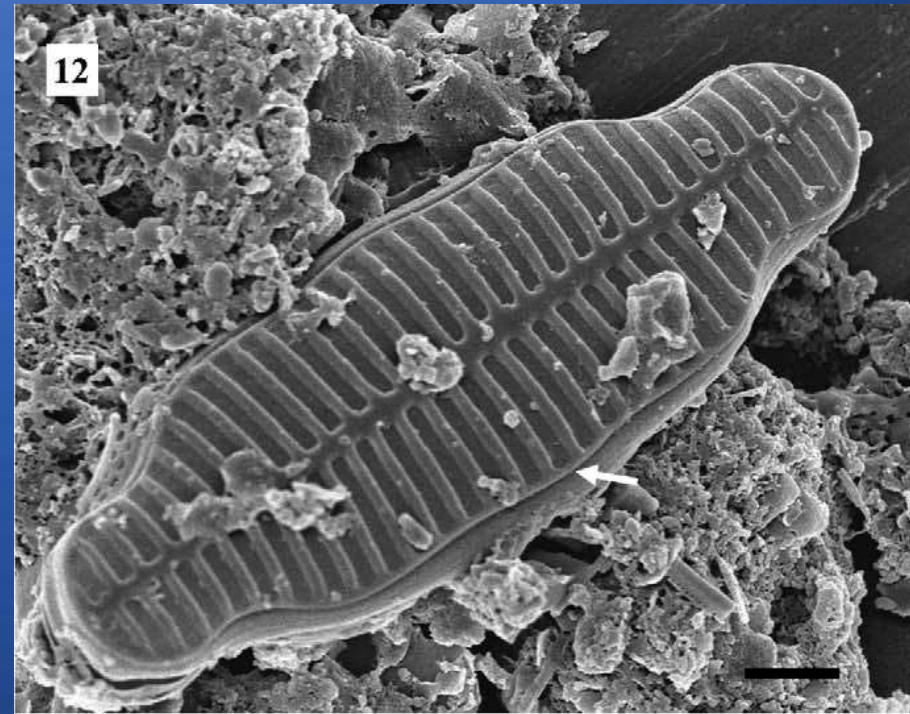
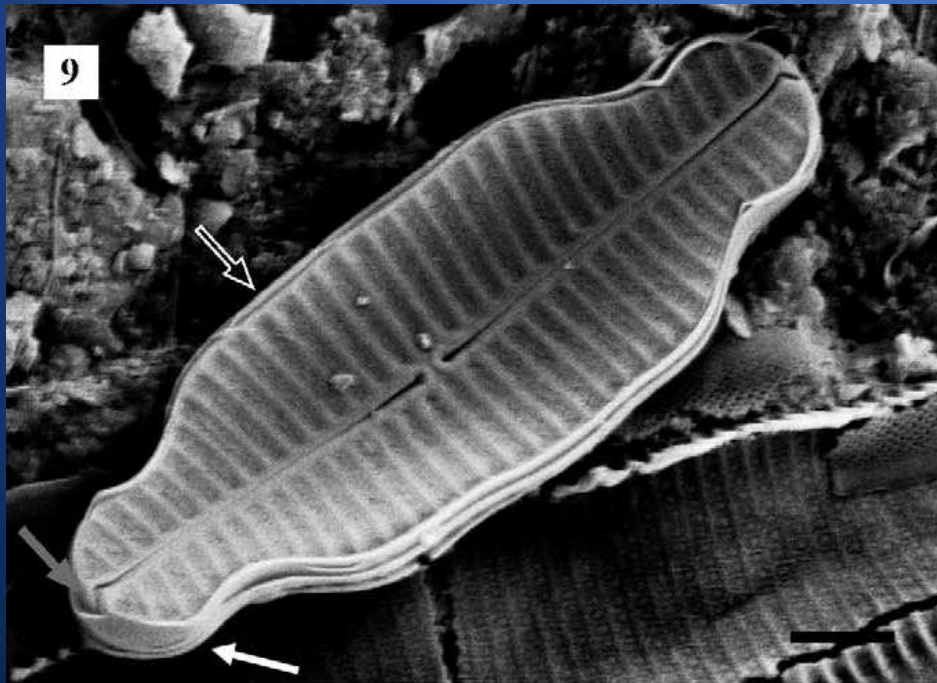
G. skvortzowii Kulikovskiy, Lange-Bertalot & Witkowski
из Kulikovskiy et al, 2013

