

1ste NVKD taxonomische workshop

Achnantheidium minutissimum (Kützing) Czarnecki
Achnantheidium pyrenaicum (Hustedt) Kobayasi

Bart Van de Vijver

Aalst, 22 april 2010

Groot aantal soorten

Achnanthidium minutissimum
Achnanthidium affine
Achnanthidium gracillimum
Achnanthidium saprophilum
Achnanthidium caledonicum
Achnanthidium neomicrocephalum
Achnanthidium eutrophilum
Achnanthidium catenatum
Achnanthidium pyrenaicum
Achnanthidium thienemannii
Achnanthidium lineare
Achnanthidium rivulare
Achnanthidium straubianum
Achnanthes minutissima inconspicua

Achnanthidium druartii

Achnanthidium strictum
Achnanthidium latecephalum
Achnanthidium lailae
Achnanthidium modestiforme
Achnanthidium exile
Achnanthidium kranzii
Achnanthidium exiguum
Achnanthidium deflexum
Achnanthidium pfisteri
Achnanthidium dolomiticum
Achnanthidium macrocephalum
Achnanthidium ...

Soorten die behandeld zullen worden

Soorten die niet behandeld worden

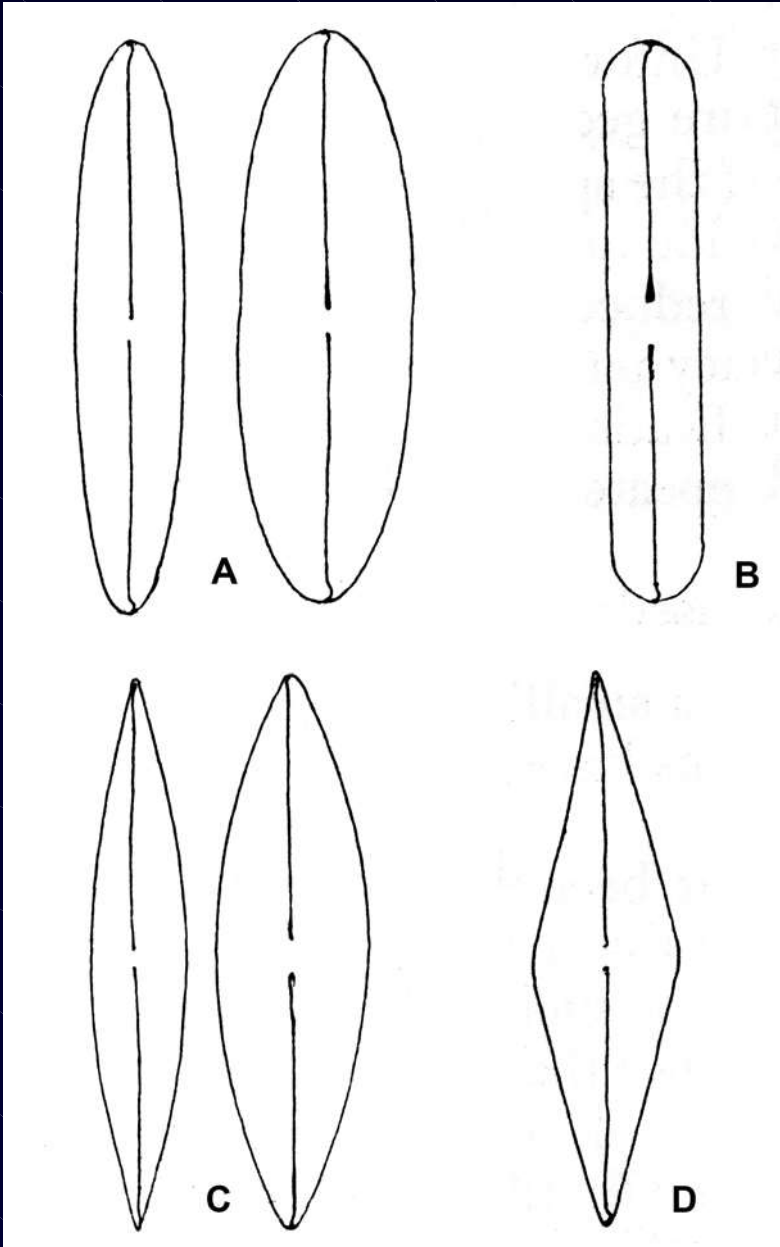
Planning van de studiedag

1. Inleidende harmonisatie van de terminologie
2. Opsplitsing van *Achnanthes* s.l.
3. *Achnanthidium* in de literatuur (presentatie Luc Ector)
4. Basisindeling *Achnanthidium* (*minutissimum* – *pyrenaicum*)
5. Soort-analyse van de verschillende *Achnanthidium*-taxa
6. Microscopische analyse gekende *Achnanthidium*-populaties
7. Onbekende *Achnanthidium*-populaties

1. Inleidende harmonisatie van de terminologie

- Omtrek en vorm van het *Achnanthidium* schaaltje
- Vorm van schaal-uiteinden
- Vorm van de raphe-uiteinden
- Vorm en grootte van axiale en centrale area

Omtrek en vorm van het *Achnanthyidium* schaalkje



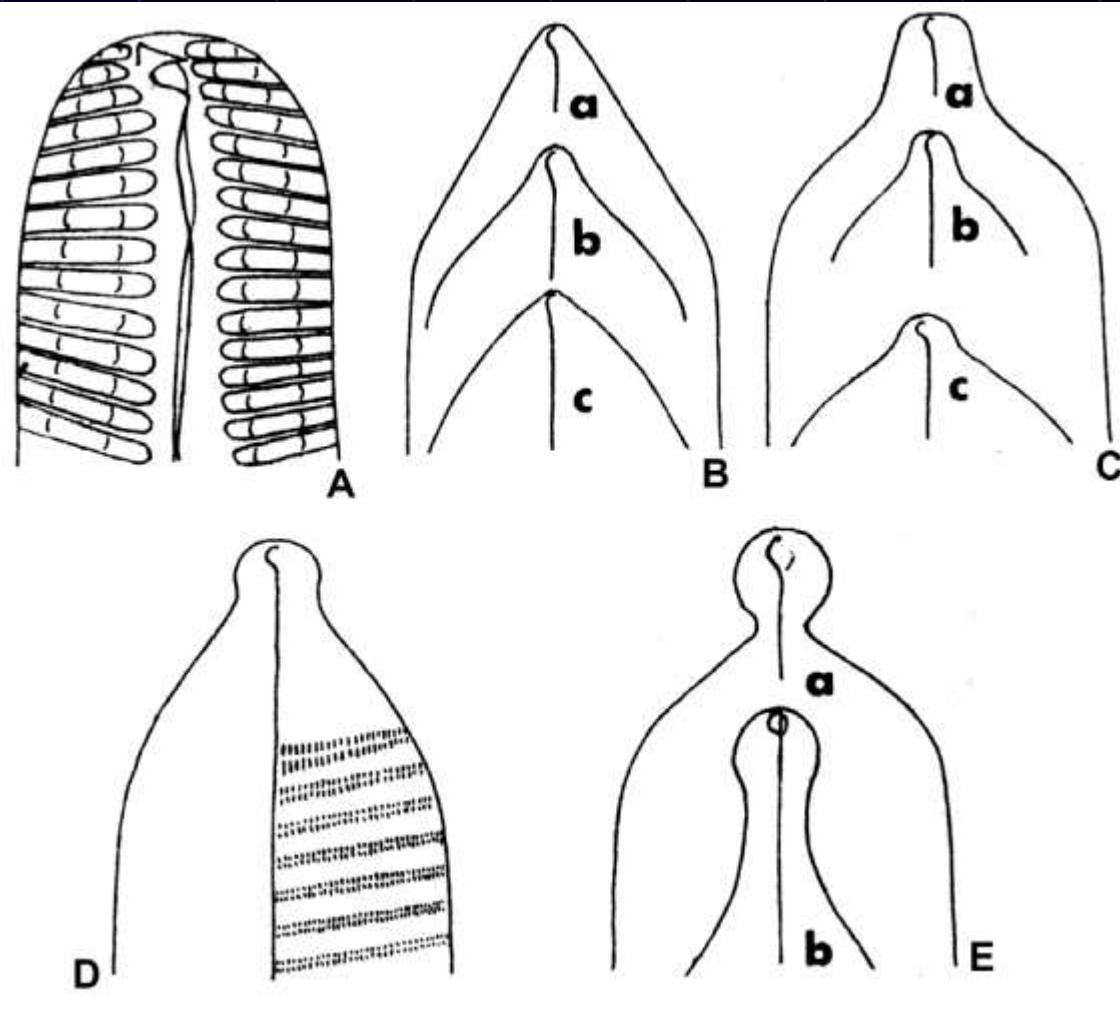
A. Smal-elliptisch tot elliptisch

B. Lineair

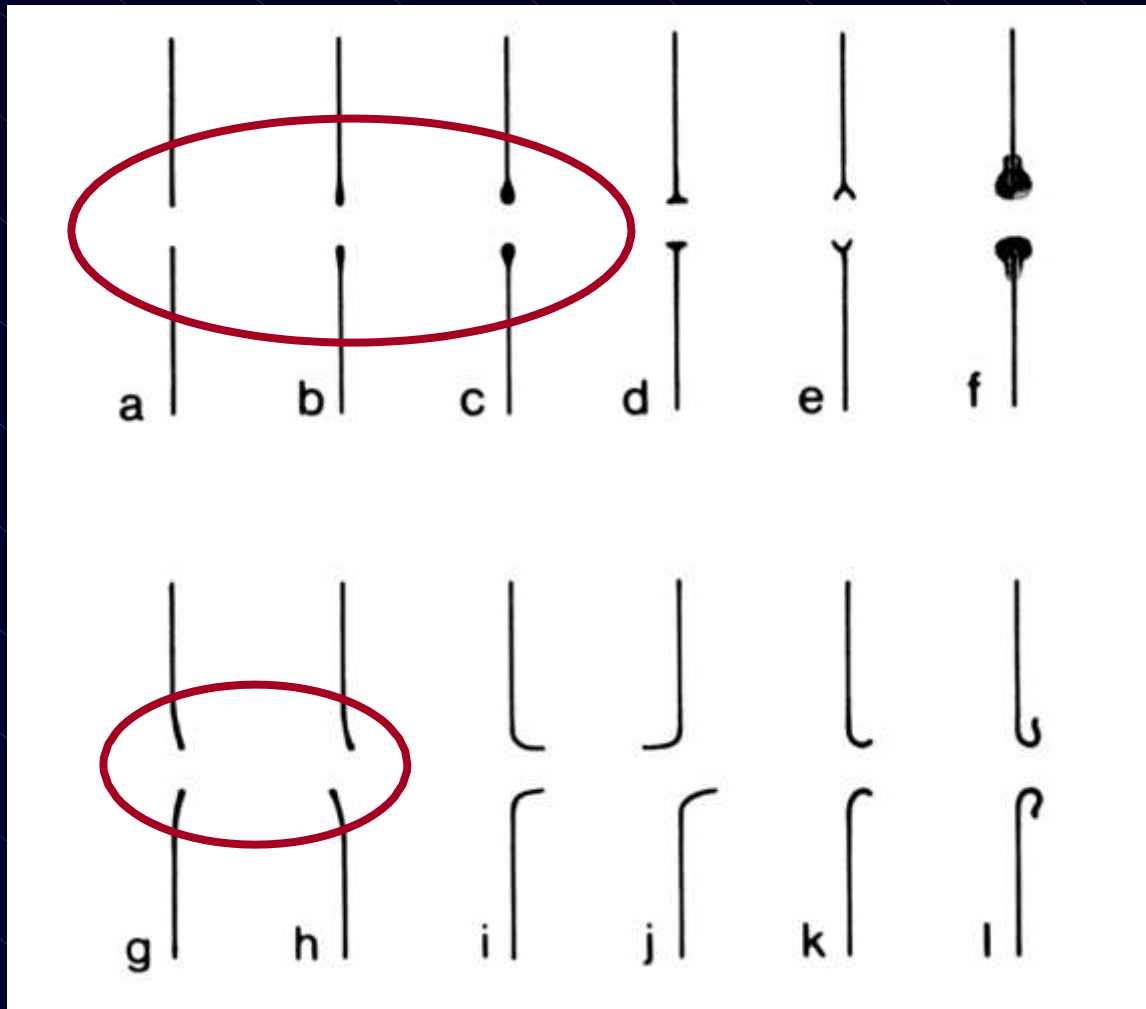
C. Smal-lanceolaat tot lanceolaat

D. Rhombisch

Vorm van schaal-uiteinden



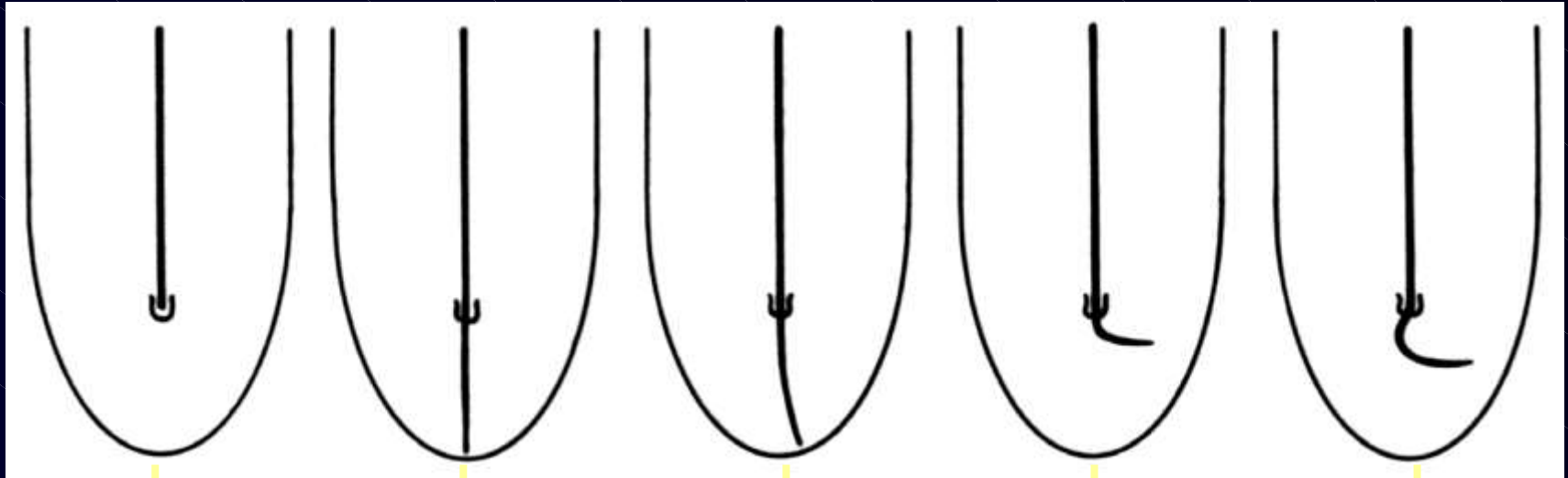
Vorm van de centrale raphe-uiteinden



a-c. recht (straight)

g-h. afgebogen (deflected)

Vorm van de terminale raphe-uiteinden



geen
(absent)

recht
(straight)

licht afgebogen
(slightly deflected)

gebogen
(bent)

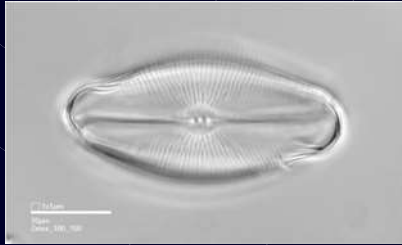
gehoekt
(hooked)

2. Opsplitsing van *Achnanthes* s.l.



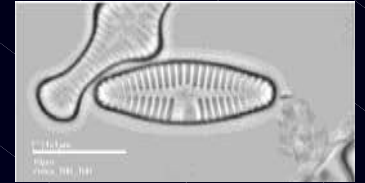
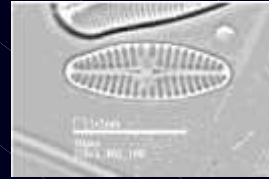
Eucoconeis

Vb. *Eucoconeis flexellum*



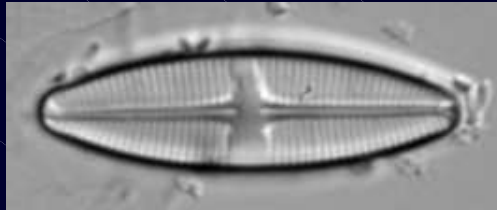
Planothidium

Vb. *Planothidium lanceolatum*



Lemnicola

Vb. *Lemnicola hungarica*



Platessa

Vb. *Platessa conspicua*



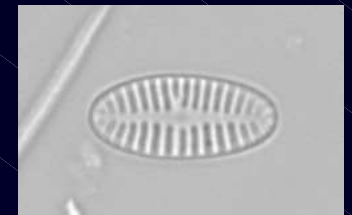
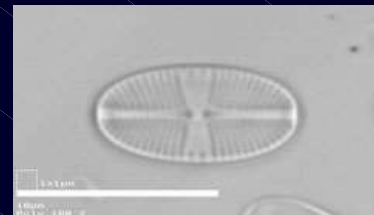
Kolbesia

Vb. *Kolbesia kolbei*



Karayevia

Vb. *Karayevia oblongella*



Verschillen tussen *Achnanthidium* & *Psammothidium*

1. Vorm van het schaalpje

Psammothidium : ovaal/elliptisch (soms lichtjes capitaat)

Achnanthidium : linear tot lineair capitaat

2. Kromming van het raphe-schaaltje

Psammothidium : convex

Achnanthidium : concaaf

3. Striae tot aan het sternum

Psammothidium : ja

Achnanthidium : nee

4. Raphe loopt in een groef

Psammothidium : ja

Achnanthidium : nee

3. *Achnanthidium* in de literatuur



Review of the main literature on the *Achnanthidium minutissimum* complex and related taxa

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Achnanthes minutissima Kützing 1833

A. minutissima var. *affinis* (Grunow) Lange-Bertalot in Lange-Bertalot & Krammer 1989

A. minutissima var. *ambigua* Palamar 1956

A. minutissima var. *amphicephala* Korshikov 1941

A. minutissima var. *capitata* Skvortzow & Noda 1971

A. minutissima var. *constricta* Skvortzow 1935

A. minutissima var. *cryptocephala* Grunow in Van Heurck 1880

A. minutissima f. *curta* Grunow in Van Heurck 1880

A. minutissima f. *curta* Gutwinski 1895

A. minutissima var. *exilissima* Cleve-Euler 1953

A. minutissima var. *genuina* Cleve-Euler 1953

A. minutissima f. *gracillima* (Meister) Cleve-Euler 1932

A. minutissima var. *gracillima* (Meister) Lange-Bertalot in Lange-Bertalot & Krammer 1989

A. minutissima f. *inconspicua* (Østrup) Cleve-Euler 1932

A. minutissima var. *inconspicua* Østrup 1910

A. minutissima var. *jackii* (Rabenhorst) Lange-Bertalot & Ruppel 1980

A. minutissima var. *macrocephala* Hustedt 1937

A. minutissima var. *microcephala* Mukhamediev 1957

A. minutissima var. *pyrenaica* (Hustedt) Cleve-Euler 1953

A. minutissima var. *robusta* Hustedt 1937

A. minutissima var. *saprophila* H. Kobayasi & S. Mayama 1982

A. minutissima var. *scotica* (Carter) Lange-Bertalot in Lange-Bertalot & Krammer 1989

A. minutissima var. *subrobusta* Maillard 1978

***Achnanthidium minutissimum* (Kützing) Czarnecki 1994, p.157**

Czarnecki, D.B. 1994. The freshwater diatom culture collection at Loras College, Dubuque, Iowa. In: J.P. Kociolek (ed.), Proceedings of the 11th International Diatom Symposium, San Francisco, 12-17 August 1990. *Memoirs of the California Academy of Sciences* no.17:155-174.

Basionym: *Achnanthes minutissima* Kützing 1833, p. 578, fig. 54

Kützing, F.T. 1833. Synopsis Diatomacearum oder Versuch einer systematischen Zusammenstellung der Diatomeen. Linnaea 8(5):529-620, pls. XIII-XIX.

Valid



Achnanthes minutissima-Sippenkomplex

Fig. 1-24: *Achnanthes minutissima* Kützling var. *minutissima* (S. 56)

Fig. 25, 26: *Achnanthes minutissima* var. *inconspicua* Oestrup (S. 58)

Fig. 27-30: *Achnanthes minutissima* var. «Sippe mit besonders schmalen Schalen» (S. 60)

Fig. 31-47: *Achnanthes minutissima* var. *jackii* (Rabenhorst) Lange-Bertalot (S. 57)

Fig. 48-52: *Achnanthes minutissima* var. (?) «*Achnanthes microcephala*» sensu auct. nonnull. (excl. Lectotypus)

Fig. 53-56: *Achnanthes minutissima* var. «Sippe mit kurzen, breit-elliptischen Schalen» (S. 61) → *A. straubianum*

Fig. 57-61: *Achnanthes minutissima* var. «Sippe mit rhombisch-lanzettlichen Schalen» (S. 61) ABEU → 102 pl. 78

Achnanthes microcephala

Fig. 1-9: Lectotypus, Alg. Ess. Dec. VIII no. 75 (vgl. Lectotypus von *Achnanthes microcephala* Kützling bei Lange-Bertalot & Ruppel 1980).

Fig. 10-17: *Achnanthes lineare* W. Smith, Lectotypus, BM 445, Lasswade/Schottland.

Fig. 18-24: Sippe aus den Südalpen, Urgestein der Adamello-Gruppe.

Fig. 25, 26: Sippe aus den USA.

Fig. 27-30: Sippe aus den Loisachquellen, Nordtiroler Kalkalpen.

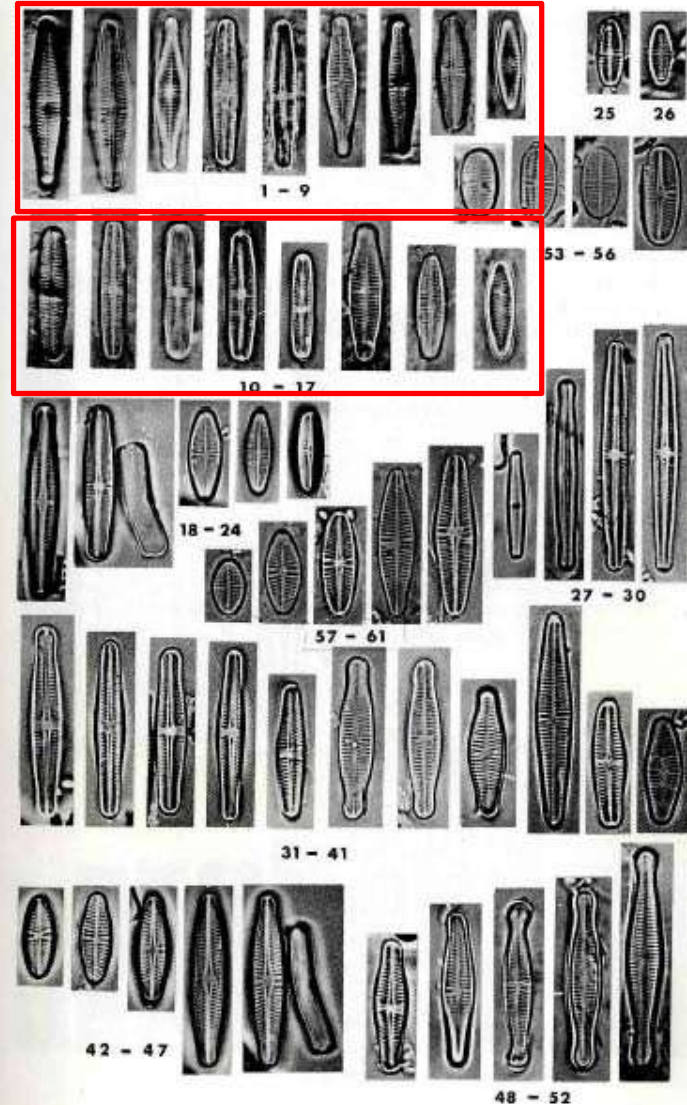
Fig. 31-41: Sippe aus den Nordtiroler Kalkalpen (oft mit *A. affinis* Grunow verwechselt).

Fig. 42-47: Sippe aus dem Libanon.

Fig. 48-52: Sippe aus den Loisachquellen, Nordtiroler Kalkalpen.

Fig. 53-56: Sippe aus dem Lac de Loclat, Schweizer Jura.

Fig. 57-61: Sippe aus dem Main.



Achnanthes minutissima-Sippen-Komplex und vergleichbare Arten

Fig. 1-6: *Achnanthes minutissima* var. *scotica* (Carter) Lange-Bertalot (S. 60)

Fig. 7-9: *Achnanthes minutissima* var. *macrocephala* Hustedt (S. 60)

Fig. 10-12: *Achnanthes minutissima* «var. aus den Südalpen»

Fig. 13-19: *Achnanthes minutissima* var. *saprophila* Kobayasi & Mayama (S. 59)

Fig. 20-22: *Achnanthes minutissima* var. *minutissima* (forma?)

Fig. 23, 24: *Achnanthes catenata* Bily & Marvan (S. 62)

Fig. 25-33: *Achnanthes kranzii* Lange-Bertalot (S. 64)

Fig. 1-6: Coll. Carter aus Schottland und Brunsee/Oberbayern.

Fig. 7-9: Brunsee/Oberbayern.

Fig. 10-12: Sippe aus den Südalpen, wahrscheinlich unabhängig von der mit ihr dort vergesellschafteten var. *minutissima*.

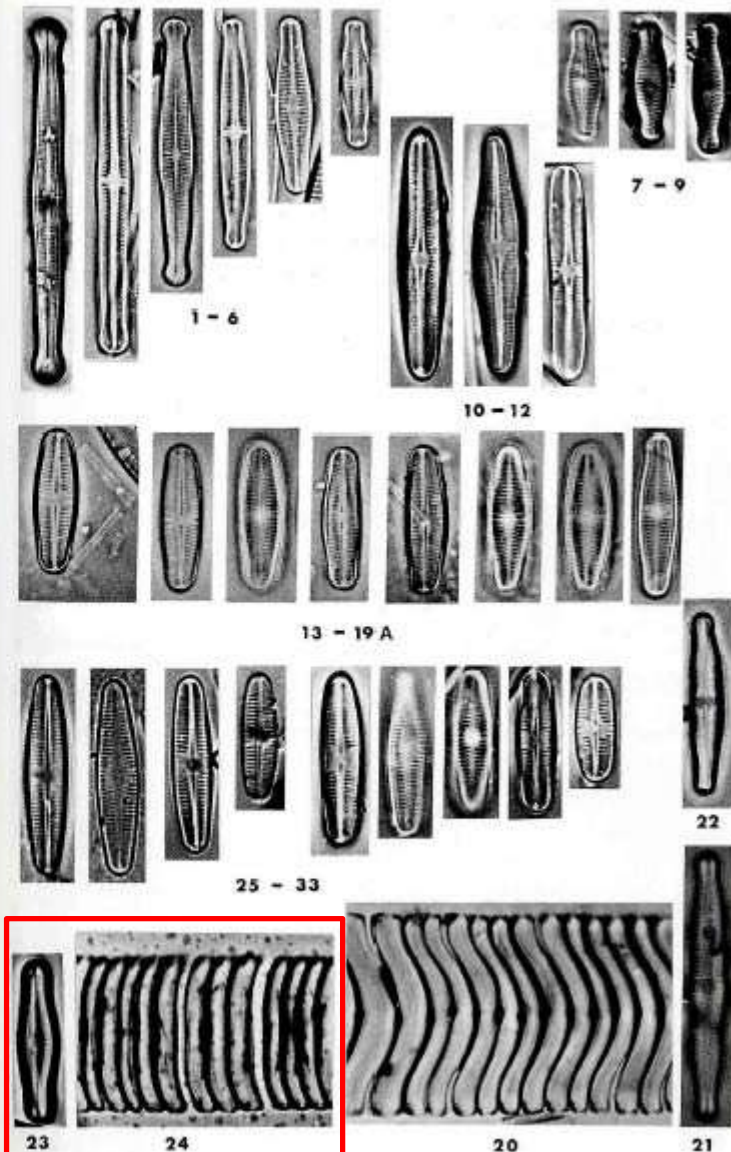
Fig. 13-19: Kläranlage Bad Vilbel bei Frankfurt a. M. (in Fig. 13 ist *Navicula saprophila* als assoziierte Art durch die je zwei verschobenen Medianrippen von zwei Frusteln zu erkennen).

Fig. 20, 21: Lake Windermere/England.

Fig. 22: Entsprechende Schale aus Zürich/Schweiz (in Herb. Kützting 836 als *Achnanthisidium microcephalum*, nicht Lectotypus).

Fig. 23, 24: Typenmaterial aus Sedlice/CSFR.

Fig. 25-33: Taunus und Alpen.



Tafel 35: (REM, Fig. 1 $\times 5400$, Fig. 2 $\times 4800$, Fig. 3 $\times 5700$, Fig. 4 $\times 4200$, Fig. 5 $\times 10000$, Fig. 6 $\times 8000$)

R-Schalen von *Achnanthes minutissima* var. *minutissima* und verwandelbaren Taxa

Fig. 1: *Achnanthes minutissima* Kützinger var. *minutissima* (S. 56)

Fig. 2: *Achnanthes minutissima* var. *jaedii* (Rabenhorst) Lange-Bertalot (S. 57)

Fig. 3: *Achnanthes minutissima* var. *affinis* (Grunow) Lange-Bertalot (S. 58)

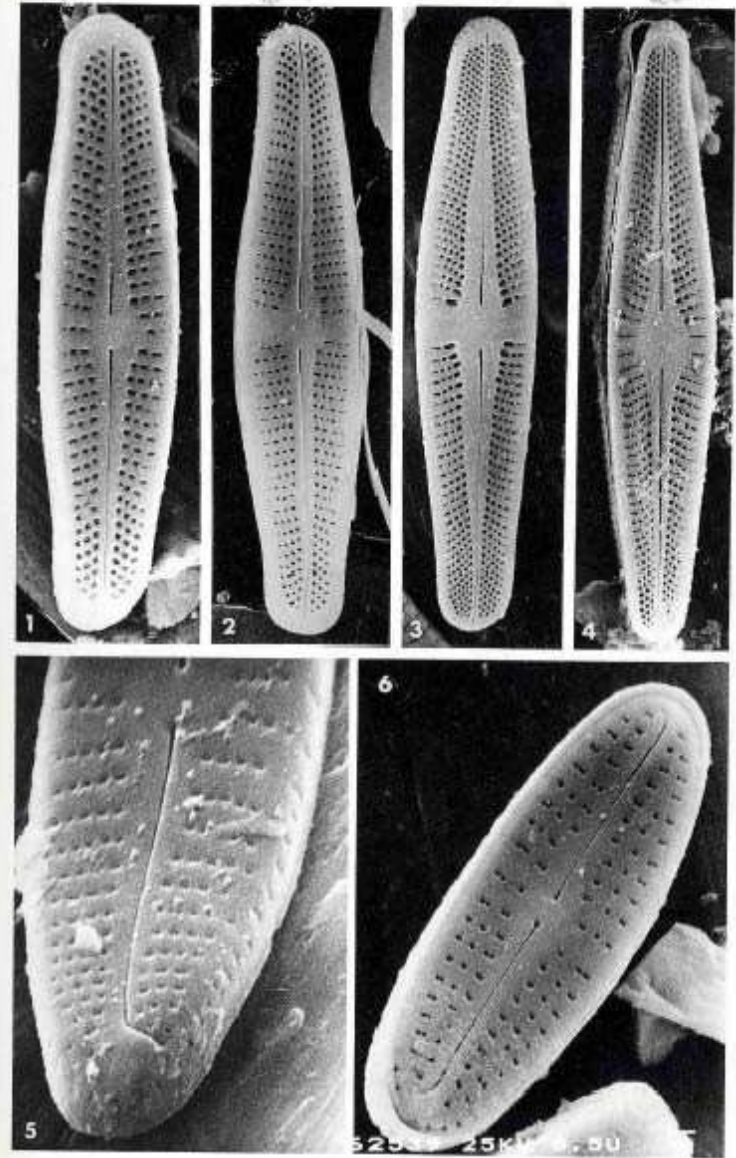
Fig. 4: *Achnanthes exilis* Kützinger (S. 61)

Fig. 5: *Achnanthes biasolettiana* Grunow var. *biasolettiana* (S. 62)

Fig. 6: *Achnanthes biasolettiana* var. *subatomus* Lange-Bertalot (S. 63)

Fig. 1-4: Alle Beispiele aus dem Sippenkomplex um *A. minutissima* zeigen starke Übereinstimmungen im Grundmuster des Schalenbaus, insbesondere Umriss, gerader Raphenverlauf mit Terminalporen, Anordnung der Areolenreihen, geringe Variabilität der Areolenforamina (punkt- bis strichförmig); stärker variabel und z. T. sippenspezifisch sind die Gestalt der Zentral- und Axialareae sowie der Neigungswinkel der Streifen.

Fig. 5, 6: Abweichend vom Sippenkomplex um *A. minutissima* sind die distalen Raphenäste im Sippenkomplex um *A. biasolettiana* gleichseitig abgekrümmt; bei der Nominatvarietät sind die Areolenreihen mit meistens strichförmigen Foramina distal erheblich dichter gestellt und parallel bis konvergent; bei var. *subatomus* sind die Foramina regelmäßig paarig «in Doppelpunkten» angeordnet.



Krammer & Lange-Bertalot 1991 Süßwasserflora von Mitteleuropa

1991

320

Tafel 36: (× 1500)

Fig. 1-18: *Achnanthes biasolettiana* Grunow var. *biasolettiana* (S. 62)

Fig. 19-23: *Achnanthes biasolettiana* aff. var. *thienemannii* Hustedt (S. 63) *non NH 82 (3-4) Platan & 322*

Fig. 24-31: *Achnanthes biasolettiana* var. *subatomus* Lange-Bertalot (S. 63)

Fig. 32-37: *Achnanthes rosenstockii* Lange-Bertalot (S. 65)

Fig. 38-41: *Achnanthes kriegeri* Krasske (S. 66)

Fig. 1-4: Lectotypus, Reka-Quellen/Jugoslawien.

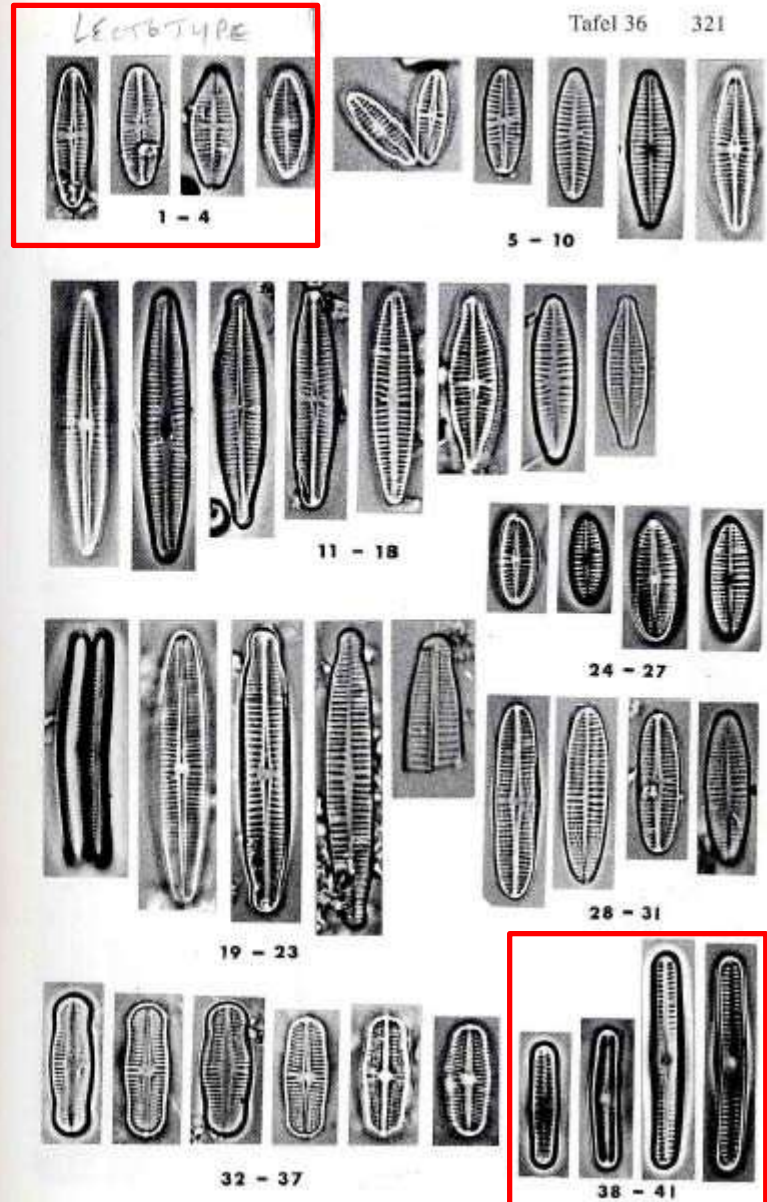
Fig. 5-18: Verschiedene Populationen aus Mitteleuropa.

Fig. 19-23: Syrien und Libanon.

Fig. 24-31: Populationen aus verschiedenen Mittelgebirgen in Europa.

Fig. 32-37: Hoptensee/Bayern.

Fig. 38-41: Lectotypus aus Finnland und in Cleve & Möller 186 als *A. pusilla*.



**Comparative studies
among four linear-lanceolate *Achnanthidium* species
(Bacillariophyceae) with curved terminal raphe endings**

von

Hiromu Kobayasi*

Tokyo Diatom Institute, Honcho 3-8-9-813, Koganei-shi, Tokyo, 184 Japan**

With 75 figures

Dedicated to Prof. Dr. Ursula Geissler on the occasion of her 65th birthday

Kobayasi, H. (1997): Comparative studies among four linear-lanceolate *Achnanthidium* species (Bacillariophyceae) with curved terminal raphe endings. - Nova Hedwigia 65: 147-163.

Abstract: In Japan there are four *Achnanthidium* taxa resembling each other in having a raphe with curved terminal endings. They occur in oligotrophic zones of streams, mostly in the upper part, and are ecologically important. All available characteristics, such as valve shape, axial area, hyaline areas at the juncture of valve face and mantle, striae arrangement on the valve face, shape of the terminal raphe endings and central raphe endings, structure of the areolae forming the striae, arrangement of the mantle areolae on both sides and ends of the valve, examined by LM and SEM, were used for comparison. *Achnanthidium latecephalum* spec. nov. is described. At the same time the already known species *Achnanthes pyrenaica*, *A. japonica* and *A. convergens* are transferred to the genus *Achnanthidium*.

Key words: *Achnanthidium latecephalum*, *Achnanthidium pyrenaicum*, *Achnanthidium japonicum*, *Achnanthidium convergens*, diatoms, taxonomy, valve morphology.

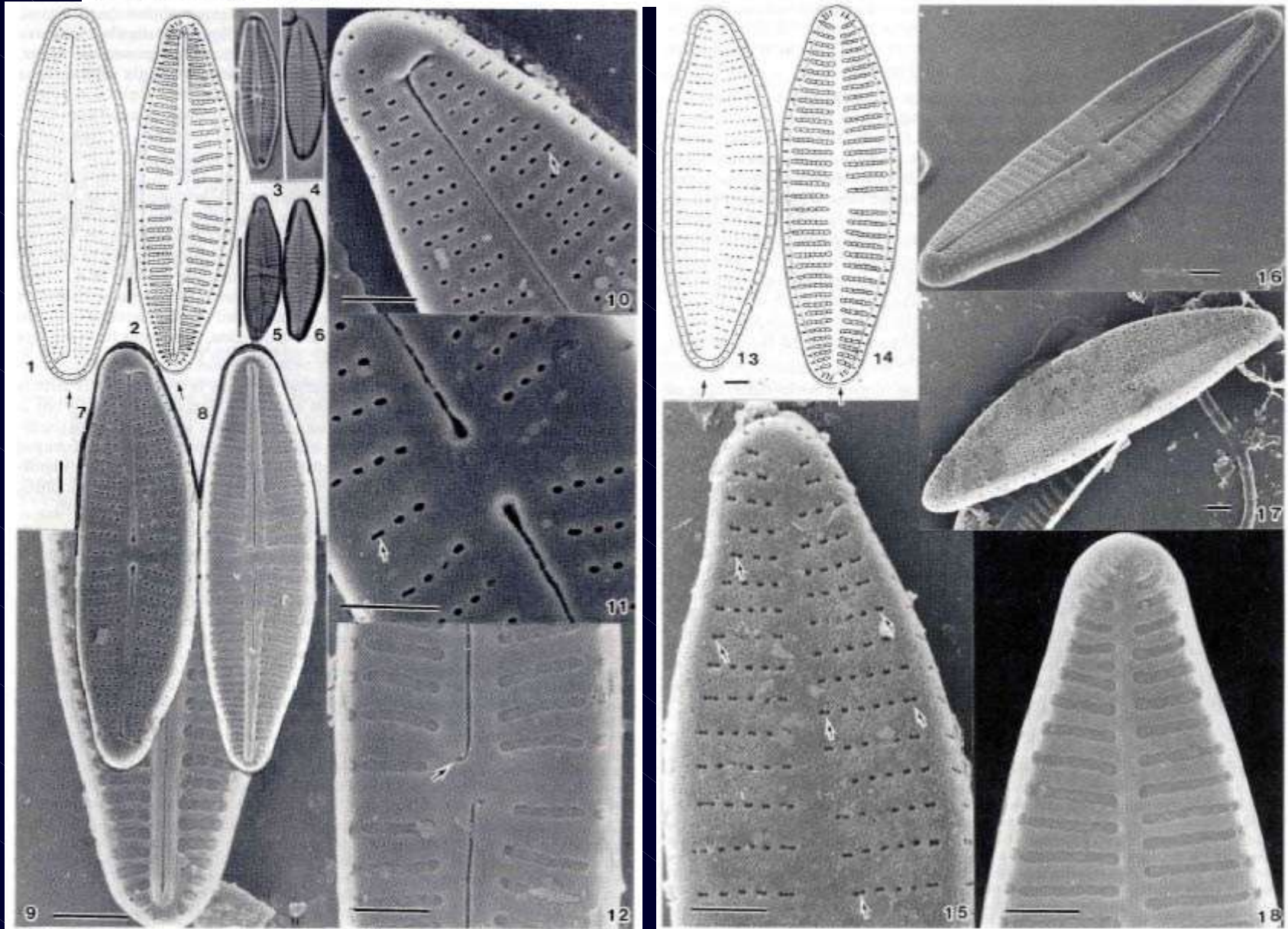
***Achnanthidium pyrenaicum* (Hustedt) Kobayasi comb. nov.**

Figs 1-18

1997

Basionym: *Achnanthes pyrenaica* Hustedt in Ber. Deutsch. Bot. Ges. 56: 554 (1939).

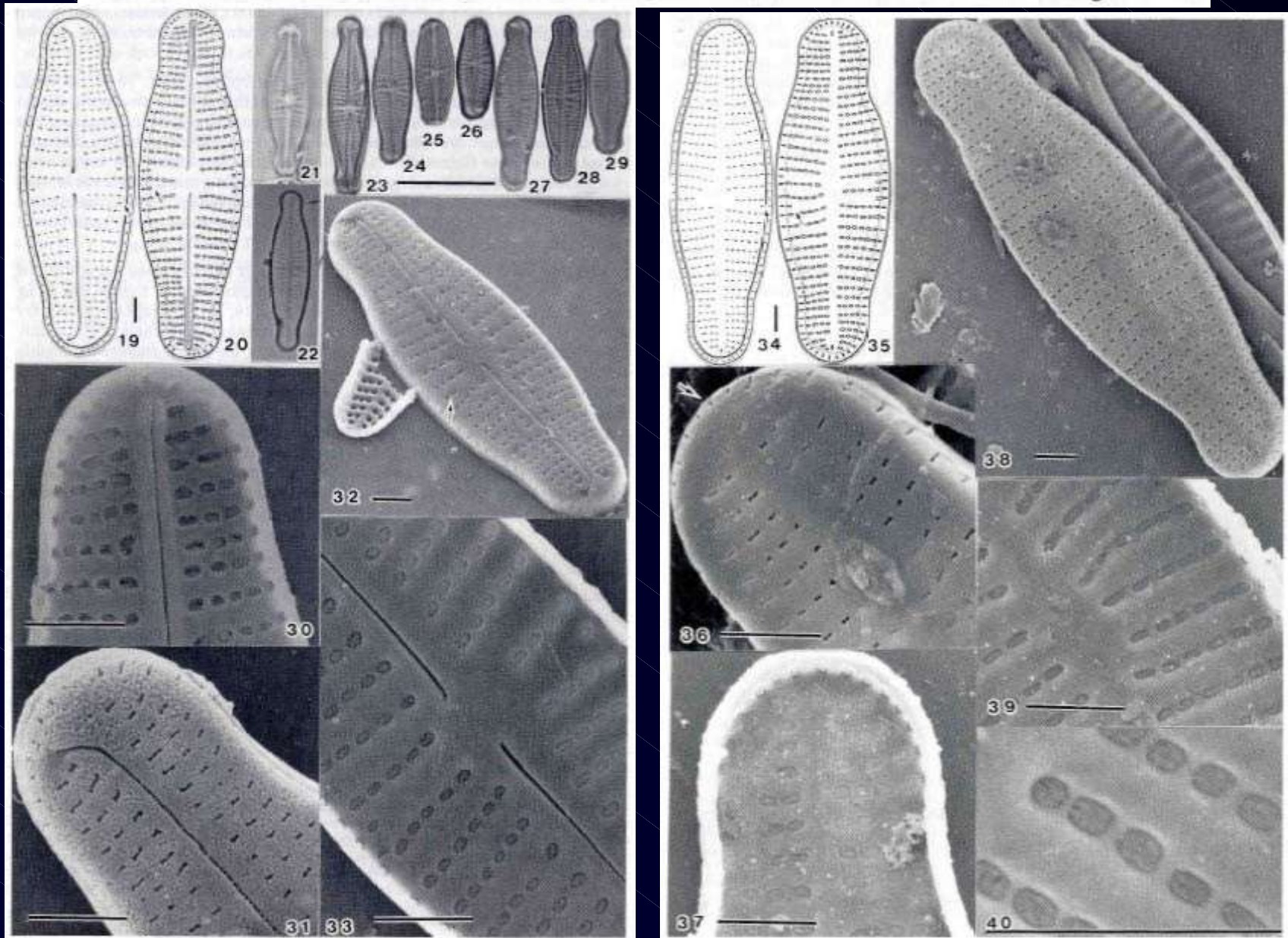
Synonym: *Achnanthes biasoletiana* sensu Lange-Bertalot et Krammer in Biblioth. Diatomol. 18: 26 (1989), non (Kützing) Grunow.



Found in Japan, France (Rimet et al. 2003), Himalaya (Jüttner) 1997

***Achnanthidium latecephalum* Kobayasi spec. nov.**

Figs 19-40



ASSEMBLAGES-TYPES DE DIATOMÉES BENTHIQUES DES RIVIÈRES NON-POLLUÉES DU BASSIN RHÔNE-MÉDITERRANÉE-CORSE (FRANCE)

2003

Frédéric RIMET¹, Loïc TUDESQUE¹, Valérie PEETERS², Henri VIDAL³ & Luc ECTOR¹

Actes du 21ème Colloque de l'ADLaF, Nantes, 10-13 septembre 2002

Achnanthydium latecephalum

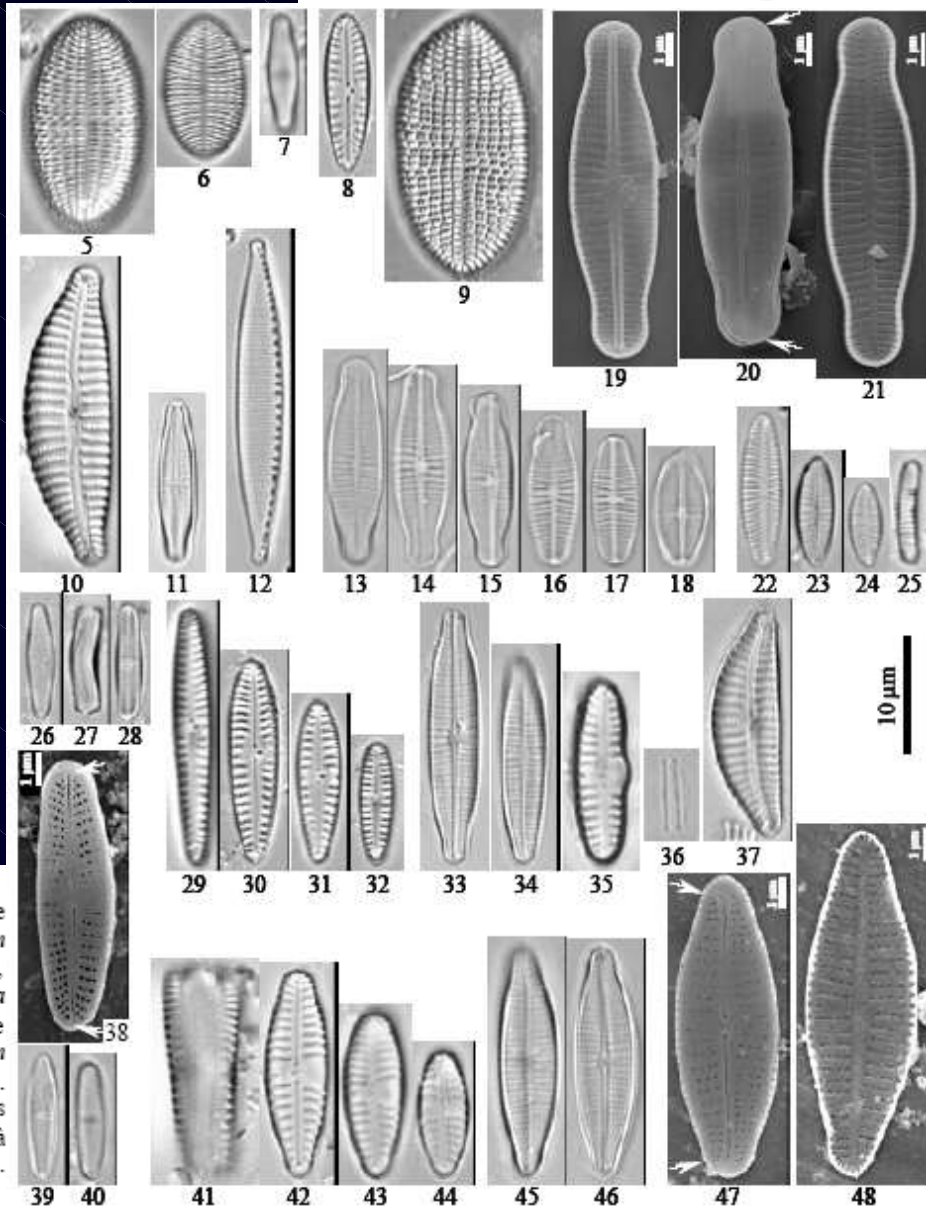
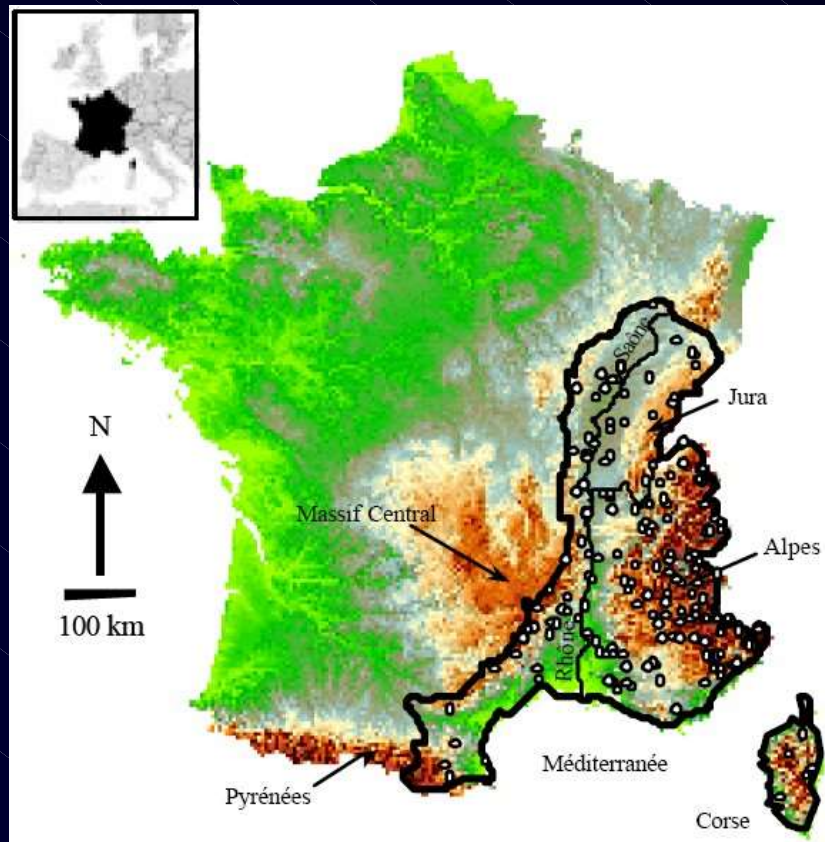


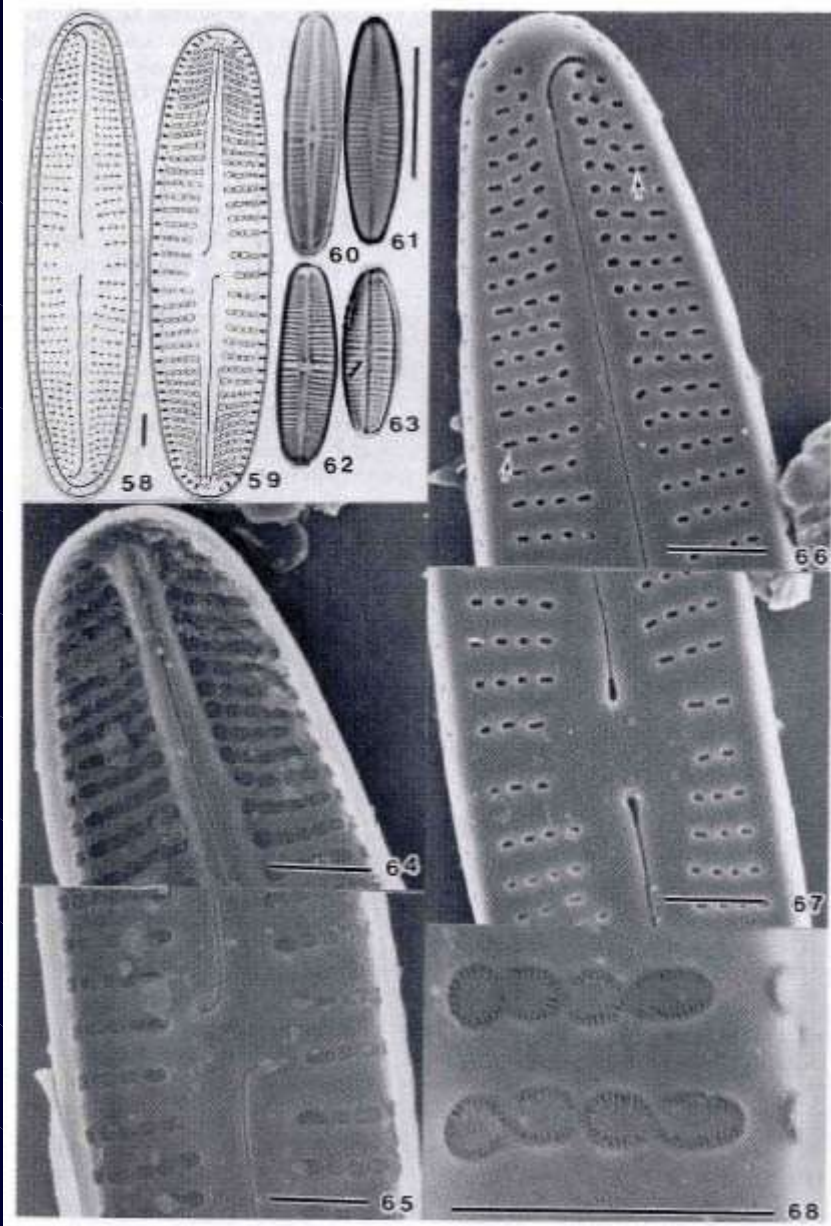
Planche 1 :

Taxons les plus fréquents de 4 assemblages-types (groupes 1, 34, 55, 39) ordonnés par abondance pour chaque groupe : Groupe 1. figs 5-6 : *Cocconeis placentula* var. *lineata*, fig. 7 : *Achnanthydium minutissimum*, fig. 8 : *Gomphonema pumilum*, figs 9 : *Cocconeis placentula* var. *pseudolineata*, Groupe 34. fig. 10 : *Cymbella excisa*, fig. 11 : *Achnanthydium minutissimum*, fig. 12 : *Nitzschia fonticola*, figs 13-21 : *Achnanthydium latecephalum* (figs. 19-21, Tavignano à Aléria, microscope électronique à balayage), figs 22-25 : *Eolimna comperet*, Groupe 55. figs 26-28 : *Achnanthydium minutissimum*, figs 29-32 : *Gomphonema pumilum*, figs 33-34 : *Achnanthydium biasoletianum*, fig. 35 : *Reimeria sinuata*, fig. 36 : *Fistulifera saprophila*, fig. 37 : *Cymbella excisa*, Groupe 39 : figs 38-40 : *Achnanthydium minutissimum* (fig. 38, Loup à Gourdon, microscope électronique à balayage), figs 41-44 : *Gomphonema tergestinum*, figs 45-48 : *Achnanthydium biasoletianum* (fig. 47-48, Loup à Gourdon, microscope électronique à balayage).

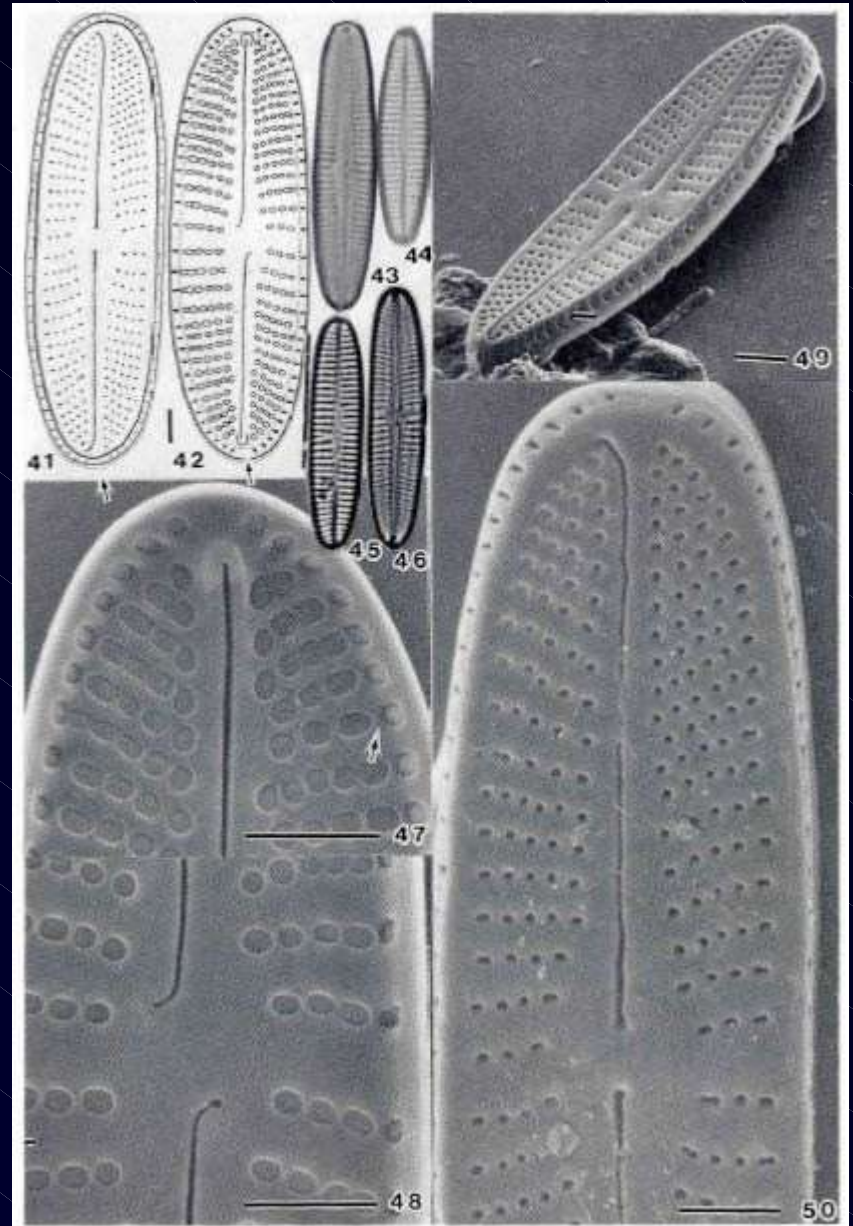
Found in Europe? Only in Japan?

1997

***Achnanthidium convergens* (Kobayasi) Kobayasi**



***Achnanthidium japonicum* (Kobayasi) Kobayasi**



Bart Van de Vijver
Yves Frenot
Louis Beyens

**Freshwater diatoms from
Ile de la Possession
(Crozet Archipelago, Subantarctica)**

Plate 22

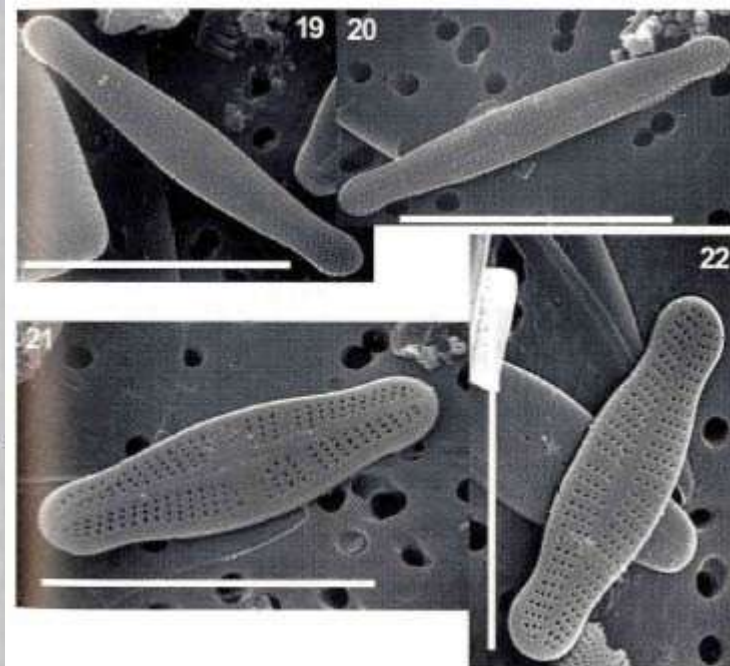
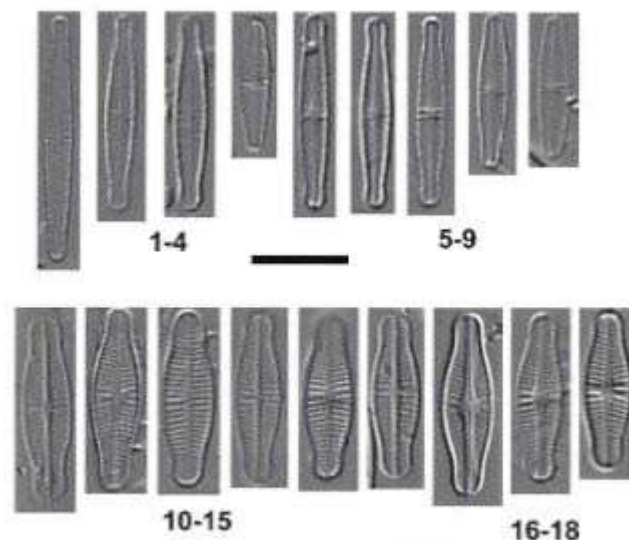
Fig. 1-9, 19-20 *Achnanthidium minutissimum* (Kützing) Czarnecki

- Fig. 1-4: LM (x1500), rapheless valves
Fig. 5-9: LM (x1500), raphe valves
Fig. 19: SEM, external raphe valve view
Fig. 20: SEM, external rapheless valve view

Fig. 10-18, 21-22 *Achnanthidium modestiforme* (Lange-Bertalot) Van de Vijver
nov. comb.

Basionym: *Achnanthes modestiformis* Lange-Bertalot

- Fig. 10-15: LM (x2000), rapheless valves
Fig. 16-18: LM (x2000), raphe valves
Fig. 21: SEM, external raphe valve view
Fig. 22: SEM, internal rapheless valve view



**Eine bemerkenswerte Diatomeenassoziation in einem
Quell habitat im Grazer Bergland, Österreich.**

Ein Beitrag zur Kenntnis seltener und wenig bekannter Diatomeen

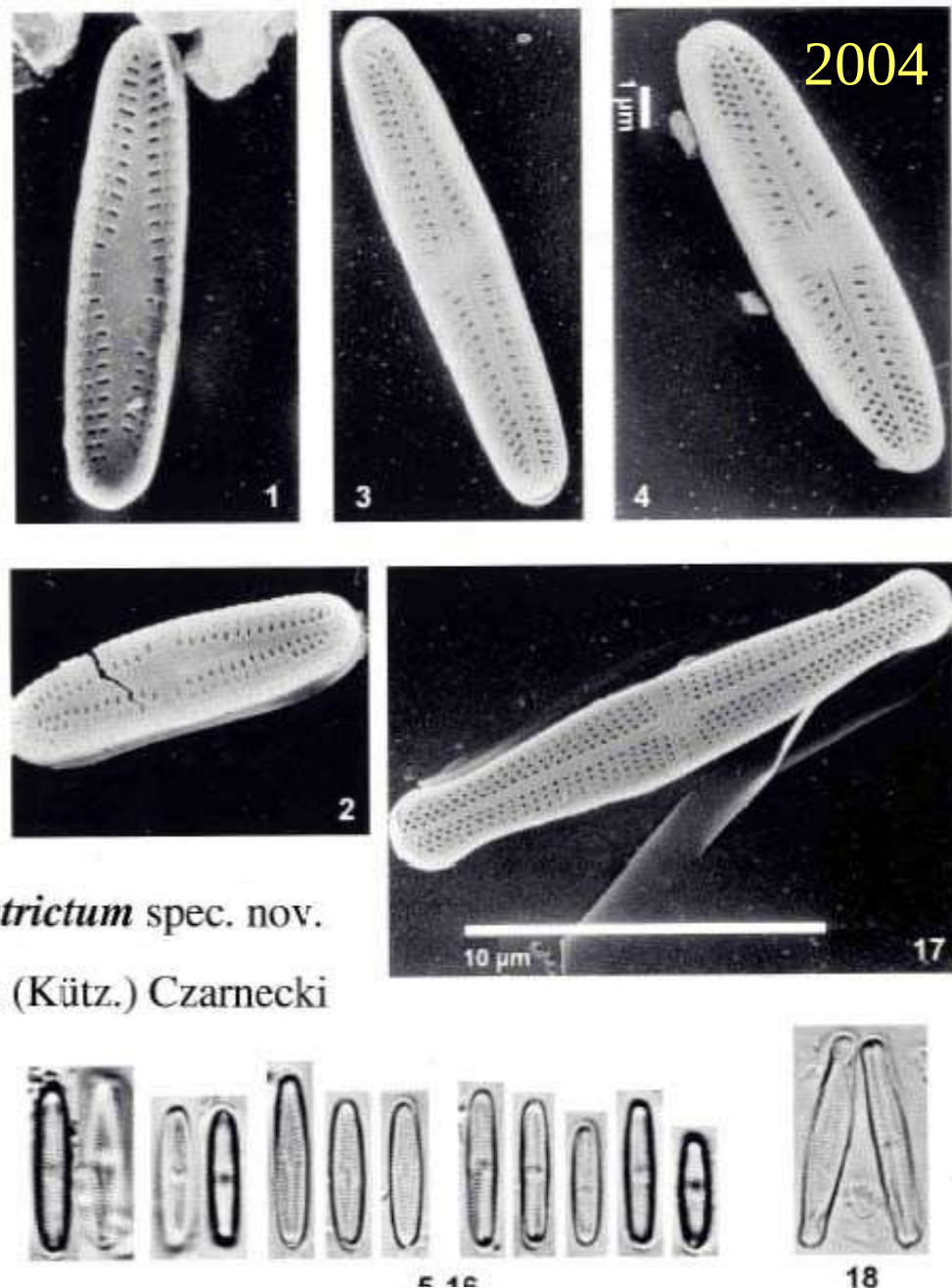
von

Erwin Reichardt

Reichardt, E. 2004. Eine bemerkenswerte
Diatomeenassoziation in einem Queehabitat im Grazer
Bergland, Österreich. Ein Beitrag zur Kenntnis seltener und
wenig bekannter Diatomeen. In: H. Lange-Bertalot (ed.),
Iconographia Diatomologica. Annotated Diatom Micrographs.
Vol. 13. Ecology-Hydrology-Taxonomy. A.R.G. Gantner Verlag
K.G. 13:pp. 419-479, 15 pls.

Fig. 1-16: *Achnanthidium strictum* spec. nov.

Fig. 17-18: *Achnanthidium minutissimum* (Kütz.) Czarnecki



Tafel 3

LM: Fig. 5-16, 18 x2000; REM: Fig. 1 x6800, Fig. 2 x5250,
Fig. 3 x5900, Fig. 4 x5800, Fig. 17 x5250

Iconographia Diatomologica

Annotated Diatom Micrographs

Edited by H. Lange-Bertalot

Volume 13

Ecology – Hydrogeology – Taxonomy



A.R.G. Gantner Verlag K.G.

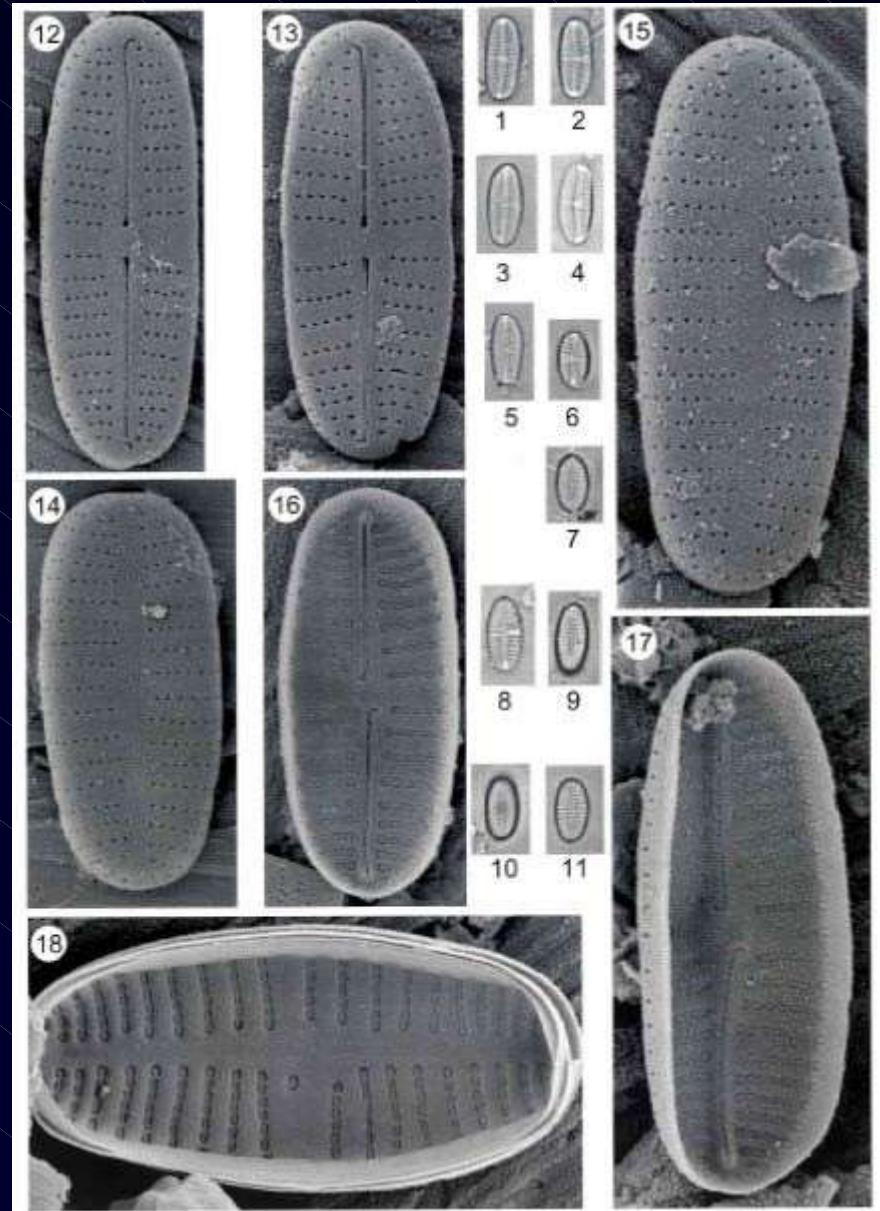
2004

Plate 20 Figs 1-18:

Achnanthidium pfisteri Lange-Bertalot

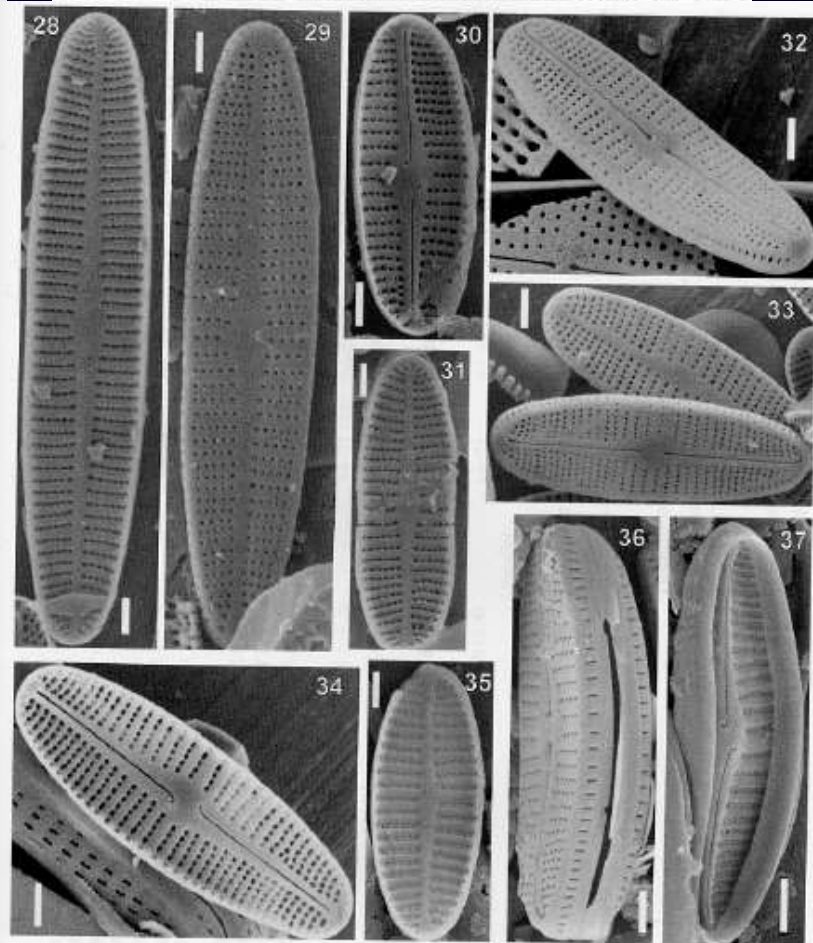
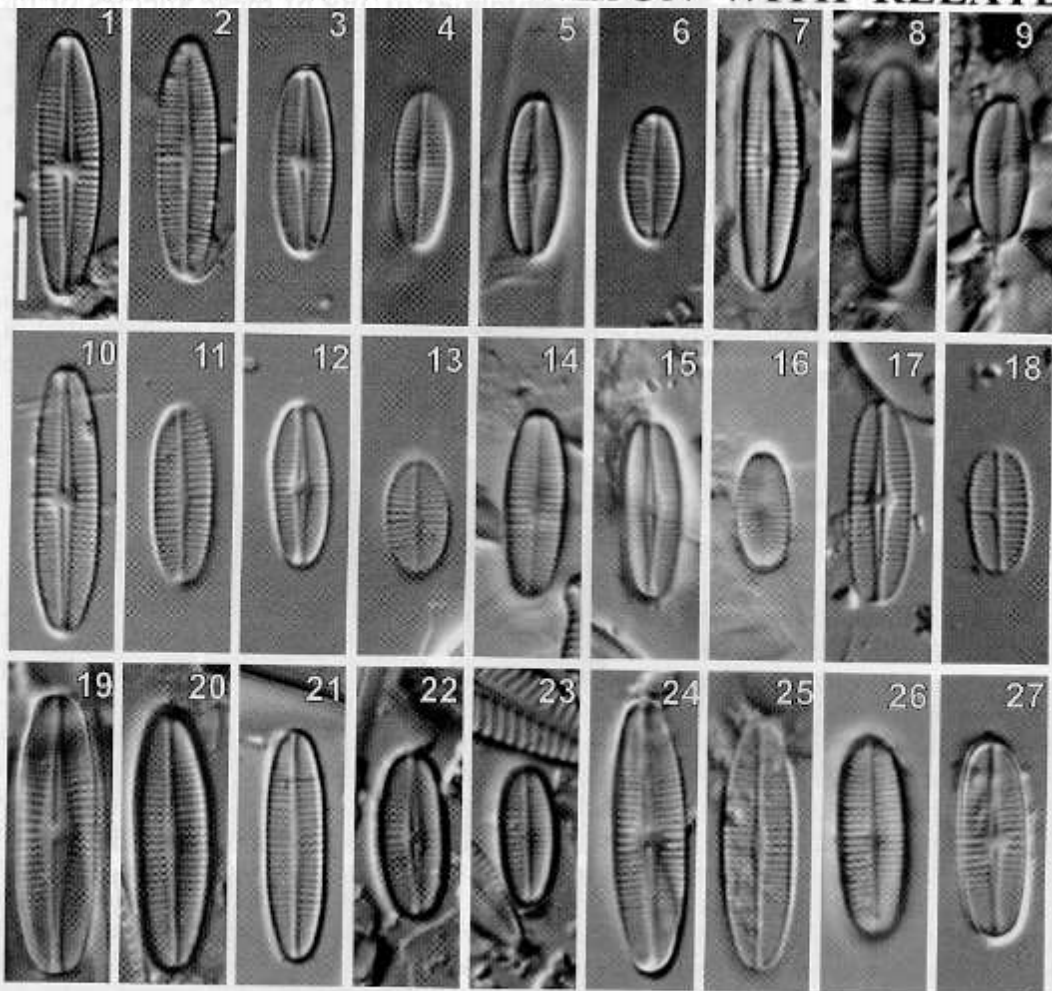
Specimens of the type population, stream Wanzbach, tributary of the river Krems in Austria, foothills of the northern Alps, limestone.

2004



Werum, M. and Lange-Bertalot, H. 2004. Diatoms in Springs from Central Europe and elsewhere under the influence of hydrogeology and anthropogenic impacts
In: H. Lange-Bertalot (ed.), Iconographia Diatomologica. Annotated Diatom Micrographs. Vol. 13. Ecology-Hydrology-Taxonomy. A.R.G. Gantner Verlag K.G., Vol: 13, pp. 3-417, 105 pls

TWO COMMON NORTH AMERICAN DIATOMS, *ACHNANTHIDIUM RIVULARE* SP. NOV. AND *A. DEFLEXUM* (REIMER) KINGSTON: MORPHOLOGY, ECOLOGY AND COMPARISON WITH RELATED SPECIES



Figs 1–27. LM. Scale bar = 5 μ m. **Figs 1–18.** *Achnanthyidium rivulare*. **Figs 1–6.** Specimens from holotype slide ANSP GC 57579, Pennichuck Brook, New Hampshire. **Figs 4, 5.** Rapheless and raphe valves of holotype specimen, respectively. **Figs 7–9.** Ferguson Creek, Oregon. **Figs 10–13.** Jacksonburg Creek, New Jersey. **Figs 14–16.** West fork of Little River, Georgia. **Figs 17, 18.** American River, California. **Figs 19–27.** *Achnanthyidium crassum*. **Figs 19–23.** Punaluu Stream, Oahu, Hawaii. **Figs 24–27.** Type material, BRM AS 719, creek at Subang pass, Sumatra.

Figs 28–37. *Achnanthyidium rivulare*, SEM. Scale bars = 1 μ m. **Figs 28–31.** Type material, NAWQA sample NECB0800ARE0031B, Pennichuck Brook, New Hampshire. **Figs 32–34.** Jacksonburg Creek, New Jersey. **Figs 35–37.** Spruce Run, New Jersey. **Figs 28, 31, 35.** Internal views of rapheless valves. **Fig. 29.** External view of rapheless valve. **Figs 30, 34.** Internal views of raphe valves. **Fig. 32.** External view of concave raphe valve. **Fig. 33.** External views of raphe and rapheless valves. **Fig. 36.** Oblique view of frustule showing slightly concave raphe valve and girdle bands. **Fig. 37.** Internal view of tilted raphe valve with valveocula.

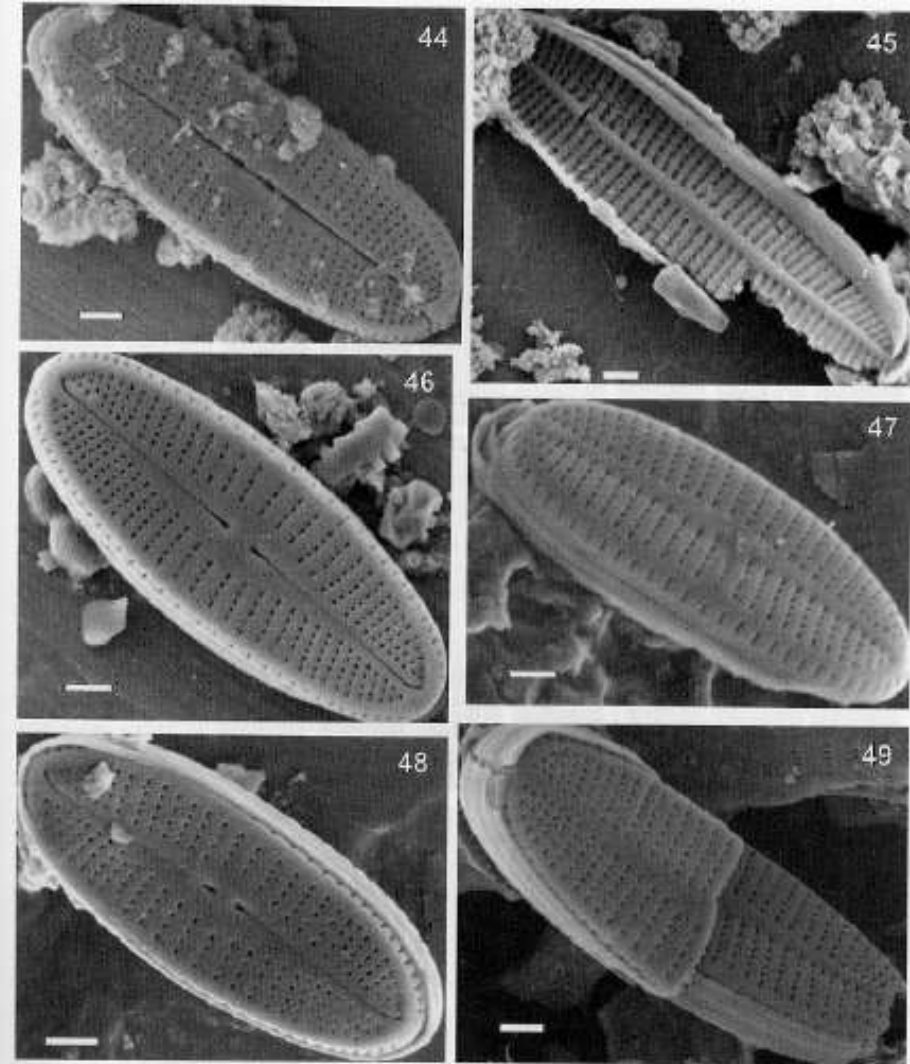
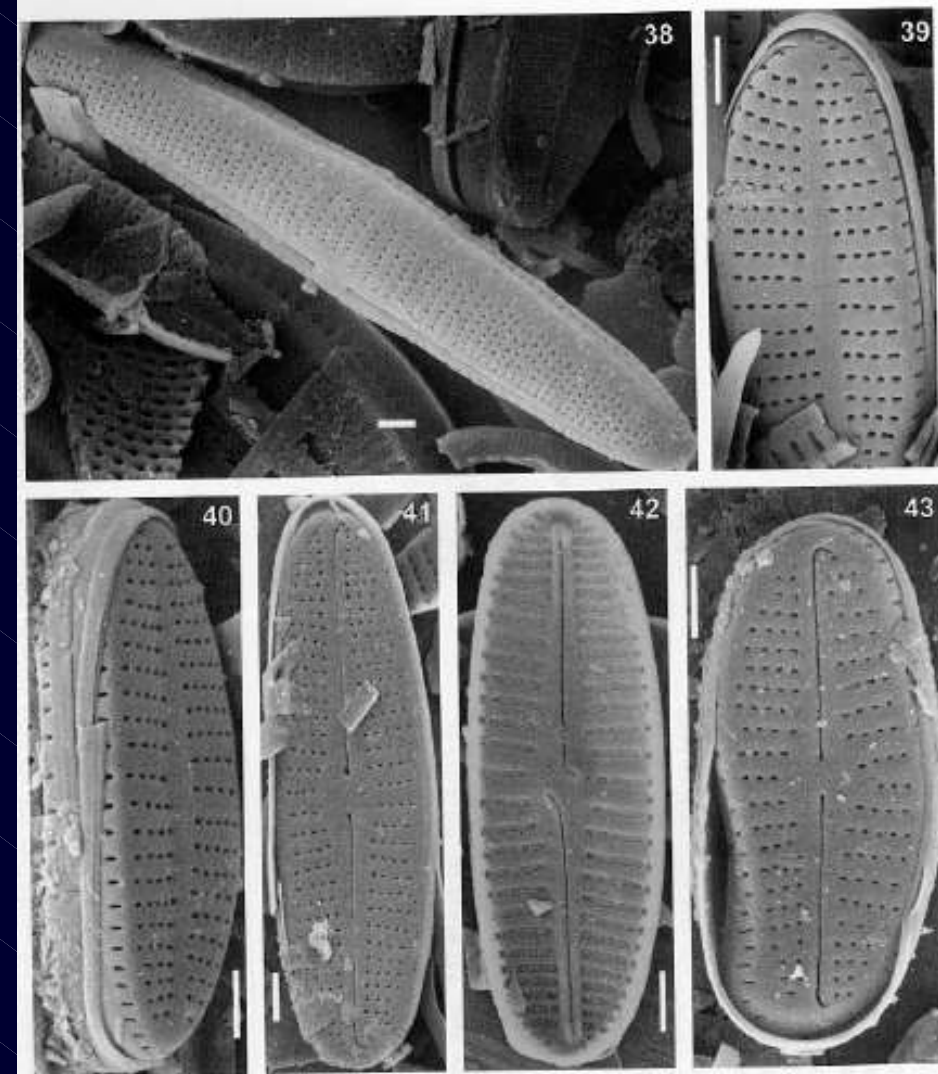
**TWO COMMON NORTH AMERICAN DIATOMS,
ACHNANTHIDIUM RIVULARE SP. NOV. AND
A. DEFLEXUM (REIMER) KINGSTON: MORPHOLOGY,
 ECOLOGY AND COMPARISON WITH RELATED SPECIES**

Diatom Research (2004)

Volume 19 (1), 33–57

Marina G. Potapova¹ & Karin C. Ponader

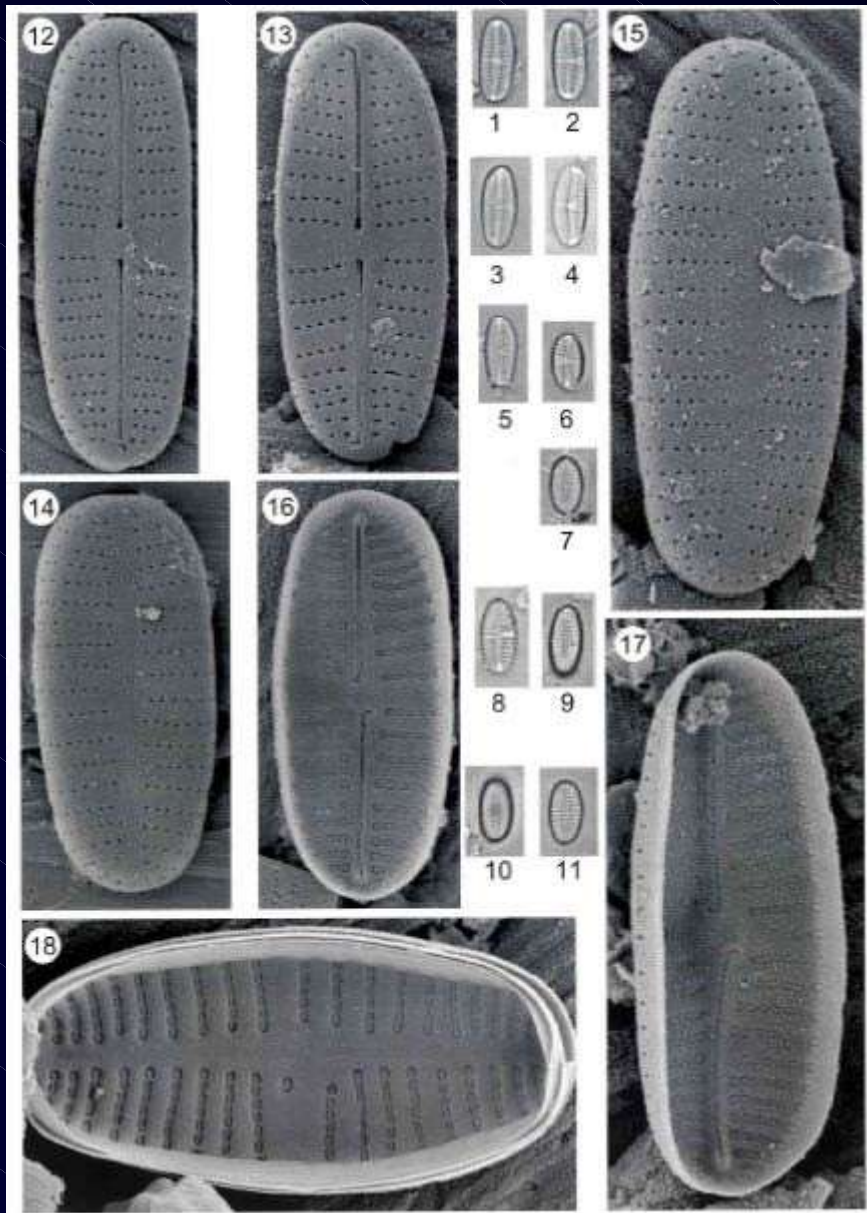
2004



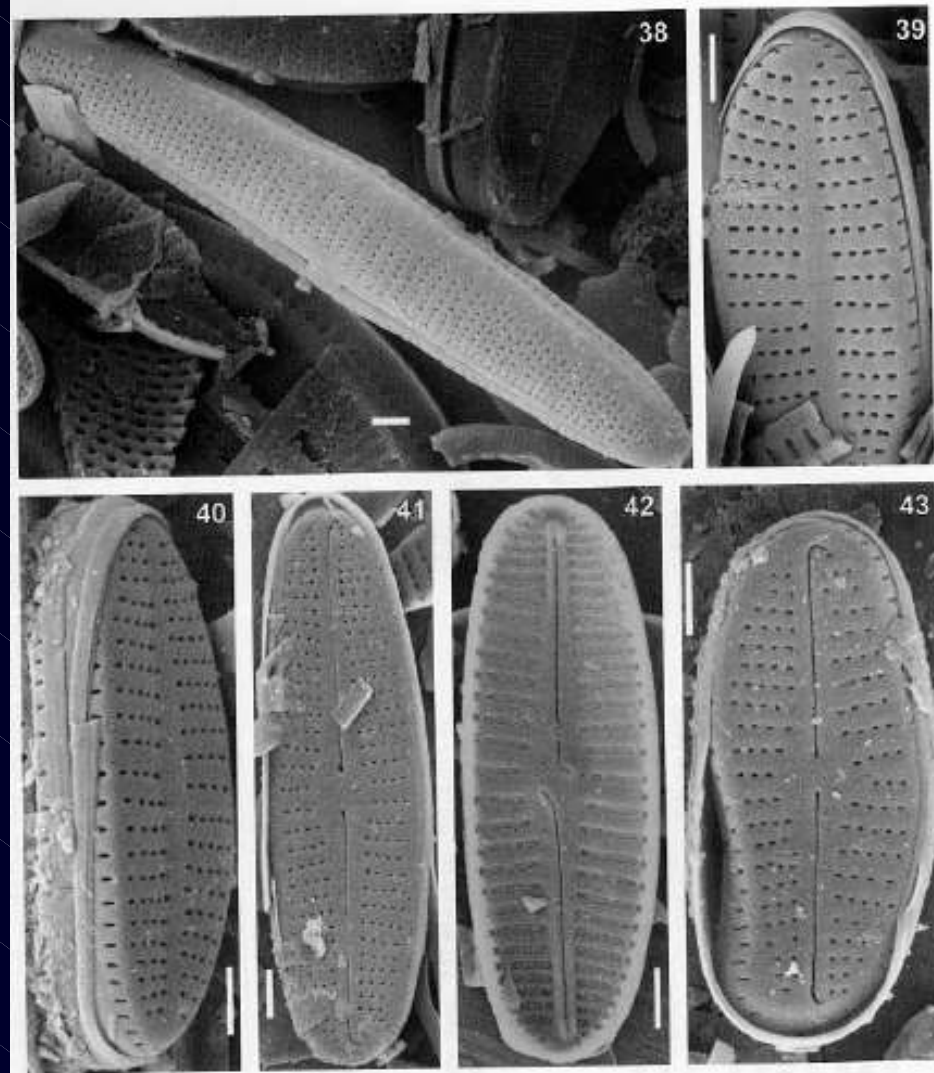
Figs 38–43. *Achnanthyidium rivulare*, SEM. Scale bars = 1 μ m. Figs 38–40. Spruce Run, New Jersey. Fig. 38. Frustule of initial cell, valve face and mantle are not differentiated. Figs 39, 40. Short rapheless valves enclosed by girdle bands of epivalve. Figs 41–43. Miry Run, New Jersey. Figs 41, 43. External views of raphe valves with striae at valve apices perpendicular to sternum. Fig. 42. Internal view of raphe valve, note unusual shape of central raphe endings.

Figs 44–49. *Achnanthyidium crassum*, SEM. Scale bars = 1 μ m. Figs 44, 45. Type material, BRM AS 719, creek at Subang pass, Sumatra. Figs 46–49. Punaluu Stream, Oahu, Hawaii. Figs 44, 46, 48. External views of raphe valves. Fig. 45. Internal view of broken rapheless valve. Fig. 47, 49. External views of rapheless valve.