Crenotia Wojtal, 2013



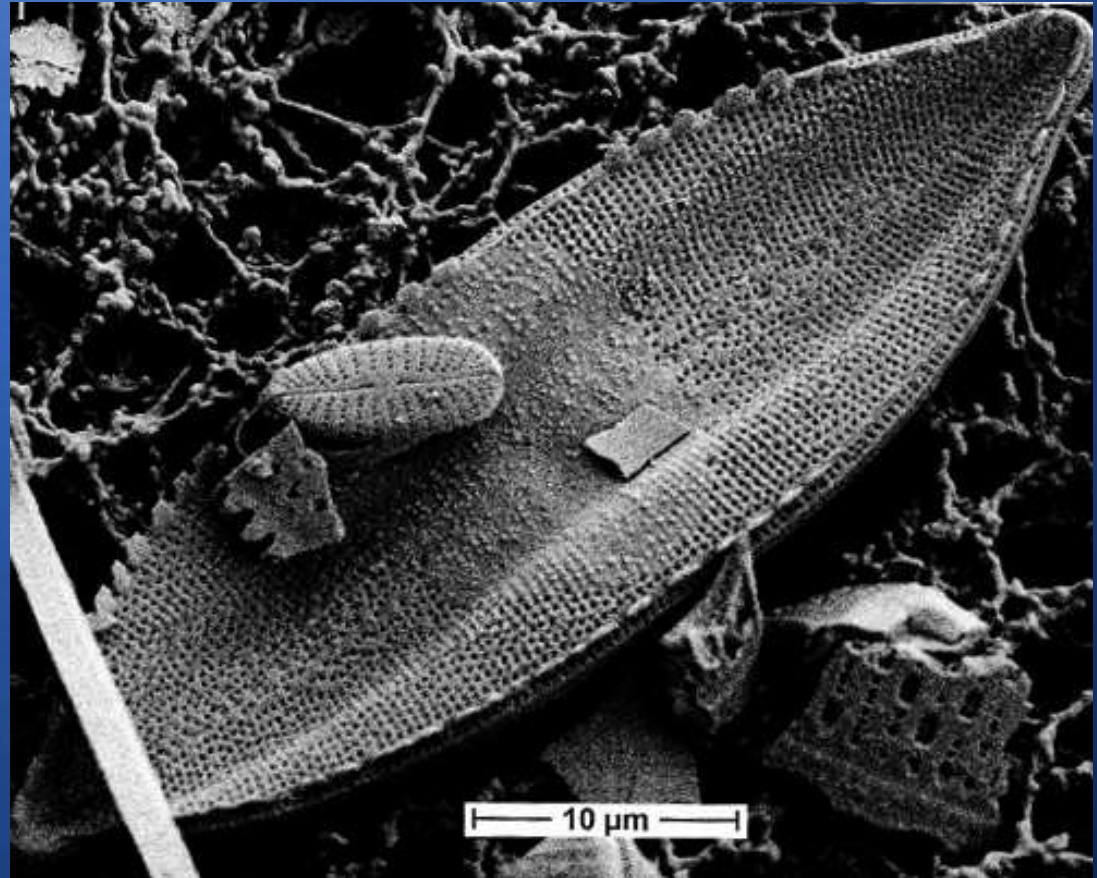
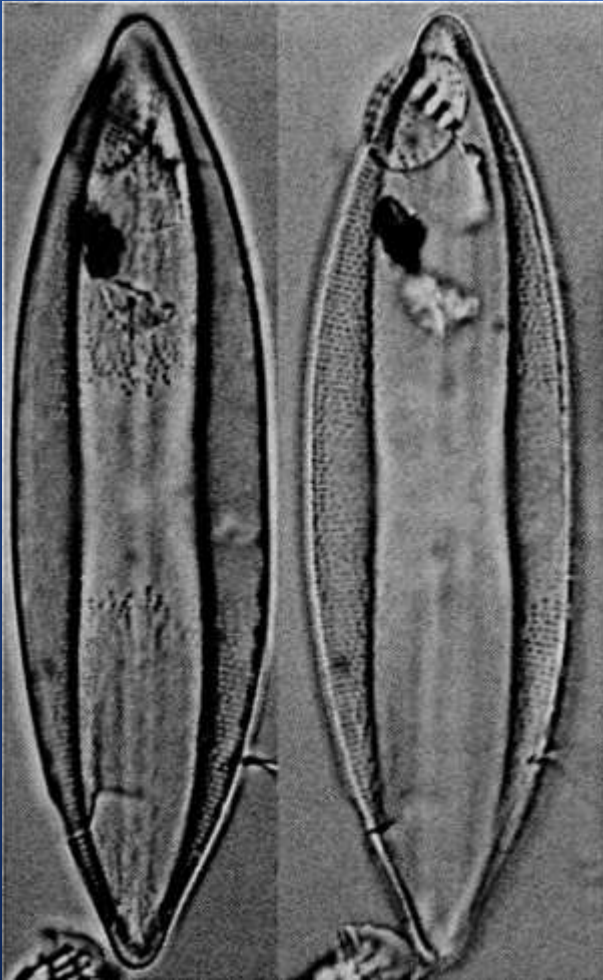
C. angustior (Grunow) Wojtal
из Wojtal, 2013