Achnanthyidum pfisteri



Achnanthyidum rivulare

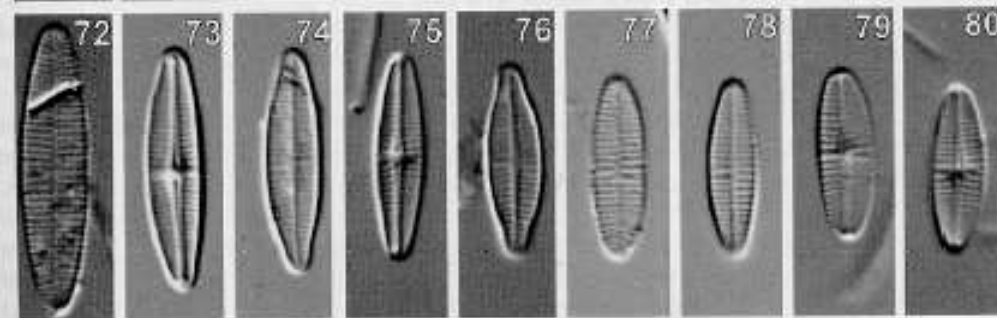


Figs 38–43, *Achnanthyidum rivulare*. SEM. Scale bars = 1 μ m. Figs 38–40. Spruce Run, New Jersey. Fig. 38. Frustule of initial cell, valve face and mantle are not differentiated. Figs 39, 40. Short rapheless valves enclosed by girdle bands of epivalve. Figs 41–43. Miry Run, New Jersey. Figs 41, 43. External views of raphe valves with striae at valve apices perpendicular to sternum. Fig. 42. Internal view of raphe valve, note unusual shape of central raphe endings.

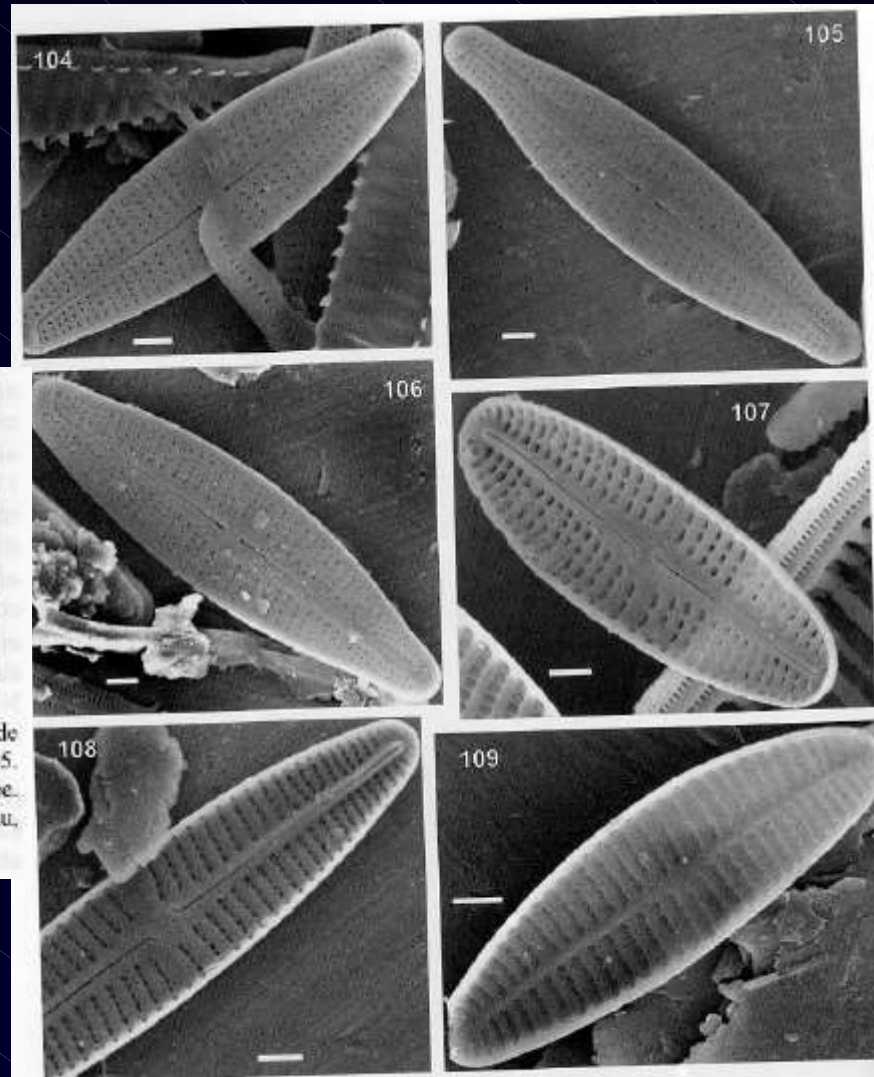
**TWO COMMON NORTH AMERICAN DIATOMS,
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Diatom Research (2004), Volume 19 (1), 33–57



Figs 51–80. LM. Scale bar = 5 μ m. Figs 51–71. *Achnanthyidium deflexum*. Figs 51–60. Holotype slide ANSP GC 1931, Lake Maxinkuckee, Indiana. Figs 61–63. Yellowstone River, Montana. Figs 64, 65. Hidden Spring, Utah. Figs 66, 67. Yocum Creek, Arkansas. Figs 68–71. Copper Creek, Tennessee. Figs 72–80. *Achnanthyidium pyrenaicum*, type material, BRM E 809, Gave d'Ossau, south from Pau, Pyrenees, France.



Figs 104–109. *Achnanthyidium pyrenaicum*, SEM. Type material, BRM E 809, Gave d'Ossau River, Pyrenees, France. Scale bars = 1 μ m. Figs 104–106. External views of raphe valves showing variable shape of outer areolae foramina. Figs 107, 108. Internal views of raphe valves. Fig. 109. Internal view of rapheless valve with occluded areolae foramina.

Iconographia Diatomologica

Annotated Diatom Micrographs
Edited by H. Lange-Bertalot

Volume 13

Ecology – Hydrogeology – Taxonomy



A.R.G. Gantner Verlag K.G.

2004

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2004

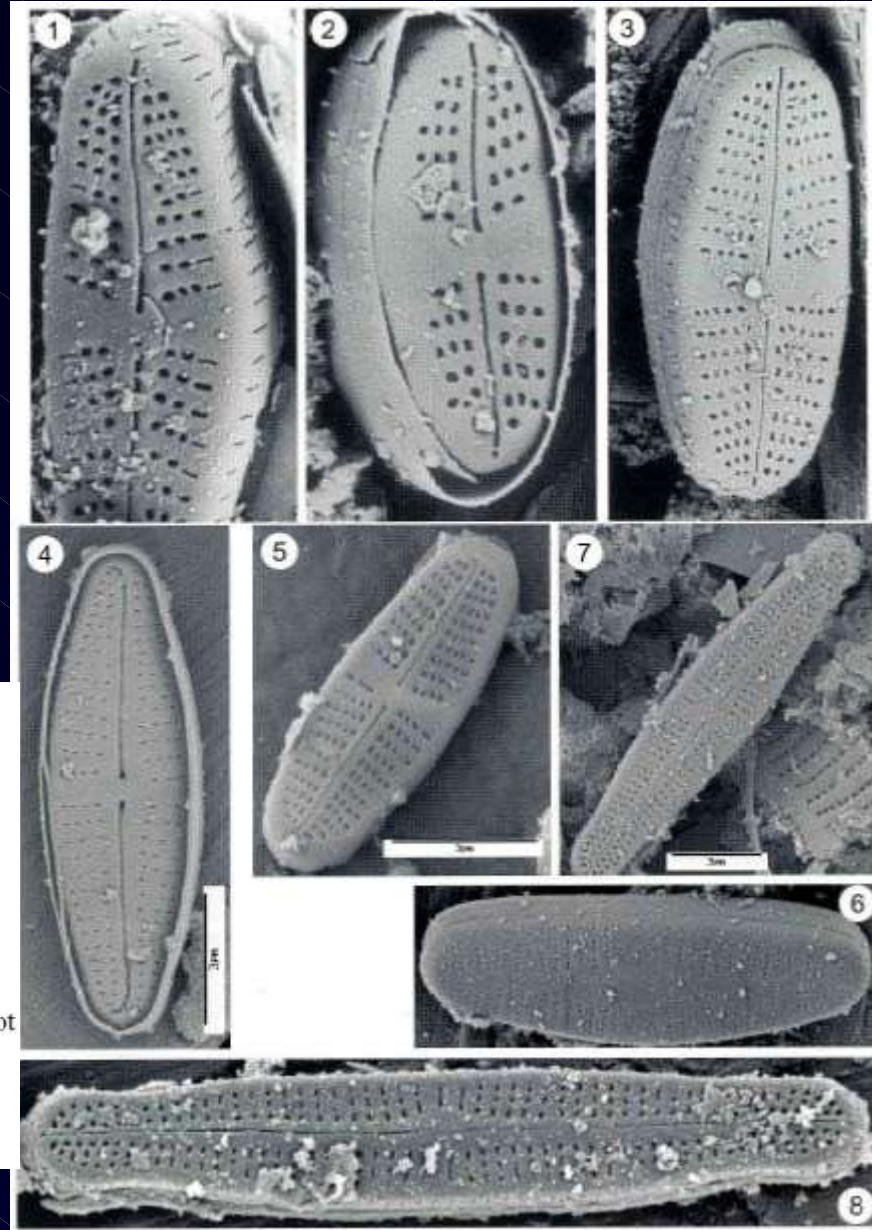


Plate 19

SEM: Fig. 1 x13000, Fig. 2 x14000, Fig. 3 x9300, Fig. 4 x7000,
Fig. 5 x9300, Fig. 6 x5600, Fig. 7 x5000, Fig. 8 x8700

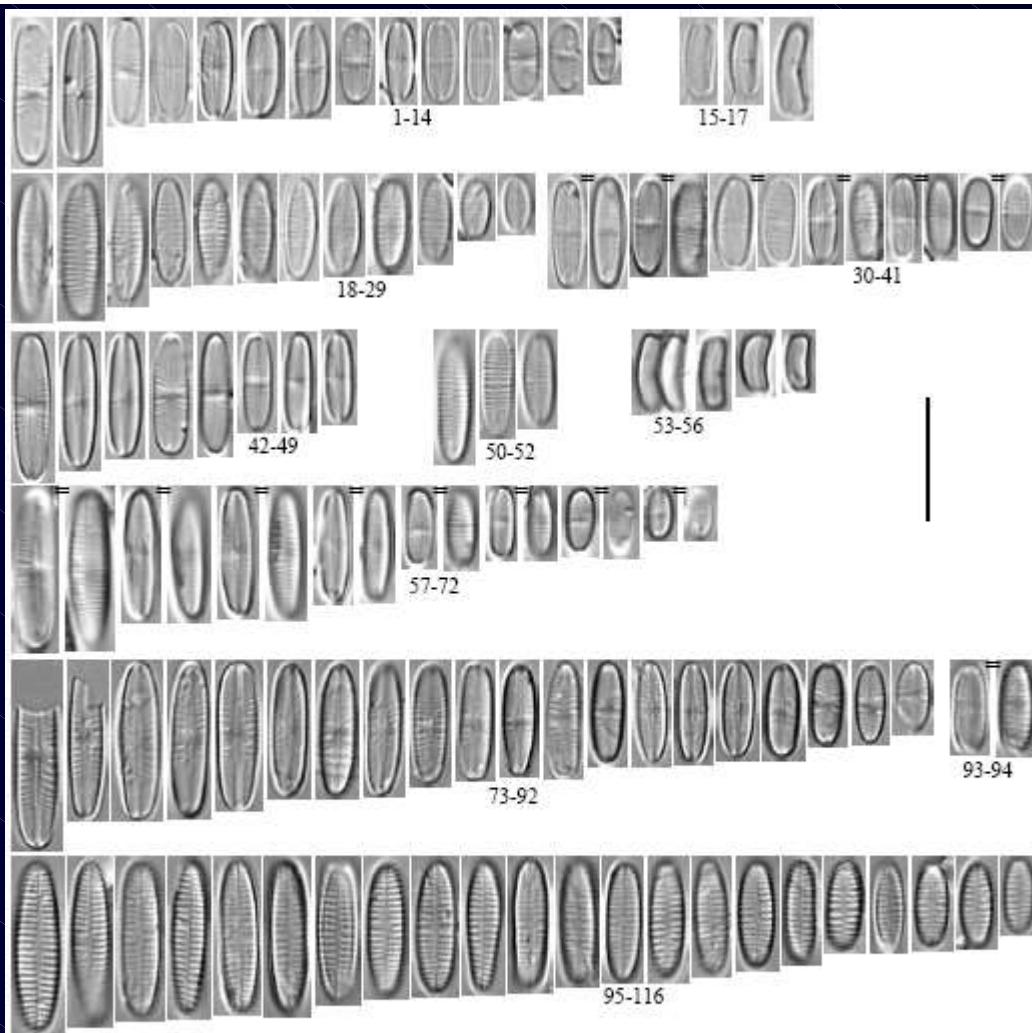
Four (or five?) taxa of *Achnantheidium* in comparison

- Figs 1, 2: (?) *Achnantheidium minutissimum* (Kützing) Czarnecki
Fig. 3: *Achnantheidium straubianum* (Lange-Bertalot) Lange-Bertalot
Fig. 4: *Achnantheidium biasolettianum* (Grunow) Round & Bukht.
Figs 5, 6: *Achnantheidium kranzii* (Lange-Bertalot) Round & Bukht.
Figs 7, 8: *Achnantheidium minutissimum* (Kützing) Czarnecki

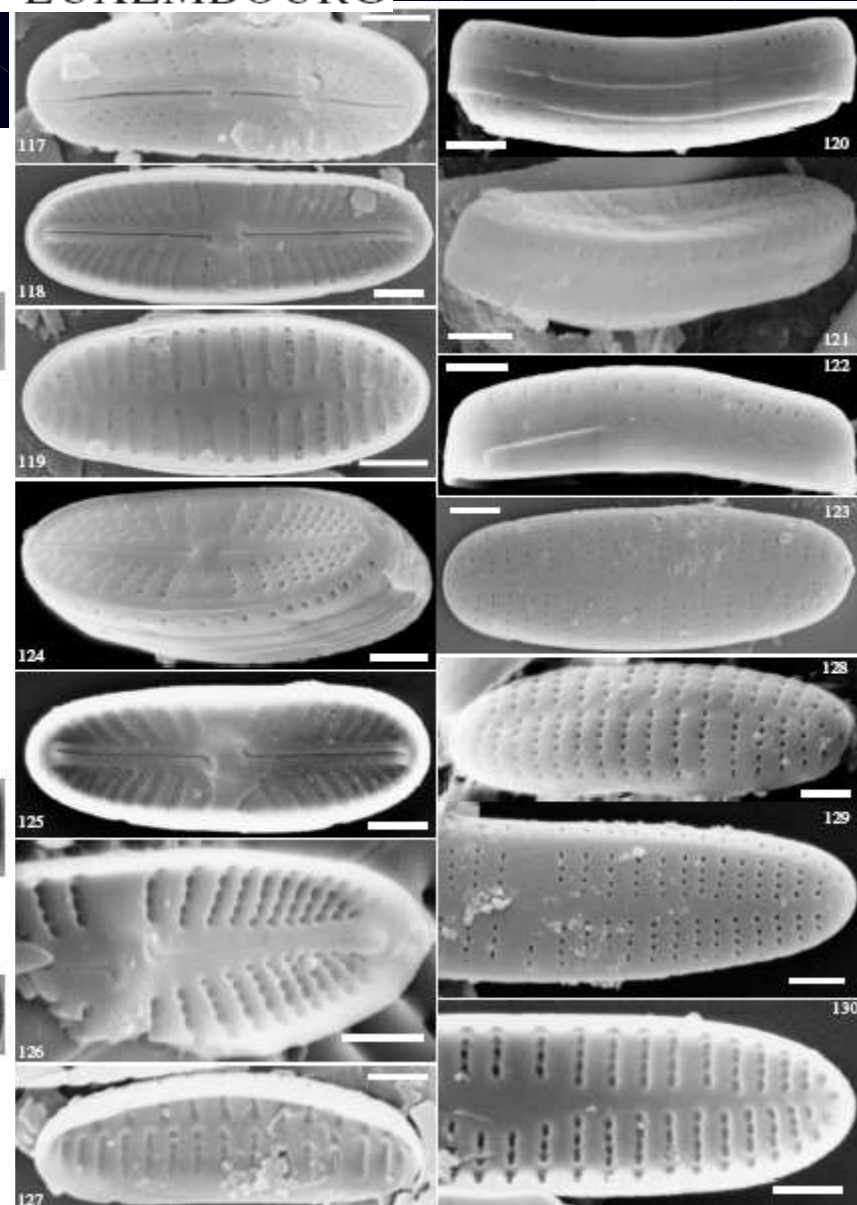
ACHNANTHIDIUM ATOMOIDES SP. NOV., A NEW DIATOM FROM THE GRAND-DUCHY OF LUXEMBOURG

2004

¹O. MONNIER, ²H. LANGE-BERTALOT, ¹F. RIMET,
¹L. HOFFMANN, ¹L. ECTOR



VIE MILIEU, 2004, 54 (2-3) : 127-136

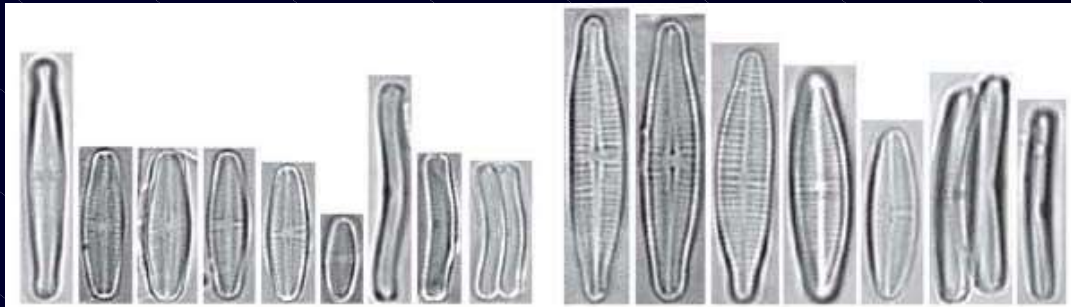


Figs 117-130. – SEM. Scale bars = 1 µm. Figs 117-123: *Achnantheidium atomoides* (original material from river Ern Z Blanche at Hessemillen, Luxembourg). Fig. 117: raphe valve, outside view. Fig. 118: raphe valve, inside view. Fig. 119: rapheless valve, inside view. Fig. 120: frustule, girdle view. Fig. 121: frustule, raphe valve and girdle, outside view. Fig. 122: rapheless valve, girdle view. Fig. 123: rapheless valve, outside view. Figs 124-130: *A. atomus* (original material from type locality, Java). Fig. 124: frustule, raphe valve and girdle, outside view. Figs 125, 126: raphe valve, inside views. Fig. 127: rapheless valve, inside view. Figs 128, 129: rapheless valve, outside views. Fig. 130: rapheless valve, inside view.

Figs 1-116. – LM. Scale bar = 10 µm. Figs 1-41: *Achnantheidium atomoides* (type material from river Ern Z Blanche at Hessemillen, Luxembourg). Figs 1-14: raphe valves. Figs 15-17: girdle views. Figs 18-29: rapheless valves. Figs 30-41: two valves of the same individual. Figs 42-72: *A. atomoides* (material from river Nalón, Spain). Figs 42-49: raphe valves. Figs 50-52: rapheless valves. Figs 53-56: girdle views. Figs 57-72: two valves of the same individual. Figs 73-116: *A. atomus* (original material from type locality, Java). Figs 73-92: raphe valves. Figs 93, 94: two valves of the same individual. Figs 95-116: rapheless valves.

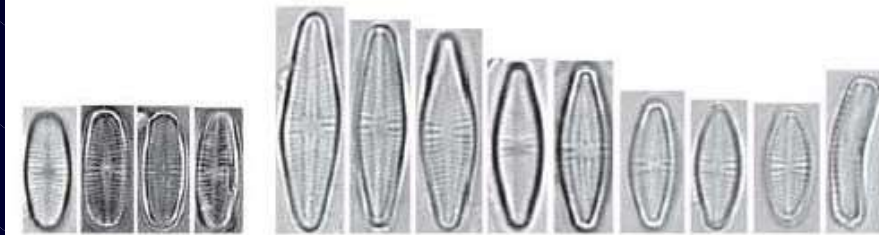
Achnantheidium temniskovae sp. nov., a new diatom from the Mesta River, Bulgaria

Plamen Ivanov¹ and Luc Ector²



45-54

55-62

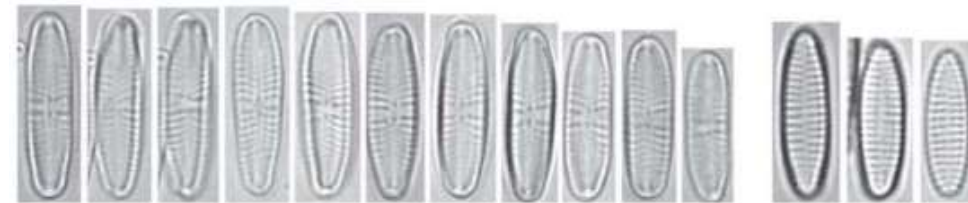


63-66

67-75

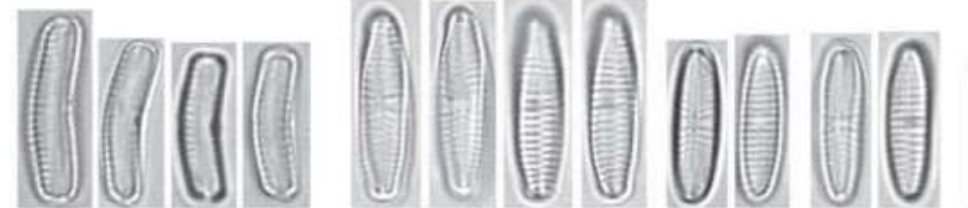


76-85



1-11

12-14



15-18

19-26

Figs 1-26. *Achnantheidium temniskovae* (type material from the Mesta River, Bulgaria), LM. Scale bar = 10 μ m. **Figs 1-11:** raphe valves. **Figs 12-14:** rapheless valves. **Figs 15-18:** girdle views. **Figs 19-26:** two valves of the same individual.

Figs 45-85. Some other close *Achnantheidium* species from the Mesta River, LM. Scale bar = 10 μ m.

Figs 45-54. *A. minutissimum*. **Figs 55-62.** *A. pyrenaicum*. **Figs 63-66.** *A. saprophilum*. **Figs 67-75.** *A. eutrophilum*. **Figs 76-85.** *A. subatomus*.

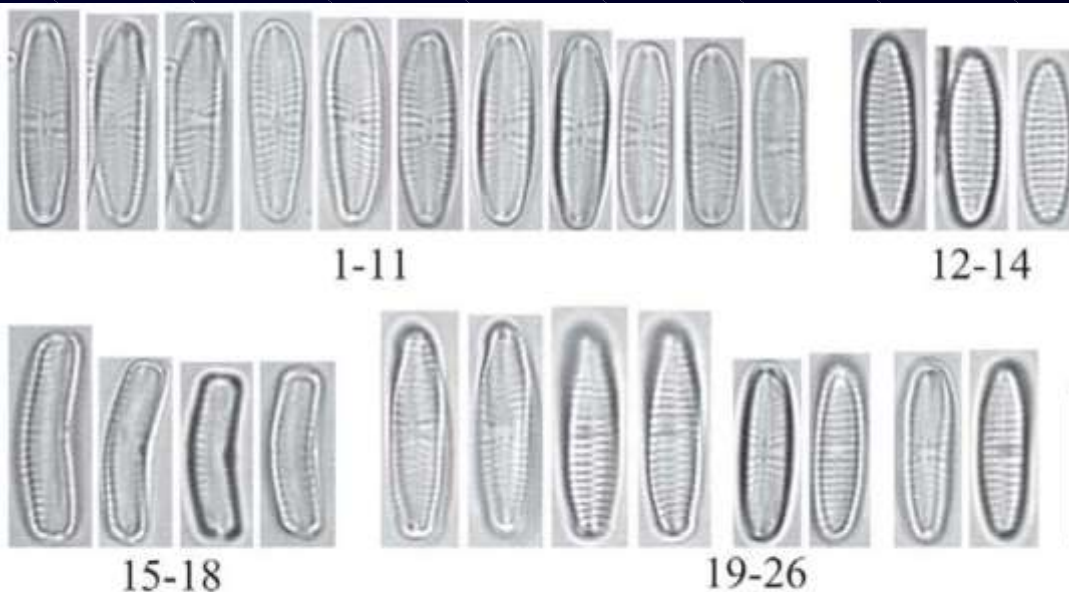
Achnanthidium temniskovae sp. nov., a new diatom from the Mesta River, Bulgaria

Plamen Ivanov¹ and Luc Ector²

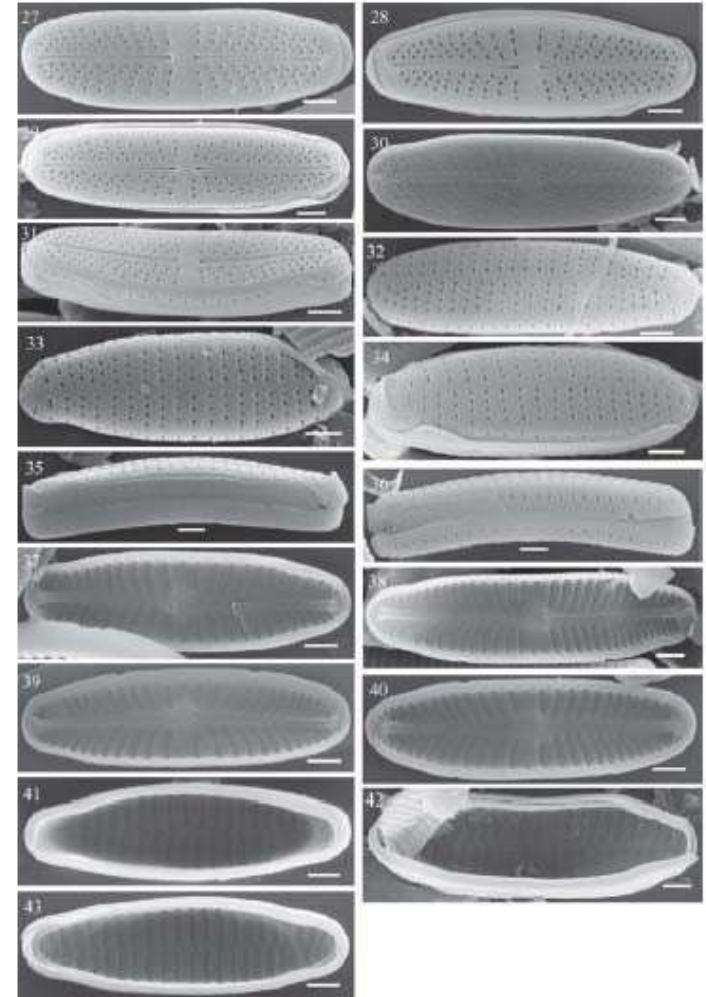
Nadja Ognjanova-Rumenova & Kalina Manoylov (eds.) 2006

ADVANCES IN PHYCOLOGICAL STUDIES

Festschrift in Honour of Prof. Dobrina Temniskova-Topalova (pp. 147-154)



Figs 1-26. *Achnanthidium temniskovae* (type material from the Mesta River, Bulgaria), LM. Scale bar = 10 μ m. **Figs 1-11:** raphe valves. **Figs 12-14:** rapheless valves. **Figs 15-18:** girdle views. **Figs 19-26:** two valves of the same individual.



Figs 27-43. *Achnanthidium temniskovae* (type material from the Mesta River, Bulgaria), SEM. Scale bar = 1 μ m. **Figs 27-30:** raphe valves, outside view. **Fig. 31:** raphe valve and girdle, outside view. **Figs 32, 33:** rapheless valves, outside view. **Fig. 34:** frustule, rapheless valve and girdle, outside view. **Figs 35, 36:** frustule, girdle view. **Figs 37-40:** raphe valves, inside view. **Figs 41-43:** rapheless valves, inside view.

Longitudinal variations of benthic diatoms and water quality along a large river (Adige River) in Northern Italy

2009

Maria Elena Beltrami, Luc Ector, Francesca Ciutti, Cristina Cappelletti, Lucien Hoffmann and Eugen Rott

Verh. Internat. Verein. Limnol.
2009, vol. 30, Part 6, p. 915–918

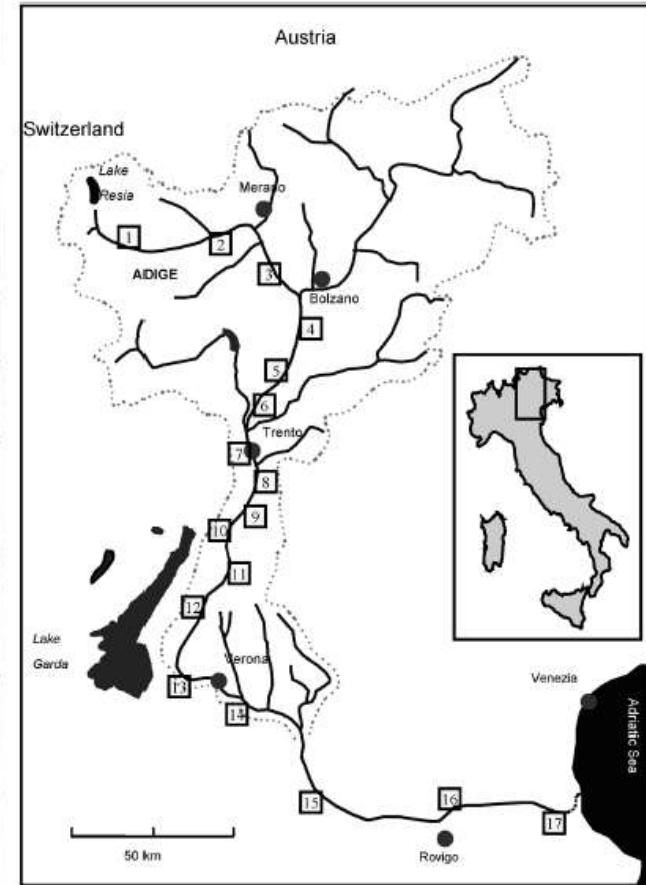
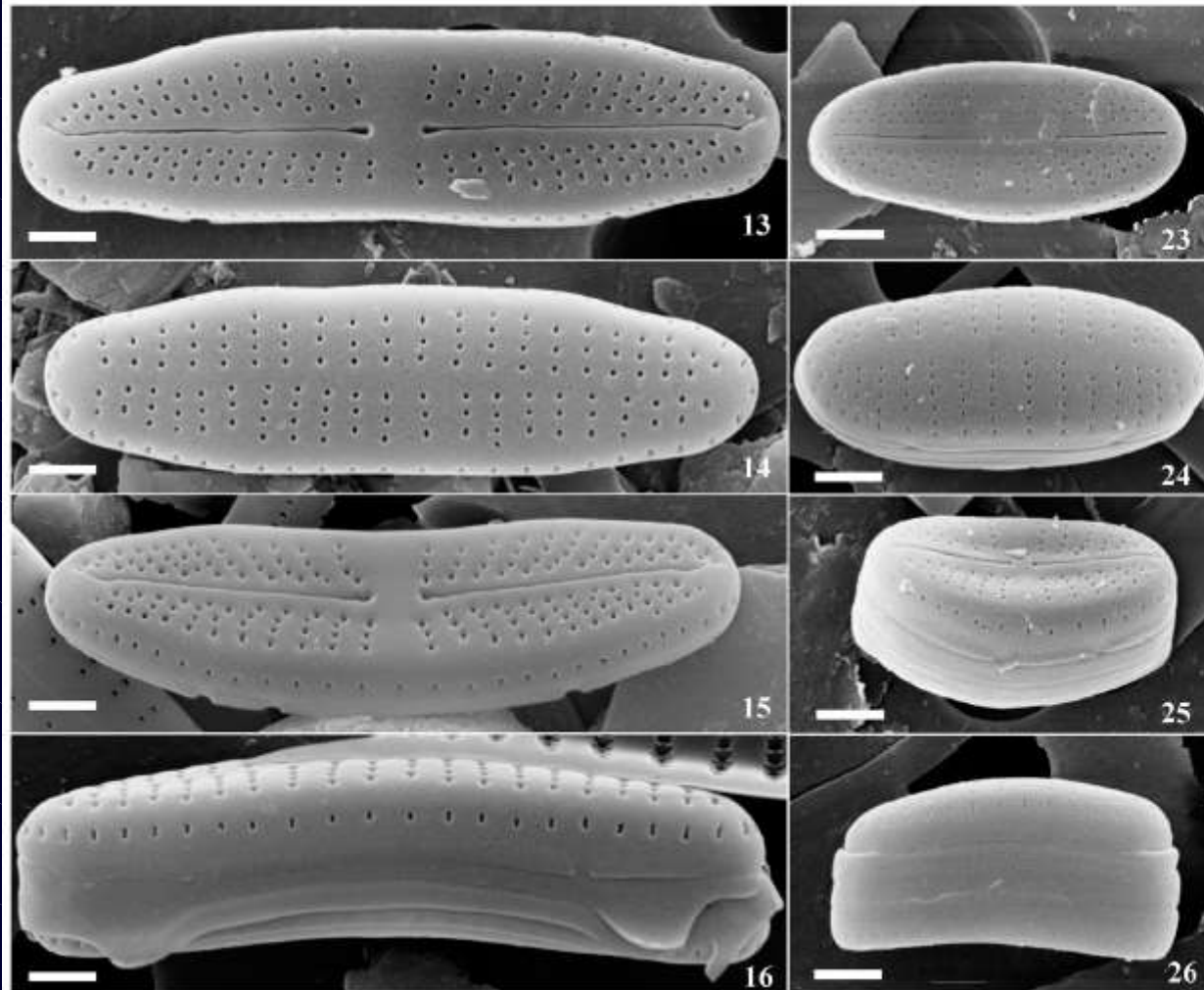
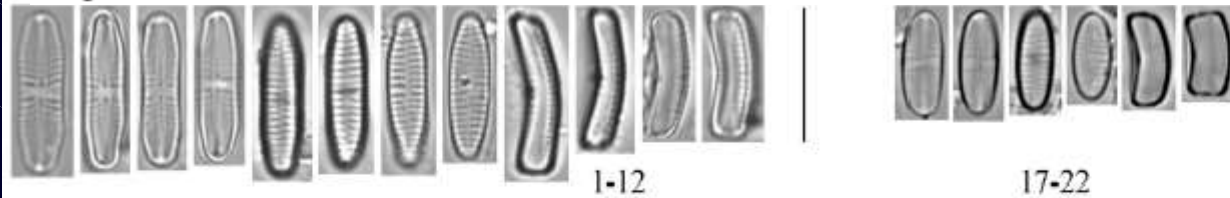


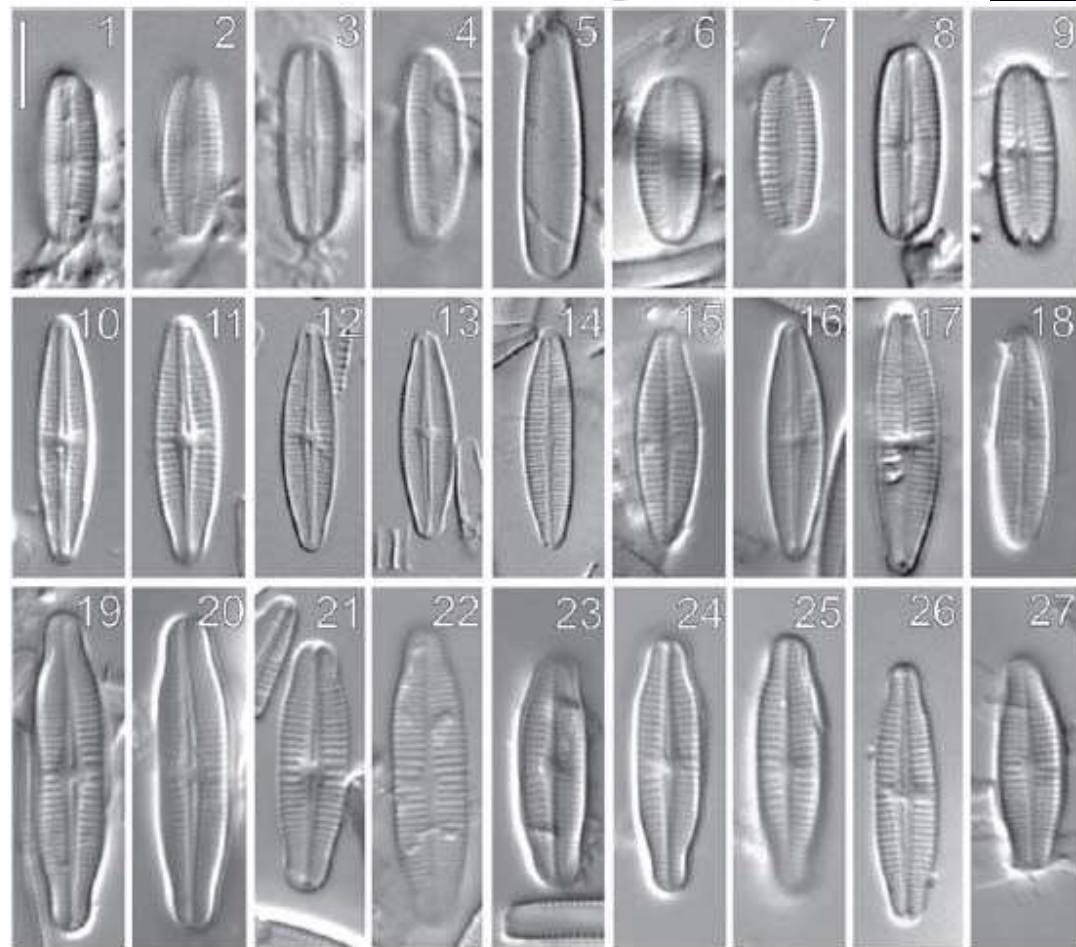
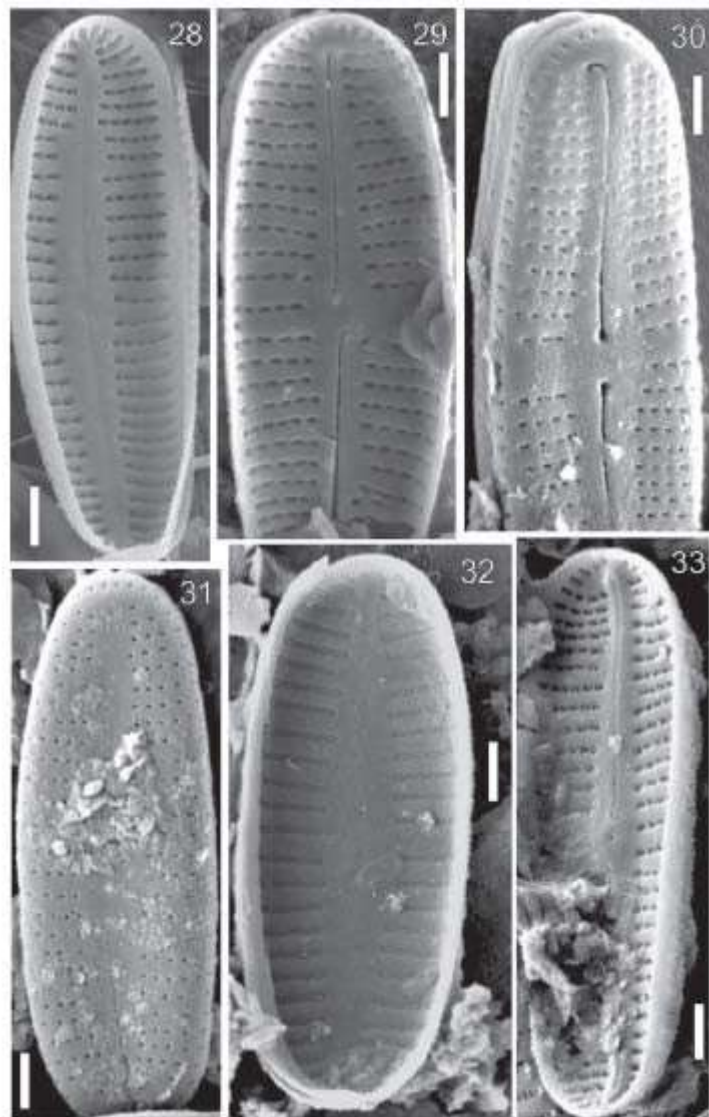
Fig. 1. Adige River basin and location of sampling sites.

Fig. 3. 1–16: *Achnanthes* *temniskovae*; 17–26: *A. atomoides*. LM scale bar: 10 μ m; SEM scale bars: 1 μ m.

Achnantheidium zhakovschikovii sp. nov. (Bacillariophyta) and related species from rivers of Northwestern Russia 2006

Nova Hedwigia 82 3—4 399—408 Stuttgart, May 2006

Marina Potapova



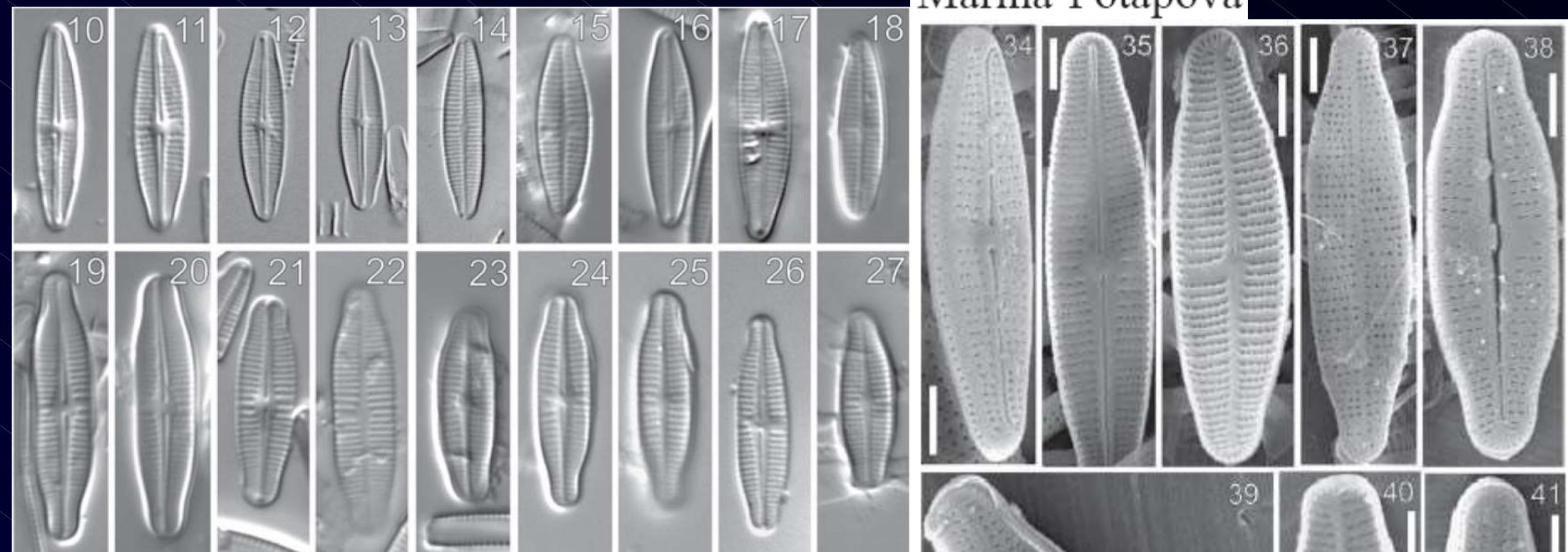
Figs 1-27. *Achnantheidium* species from NW Russia. LM. Scale bar = 5 μ m. Figs 1-9. *Achnantheidium zhakovschikovii* Potapova, sp. nov. Specimens from the type locality, Oredezh River. Figs 1, 2. Two valves of the holotype specimen. Figs 10-18. *Achnantheidium pyrenaicum* (Hustedt) Kobayasi. Figs 10-15. Specimens from Oredezh River. Figs 16-18. Specimens from Lamoshka River. Figs 19-27. *Achnantheidium thienemannii* (Hustedt) Lange-Bertalot. Figs 19-23. Specimens from Lamoshka River. Figs 24, 25. Two valves of the same frustule, specimens from Yablonka River. Figs 26, 27. Specimens from Divenka River.

Figs 28-33. *Achnantheidium zhakovschikovii* Potapova, sp. nov., specimens from the type locality, Oredezh River, NW Russia. SEM. Scale bars = 1 μ m.

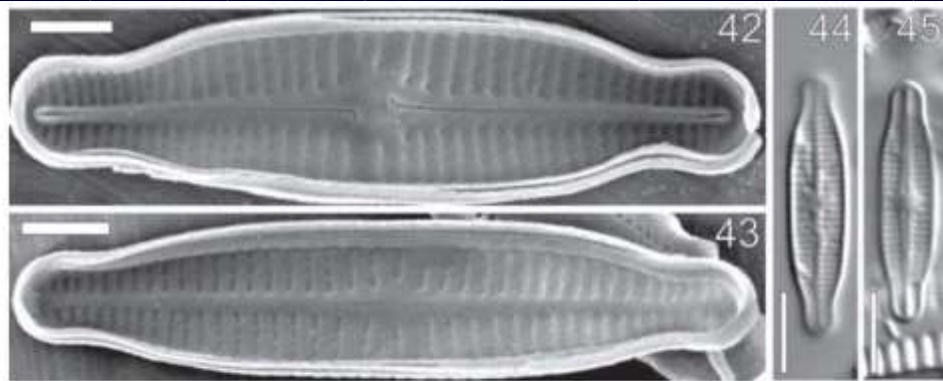
Achnantheidium zhakovschikovii sp. nov. (Bacillariophyta) and related species from rivers of Northwestern Russia 2006

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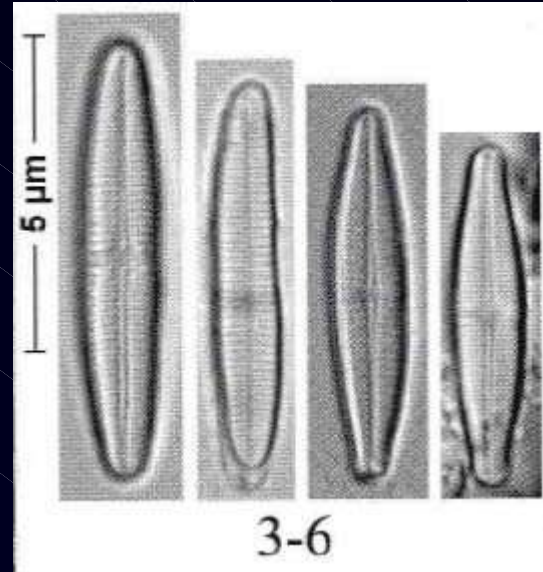
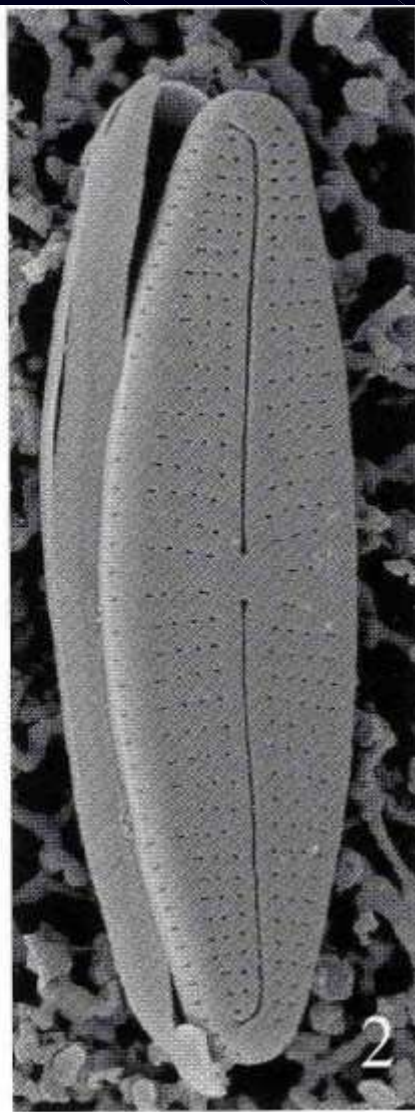
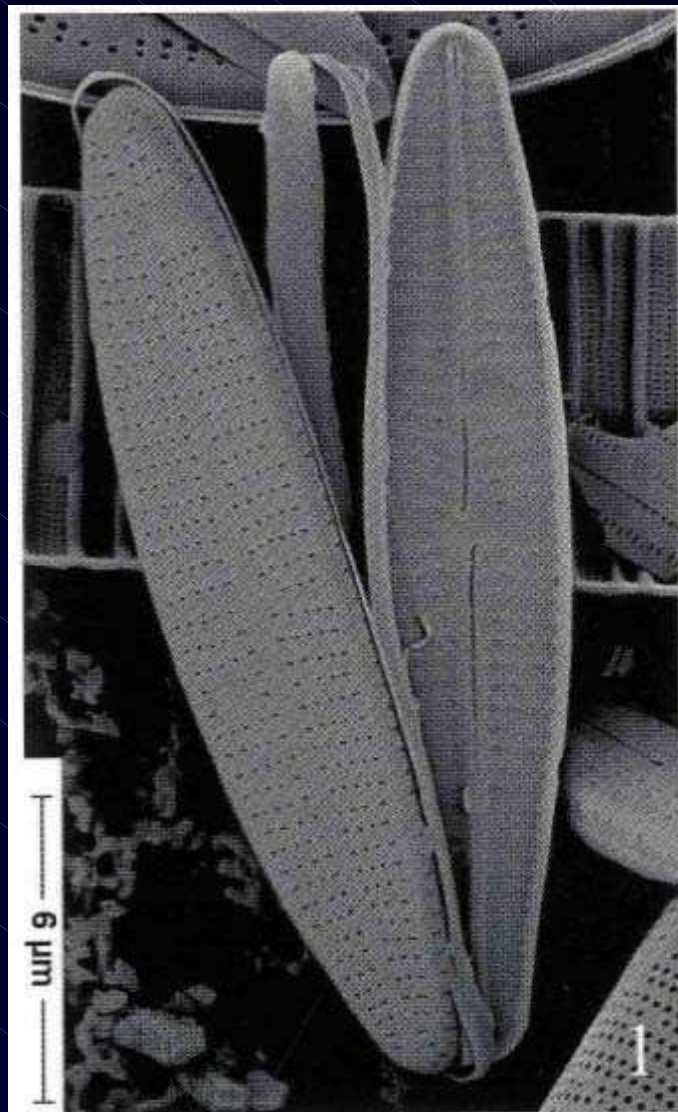
Achnantheidium thienemannii (Hustedt) Lange-Bertalot.



Figs 42-45. *Achnantheidium thienemannii* (Hustedt) Lange-Bertalot, specimens from the type material, sample E 3846, Quelle am Njulia, Abisko, Sweden. Figs 42-43. SEM. Scale bars = 2 μ m. Figs 44-45. LM. Scale bars = 5 μ m.

Figs 34-41. *Achnantheidium* taxa from NW Russia. SEM. Scale bars = 2 μ m. Figs 34-37. *Achnantheidium pyrenaicum* (Hustedt) Kobayasi, specimens from Oredzh River. Figs 38-41. *Achnantheidium thienemannii* (Hustedt) Lange-Bertalot, specimens from Divenka River.

2007



Iconographia Diatomologica

Annotated Diatom Micrographs

Edited by Horst Lange-Bertalot

Volume 16

Biogeography - Ecology - Taxonomy



Diatoms of Lakes Prespa and Ohrid

Plate 24

Figs 1-31. St. Naum springs, Lake Ohrid.

Figs 1-6.

Achnantheidium pyrenaicum (Hustedt) Kobayasi

Levkov, Z. and Krstic, S., Metzeltin, D. & Nakov, T. 2007. Diatoms of lakes Prespa and Ohrid, about 500 taxa from ancient lake system. In: H. Lange-Bertalot (ed.), Iconographia Diatomologica. Annotated Diatom Micrographs. Vol. 16. Biogeography, Ecology, Taxonomy. A.R.G. Gantner Verlag K.G., Vol: 16, 613 pp.

Diatoms from the genus *Achnanthidium* in flowing waters of the Appalachian Mountains (North America): Ecology, distribution and taxonomic notes

Karin C. Ponader^{a,*}, Marina G. Potapova^b

Limnologia 37 (2007) 227–241

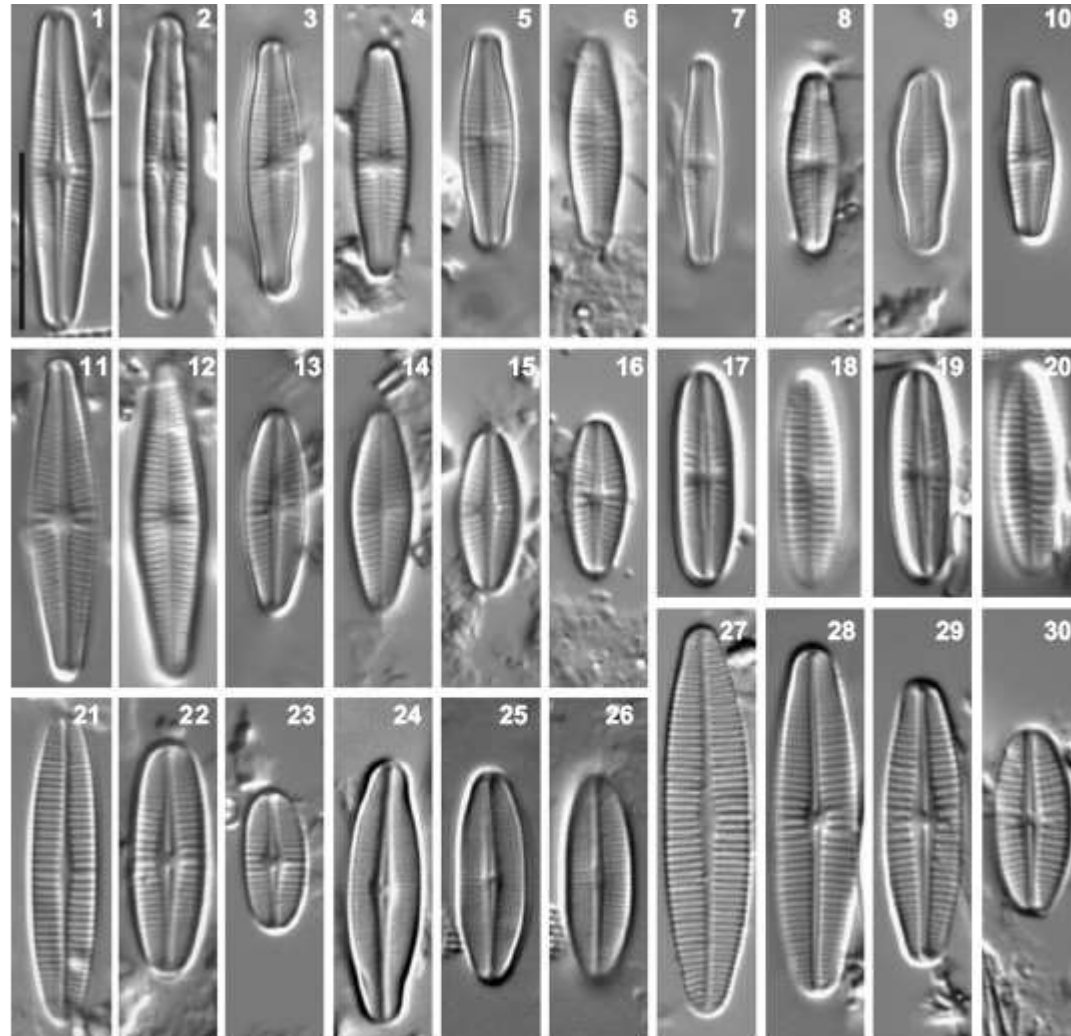


Plate 1. LM, Scale bar 10 μ m. 1–10. *Achnanthidium minutissimum*. 1–2, 7. Williams River, West Virginia. 3. Clear Fork, West Virginia. 4. Sinking Creek, Tennessee. 5–6. Watuaga River, Tennessee. 8. Williams River, West Virginia. 9. Big Creek, Tennessee. 10. Daddy Run, Virginia. 11–16. *Achnanthidium eutrophilum*. 11–12. Big Creek, Tennessee. 13–14. Indian Creek, Tennessee. 15–16. Sinking Creek, Tennessee. 17–20. *Achnanthidium atomus*. Peak Creek, Virginia. 21–23. *Achnanthidium rivulare*. Pigeon River, Tennessee. 24–26. *Achnanthidium alpestre*. Mills River, North Carolina. 27–30. *Achnanthidium deflexum*. 27, 30. Copper Creek, Virginia. 28–29. Mason Spring, Tennessee.

Diatoms from the genus *Achnanthidium* in flowing waters of the Appalachian Mountains (North America): Ecology, distribution and taxonomic notes

Limnologia 37 (2007) 227–241

Karin C. Ponader^{a,*}, Marina G. Potapova^b

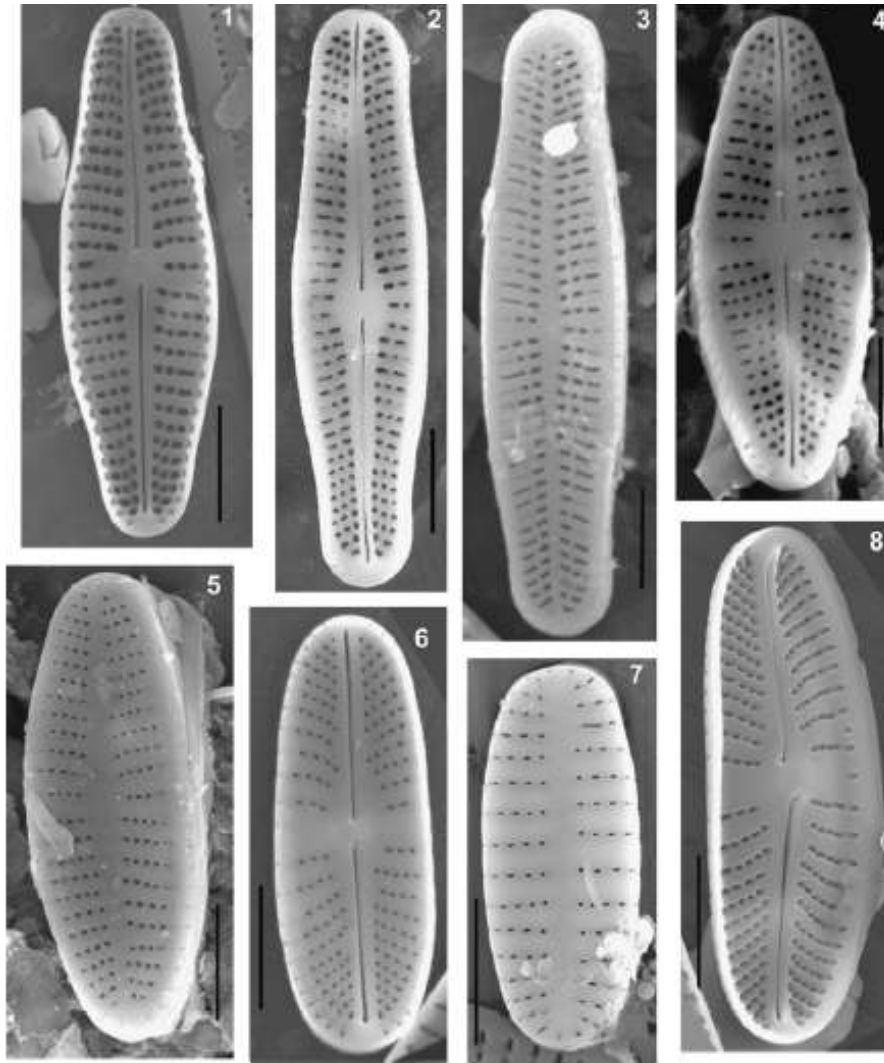


Plate 2. 1–8, SEM, Scale bar 2 μm . 1–3. *Achnanthidium minutissimum*. 1. Internal view of the raphe valve, Antes Creek, Pennsylvania. 2–3. Sinnemahoning Creek, Pennsylvania. 2. External view of the raphe valve, 3. External view of the rapheless valve. 4–5. *Achnanthidium eutrophilum*. 4. External view of the raphe valve, Antes Creek, Pennsylvania. 5. External view of the rapheless valve, Antes Creek, Pennsylvania. 6–8. *Achnanthidium atomus*. Holston River, Virginia. 6. External view of the raphe valve. 7. External view of the rapheless valve. 8. Internal view of the raphe valve.

Diatoms from the genus *Achnantheidium* in flowing waters of the Appalachian Mountains (North America): Ecology, distribution and taxonomic notes

Limnologia 37 (2007) 227–241

Karin C. Ponader^{a,*}, Marina G. Potapova^b

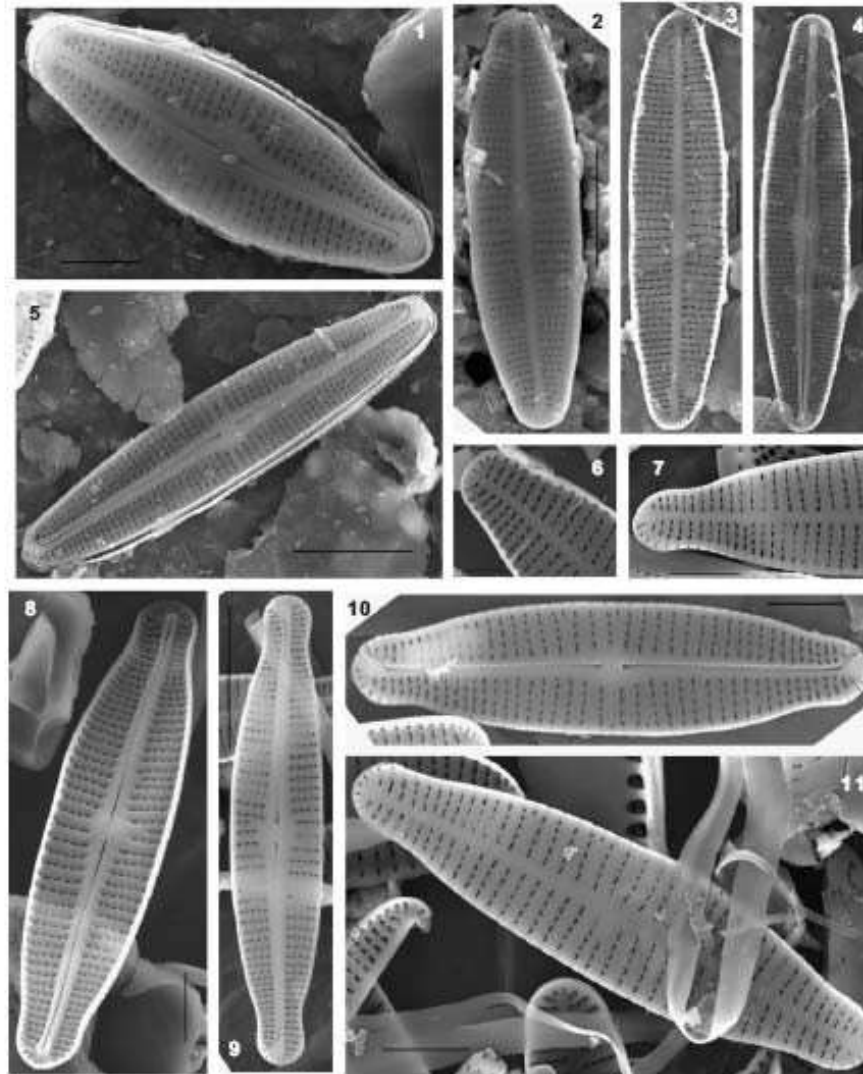


Plate 3. 1, 7, 8, 10. SEM, Scale bar 2 μ m. 2–5, 9, 11. SEM, Scale bar 5 μ m. 6. SEM, Scale bar 1 μ m. 1–5. *Achnantheidium alpestre*. 1. External view of the raphe valve, Mills River, North Carolina. 2. External view of the rapheless valve, Big Creek, Tennessee. 3–5. Jacob Fork, North Carolina. 3. Internal view of the rapheless valve. 4. Internal view of the raphe valve. 5. External view of the raphe valve. 6–11. *Achnantheidium* cf. *gracillimum*. 6–7. Antes Creek, Pennsylvania. 8–11. Holston River, Virginia. 6. Internal view of the rapheless valve. 7. External view of the rapheless valve. 8. Internal view of the raphe valve. 9–10. External view of the raphe valve. 11. External view of the rapheless valve.

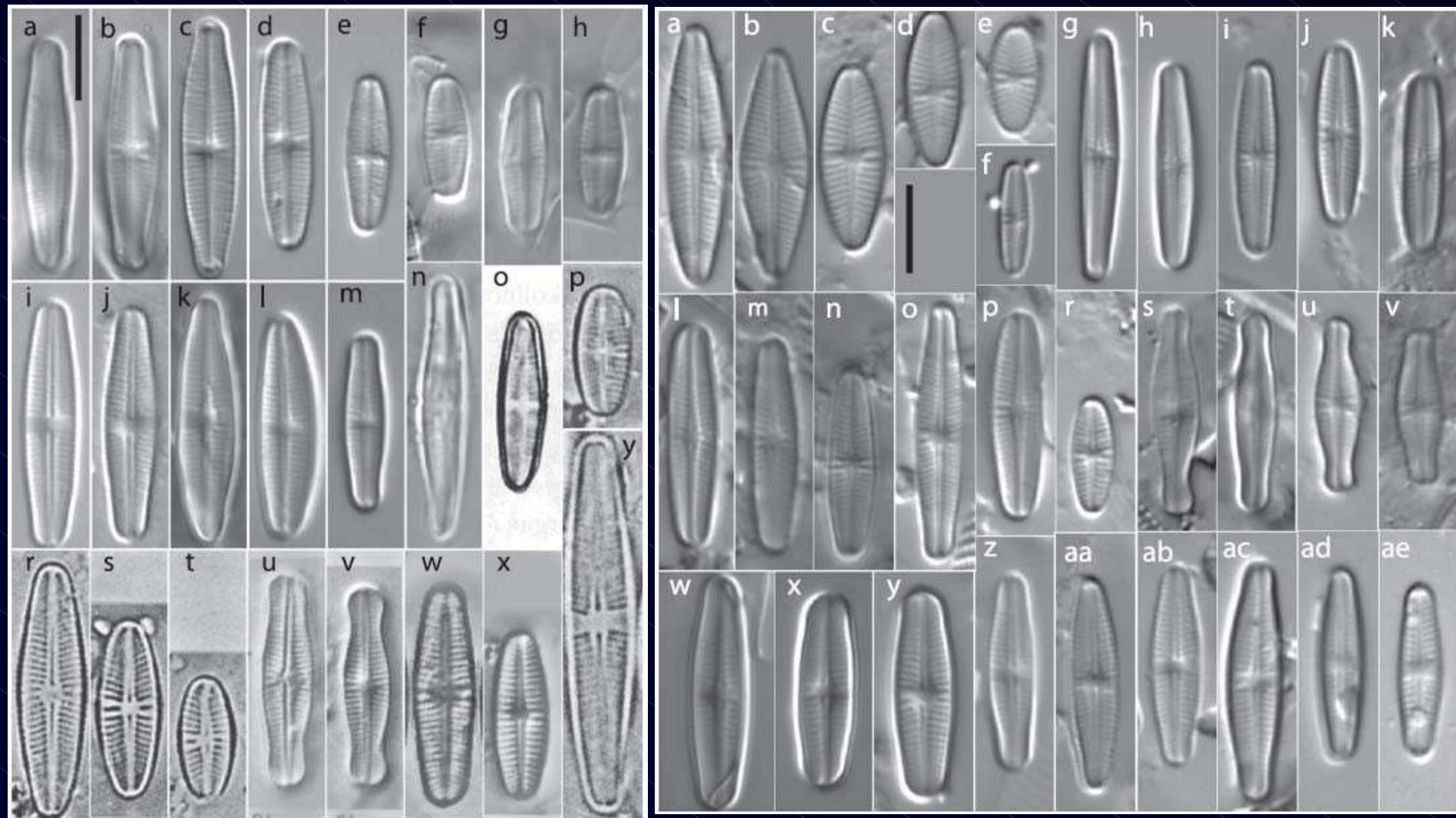
MORPHOLOGICAL AND ECOLOGICAL VARIATION WITHIN THE *ACHNANTHIDIUM MINUTISSIMUM* (BACILLARIOPHYCEAE) SPECIES COMPLEX¹

2007

Marina Potapova

Paul B. Hamilton

J. Phycol. **43**, 561–575 (2007)



MORPHOLOGICAL AND ECOLOGICAL VARIATION WITHIN THE *ACHNANTHIDIUM MINUTISSIMUM* (BACILLARIOPHYCEAE) SPECIES COMPLEX¹

2007

Marina Potapova

J. Phycol. 43, 561–575 (2007)

Paul B. Hamilton

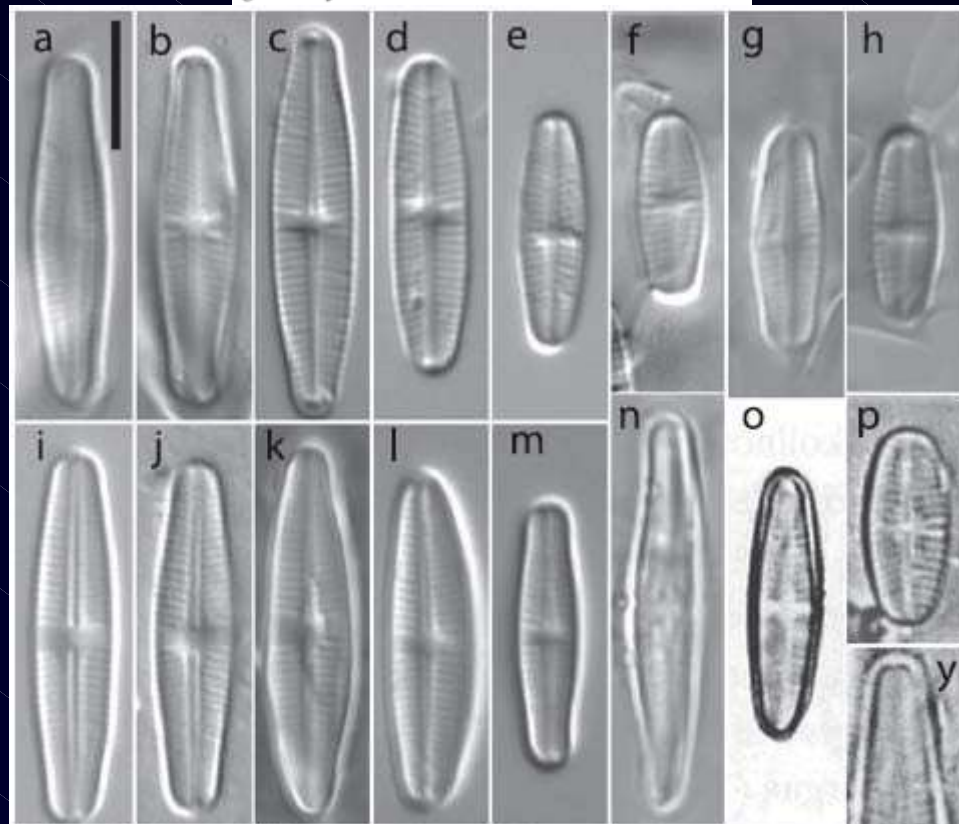


FIG. 4. Light microscopic and scanned images of some specimens from type populations of *Achnanthidium minutissimum* complex included in morphometric analysis. (a, b) *Achnanthidium minutissimum*, isotype material, Kützing Dec. VIII, no. 75, ANSP. (c–e) *Achnanthidium lineare*, slide 3120, ANSP-Febiger collection. (f–h) *Achnanthes linearis* f. *curta*, holotype slide A-V-4, ANSP-Boyer collection. (i, j) *Achnanthidium jackii*, isotype slide ANSP GC11288. (k–m) *Achnanthes minutissima* var. *cryptocephala*, slide 238, ANSP Van Heurck collection. (n, o) *Achnanthidium microcephalum*, isotype slide BM 18434. (p) *Achnanthidium straubianum*, scanned figure 21a from Lange-Bertalot and Metzeltin (1996). (r–t) *Achnanthidium eutrophilum*, scanned figures 78: 36, 33, 30 from Lange-Bertalot and Metzeltin (1996). (u, v) *Achnanthidium macrocephalum*, scanned figures 325: 13, 19 from Simonsen (1987). (w) *Achnanthidium saprophilum*, scanned figure 2e from Kobayasi and Mayama (1982). (x) *Achnanthes minutissima* var. *robusta*, scanned figure 325:5 from Simonsen (1987). (y) *Achnanthidium affine*, scanned figure 53:36 from Lange-Bertalot and Krammer (1989). Scale bar, 5 μ m. Scanned figures in plates (p) and (r–t) are reprinted from Lange-Bertalot and Metzeltin (1996) with the permission of Koeltz Scientific Books. Scanned figures in plates (u, v) and (y) are reprinted from Simonsen (1987) and Lange-Bertalot and Krammer (1989), respectively, with the permission of E. Schweizerbart'sche Verlagsbuchhandlung (<http://www.borntraeeger-cramer.de>). The scanned figure in plate (w) is reprinted from Kobayasi and Mayama (1982) with the permission of Blackwell Publishing, Inc. For complete article citations, see the References.

MORPHOLOGICAL AND ECOLOGICAL VARIATION WITHIN THE *ACHNANTHIDIUM MINUTISSIMUM* (BACILLARIOPHYCEAE) SPECIES COMPLEX¹

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2007

Paul B. Hamilton

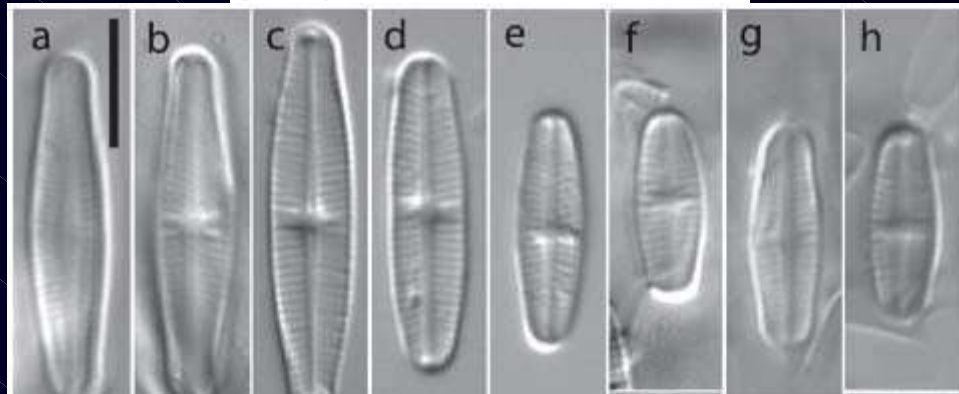
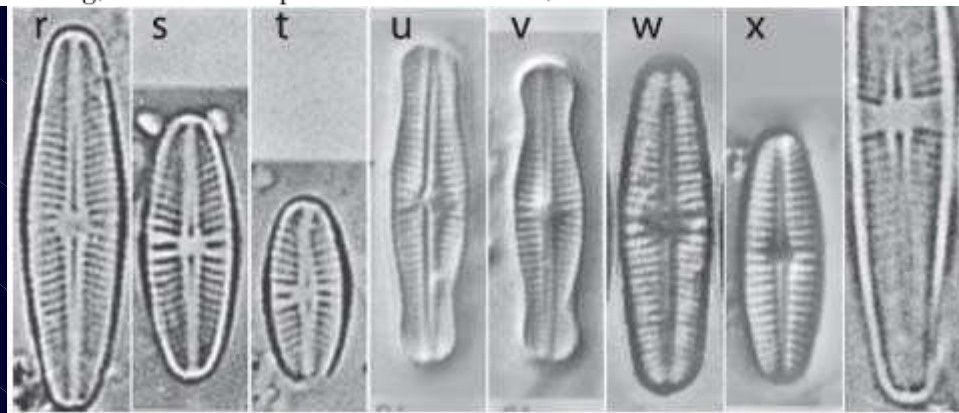


FIG. 4. Light microscopic and scanned images of some specimens from type populations of *Achnanthidium minutissimum* complex included in morphometric analysis. (a, b) *Achnanthidium minutissimum*, isotype material, Kützing Dec. VIII, no. 75, ANSP. (c–e) *Achnanthidium lineare*, slide 3120, ANSP-Febiger collection. (f–h) *Achnanthes linearis* f. *curta*, holotype slide A-V-4, ANSP-Boyer collection. (i, j) *Achnanthidium jackii*, isotype slide ANSP GC11288. (k–m) *Achnanthes minutissima* var. *cryptocephala*, slide 238, ANSP Van Heurck collection. (n, o) *Achnanthidium microcephalum*, isotype slide BM 18434. (p) *Achnanthidium straubianum*, scanned figure 21a from Lange-Bertalot and Metzeltin (1996). (r–t) *Achnanthidium eutrophilum*, scanned figures 78: 36, 33, 30 from Lange-Bertalot and Metzeltin (1996). (u, v) *Achnanthidium macrocephalum*, scanned figures 325: 13, 19 from Simonsen (1987). (w) *Achnanthidium saprophilum*, scanned figure 2e from Kobayasi and Mayama (1982). (x) *Achnanthes minutissima* var. *robusta*, scanned figure 325:5 from Simonsen (1987). (y) *Achnanthidium affine*, scanned figure 53:36 from Lange-Bertalot and Krammer (1989). Scale bar, 5 μ m. Scanned figures in plates (p) and (r–t) are reprinted from Lange-Bertalot and Metzeltin (1996) with the permission of Koeltz Scientific Books. Scanned figures in plates (u, v) and (y) are reprinted from Simonsen (1987) and Lange-Bertalot and Krammer (1989), respectively, with the permission of E. Schweizerbart'sche Verlagsbuchhandlung (<http://www.borntraeger-cramer.de>). The scanned figure in plate (w) is reprinted from Kobayasi and Mayama (1982) with the permission of Blackwell Publishing, Inc. For complete article citations, see the References.



MORPHOLOGICAL AND ECOLOGICAL VARIATION WITHIN THE *ACHNANTHIDIUM MINUTISSIMUM* (BACILLARIOPHYCEAE) SPECIES COMPLEX¹

2007

Marina Potapova

J. Phycol. 43, 561–575 (2007)

Paul B. Hamilton

*Achnantheidium
minutissimum*

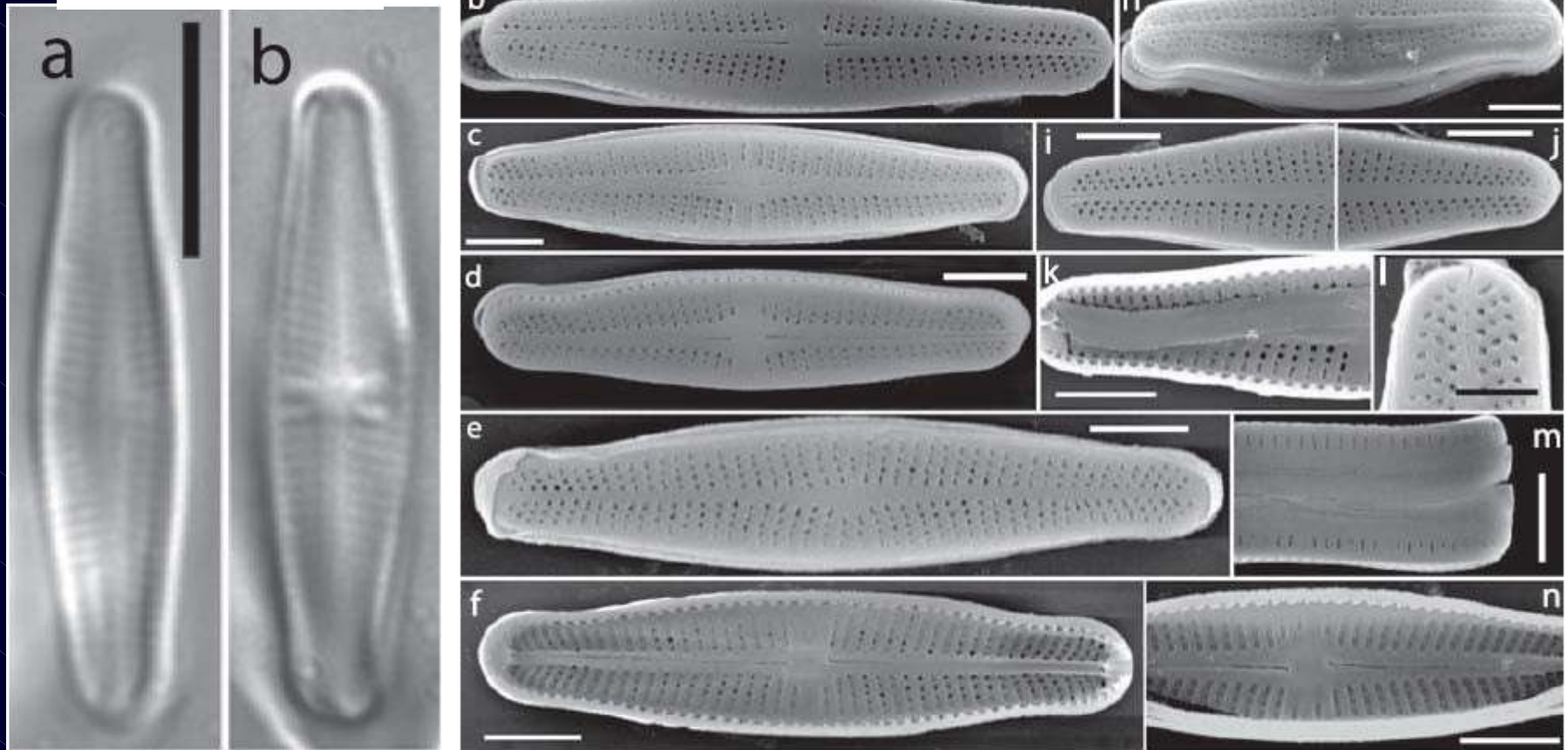


FIG. 2. Scanning electron micrographs of the type material of *Achnantheidium minutissimum*. (a–d, g, h) External views of whole raphe valves. (e) External view of a rapheless valve. (f) Internal view of a raphe valve. (i, j, l) External views of valve fragments; (i) and (j) are fragments of the same valve showing straight (i) and slightly deflected (j) terminal raphe ends. (k) Internal view of a valve fragment with a copula. (m) Circular view showing valve mantle and copulae. (n) Internal view of the central part of a valve showing proximal raphe ends slightly deflected in opposite directions. Scale bars, 2 μ m.

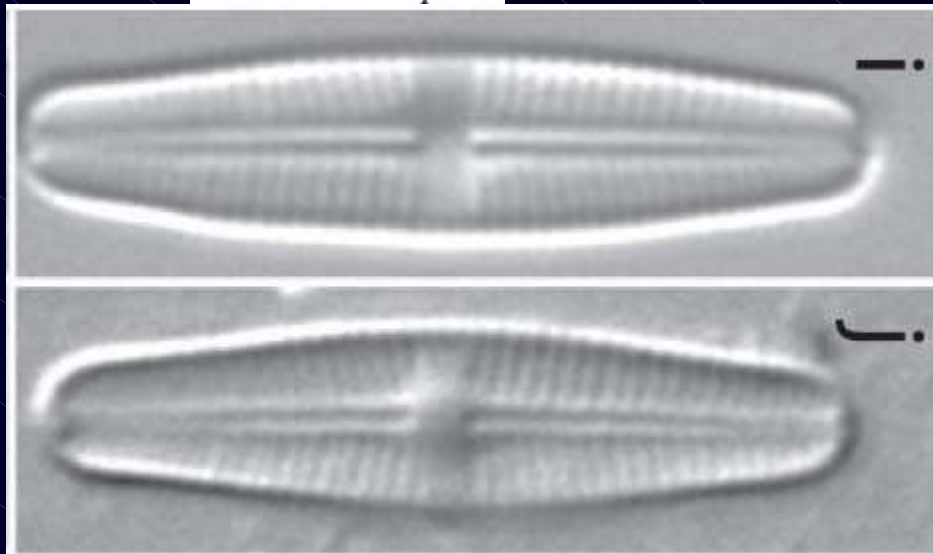
MORPHOLOGICAL AND ECOLOGICAL VARIATION WITHIN THE *ACHNANTHIDIUM MINUTISSIMUM* (BACILLARIOPHYCEAE) SPECIES COMPLEX¹

Marina Potapova

Paul B. Hamilton

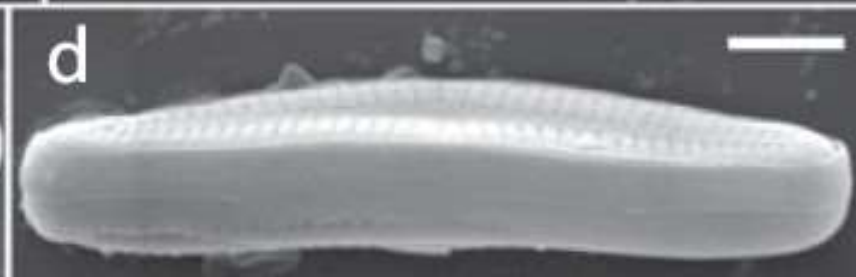
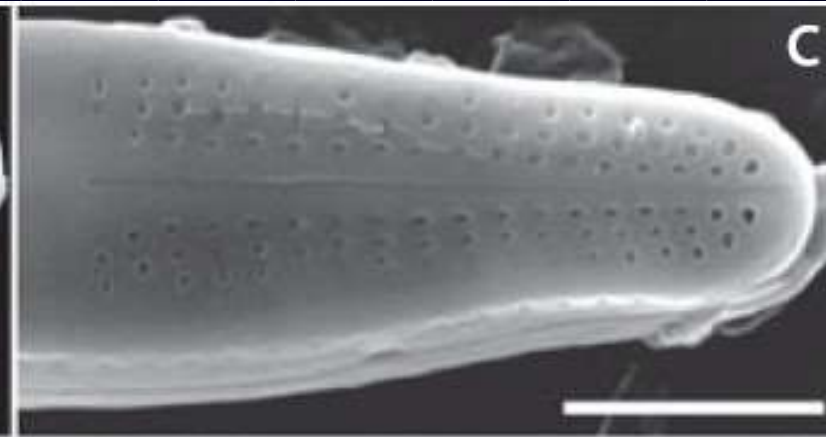
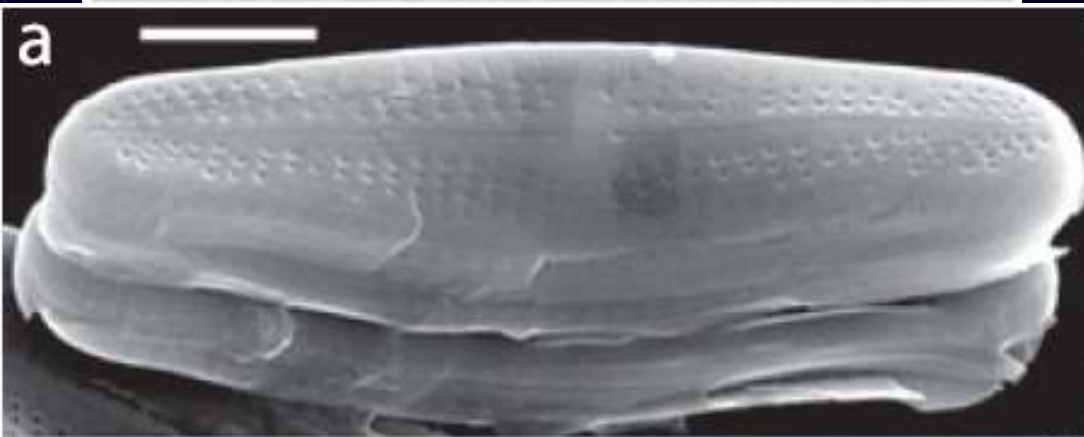
J. Phycol. **43**, 561–575 (2007)

2007



Achnanthidium jackii

FIG. 3 . Scanning electron micrographs of the type material of *Achnanthidium jackii*. (a) External view of two frustules. (b) External view of a rapheless valve. (c) External view of a fragment of raphe valve. (d) Girdle view of a frustule with a rapheless valve upside. Scale bars, 2 μ m.



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J. Phycol. **43**, 561–575 (2007)

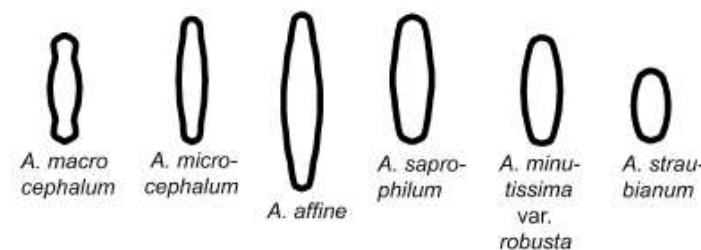
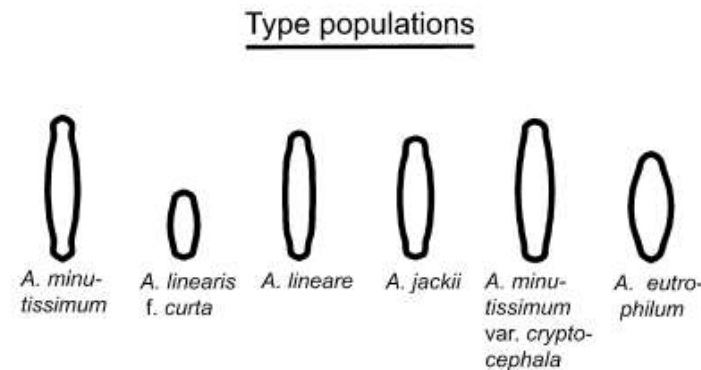
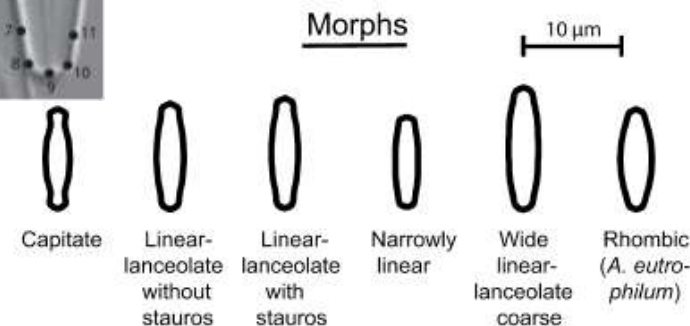
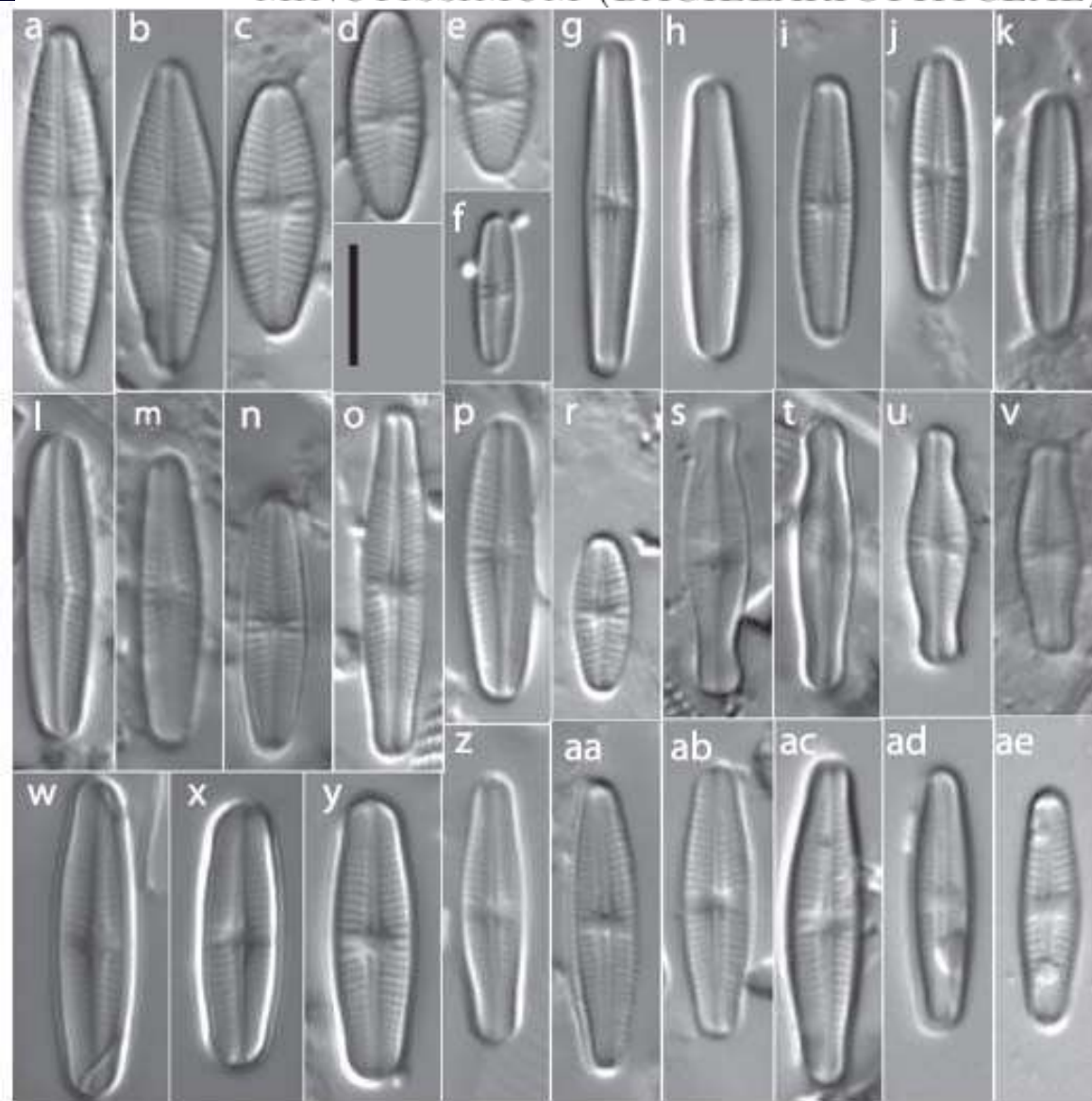


FIG. 8. Light microscopic images of some specimens from North American populations of *Achnanthes minutissimum* complex included in morphometric analysis. (a–e) Rhombic morph or *A. eutrophilum*: Palouse River, Washington. (f–k) Narrowly linear morph: (f–h) Merced River, California; (i) Neversink River, New York; (j) Jacob Fork, North Carolina; and (k) Green River, Washington. (l–r) Linear-lanceolate without stauros morph: (l–n) East Fork Carson River, Nevada; (o–r) Snake Creek, Georgia. (s–v) Capitate morph: Alligator Creek, Georgia. (w–y) Wide linear-lanceolate coarse morph: (w) Tributary of Shades Creek, Alabama; (x, y) Shirree Creek, Alabama. (z–ae) Linear-lanceolate with stauros morph: (z–ah) Portneuf River, Idaho; (ac) Pequabuck River, Connecticut; and (ad, ae) Yellowstone River, Montana. Scale bar, 5 µm.