Madinithidium C.Desrosiers, A.Witkowski & C.Riaux-Gobin, 2014



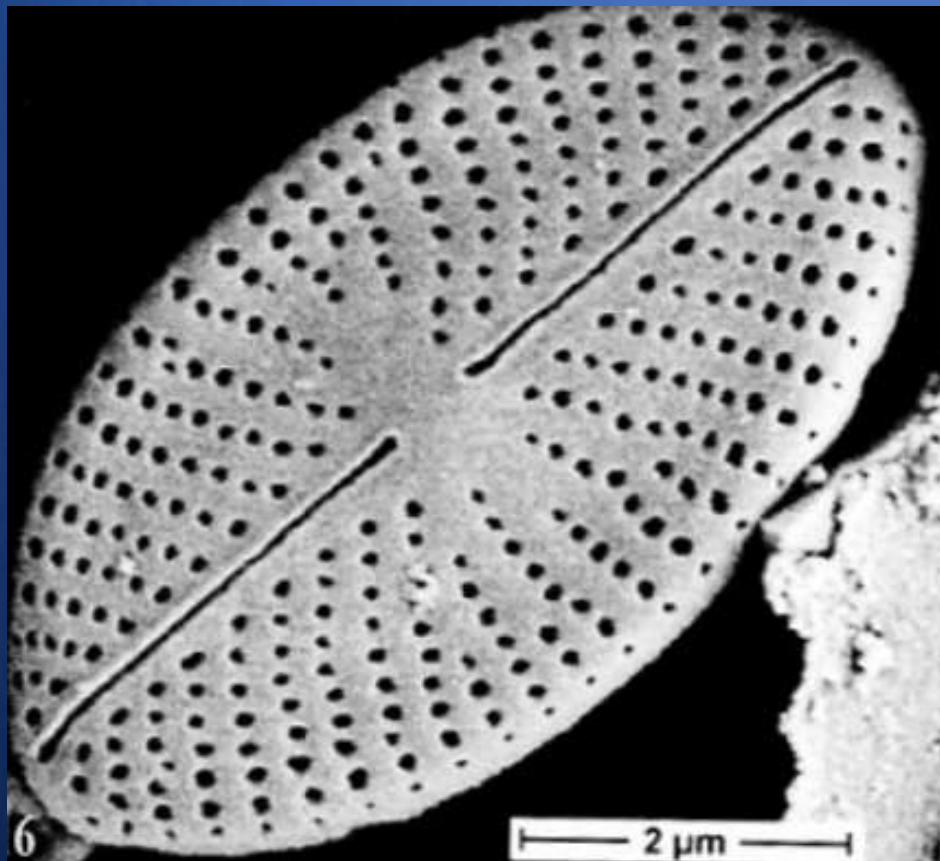
M. undulatum Desrosiers & Witkowski
из Desrosiers et al, 2014