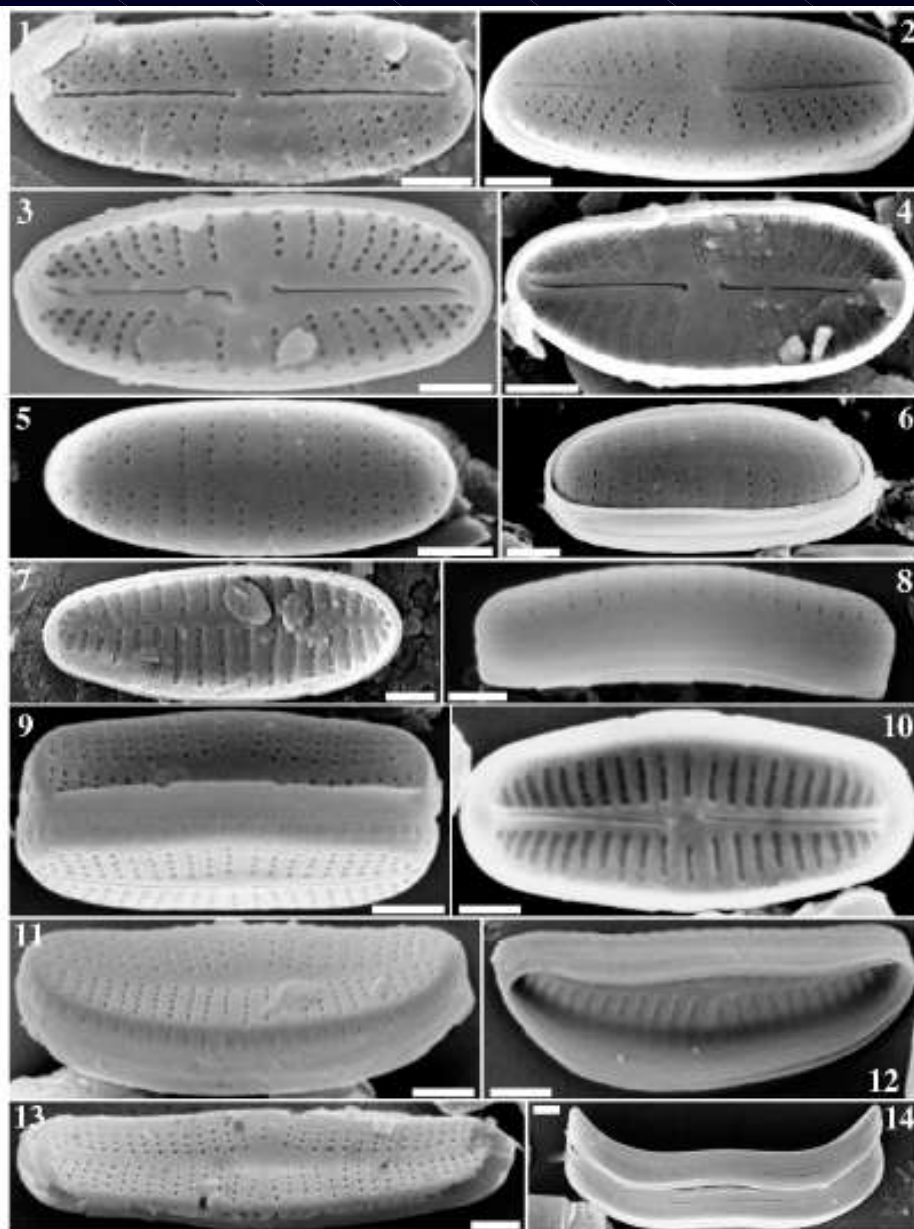
Cryptogamie, Algal., 2007, 28 (2): 141-158
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**The genera *Achnanthidium* Kützing
and *Psammothidium* Bukhtiyarova et Round
in the family Achnanthidiaceae (Bacillariophyceae):
a reappraisal of the differential criteria**

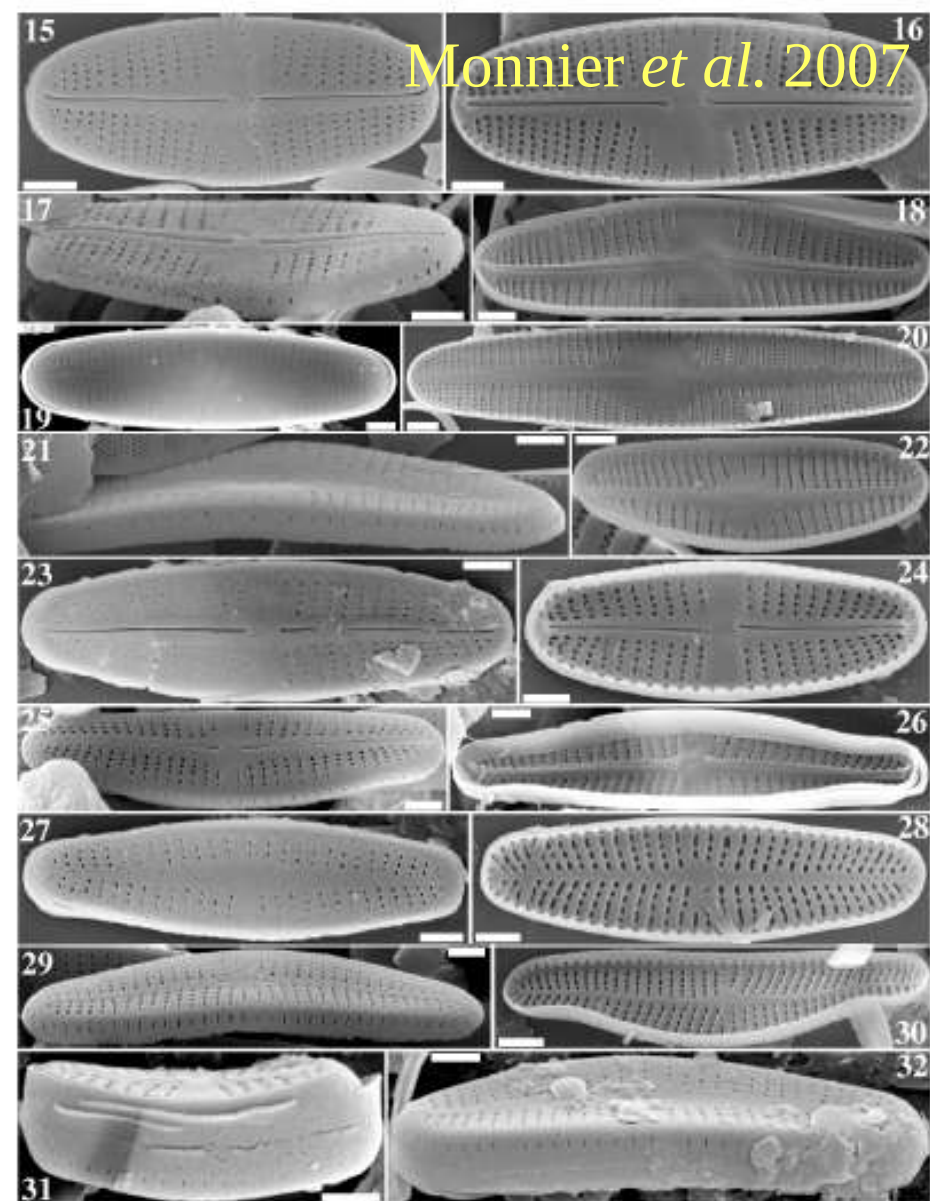
Olivier MONNIER^a, Horst LANGE-BERTALOT^b, Lucien HOFFMANN^a
& Luc ECTOR^{a*}

Abstract – The diagnostic characteristics of the genera *Achnanthidium* and *Psammothidium*, the latter genus recently separated from other species of *Achnanthes sensu lato*, of the family Achnanthidiaceae D.G. Mann have been evaluated on the basis of a morphological study of eleven common species found in rivers and streams of Luxembourg. In light of these observations – supplemented by a literature review – it is concluded that the two genera cannot be unambiguously defined on the basis of morphological criteria. Furthermore, no ontogenetic or phylogenetic studies support any of the discriminating characteristics. On the basis of these results, *Achnanthes bioretii*, *A. daonensis*, *A. austriaca* var. *helvetica*, *A. lauenburgiana* and *Navicula subatomoides* have been transferred to *Achnanthidium*.

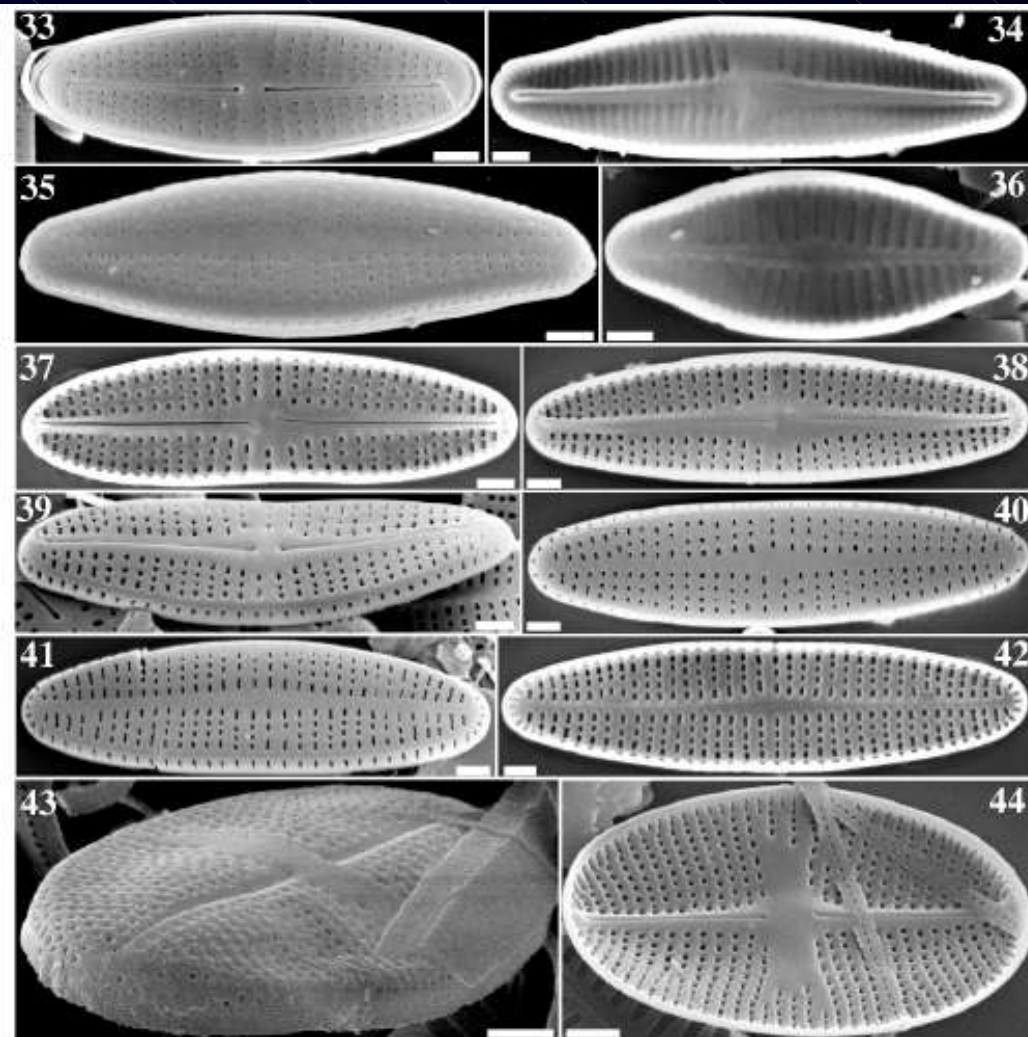
<i>Taxon</i>	<i>Valve shape</i>	<i>RV apical axis</i>	<i>RV transapical axis</i>	<i>Striae extension</i>	<i>Raphe slit</i>	<i>Central raphe ends</i>
<i>Achnantheidium</i>						
<i>A. atomoides</i>	narrowly elliptic	concave	concave	valve face	simple	small pin-hole
<i>A. catenatum</i>	linear-lanceolate	convex to concave-convex	convex	valve face	simple	simple slit
<i>A. kranzii</i>	elliptic to elliptic-lanceolate	concave to concave-convex	convex	valve face	simple	simple slit
<i>A. minutissimum</i>	elliptic to linear-lanceolate	concave	convex	valve face	simple	simple slit
<i>A. pyrenaicum</i>	elliptic to linear-lanceolate	slightly concave	slightly convex	valve face	simple	drop
<i>A. subatomus</i>	elliptic to linear-elliptic	slightly concave	convex	valve face	furrow	drop
<i>Psammothidium</i>						
<i>P. bioretii</i>	elliptic	concave-convex	centrally convex	on mantle	furrow and ridges	pin-hole
<i>P. daonense</i>	elliptic	concave-convex	centrally convex	valve face	furrow and ridges	pin-hole
<i>P. helveticum</i>	elliptic	concave-convex	convex	on mantle	furrow and ridges	drop
<i>P. lauenburgianum</i>	elliptic	concave-convex	convex	valve face	furrow and ridges	pin-hole
<i>P. subatomoides</i>	elliptic	concave-convex	slightly convex	valve face	furrow and ridges	pin-hole



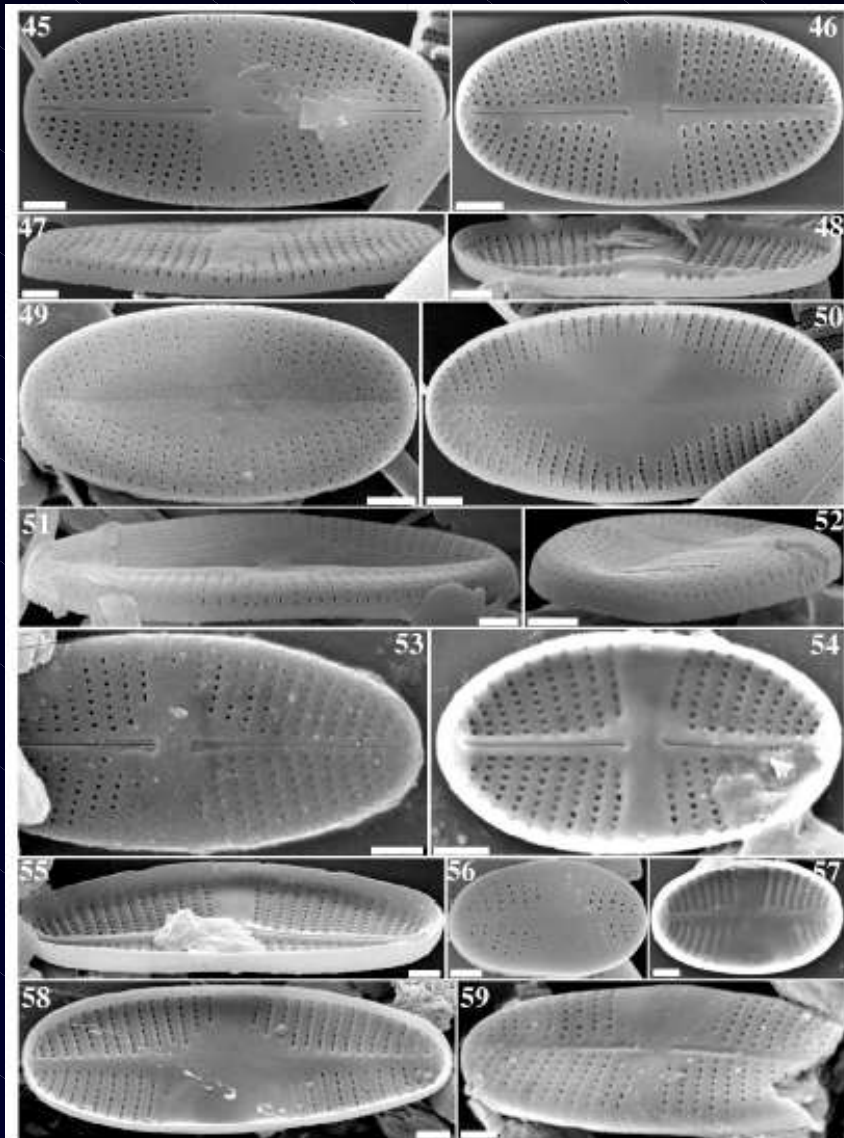
Figs 1-14. SEM. 1-8. *Achnanthyidium atomoides*. Specimens from a population of the river ErnZ Blanche in Hessemillen, 27.09.2002. 1, 2. RV, outside. 3, 4. RV, inside. 5, 6. AV, outside. 7. AV, inside. 8. Frustule, girdle. 9-14. *Achnanthyidium catenatum*. Specimens from a population of the streamlet Reideschbaach in Niederfeulen, 30.09.1996. 9. RV, outside tilted, with a AV behind. 10. RV, inside. 11. AV, outside tilted. 12. AV, inside tilted. 13. AV, outside. 14. Girdle view of two attached frustules. Scale bars = 1 μ m



Figs 15-32. SEM. 15-22. *Achnanthyidium kranzii*. Specimens from a population of the streamlet Breschterbaach in Pratz, 23.03.1995. 15. RV, outside. 16. RV, inside. 17. RV, outside tilted. 18. RV, inside tilted. 19. AV, outside. 20. AV, inside. 21. AV, outside tilted. 22. AV, inside tilted. 23-32. *Achnanthyidium minutissimum*. Specimens from different populations of Luxembourg, mainly of the river ErnZ Blanche near Hessemillen, 27.09.2002. 23. RV, outside. 24. RV, inside. 25. RV, outside tilted. 26. RV, inside tilted. 27. AV, outside. 28. AV, inside. 29. AV, outside tilted. 30. AV, inside tilted. 31. Frustule, strongly tilted. 32. Frustule, tilted. Scale bars = 1 μ m.



Figs 33-44. SEM. 33-36. *Achnanthyidium pyrenaicum*. Specimens from a population of the streamlet Rollingenbaach in Rollingen, 26.05.2002. 33. RV, outside. 34. RV, inside. 35. AV, outside slightly tilted. 36. AV, inside. 37-42. *Achnanthyidium subatomus*. Specimens from a population of the streamlet Stool in Brandenburg, 19.07.1995. 37, 38. RV, inside. 39. RV, outside tilted. 40. AV, outside. 41. AV, outside slightly tilted. 42. AV, inside. 43, 44. *Psammolithidium bioretii*. Specimens from a population of the streamlet Breschterbaach in Pratz, 23.03.1995. 43. RV, tilted outside. 44. RV, inside. Scale bars = 1 μ m.



Figs 45-59. SEM. 45-52. *Psammolithidium daonense*. Specimens from a population of the streamlet Breschterbaach in Pratz, 23.03.1995. 45. RV, outside. 46. RV, inside. 47. RV, outside tilted. 48. RV, inside tilted. 49. AV, outside. 50. AV, inside. 51, 52. AV, outside tilted. 53-59. *Psammolithidium lauenburgianum*. Specimens from a population of the streamlet Gander in Aspelt, 24.10.96. 53. RV, outside. 54. RV, inside. 55. RV, inside tilted. 56. AV, outside. 57. AV, inside. 58. AV, inside slightly tilted. 59. AV, outside tilted. Scale bars = 1 μ m.

DIATOM ASSEMBLAGES AND WATER QUALITY ASSESSMENT IN
THE DUERO BASIN (NW SPAIN)

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Received 17 May 2007; accepted 9 October 2007.

ABSTRACT. — In order to determine water quality status in the Duero basin (NW Spain), epilithic diatom samples were collected and analyzed in 137 stations in August 2004 following normalized standard protocols. The floristic particularities of the diatom assemblages in the basin are discussed. A total of 429 diatom taxa were identified in the basin and 90 taxa (21%) were new for the Iberian Peninsula. Especially noticeable was the presence of *Achnanthis rivulare*, only known until now from North America. Ordination revealed the existence of five species assemblages related to the following environmental factors: 5-Day Biochemical Oxygen Demand (BOD₅), [PO₄³⁻], and conductivity. Light and scanning electron microscopy micrographs are provided for some common, infrequent or exotic diatom species present in the Duero basin. Three diatom indices (Specific Pollution Index SPI, European Index CEC and Biological Diatom Index BDI) were applied. All of them correlated significantly with water physical and chemical variables, but SPI achieved the best correlations, and is therefore recommended as the reference diatom index for this Mediterranean basin.

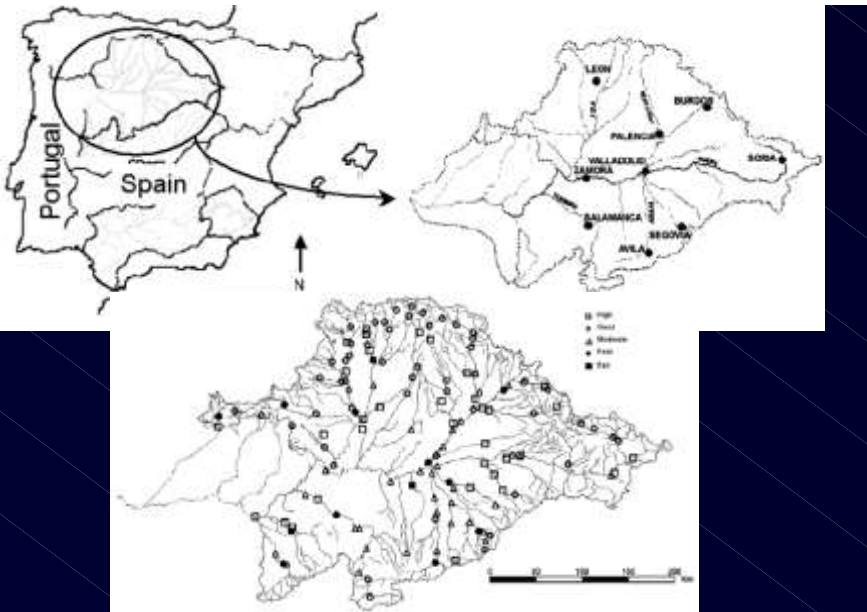
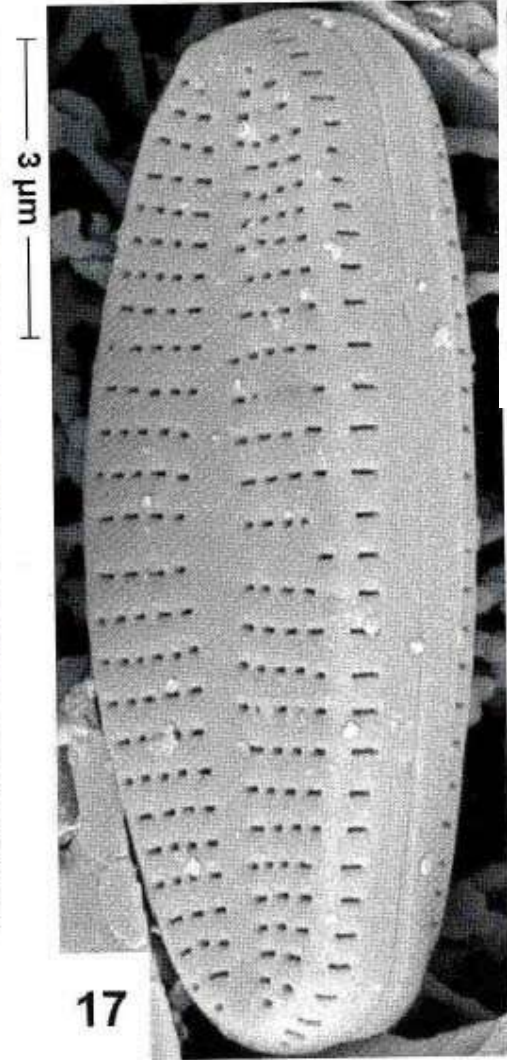


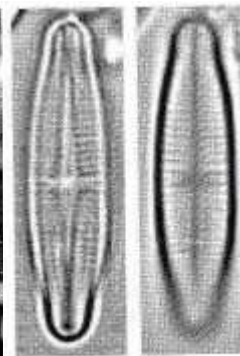
Plate 26 LM: x1500; SEM: Figs 16, 17 x9000Figs 8-11, 13-17. *Achnanthidium pyrenaicum* (Hustedt) Kobayasi sensu latoFigs 8-11, 13-17. Syn. *Achnanthes biasolettiana* Grunow (excl. lectotypus).

16

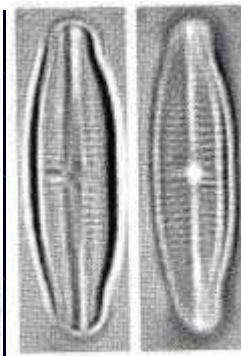
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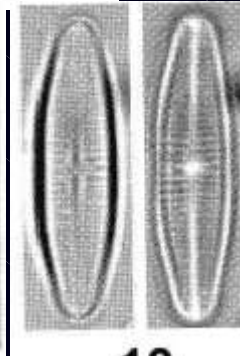
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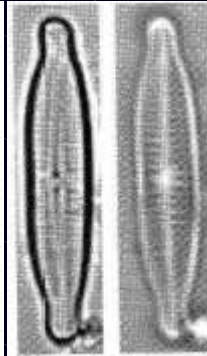
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9



10



11

Iconographia Diatomologica

Annotated Diatom Micrographs

Edited by Horst Lange-Bertalot

Volume 20

Diatoms in Mongolia

&

Sichuania lacustris spec. et gen. nov.

A.R.G. Gantner Verlag K.G.

2008

THE UNMASKING OF A SUB-ANTARCTIC ENDEMIC: *PSAMMOTHIDIUM ABUNDANS* (MANGUIN) BUKHTIYAROVA ET ROUND IN EUROPEAN RIVERS

Bart Van de Vijver

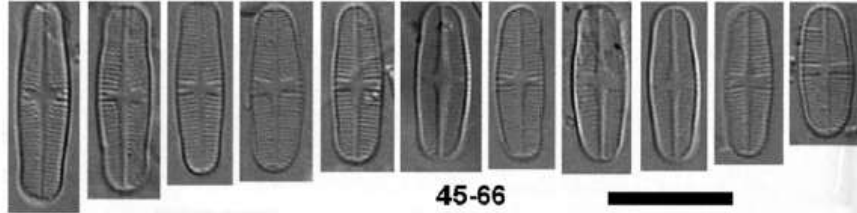
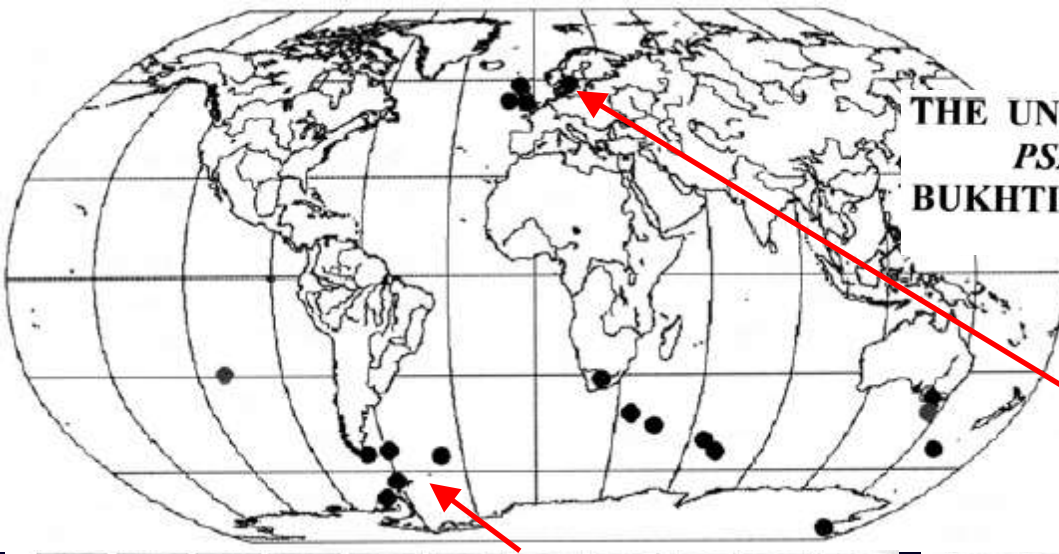
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Saúl Blanco

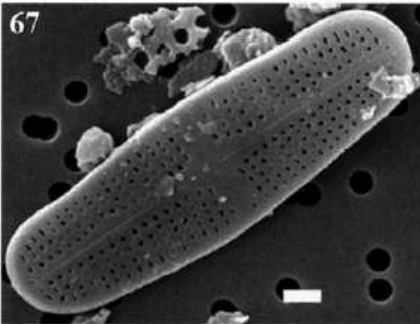
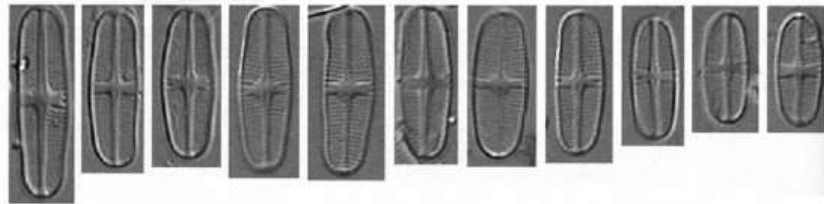
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Luc Ector

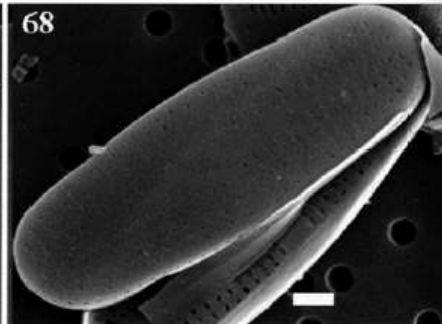
Diatom Research (2008), Volume 23 (1), 233–242



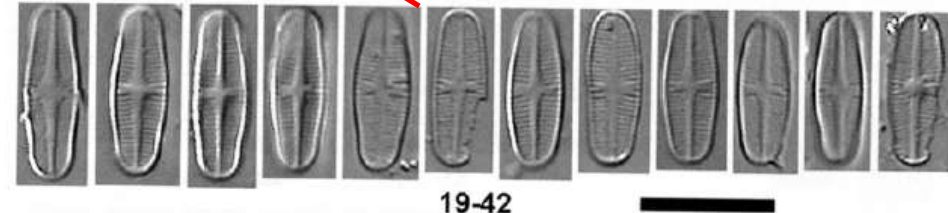
45-66



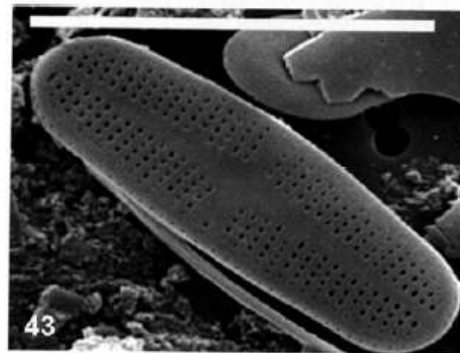
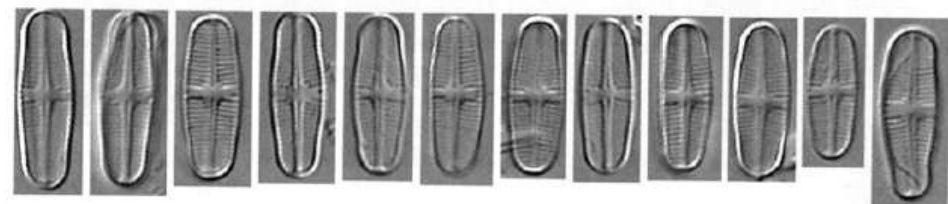
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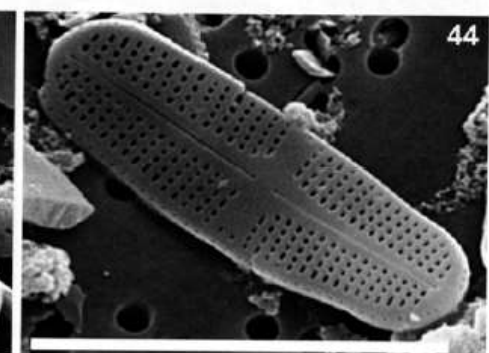
68



19-42



43



44

Figs 45–68. (LM: Figs 45–66; SEM: Figs 67–68); *Psammothidium abundans*. Specimens from several sub-Antarctic populations (Crozet and Kerguelen). Scale bar = 10 μ m except for Figs 67–68 where scale bar = 1 μ m.

Figs 19–44. (LM: Figs 19–42; SEM: Figs 43, 44); *Psammothidium abundans*. Specimens from various Swedish populations. Scale bar = 10 μ m.

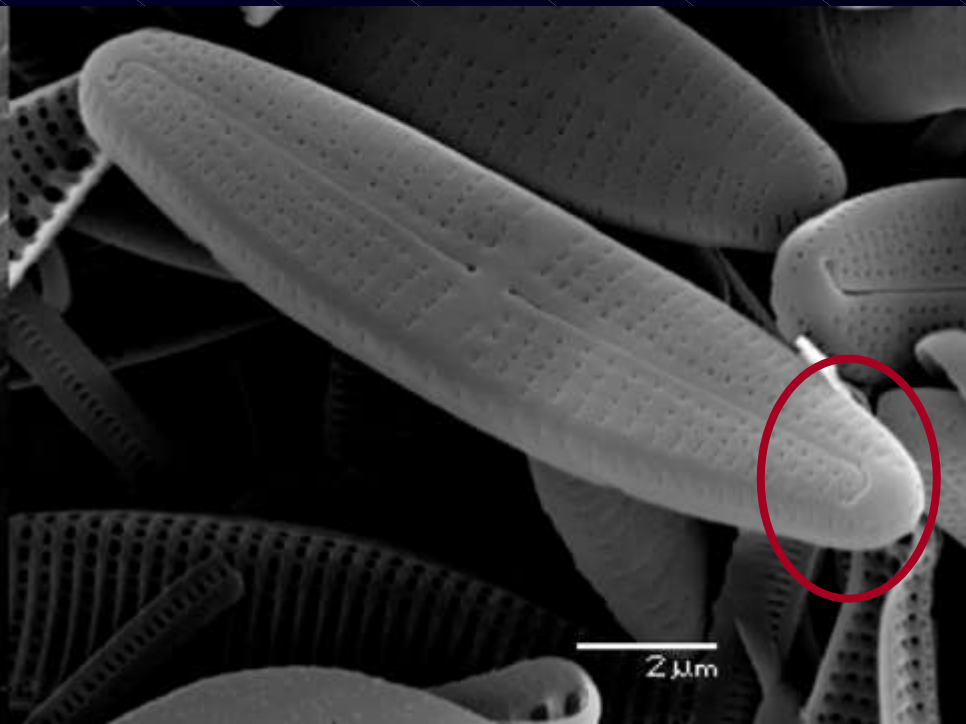
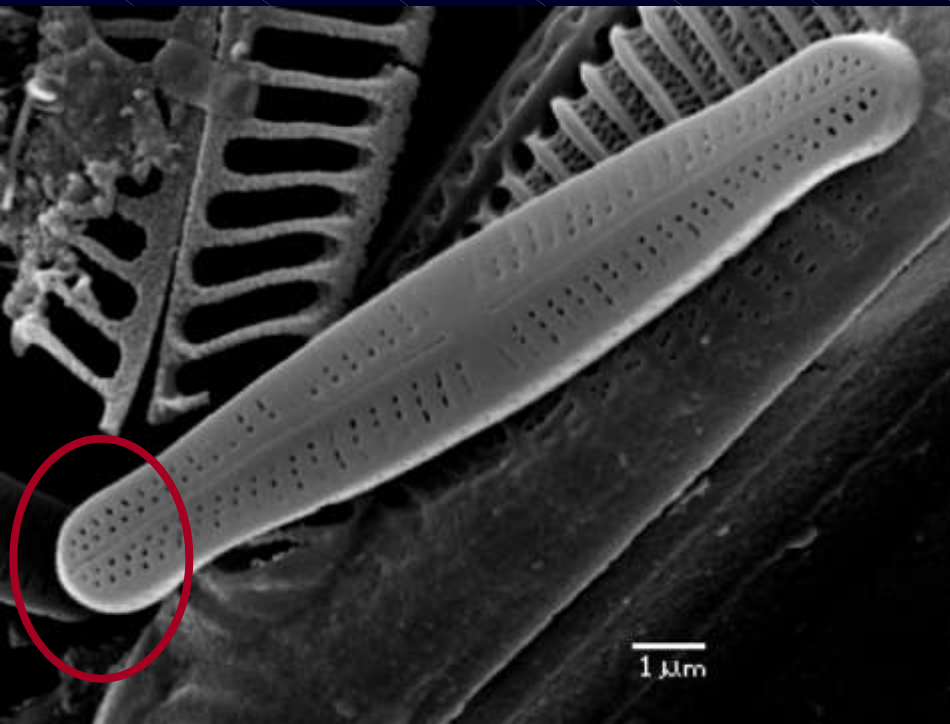
4. Basisindeling *Achnantheidium* (*minutissimum* – *pyrenaicum*)

A. minutissimum-complex

- schaaltsjes lineair tot lanceolaat
- meestal goed ontwikkelde uiteinden
- terminale raphe-eindjes: recht
- meestal fijnere stria structuur

A. pyrenaicum-complex

- schaaltsjes elliptisch tot lanceolaat/elliptisch
- uiteinden afgerond tot zwak rostraat, soms capitaat
- terminale raphe-eindjes: gebogen
- meestal grovere stria structuur



A. minutissimum-complex

A. affine

A. caledonicum

A. eutrophilum

A. inconspicuum

A. lineare

A. minutissimum

(*A. neomicrocephalum*)

A. saprophilum

A. straubianum

A. catenatum

A. pyrenaicum-complex

A. gracillimum

A. pyrenaicum

A. thienemannii

A. rivulare

A. latecephalum

A. macrocephalum

A. zhakovschikovii

A. deflexum

A. convergens

...

Achnanthidium minutissimum (Kützing) Czarnecki

Basioniem: *Achnanthes minutissima* Kützing 1833

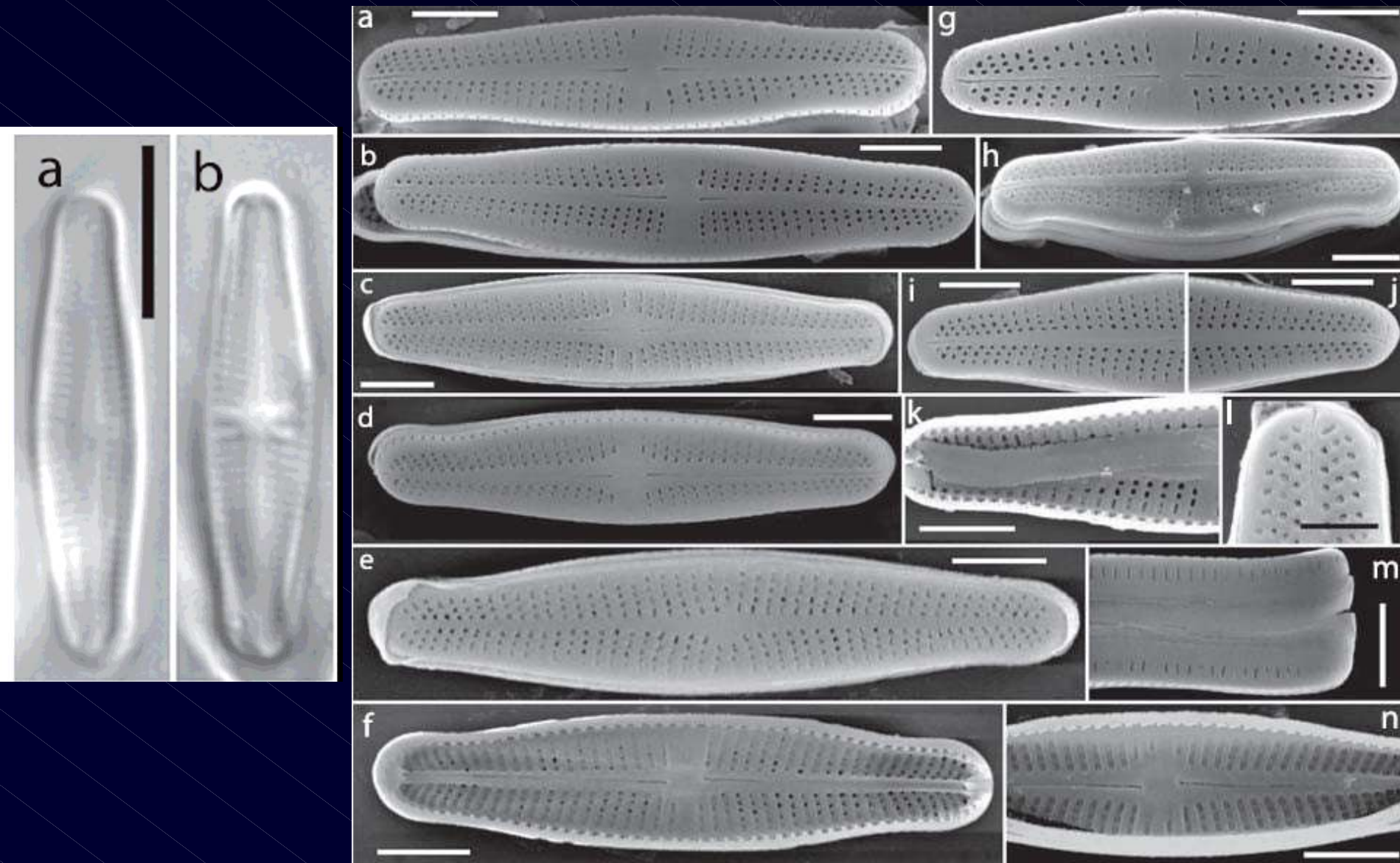
Synoniemen: *Achnanthidium microcephalum* Kützing

Achnanthes minutissima var. *cryptocephala* Grunow in Van Heurck

Beschrijving: schaaltes lineair-elliptisch tot smal lanceolaat (linear-lanceolate)
afgeronde, (lichtjes) capitate uiteinden, steeds zwak voorgevormd
Valve lengte: 5-20 (25) μm valve breedte: (2.5) 3-3.5 (4) μm
Axiale zone zeer smal, lineair tot zwak lanceolaat
Centrale zone onregelmatig door 1-2 verkorte striae, elliptisch tot
lanceolaat op rapheloos schaalte,
Striae op beide schaaltes radiaat : ± 30 in 10 μm

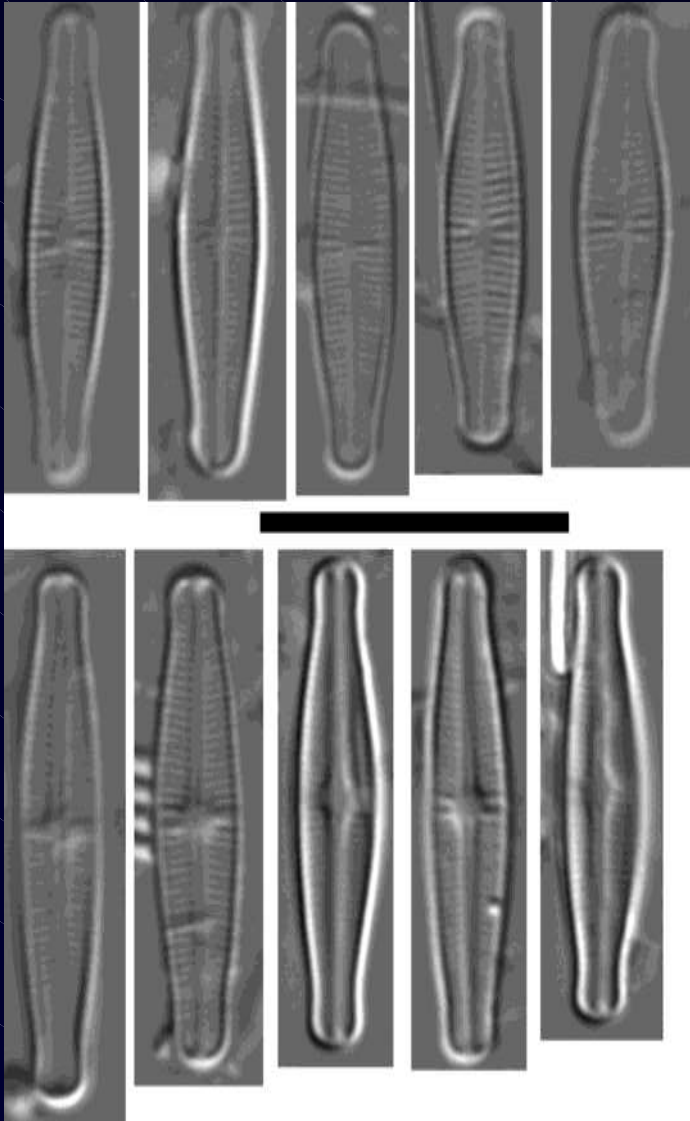
Ultrastructuur: terminale raphe uiteinden recht, licht gebogen
maximaal 3-4 ronde areolen + soms 1 langgerekte
areola per stria

Achnantheidium minutissimum (Kützing) Czarnecki

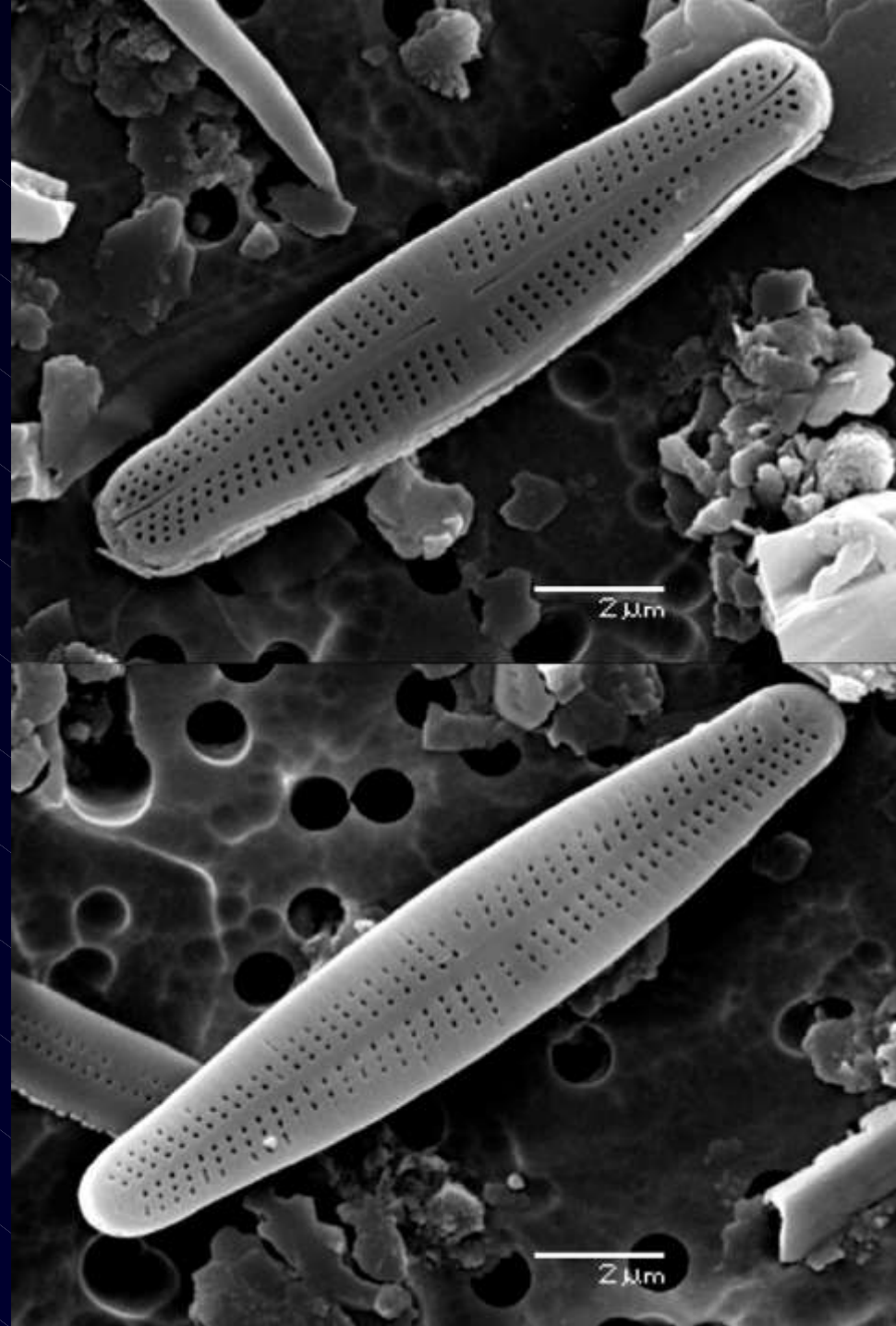


Foto's van typemateriaal, uit Potapova & Hamilton (2007)

Zweedse *A. minutissimum*

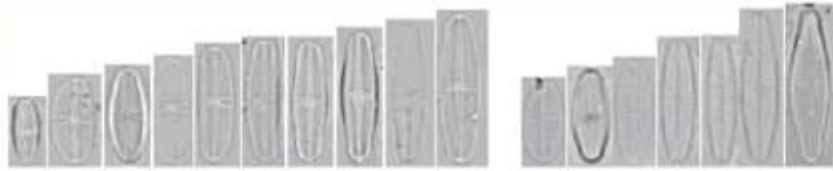


Length: 14-16 μm
Width: 2,5-2,7 μm
Number of striae: 28-32

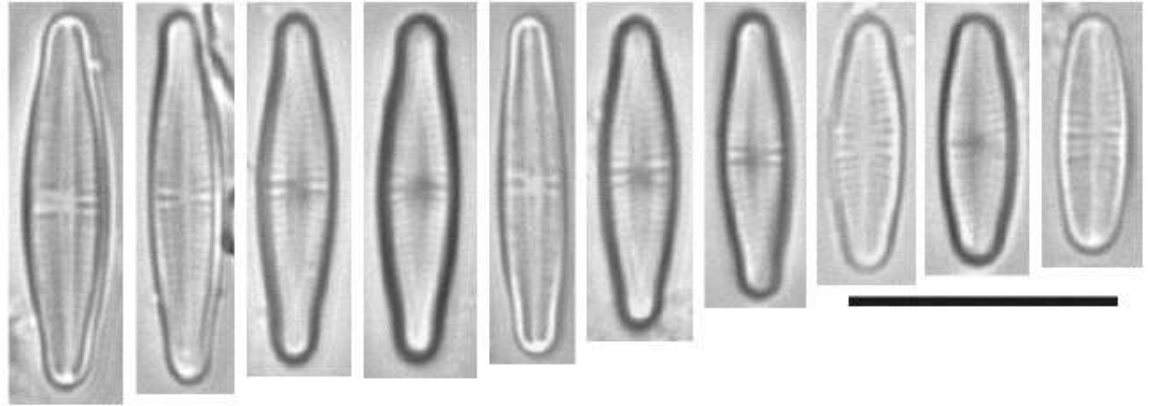
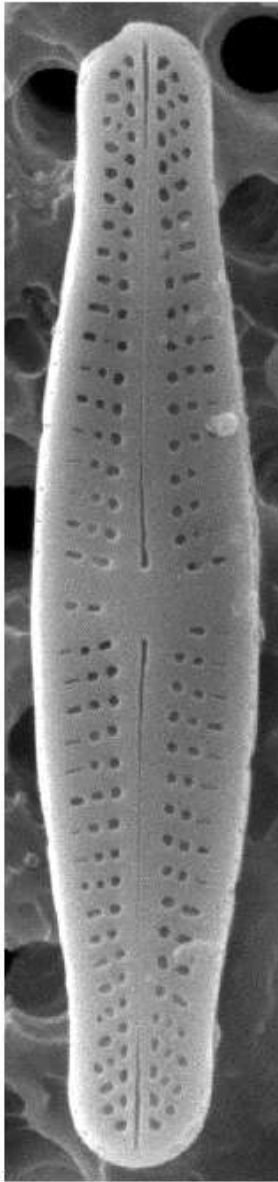
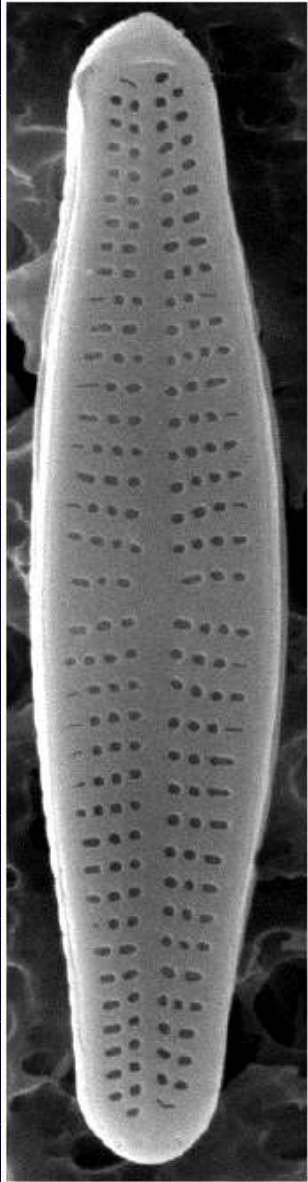


Portuguese *A. minutissimum*

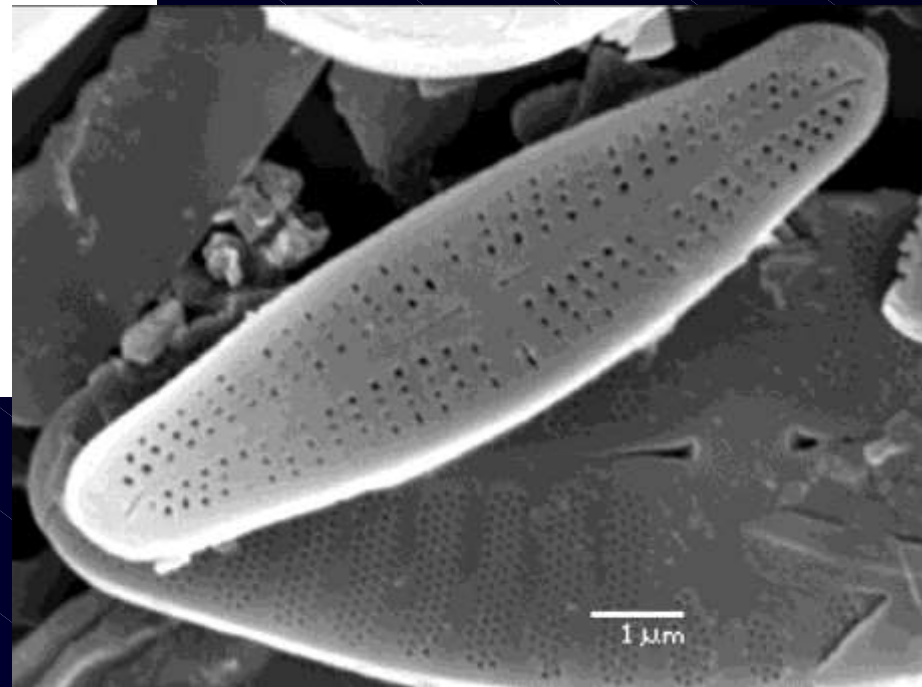
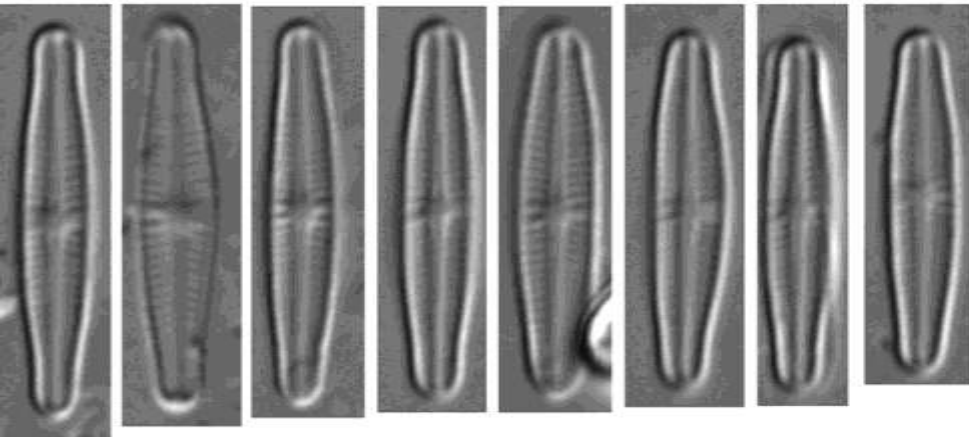
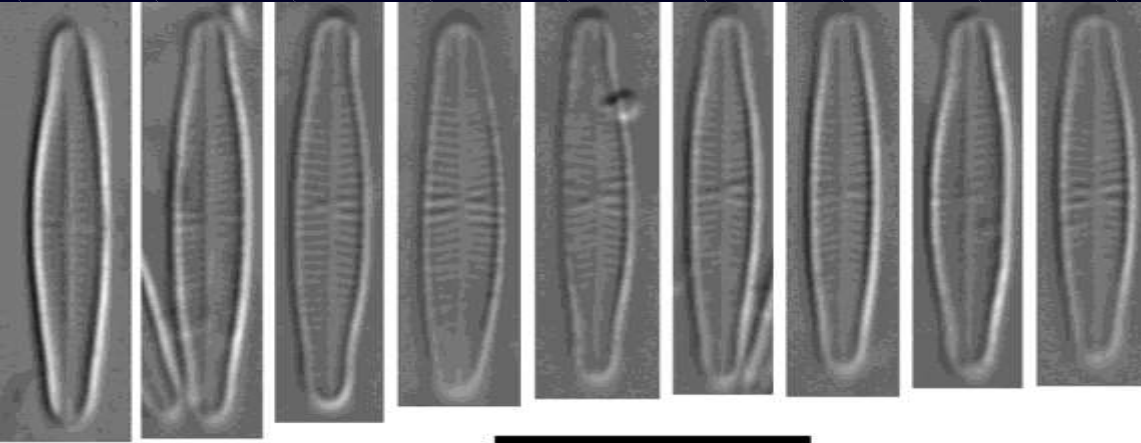
Achnantheidium minutissimum s.l.



Zuid-Afrikaanse *A. minutissimum*



Antarctische *A. minutissimum*



Lineair-lanceolate schaalpjes

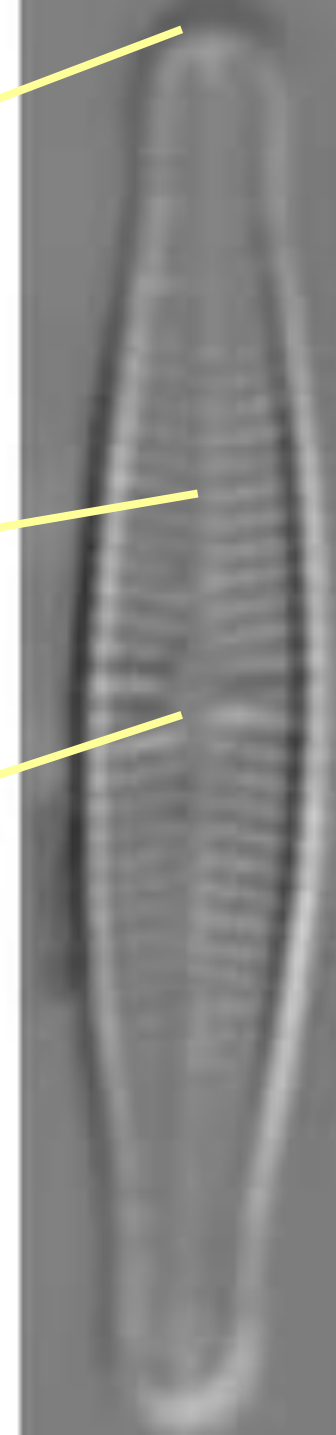
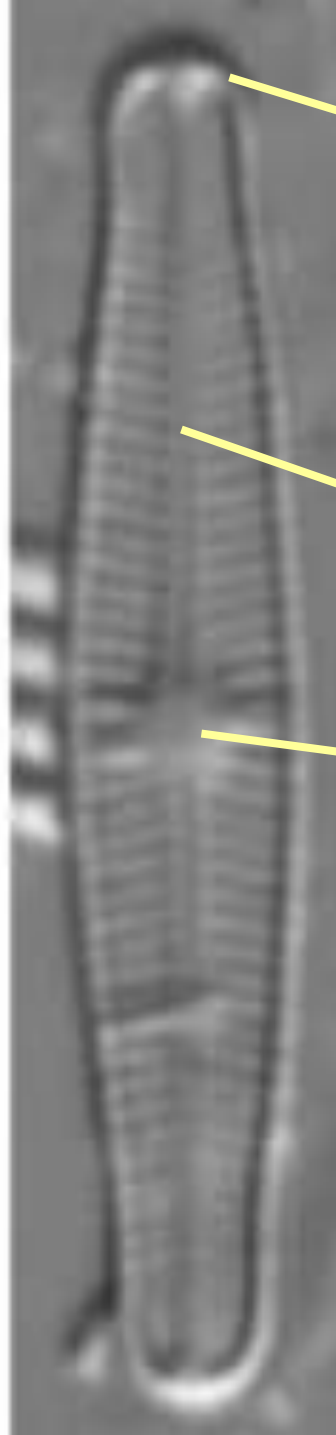
Lichtjes capitate,
voorgevormde uiteinden

axiale zone zeer smal

centrale zone
duidelijk in R-schaal

centrale zone
minder duidelijk in RL-schaal
elliptisch tot lanceolaat

striatie patroon
zeer fijn, radiaat



ACHNANTHIDIUM
NEOMICROCEPHALUM

ACHNANTHIDIUM
EUTROPHILUM

Smallere schaal-
tjes
Langere schaal-
tjes

ACHNANTHIDIUM
CALEDONICUM

Langere schaal-
tjes

Bredere schaal-
tjes
Rhombische vorm
Geen kopjes

ACHNANTHIDIUM
AFFINE

ACHNANTHIDIUM
LINEARE

Smallere schaal-
tjes
Lineaire vorm

Langere, bredere schaal-
tjes
Rhombische vorm
Smalle kopjes

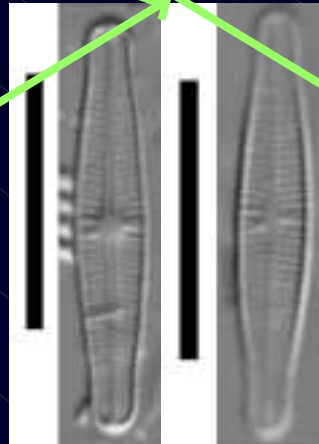
Kleine, brede,
elliptische schaal-
tjes

ACHNANTHIDIUM
STRAUBIANUM

Bredere schaal-
tjes
Lineaire-elliptische vorm
Uitgerokken uiteinden

ACHNANTHIDIUM
SAPROPHILUM

ACHNANTHIDIUM *MINUTISSIMUM*



Achnanthidium straubianum (Grunow) Czarnecki

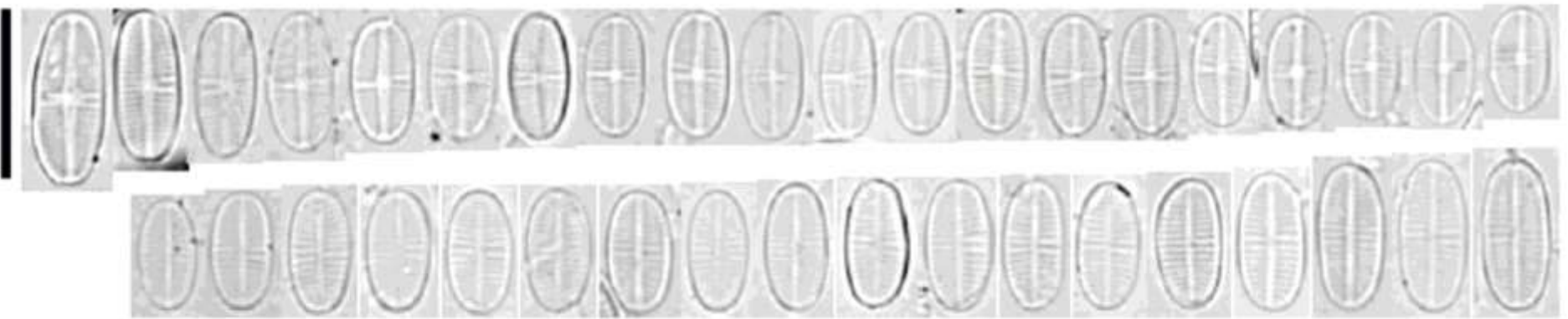
Basioniem: *Achnanthes straubiana* Lange-Bertalot in Icon. Diat. 2 (1996)

Synoniemen: *Achnanthes minutissima* ‘Sippe mit breit elliptische Schalen’

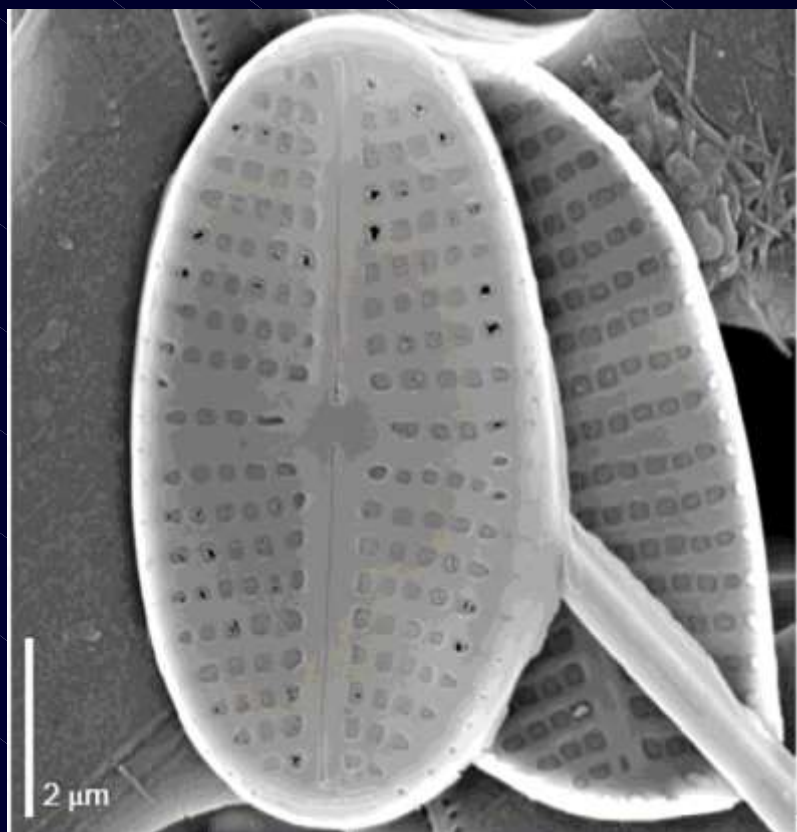
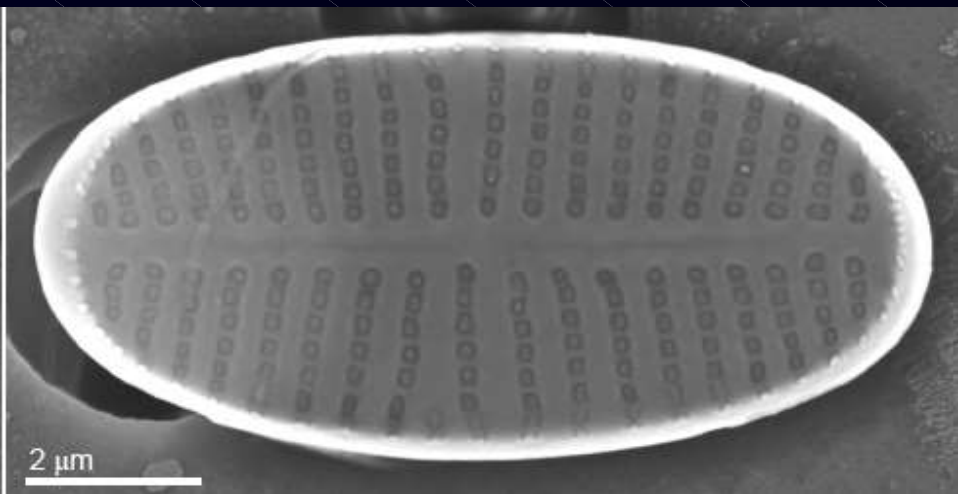
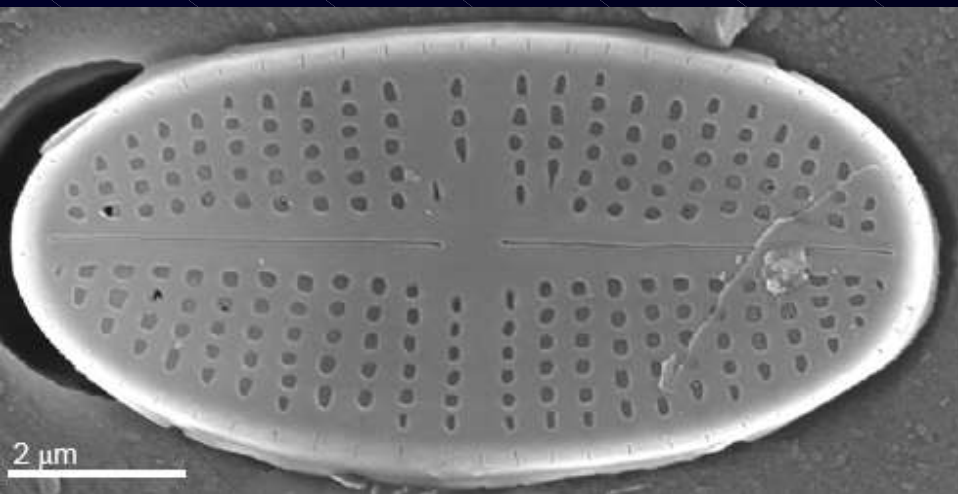
Beschrijving: schaaltsjes elliptisch tot langgerektelliptisch
breed afgeronde uiteinden, nooit uitgerokken of voorgevormd
Valve lengte: 6-10 μm valve breedte: 3.5-4 μm
lengte/breedte verhouding duidelijk typerend!
Axiale zone zeer smal, lineair voor beide schaaltsjes
Centrale zone zeer klein, afwezig of beetje verbreed door 1 verkorte
midden stria
Striae op beide schaaltsjes parallel tot zeer zwak radiaat
26-29 in 10 μm

Ultrastructuur: terminale raphe uiteinden recht, kort
maximaal 2-3 ronde areolen + 1 langgerekte areola
per stria

Achnanthidium straubianum (Grunow) Czarnecki



Foto's Luc Ector & Dasha Hlubicková



Foto's Luc Ector & Dasha Hlubicková

Ecologie

Krammer & Lange-Bertalot (1991):

kalkrijke, mesotrofe tot eutrofe meren
vaak in grote populaties

Lange-Bertalot & Metzeltin (1996):

kalkrijke, mesotrofe tot eutrofe meren, zeer zelden onder oligotrofe
omstandigheden

Achnanthidium lineare W. Smith

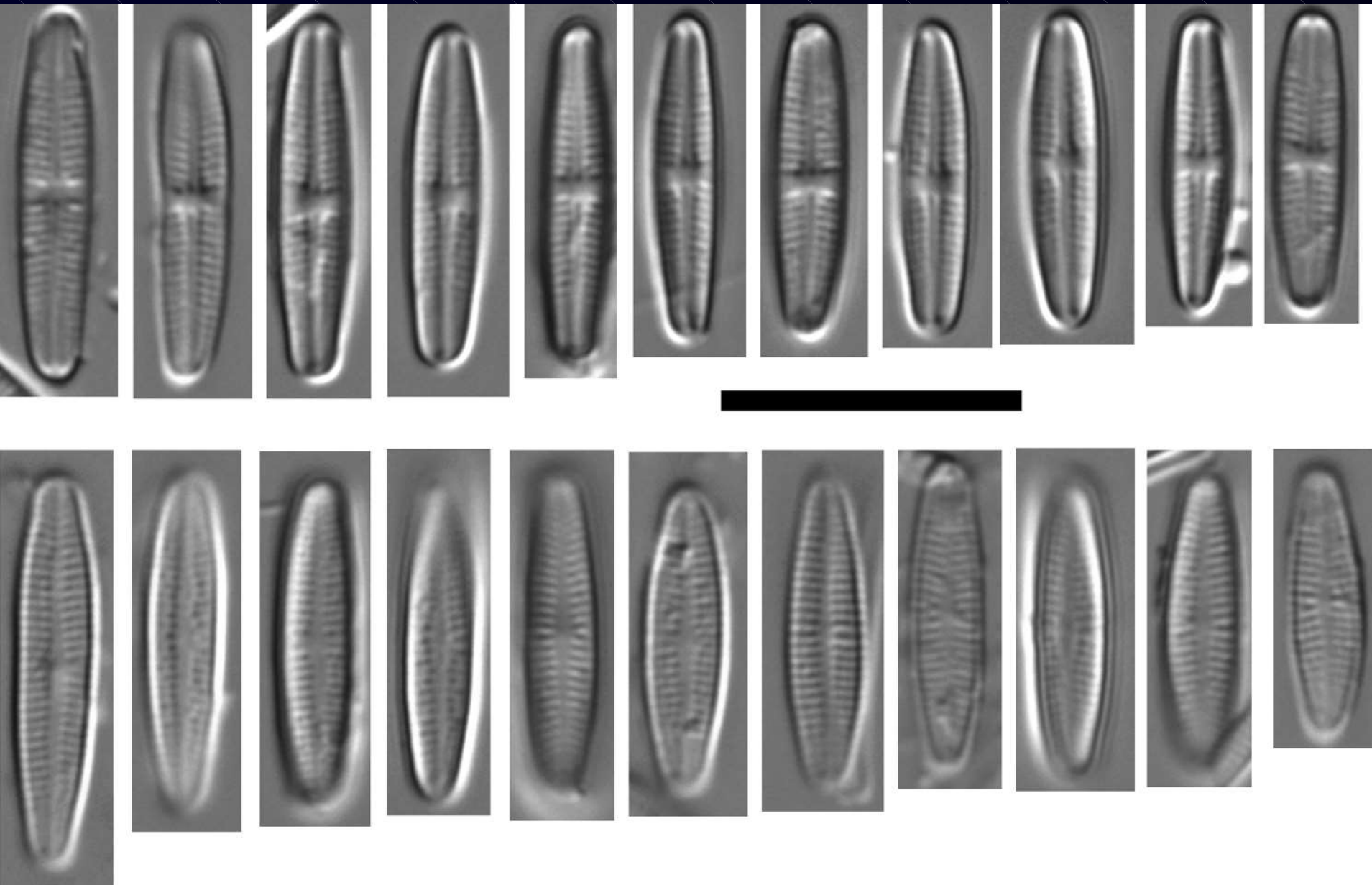
Described from: Lasswade, Schotland (1854)

Synoniemen: *Achnanthes minutissima* Kützing sensu K & L-B 1991

Beschrijving: schaaltes klein, lineair to zeer smal elliptisch
smalle, niet of zelden voorgevormde of uitgerokken uiteinden
Valve lengte: 10-12 μm valve breedte: 2.0-2.5 μm
Axiale zone zeer smal voor raphe schaalte, smal en lanceolaat voor
rapheloos schaalte
Centrale zone klein tot onbestaande op rapheloos schaalte,
duidelijk reikend tot beide randen op raphe schaalte
Striae op beide schaaltes radiaat tot recht: 30-35 in 10 μm

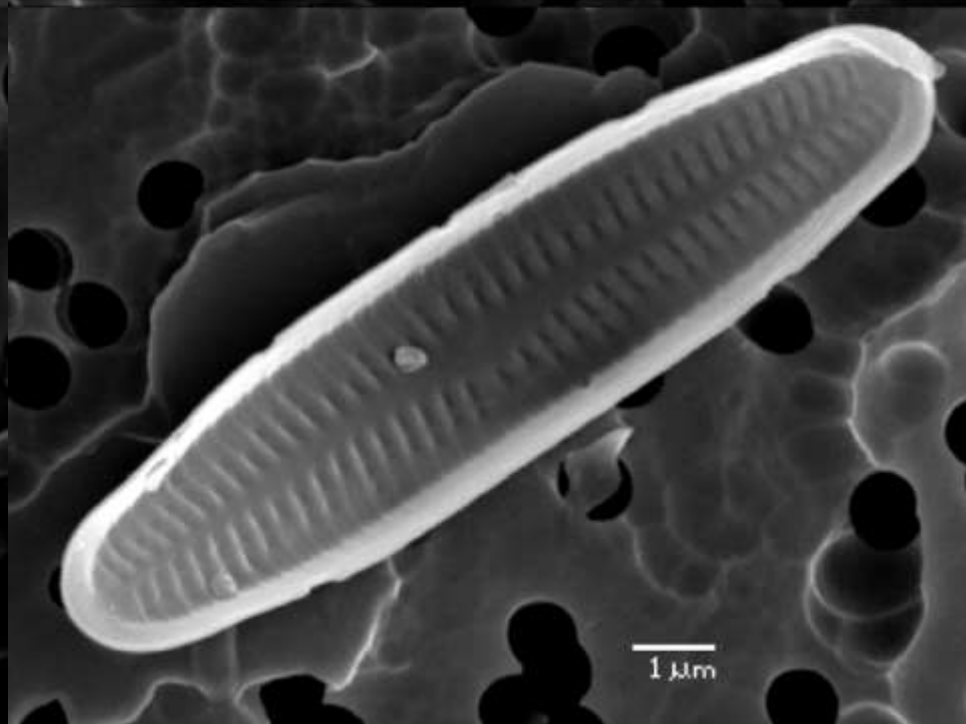
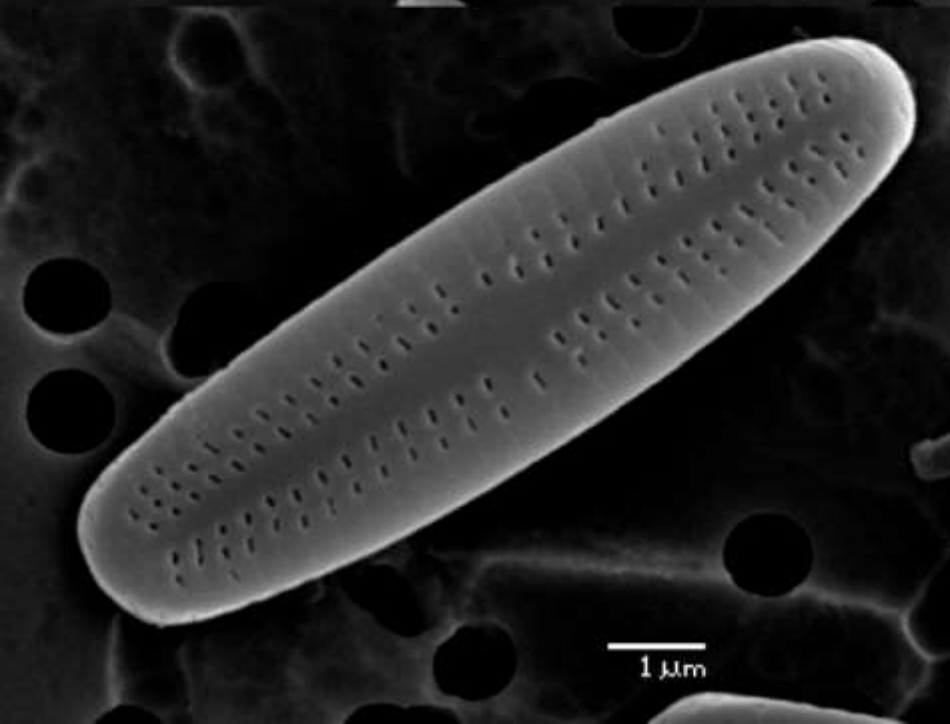
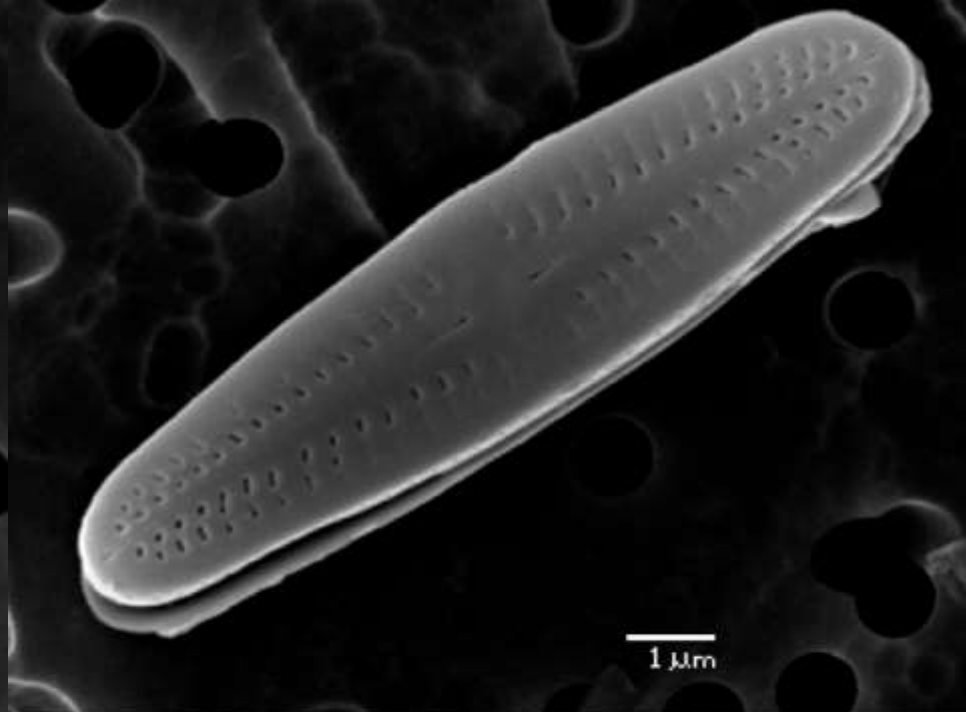
Ultrastructuur: terminale raphe uiteinden recht, kort
maximaal 2 ronde areolen + 1 langgerekte areola
per stria

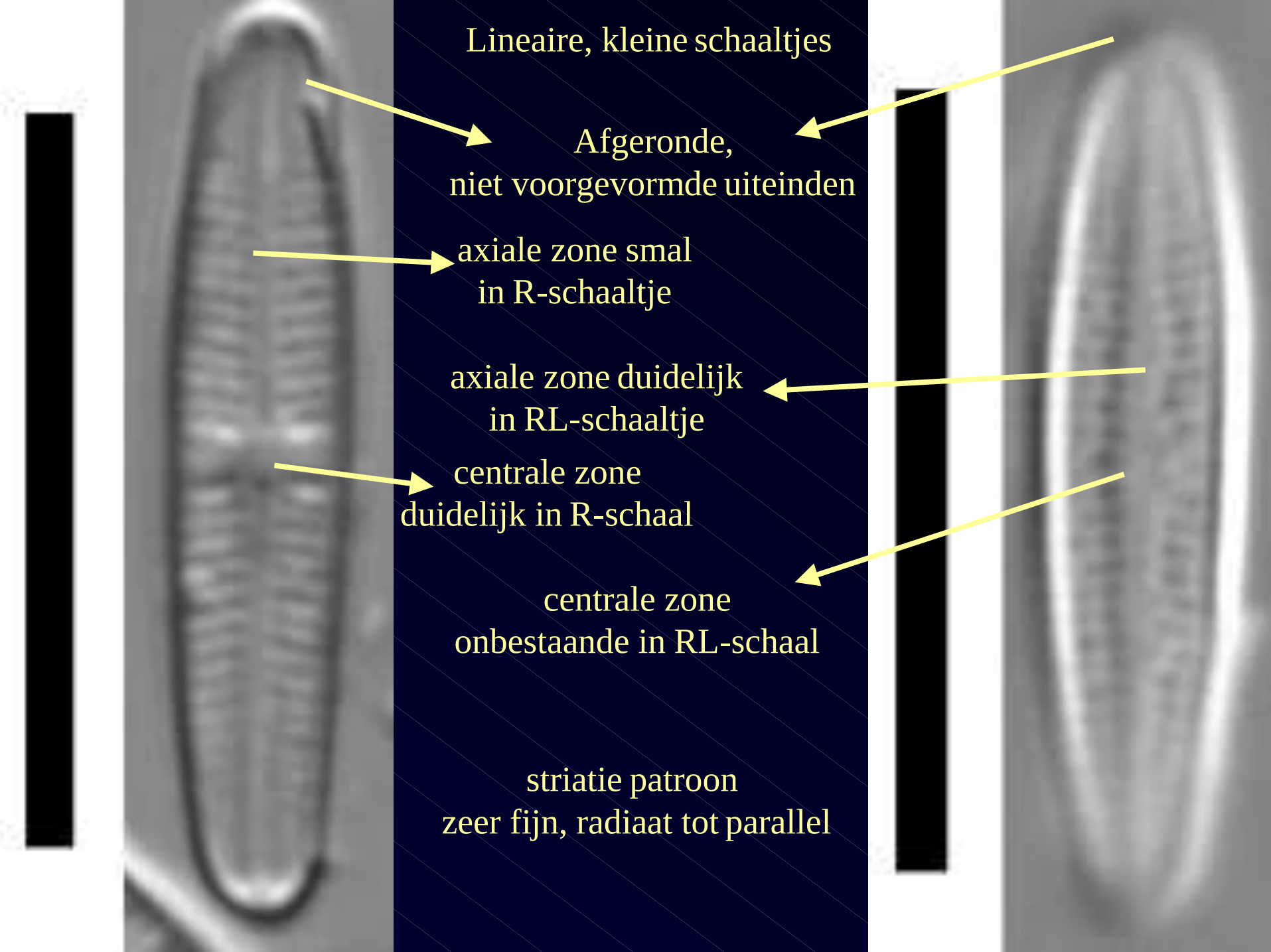
Achnanthydium lineare W. Smith



Lasswade (Scotland)

Coll. Dr. Greville, July, 03 1854





Lineaire, kleine schaalpjes

Afgeronde,
niet voorgevormde uiteinden

axiale zone smal
in R-schaaltje

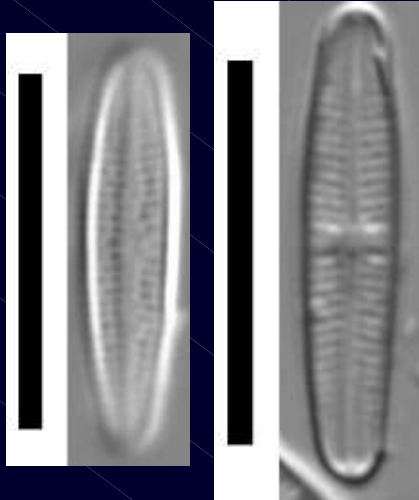
axiale zone duidelijk
in RL-schaaltje

centrale zone
duidelijk in R-schaal

centrale zone
onbestaande in RL-schaal

striatie patroon
zeer fijn, radiaat tot parallel

Vershil met *A. minutissimum*



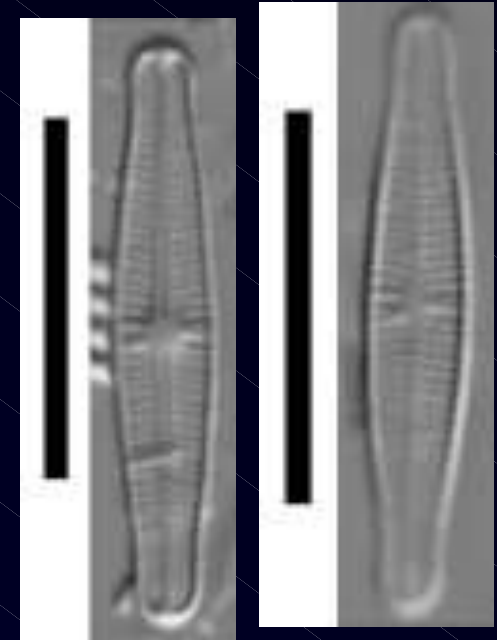
L 4-18 μm
W 2-2.5 μm
 S_{RL} 30-35 in 10 μm
 S_{R} 30-35 in 10 μm

A. lineare

duidelijk lineaire,
kleine schaaltsjes

geen 'kopjes'

duidelijke centrale zone
op R-schaaltje



L 5-25 μm
W 2.5-3.5 (4) μm
 $S_{\text{RL}} \pm 30$ in 10 μm
 $S_{\text{R}} \pm 30$ in 10 μm

A. minutissimum

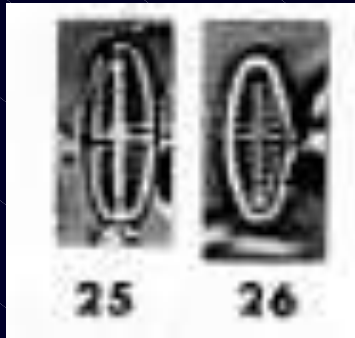
Achnanthes minutissima var. *inconspicua* Oestrup

Tot nu toe niet overgezet naar *Achnanthidium*.

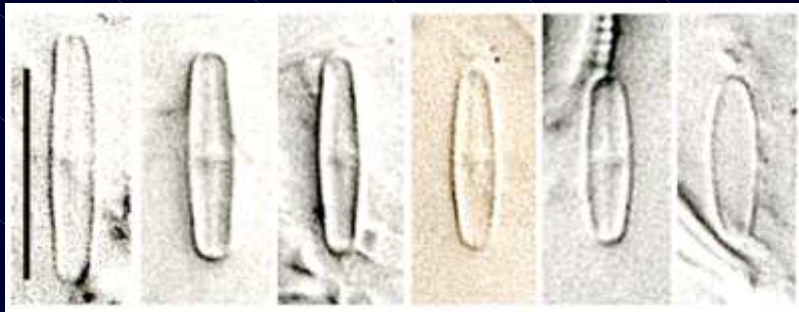
Status nog steeds onzeker maar in onderzoek (door I. Jüttner, Museum of Wales)

Beschrijving: schaaltes zeer klein, lineair to zeer smal elliptisch
smalle, niet of zelden voorgevormde of uitgerokken uiteinden
Valve lengte: 2.7-10 μm valve breedte: 2.0- μm
Axiale zone zeer smal voor raphe schaalte, smal en lanceolaat voor
rapheloos schaalte
Centrale zone aanwezig door uiteenwijkende striae in het midden
Striae op beide schaaltes radiaat tot recht: >30 in 10 μm

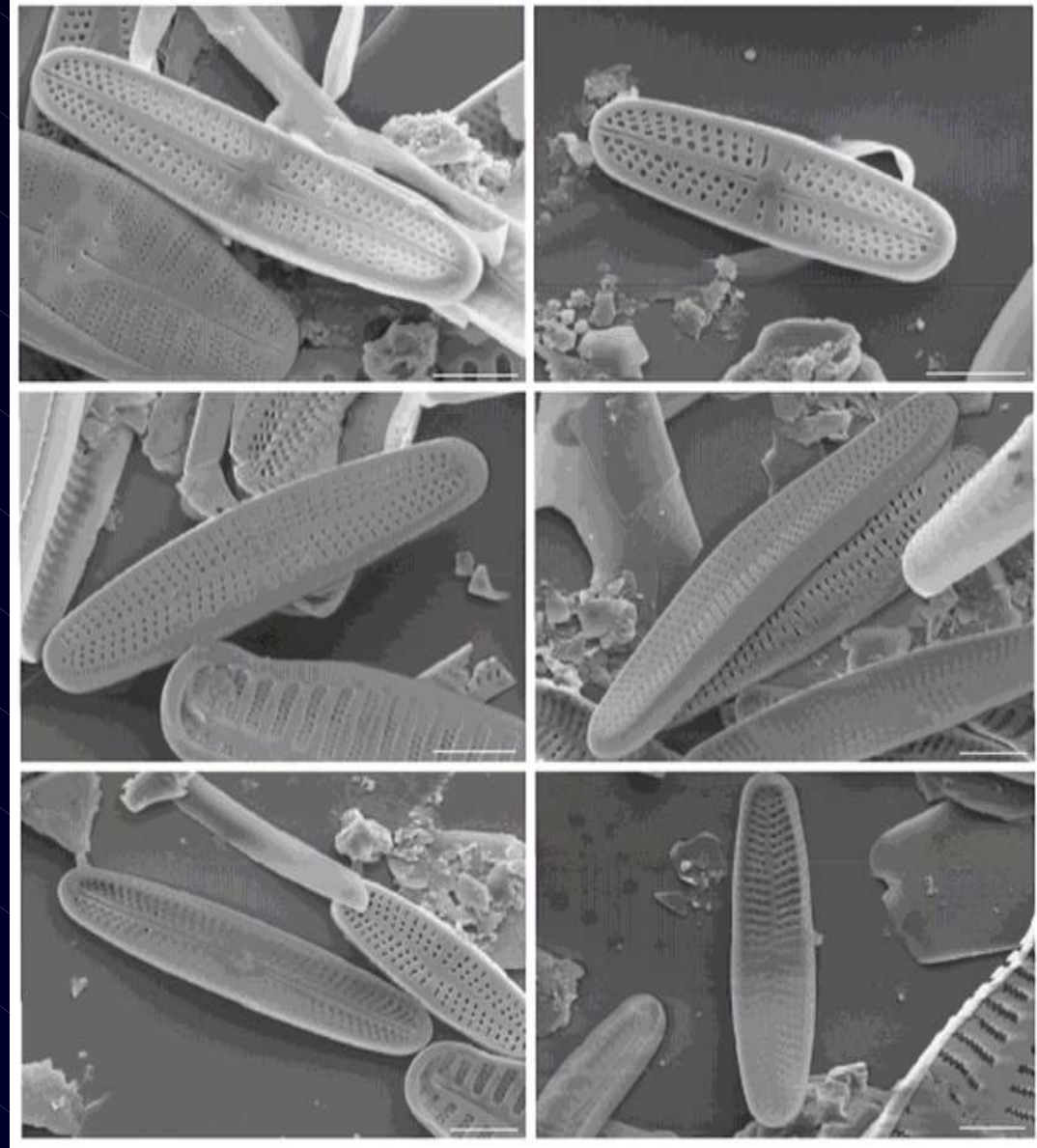
Ultrastructuur: terminale raphe uiteinden recht, kort
maximaal 3-4 areolen



A. minutissima var. *inconspicua*
sensu K & LB 1991



A. minutissima var. *inconspicua*
type materiaal Kopenhagen



A. minutissima var. *inconspicua*
Himalaya-materiaal

Achnanthidium eutrophilum (Lange-Bertalot) Lange-Bertalot

Basionym: *Achnanthes eutrophila* Lange-Bertalot in Icon. Diat. 2 (1996)

Synoniemen: *Achnanthes minutissima* “Sippe mit rhombisch-lanzettlichen Schalen”

Beschrijving: schaaltes rhombisch tot uitgetrokken rhombisch (rhombic-lanceolate)

breed afgeronde, nooit voorgevormde uiteinden

Valve lengte: 4-18 μm valve breedte: 3-4 μm

Axiale zone zeer smal voor beide schaaltes

Centrale zone klein tot onbestaande op rapheloos schaalte, vrij
duidelijk op raphe schaalte door verkorte striae

Striae op beide schaaltes radiaat: 24-27 in 10 μm

Ultrastructuur: terminale raphe uiteinden recht, kort
maximaal 2-3 ronde areolen + 1 langgerekte areola
per stria

Achnanthidium caledonicum (Lange-Bertalot) Lange-Bertalot

Basionym: *Achnanthes microcephala* f. *scotica* Carter, Nova Hedwigia (1981)

Synoniemen: *Achnanthes scotica* (Carter) Lange-Bertalot
Achnanthes caledonica Lange-Bertalot

Beschrijving: schaaltsjes lineair tot zeer smal lanceolaat
breed afgeronde, capitate uiteinden