Trifonovia Kulikovskiy & Lange-Bertalot, 2012

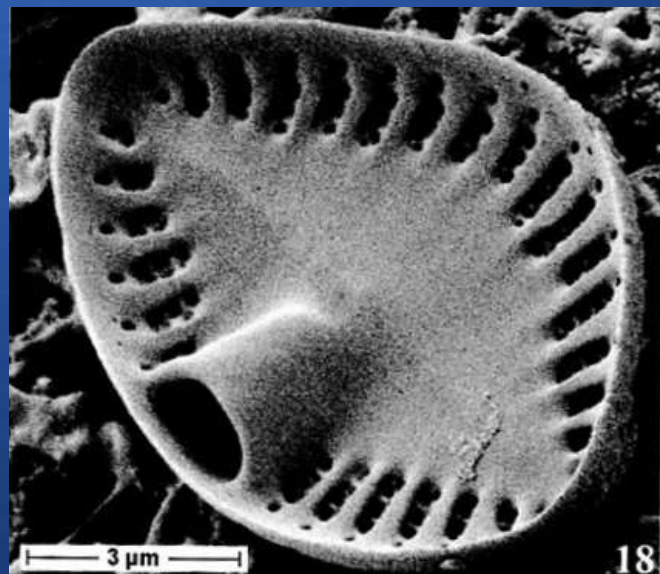
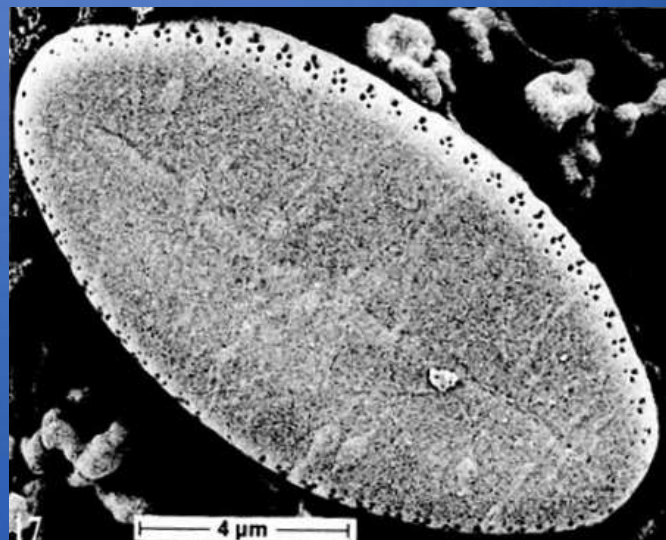