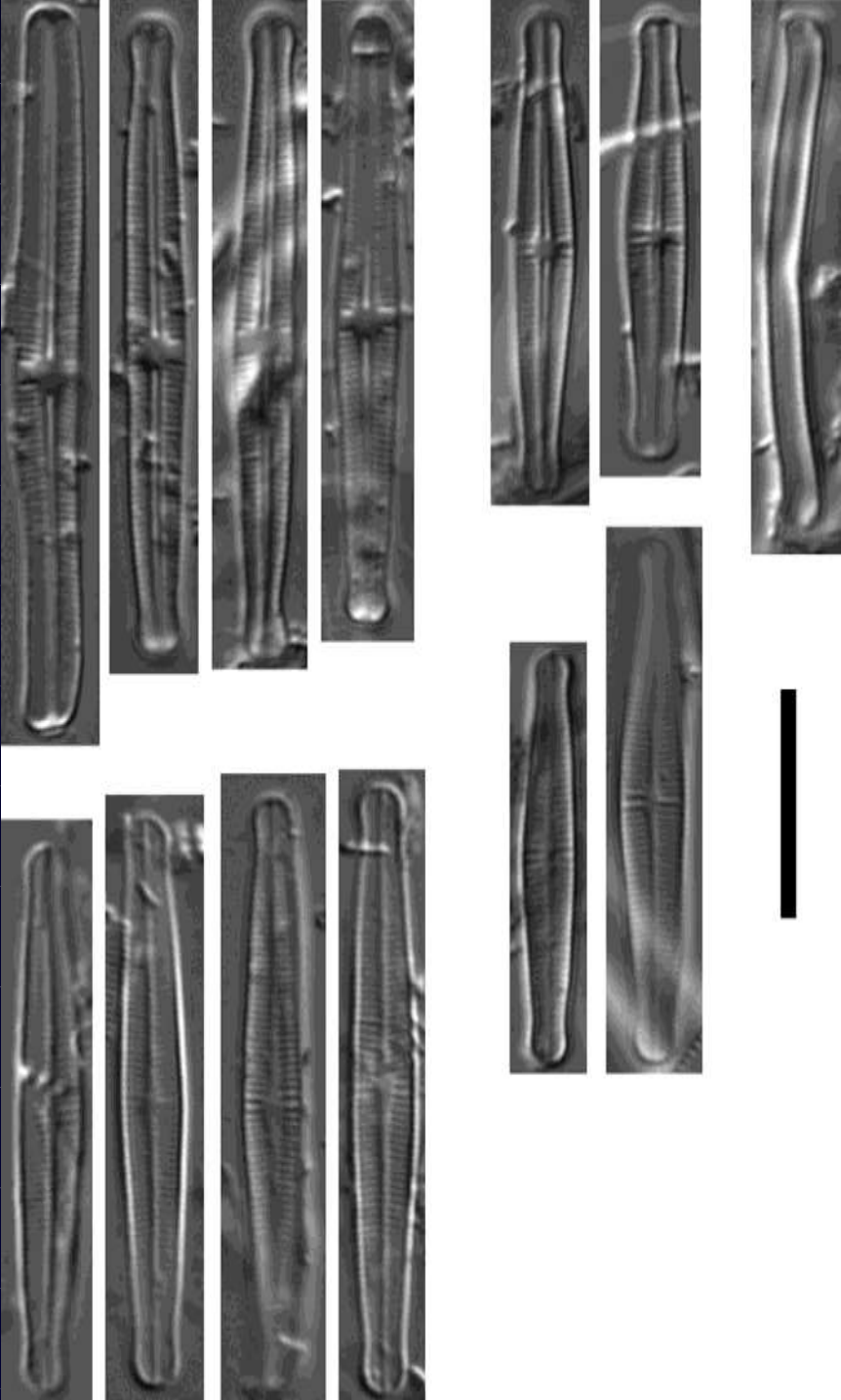
Valve lengte: 10-35 μm valve breedte: 2.7-3.8 μm

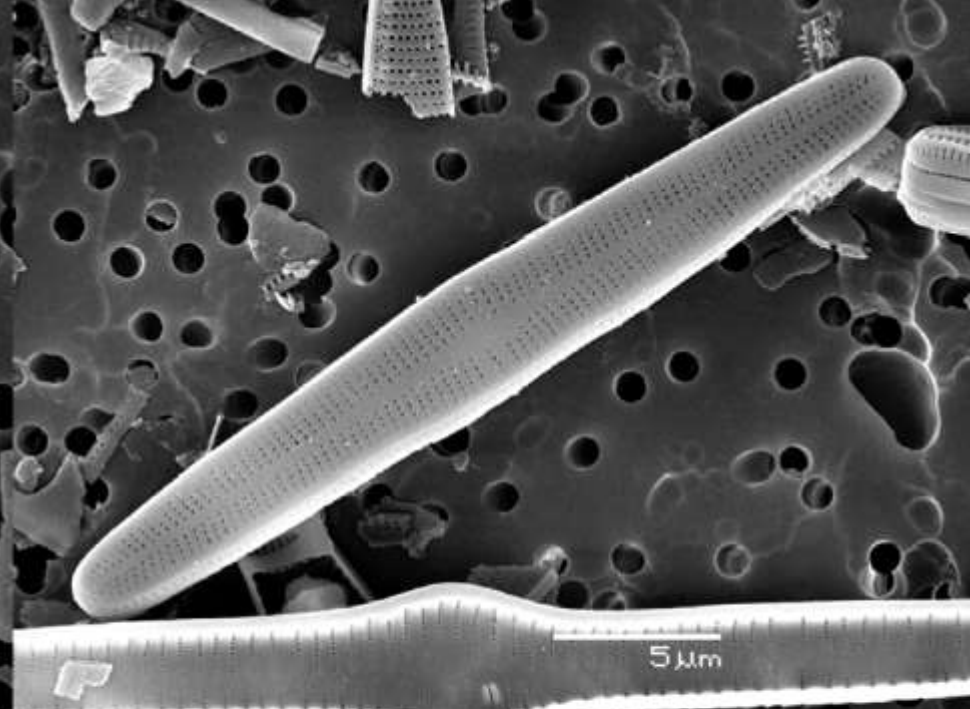
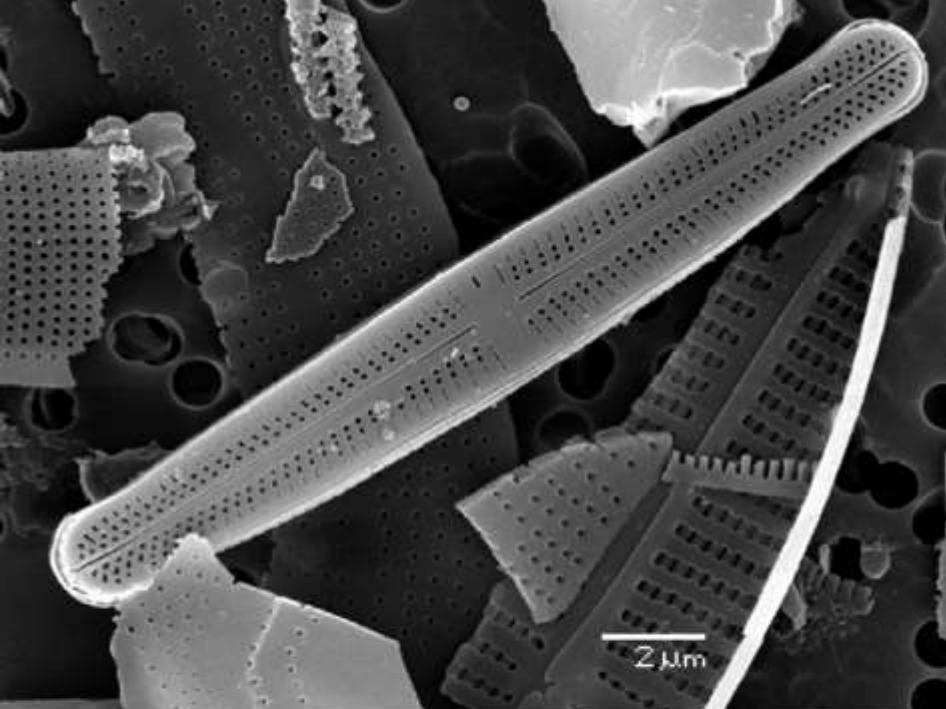
Axiale zone zeer smal, lineair voor beide schaaltsjes

Centrale zone klein tot onbestaande in rapheloos schaaltsje, goed ontwikkeld in raphe schaaltsje door verkorte tot verdwenen striae

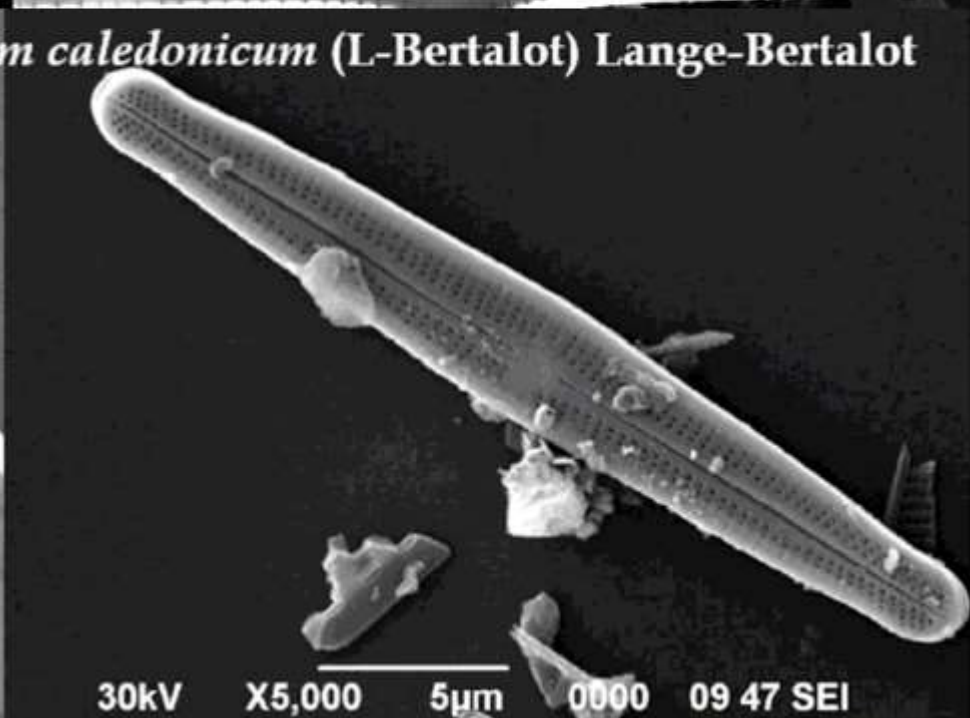
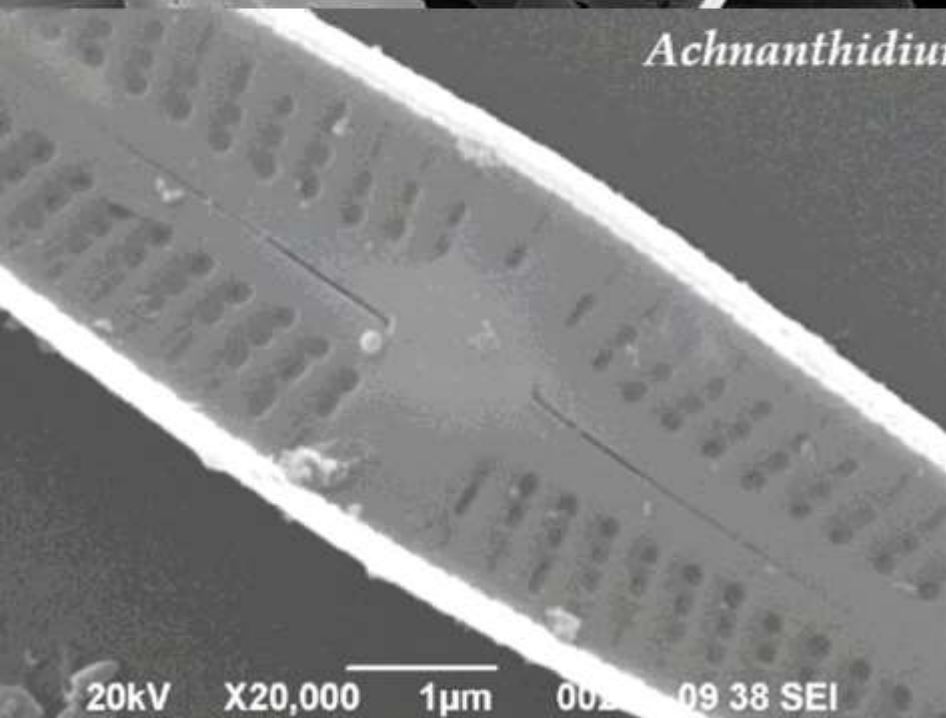
Striae op beide schaaltsjes radiaat: 30-33 in 10 μm

Ultrastructuur: terminale raphe-uiteinden recht, kort
maximaal 2-3 ronde areolen + 1 langgerekte areola
per stria





Achnanthidium caledonicum (L-Bertalot) Lange-Bertalot



Lineaire,
lang uitgerokken schaalpjes

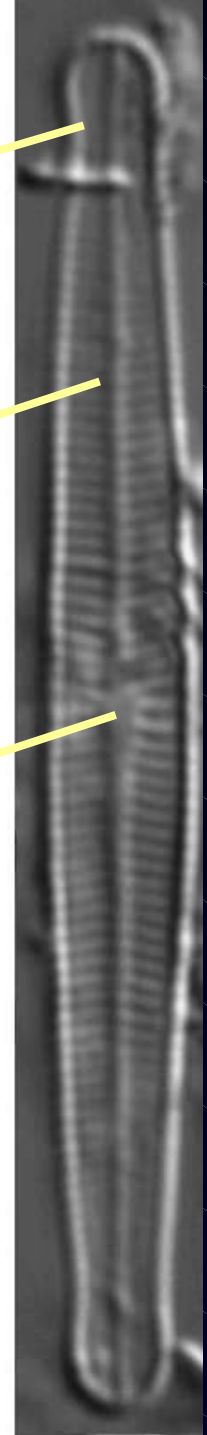
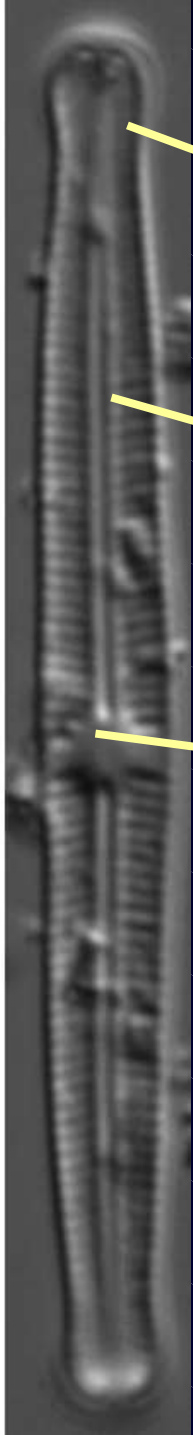
duidelijk
capitate uiteinden

axiale zone smal

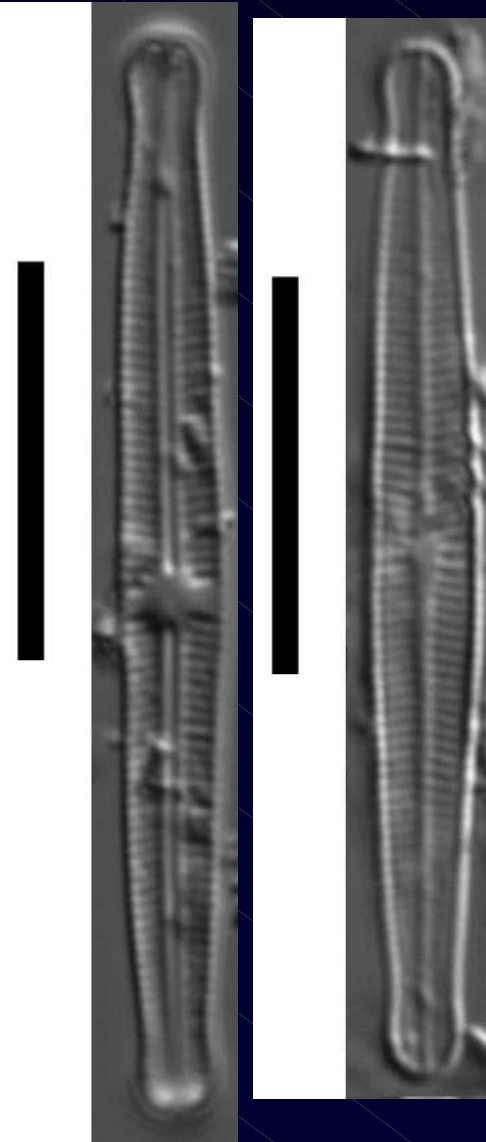
centrale zone
duidelijk in R-schaal

centrale zone
zeer klein in RL-schaal

striatie patroon
fijn, duidelijk radiaat



Verskil met *A. minutissimum*

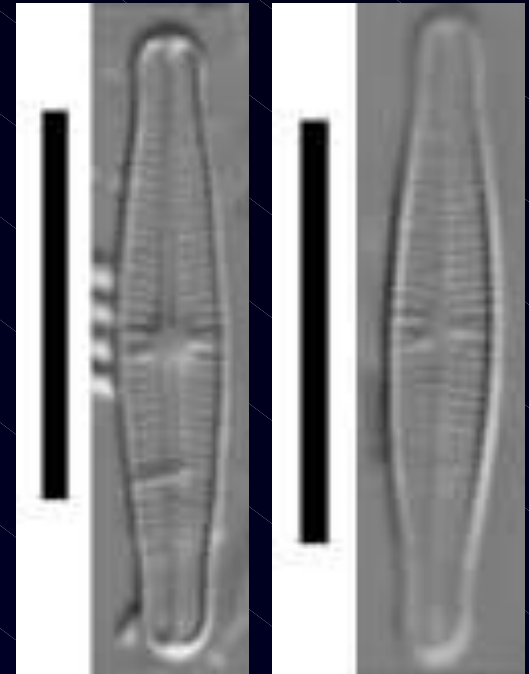


A. caledonicum

duidelijk langere
meer lineaire schaaltes

duidelijke 'kopjes'

duidelijke centrale zone
op R-schaaltje



A. minutissimum

Verschil met *A. neomicrocephalum*

A. neomicrocephalum Lange-Bertalot & Staab
beschreven uit Beieren
zeer smalle schaaltes (1.8-2.8 μm)
lange schaaltes (22-38 μm)

ENIGE VERSCHIL!!!

<i>A. caledonicum</i>	2.7-3.8 μm
<i>A. neomicrocephalum</i>	1.8-2.8 μm

A. caledonicum

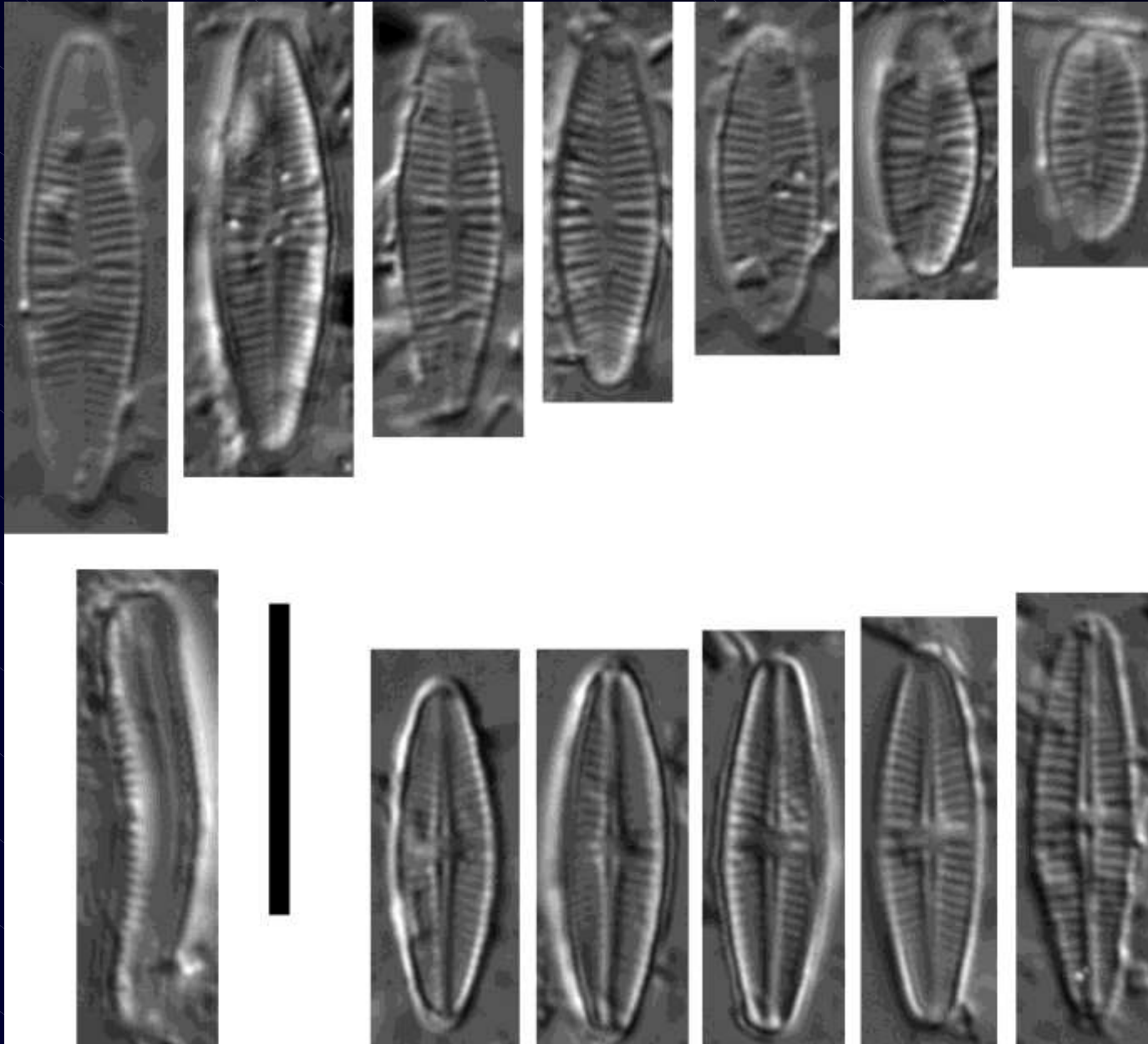
Ecologie

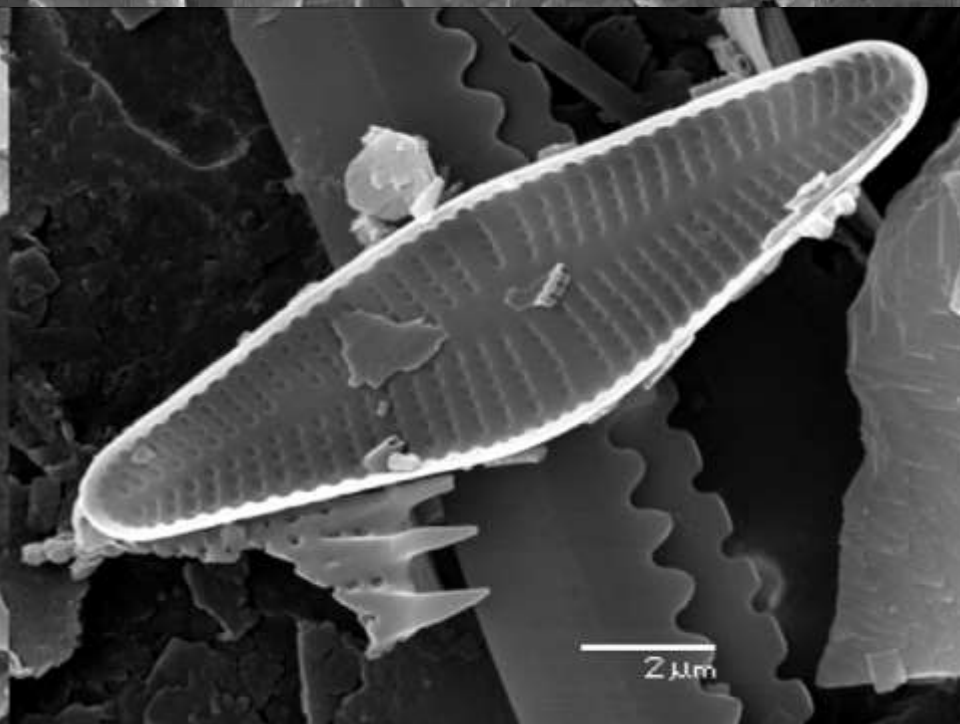
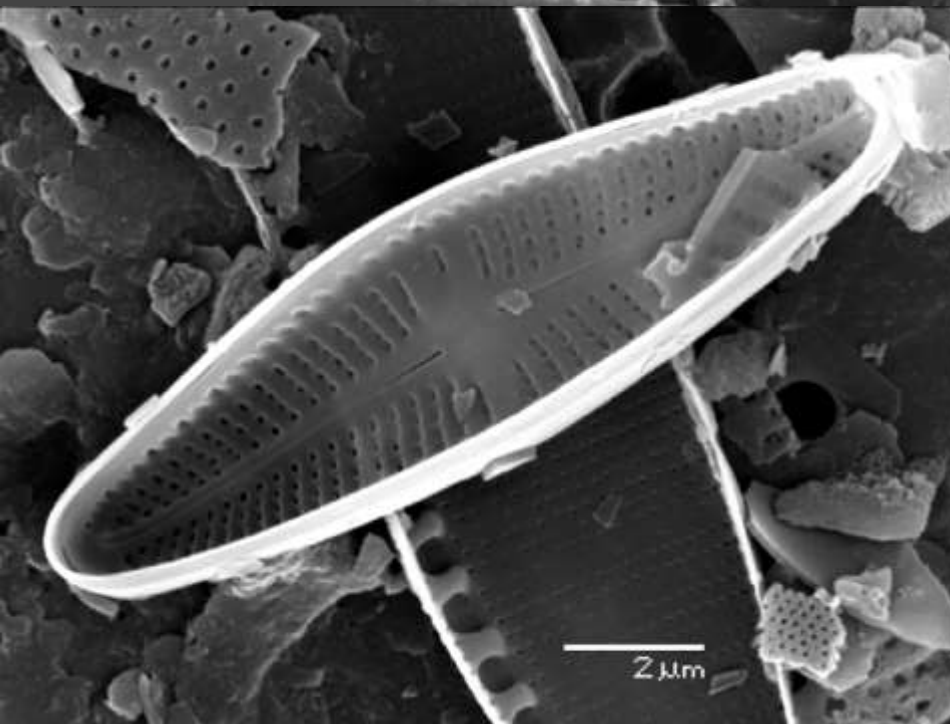
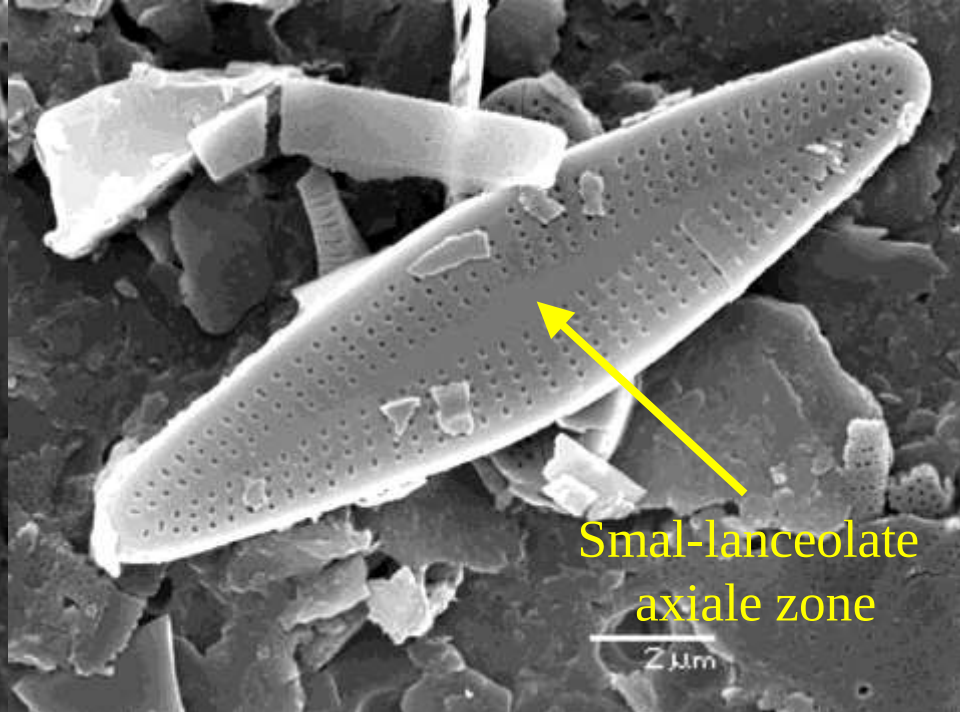
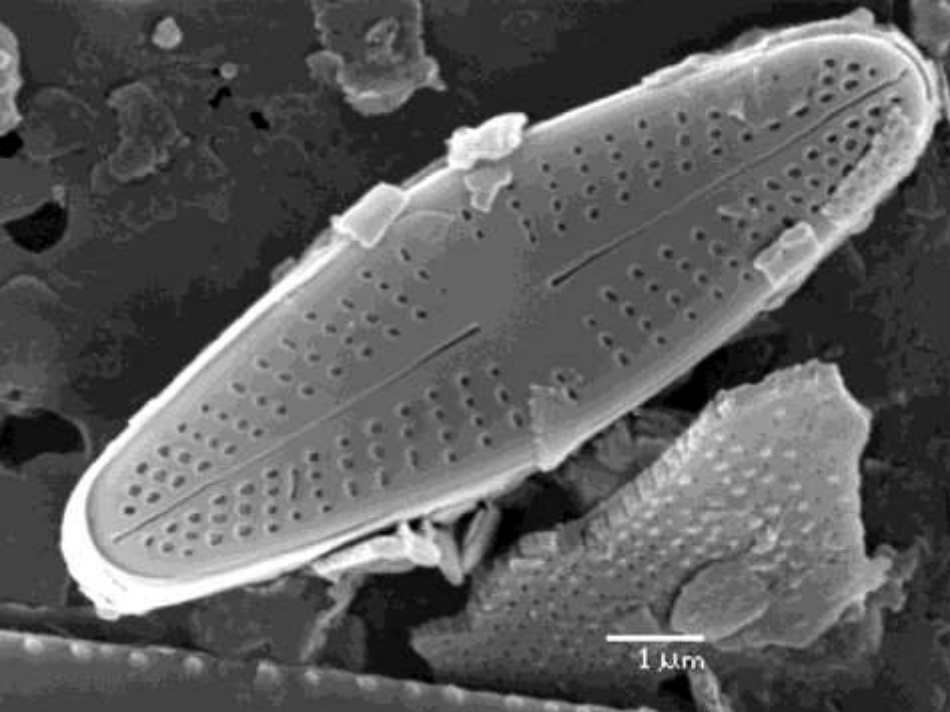
Krammer & Lange-Bertalot (1991):
oligotrofe, circumneutrale waterlopen

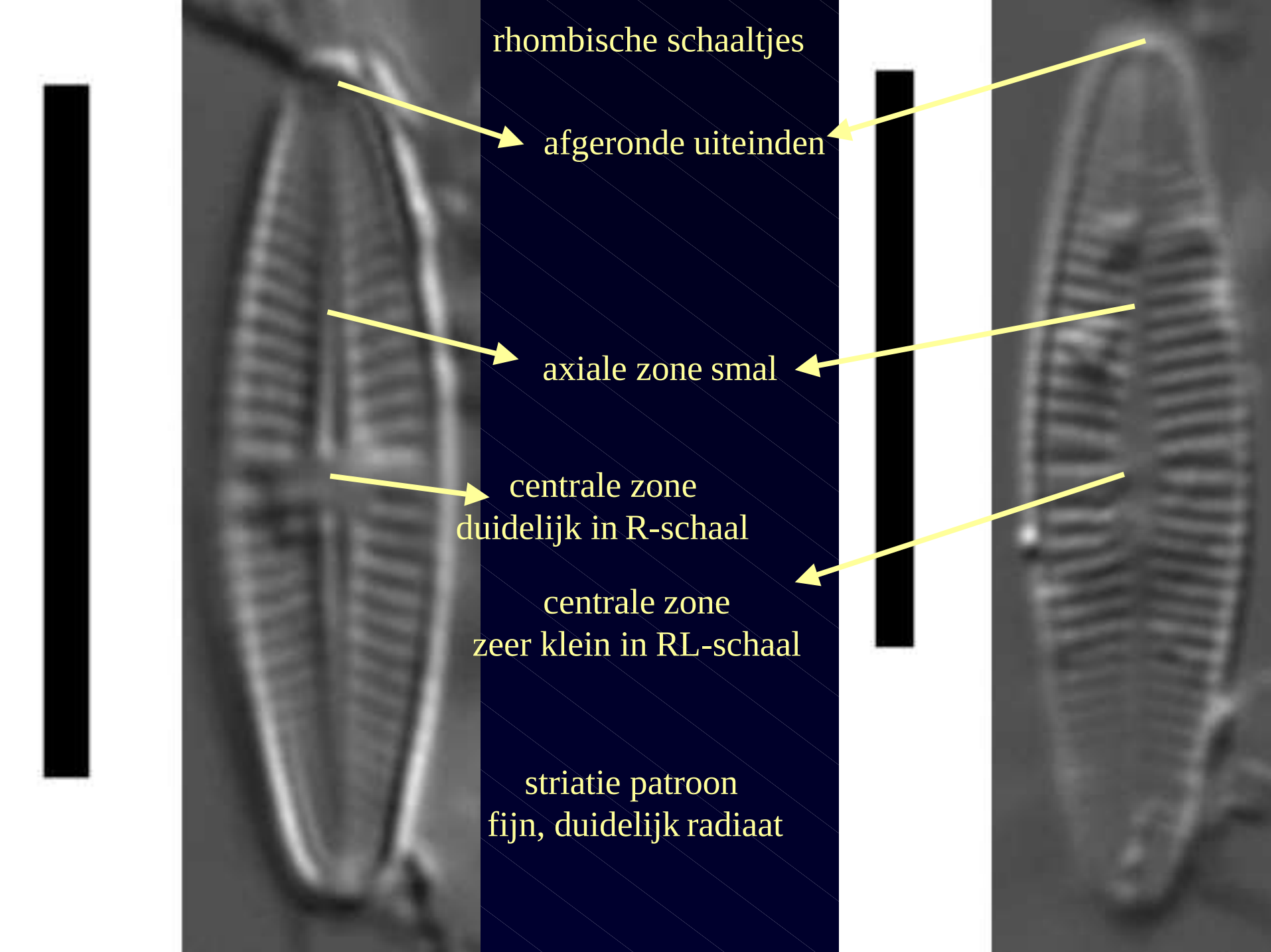
Lange-Bertalot (1993):
Midden- en Zuid-Europa, oligotrofe waterlopen
verdwijnt bij toenemende voedselrijkdom

Van Dam (1994):
circumneutraal, zoet-brak

Achnanthydium eutrophilum (Lange-Bertalot) Lange-Bertalot







The diagram shows a bivalve shell with various anatomical features labeled in Dutch. The labels are: 'rhombische schaal'tjes' (rhombic scales), 'afgeronde uiteinden' (rounded ends), 'axiale zone smal' (axial zone narrow), 'centrale zone duidelijk in R-schaal' (central zone clearly in R-valve), 'centrale zone zeer klein in RL-schaal' (central zone very small in RL-valve), and 'striatie patroon fijn, duidelijk radiaat' (striation pattern fine, clearly radial). Yellow arrows point from the text to the corresponding features on the shell. The shell is shown in a lateral view, with the hinge at the top and the rounded ends at the bottom. The central zone is the area between the axial zone and the hinge. The striation pattern is the fine, radial lines on the shell surface.

rhombische schaal'tjes

afgeronde uiteinden

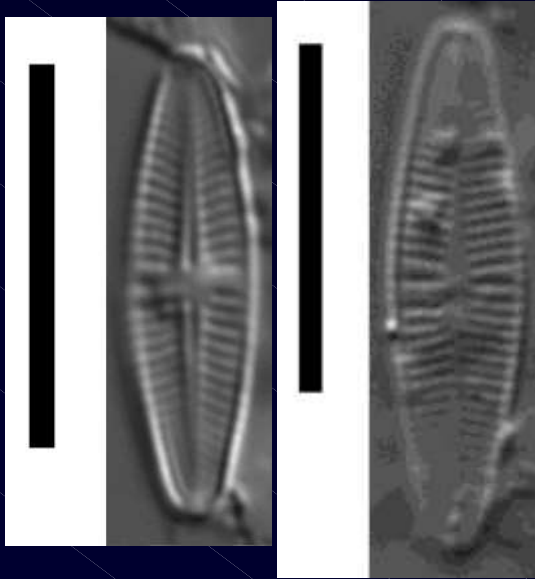
axiale zone smal

centrale zone
duidelijk in R-schaal

centrale zone
zeer klein in RL-schaal

striatie patroon
fijn, duidelijk radiaat

Verskil met *A. minutissimum*



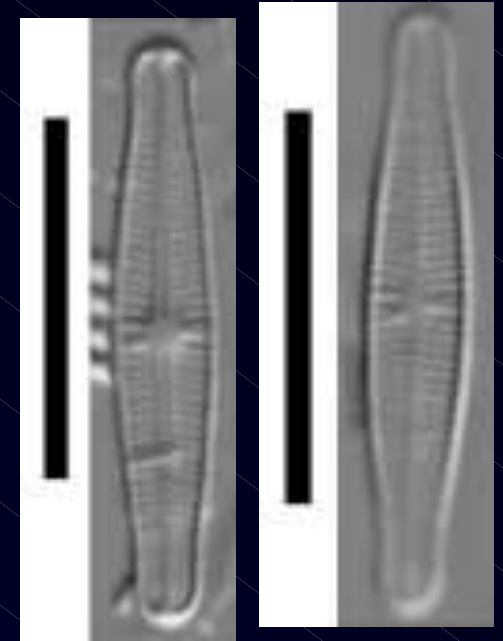
L 4-18 μm
W 3-4 μm
S_{RL} 24-27 in 10 μm
S_R 24-27 in 10 μm

A. eutrophilum

duidelijk rhombische schaaltes

geen 'kopjes'

Minder striae/10 μm



L 5-25 μm
W 2.5-3.5 (4) μm
S_{RL} $\pm$ 30 in 10 μm
S_R $\pm$ 30 in 10 μm

A. minutissimum

Ecologie

Lange-Bertalot & Metzeltin (1996):

eutrofe tot polytrofe waterlopen, β -mesosaproob

Ponader & Potapova (2007):

vrij hoge pH (8.1–8.3) en conductiviteit (291–583 $\mu\text{S}/\text{cm}$) met een brede waaier aan trofische gehalten ($\text{NO}_3 + \text{NO}_2$: 0.7–2.2 mg/l; PO_4^{3-} : 0.010–0.026 mg/l).

Achnanthidium affine (Grunow) Czarnecki

Basionym: *Achnanthes affinis* Grunow in Cleve & Grunow 1880

Synoniemen: *Achnanthes minutissima* var. *affinis* (Grunow) Lange-Bertalot

Beschrijving: schaaltes rhombisch tot rhombisch-lanceolaat
puntig uitgerokken uiteinden

Valve lengte: 8-30 μm valve breedte: 3.5-5.0 μm

Axiale zone zeer smal voor raphe schaalte, smal en lanceolaat voor
rapheloos schaalte

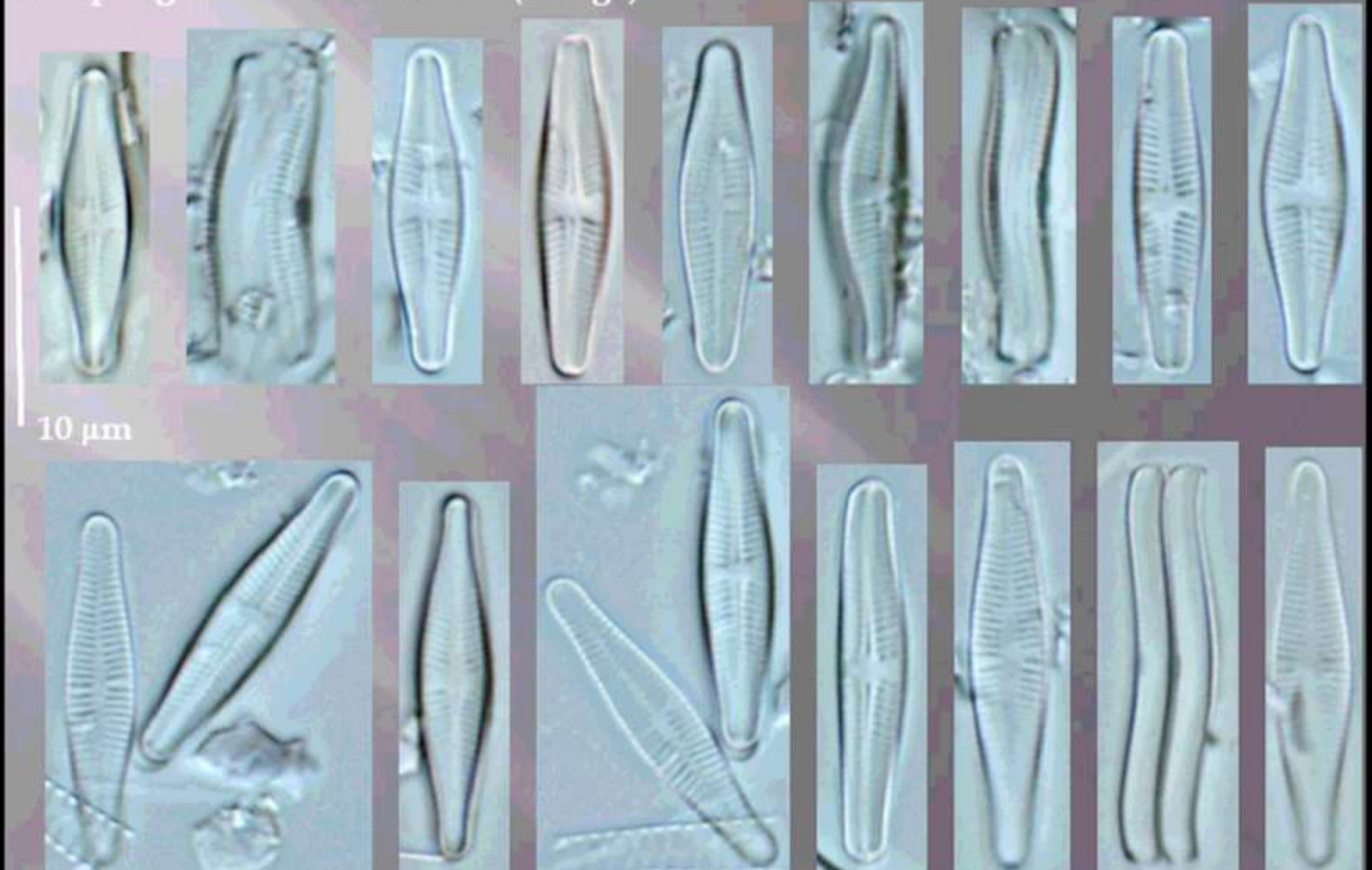
Centrale zone asymmetrisch op rapheloos schaalte, duidelijk
reikend tot beide randen op raphe schaalte

Striae op beide schaaltes radiaal, in het midden verder uit elkaar dan
aan de uiteinden: 22-24 tot ± 30 in 10 μm

Ultrastructuur: terminale raphe uiteinden recht, kort
maximaal 2-3 ronde areolen + 1 langgerekte areola
per stria

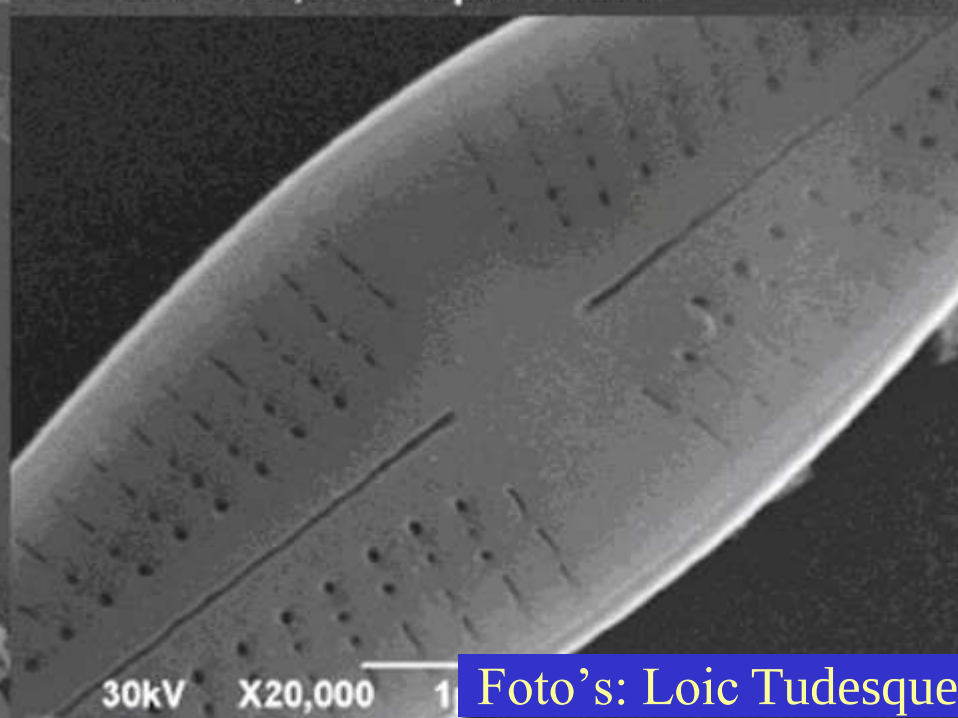
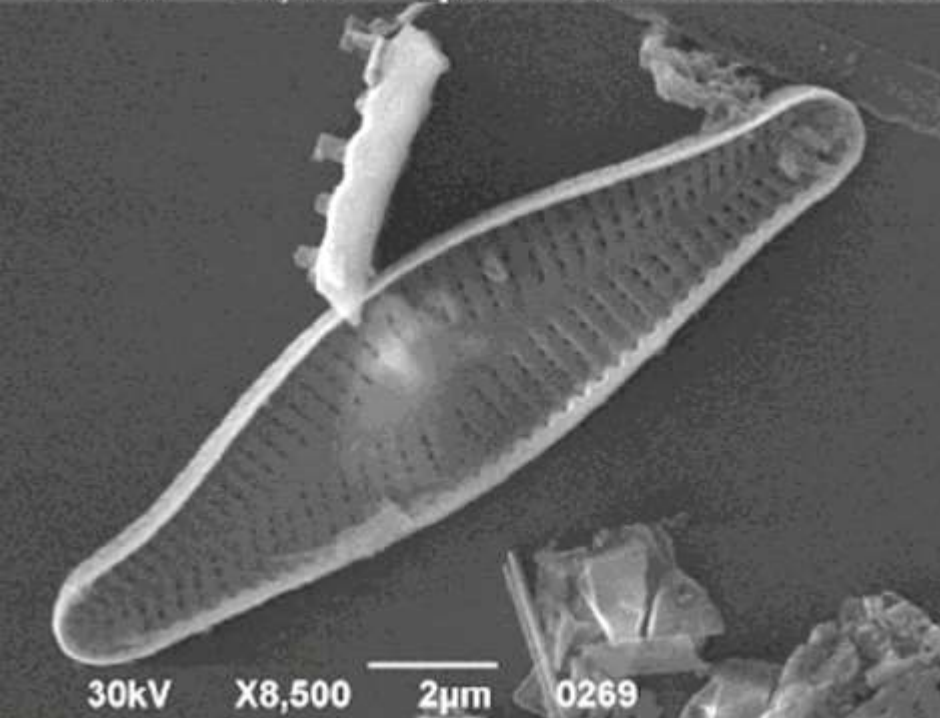
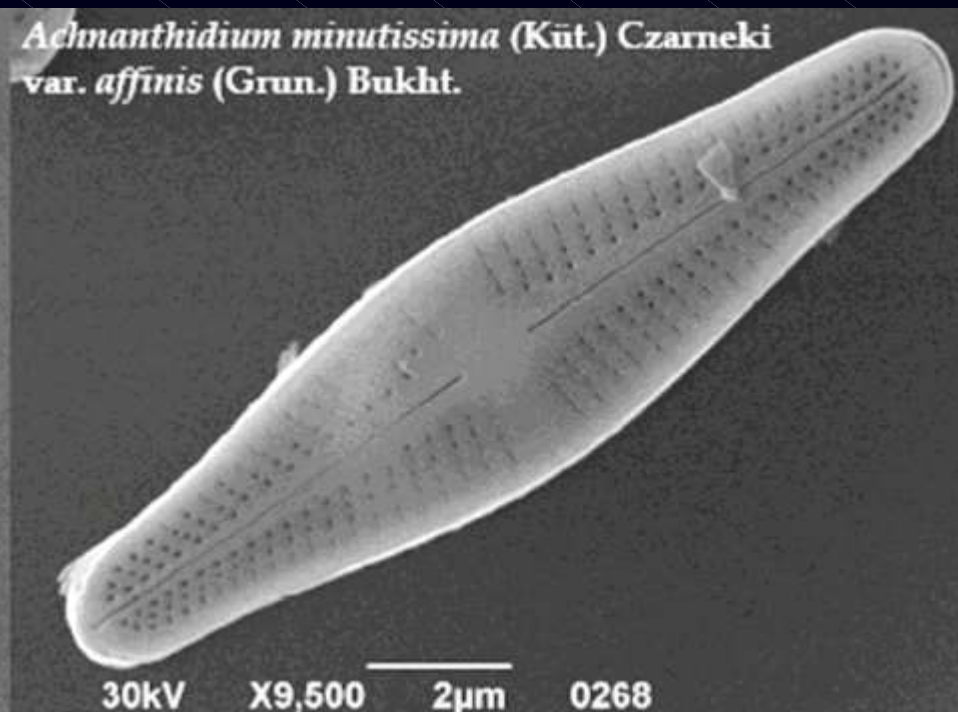
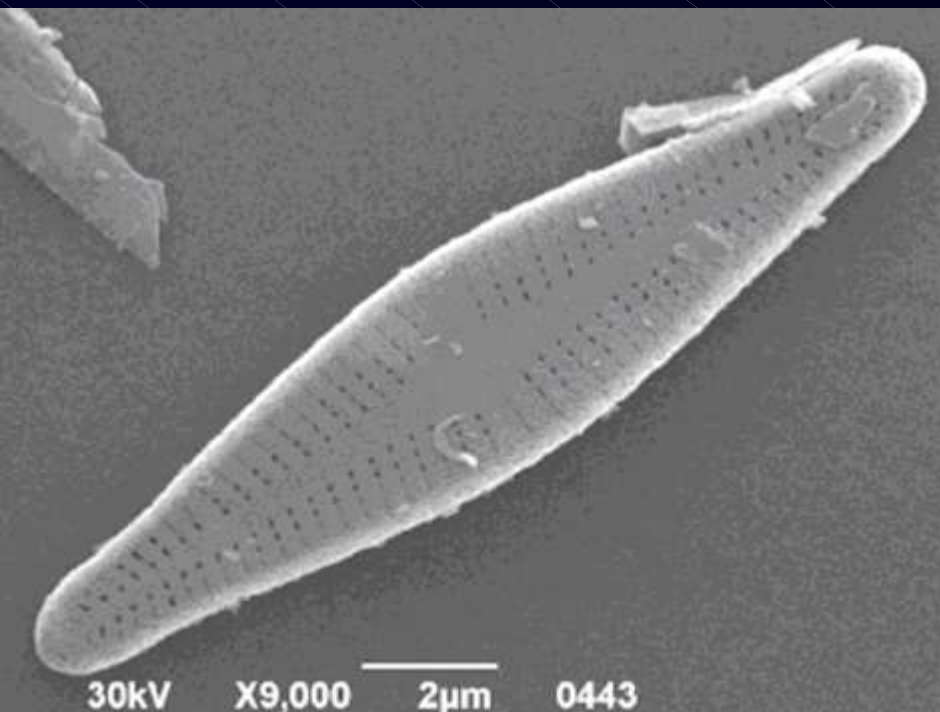
Achnantheidium affine (Grunow) Czarnecki

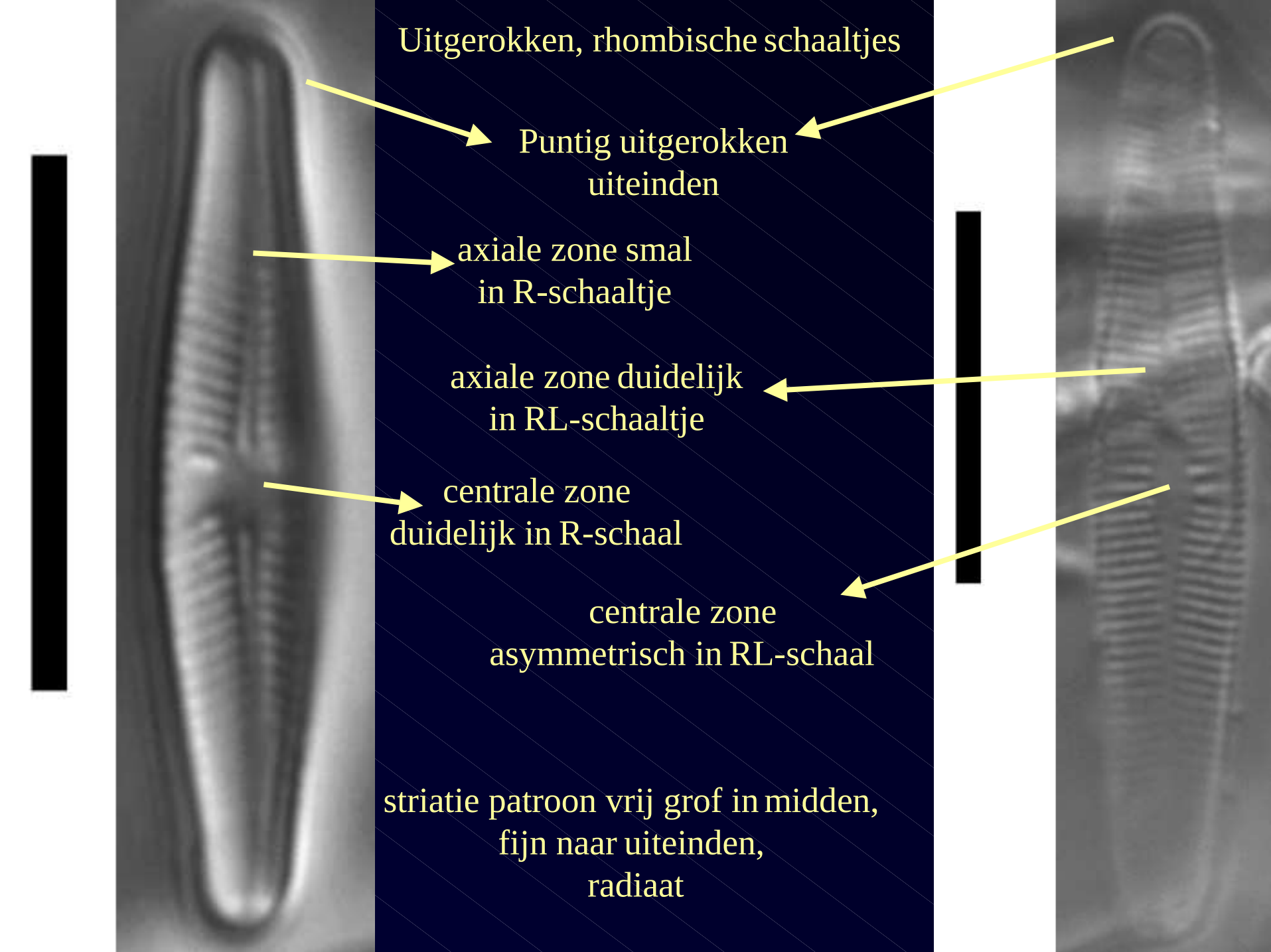
Sampling site : Bethmale lake (Ariège)



Foto's: Loic Tudesque

Achnanthidium minutissima (Küt.) Czarnecki
var. *affinis* (Grun.) Bukht.