T. irinae Kulikovskiy, Lange-Bertalot & Metzeltin
из Kulikovskiy et al, 2012

Skabitschewskia Kulikovskiy & Lange-Bertalot, 2015



S. exigua Kulikovskiy & Lange-Bertalot
из Kulikovskiy et al, 2015



S. circumradians Kulikovskiy & Lange-Bertalot
из Kulikovskiy et al, 2015

Положение ахнантоидных диатомовых в
классификациях конца XX - начала XXI
веков

Simonsen, 1979

класс **Vacillariophyceae**

порядок **Pennales**

подпорядок **Raphidineae**

семейство **Achnanthaceae**

Achnanthes, Anorthoneis, Campyloneis,
Cocconeis

Глезер и др., 1988

отдел **Vacillariophyta**

класс **Pennatophyceae**

порядок **Raphales**

семейство **Achnanthaceae**

*Achnanthes, Anorthoneis, Campyloneis,
Cocconeis, Eucocconeis*

Round et al, 1990

отдел **Bacillariophyta**

класс **Bacillariophyceae**

подкласс **Bacillariophycidae**

порядок **Achnanthes**

семейство **Achnanthaceae**

Achnanthes

семейство **Cocconeidaceae**

Cocconeis, Campyloneis, Anorthoneis, Bennettella, Eripellis

семейство **Achnanthidiaceae**

Achnanthidium, Eucocconeis

Cox in Frey, 2015

отдел **Bacillariophyta**

класс **Bacillariophyceae**

подкласс **Bacillariophycidae**

порядок **Mastogloiales**

семейство **Achnanthaceae**

Achnanthes

порядок **Cocconeidales nom. prov.**

семейство **Achnanthidiaceae**

Achnanthidium, Astartiella, Eucocconeis, Karayevia, Kolbesia, Lemnicola, Planothidium, Psammothidium, Rossithidium

семейство **Cocconeidaceae**

Amphicocconeis, Anorthoneis, Bennettella, Campyloneis, Cocconeiosis, Cocconeis, Epipellis, Psammococconeis, Vikingea

Куликовский и др., 2016

отдел **Vacillariophyta**

класс **Vacillariophyceae**

подкласс **Vacillariophycidae**

порядок **Achnanthales**

семейство **Achnanthaceae**

Achnanthes

семейство **Cocconeidaceae**

Cocconeis

семейство **Achnanthidiaceae**

Achnanthidium, Eucocconeis, Crenotia, Gliwiczia, Karayevia, Lemnicola, Planothidium, Platessa, Psammothidium, Skabitschewskia, Trifonovia

порядок **Naviculales**

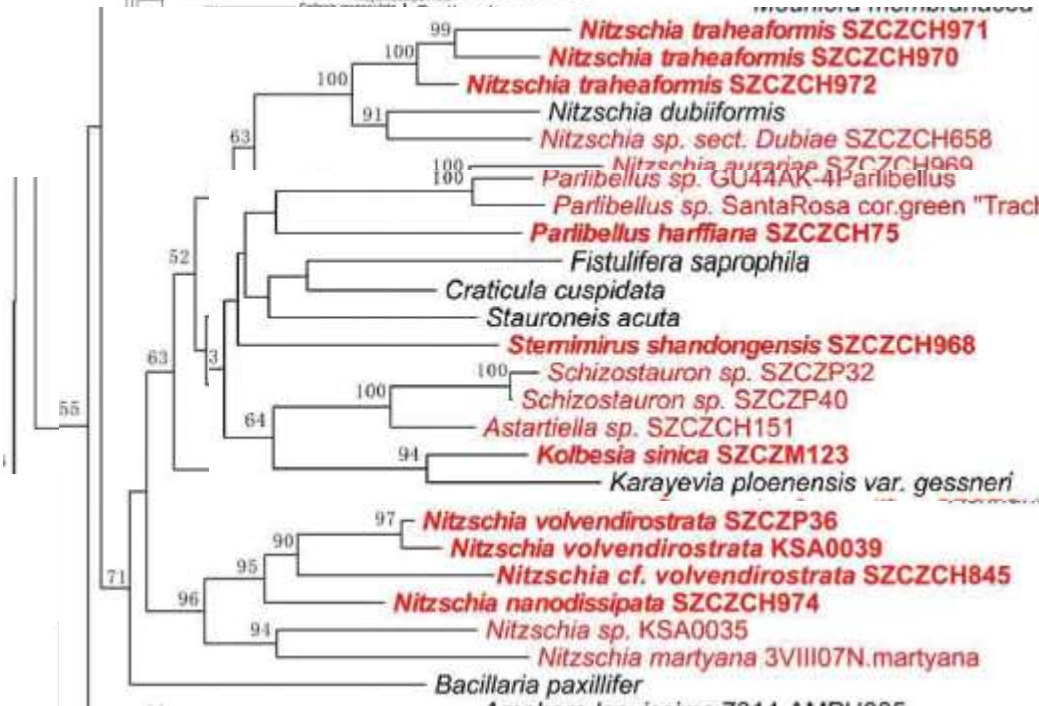
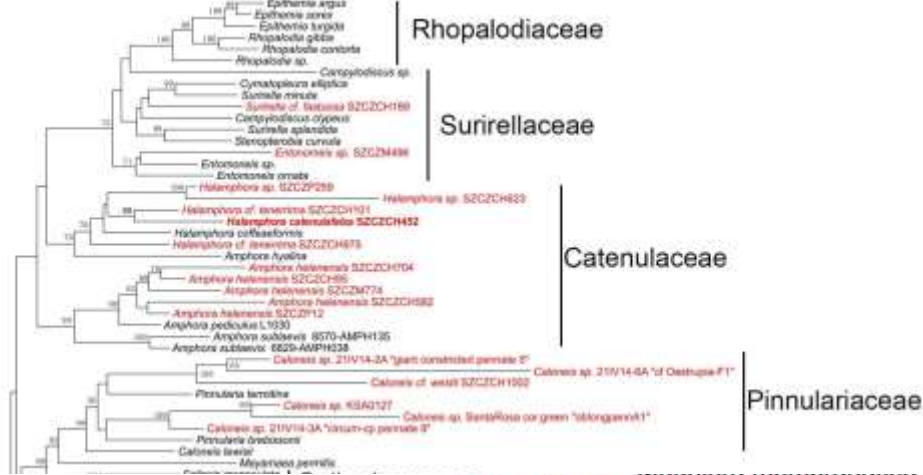
подпорядок **Neidiineae**

семейство **Nupelaceae fam. prov.**

Nupela

Данные по молекулярной филогенетике ахнантоидных диатомовых

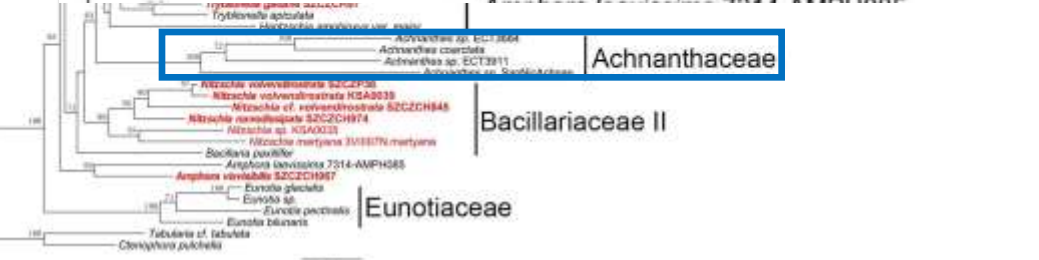
Филогенетическое древо диатомовых водорослей по Witkowski et al, 2016



Stauroneidaceae

ceae

Bacillariaceae II



Заключение

- На данный момент группа ахнантоидных диатомовых состоит из 20 родов, включая непосредственно *Achnanthes* s.str.
- За последние десятилетия было описано и выделено 19 ахнантоидных родов.
- Основные признаки, по которым данные таксоны отличаются друг от друга, включают форму, размеры и рельеф панциря, характер штрихов и структуру составляющих их ареол, и форму шва.
- Основным выводом, сделанным на основе молекулярных исследований, было то, что моношовные диатомовые являются полифилетичной группой внутри клады пеннатных. Непосредственно род *Achnanthes* сближен с нитшиоидными диатомовыми, другие ахнантоидные рода были отнесены к другим кладам.

Спасибо за внимание!