Uitgerokken, rhombische schaaltes

Puntig uitgerokken
uiteinden

axiale zone smal
in R-schaaltje

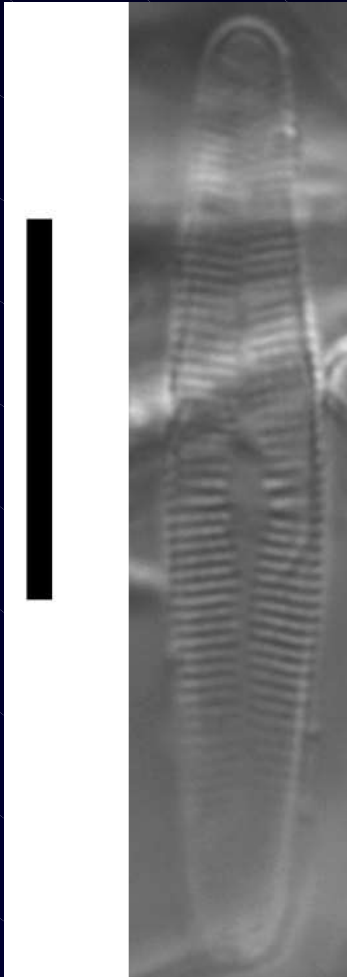
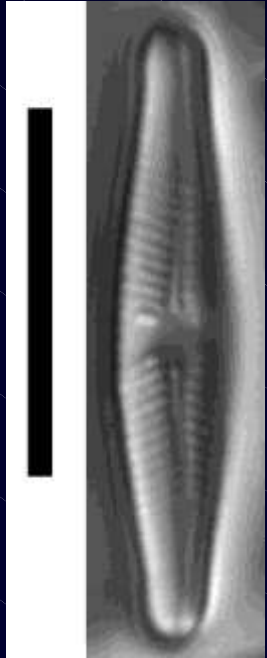
axiale zone duidelijk
in RL-schaaltje

centrale zone
duidelijk in R-schaal

centrale zone
asymmetrisch in RL-schaal

striatie patroon vrij grof in midden,
fijn naar uiteinden,
radiaat

Verskil met *A. minutissimum*



L 8-30 μm
W 3,5-5 μm
S 22-24 tot 30 in 10 μm

A. affine

gewoonlijk groter

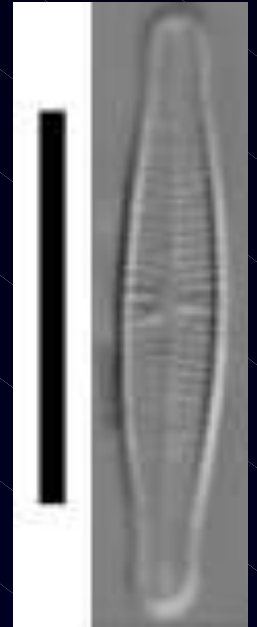
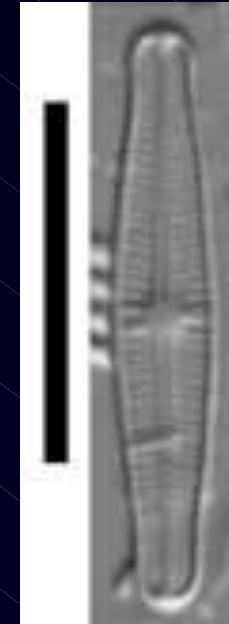
duidelijk rhombisch
uitgerokken schaaltsjes

Puntige uiteinden

duidelijke centrale zone

Minder striae/10 μm

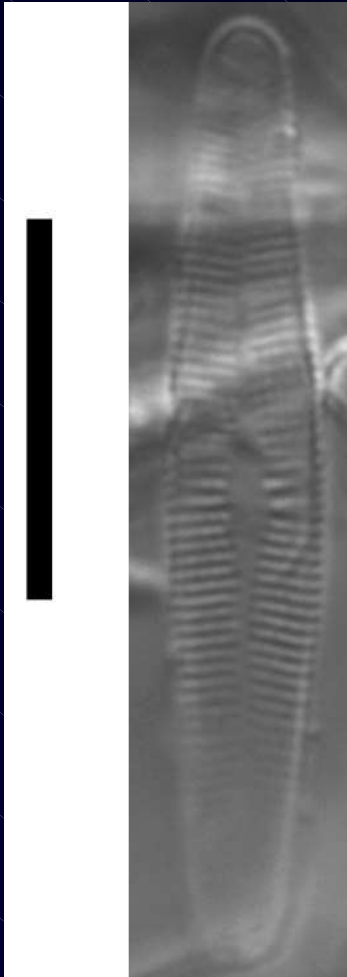
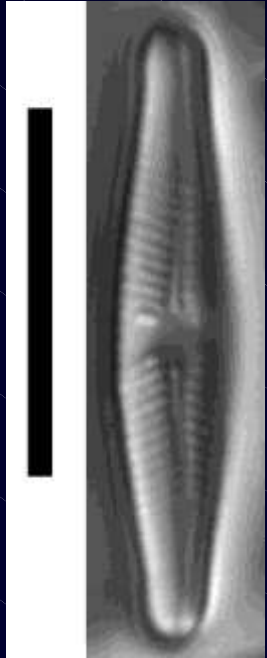
Stria densiteit in gradiënt



L 5-25 μm
W 2.5-3.5 (4) μm
 $S_{RL} \pm 30$ in 10 μm
 $S_R \pm 30$ in 10 μm

A. minutissimum

Verskil met *A. eutrophilum*



L 8-30 μm
W 3,5-5 μm
S 22-24 tot 30 in 10 μm

A. affine

gewoonlijk groter

duidelijk
uitgerokken schaaltes

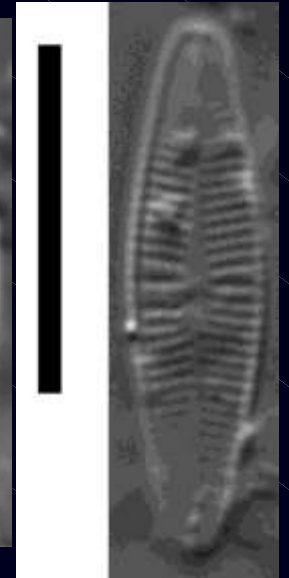
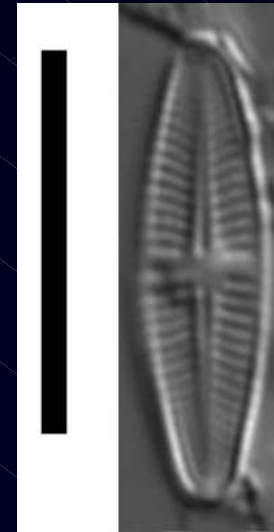
Puntige uiteinden

duidelijke centrale zone

Minder striae/10 μm

Stria densiteit in gradiënt

andere ecologie



L 4-18 μm

W 3-4 μm

S_{RL} 24-27 in 10 μm

S_R 24-27 in 10 μm

A. eutrophilum

Ecologie

Krammer & Lange-Bertalot (1991):

oligosaprobe (niet noodzakelijk oligotrofe), zwak alkalische, meestal kalkhoudend waterlopen met gematigde tot matig hoge elektrolythgehalte

Van Dam et al. (1994):

alkalifiel, zoet-brak, oligosaproob

Achnanthidium saprophilum (Kobayasi & Mayama) Round & Bukht.

Basionym: *Achnanthes minutissima* var. *saprophila* Kobayasi & Mayama 1982

Beschrijving: schaaltes lineair-elliptisch

breed afgeronde, voorgevormde uiteinden, duidelijke 'dikke nek'

Valve lengte: 8-15 μm valve breedte: 3-4 μm

Axiale zone zeer smal lanceolaat voor beide schaaltes

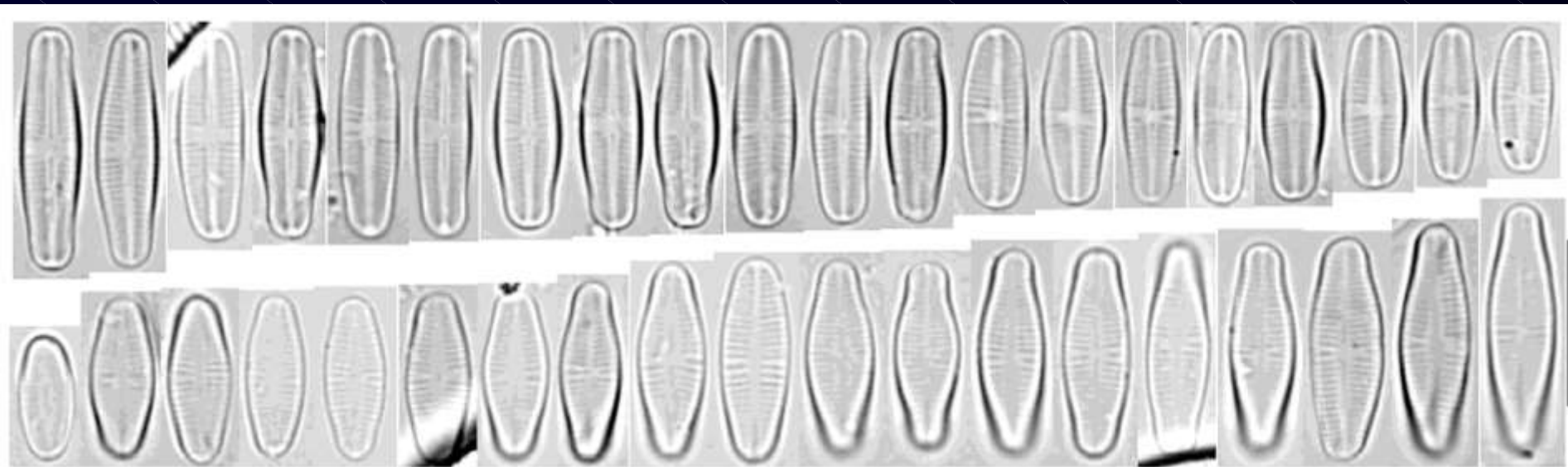
Centrale zone klein tot onbestaande op rapheloos schaalte, vrij
duidelijk op raphe schaalte door verkorte striae

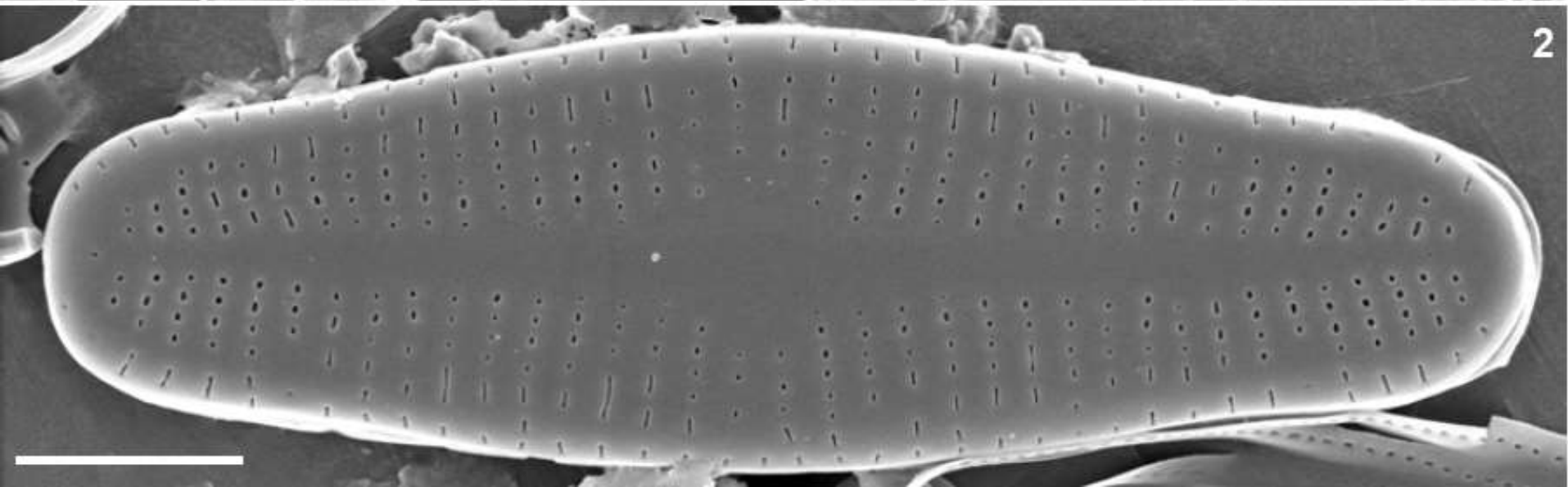
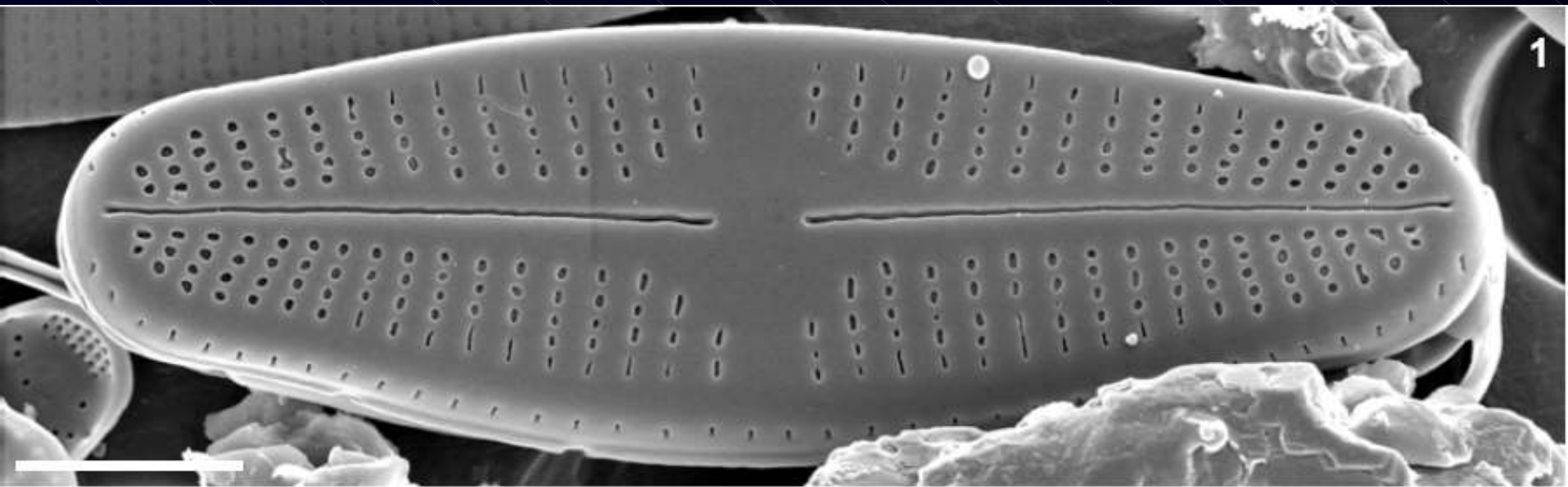
Striae op beide schaaltes radiaal: 28 in 10 μm (32 naar uiteinden)

Ultrastructuur: terminale raphe uiteinden recht, kort

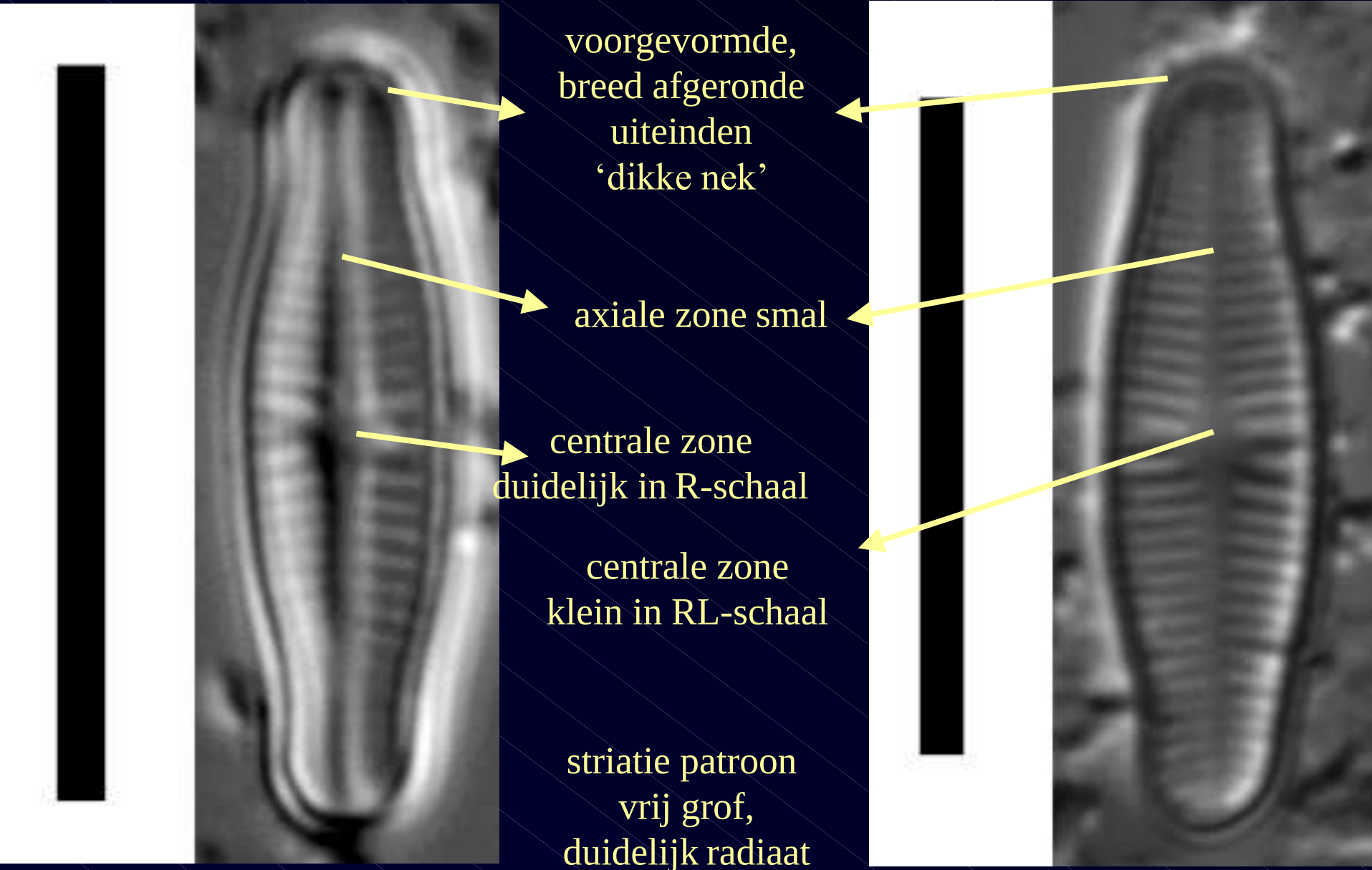
maximaal 3-5 ronde areolen + 1 langgerekte areola
per stria

Achnanthyidium saprophilum (Kobayasi & Mayama) Round & Bukt.

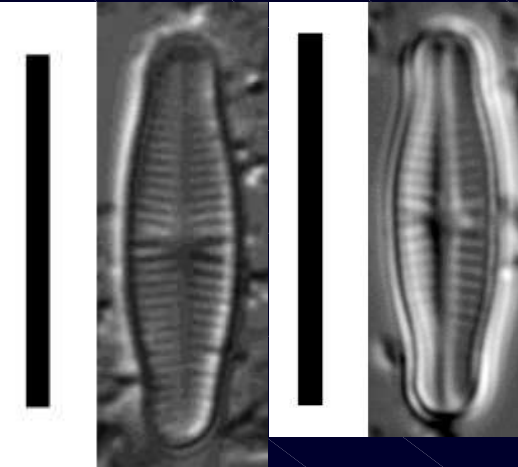




Lineair-elliptisch schaaltsjes



Verskil met *A. minutissimum*



duidelijk convex in centrum
minder gracieuze vorm

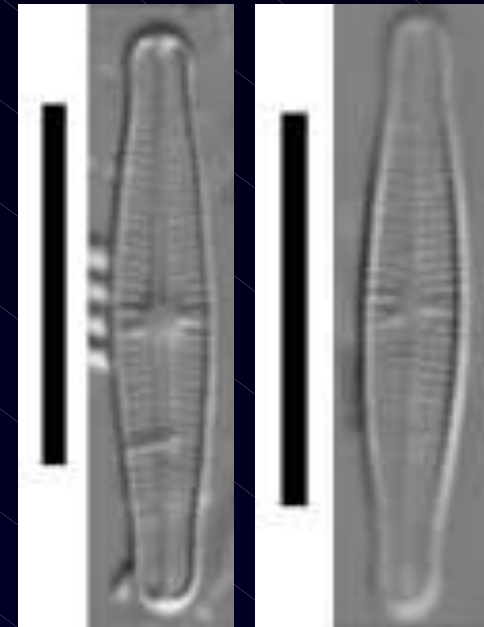
‘dikke nek’

dikke, voorgevormde uiteinden

Minder striae/10 μm

L 8-15 μm
W 3-4 μm
 S_{RL} 28 in 10 μm
 S_{R} 28 in 10 μm

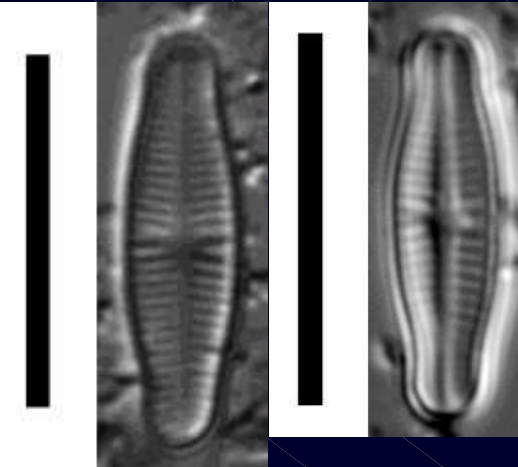
A. saprophilum



L 5-25 μm
W 2.5-3.5 (4) μm
 $S_{\text{RL}} \pm 30$ in 10 μm
 $S_{\text{R}} \pm 30$ in 10 μm

A. minutissimum

Verschil met *A. eutrophilum*



L 8-15 μm
W 3-4 μm
S_{RL} 28 in 10 μm
S_R 28 in 10 μm

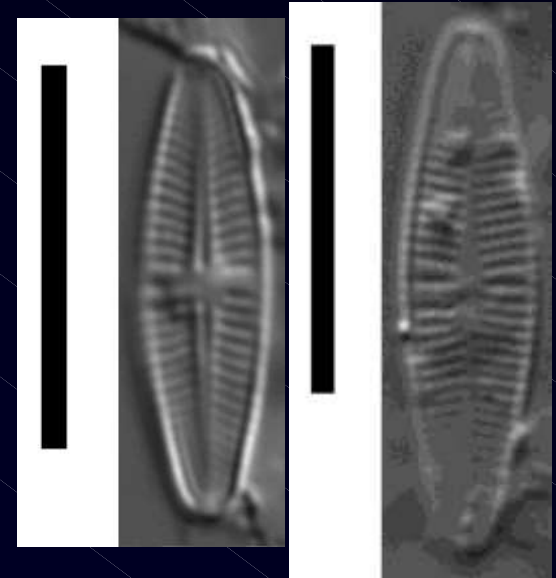
A. saprophilum

Andere vorm
(elliptisch vs rhombisch)

Duidelijk dikke kopjes

Andere centrale zone

andere ecologie



L 4-18 μm
W 3-4 μm
S_{RL} 24-27 in 10 μm
S_R 24-27 in 10 μm

A. eutrophilum

Ecologie

Krammer & Lange-Bertalot (1991):

in organisch zwaar tot zeer zwaar belaste waterlopen
verhoogd trofisch gehalte

Verskillende bronnen:

pollutie-tolerant
verhoogde saprobie

Hlubicková & Ector (2009):

	pH	Cond. μS/cm	O2 mg/l	BOD mg/l	COD mg/l	NH4+ mg/l	NO3- mg/l	PO4-- mg/l
14.03.05	8.1	1019	10	14	13.4		3.6	4.85

Achnantheidium catenatum (Bily & Marvan) Lange-Bertalot

Basionym: *Achnanthes catenata* Bily & Marvan 1959

Beschrijving: Gordelaanzicht duidelijk gekromd, ketting-vormend
schaaltjes lineair tot zeer smal lanceolaat met verdikt
middengedeelte

breed afgeronde, capitate uiteinden

Valve lengte: 9-16 μm valve breedte: 3.0-3.5 μm

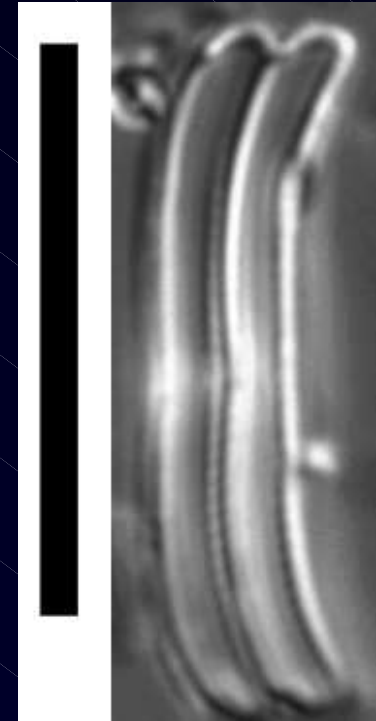
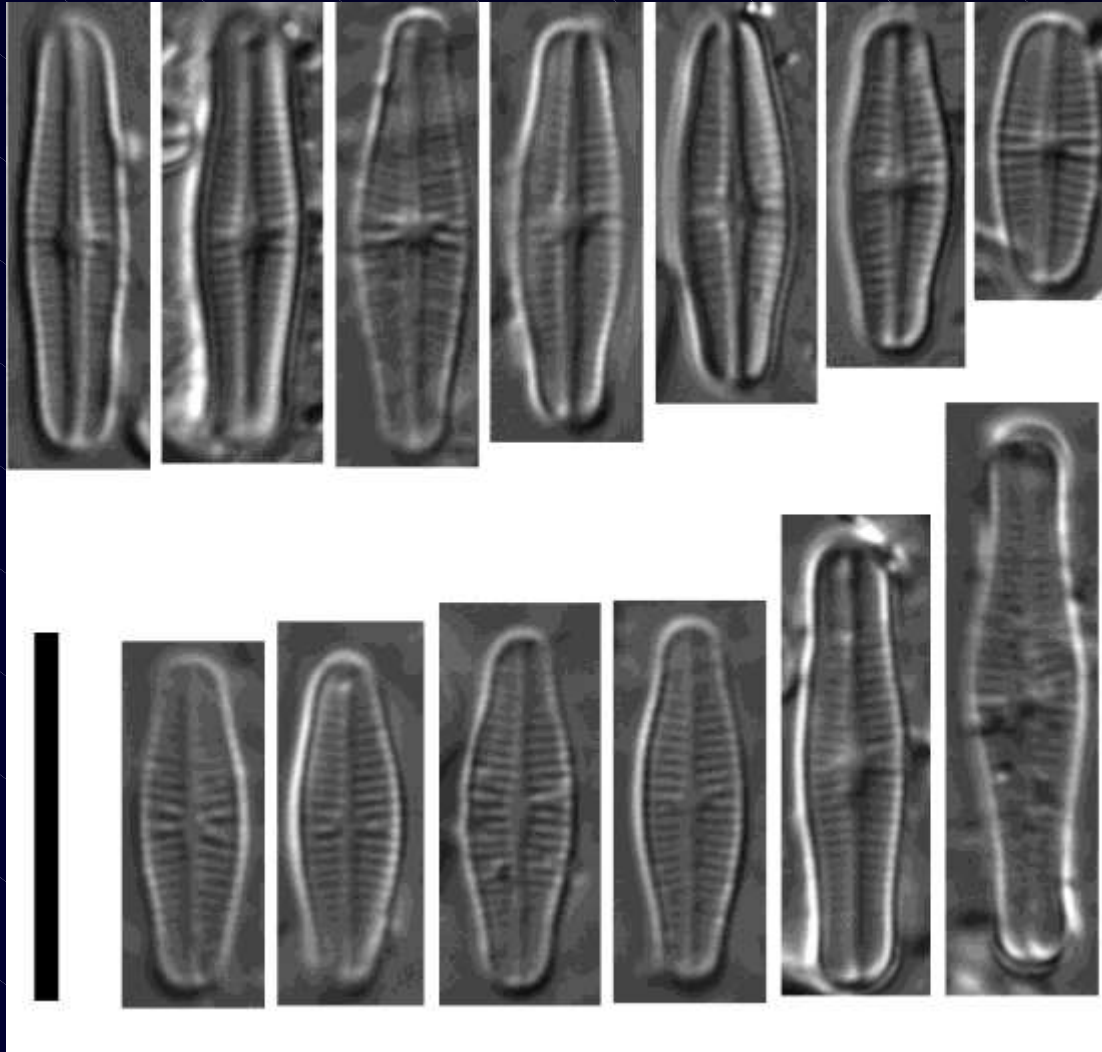
Axiale zone zeer smal, lineair voor beide schaaftjes

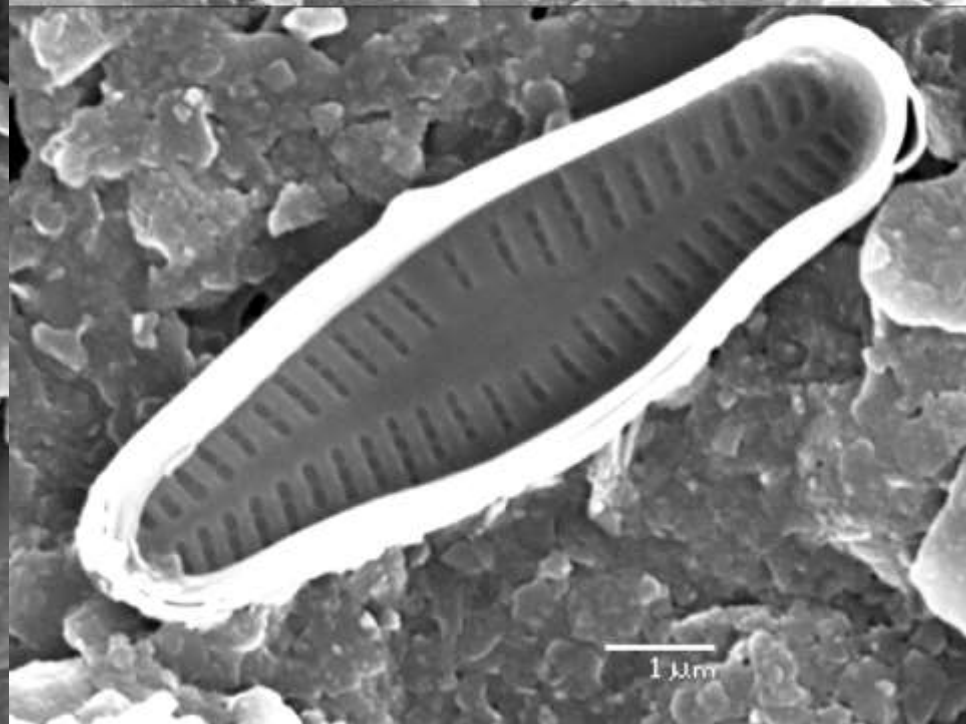
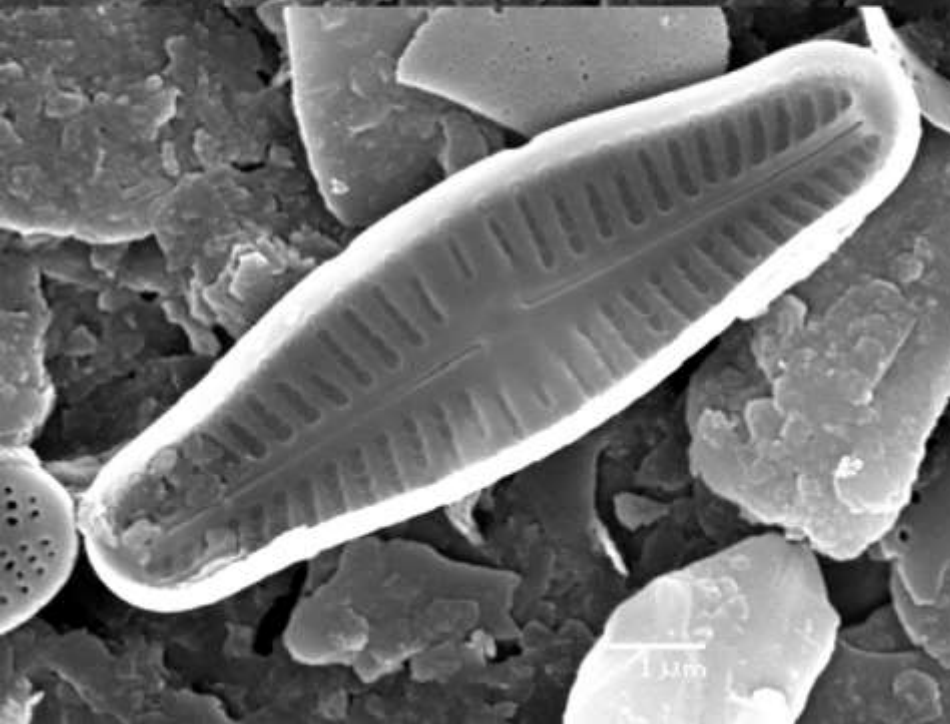
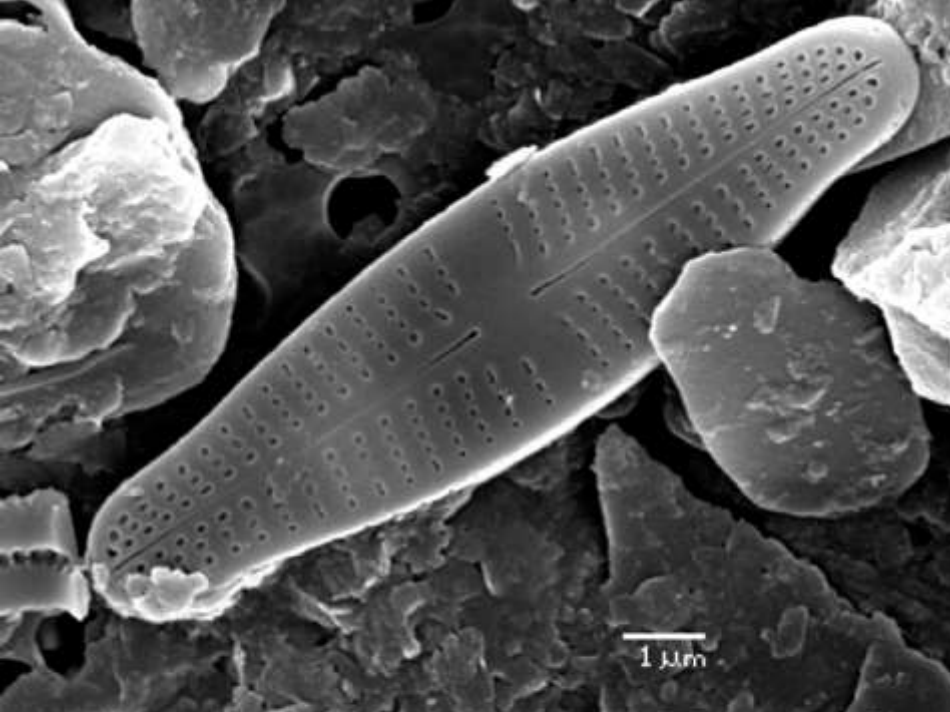
Centrale zone klein maar aanwezig door korte of verdwenen striae

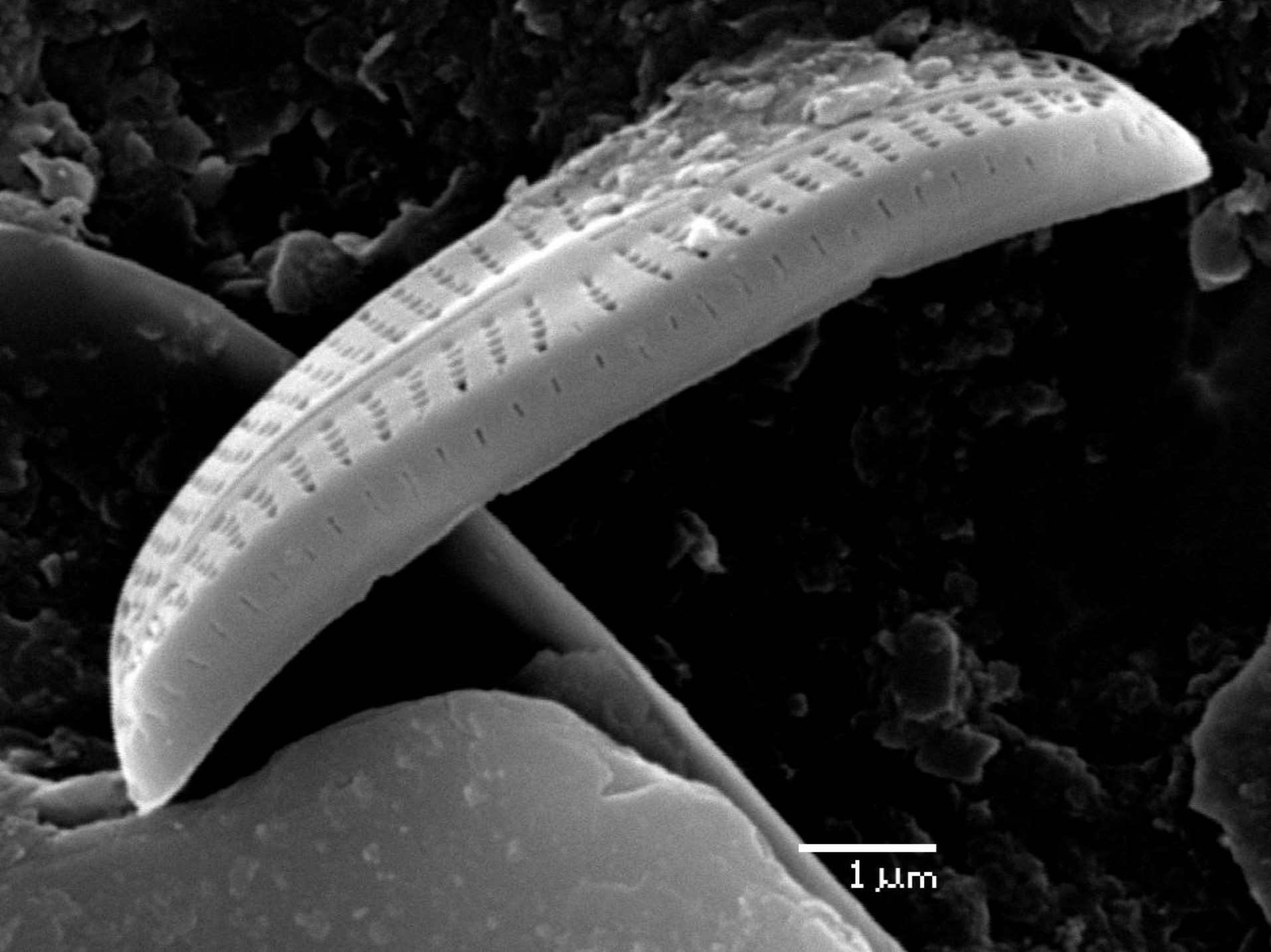
Striae op beide schaaftjes radiaat, in het midden verder
uiteenwijkend: 28-30 in 10 μm

Ultrastructuur: terminale raphe-uiteinden recht, kort
maximaal 2-3 ronde areolen + 1 langgerekte areola
per stria

Achnanthydium catenatum (Bily & Marvan) Lange-Bertalot







1 μm

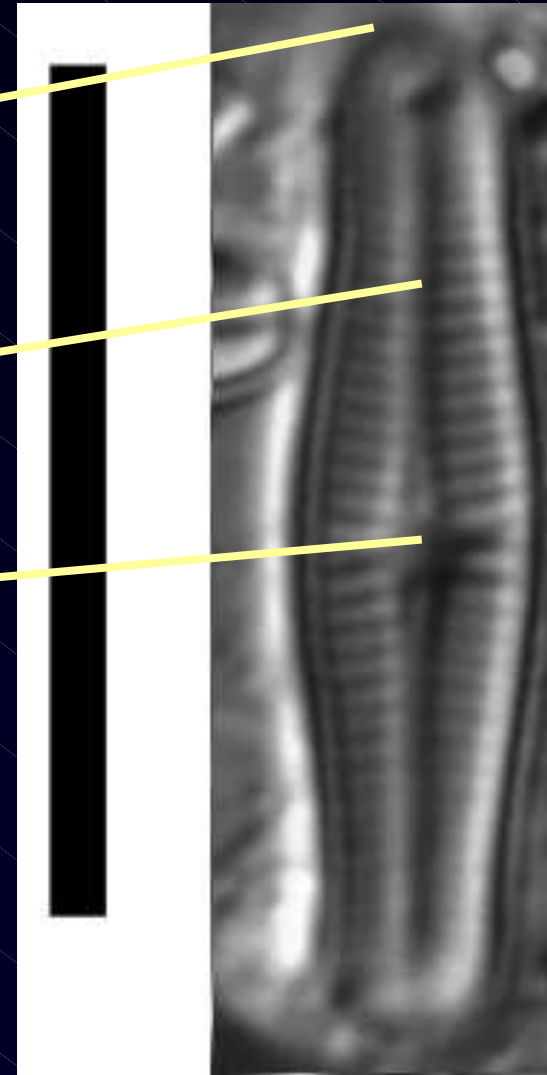
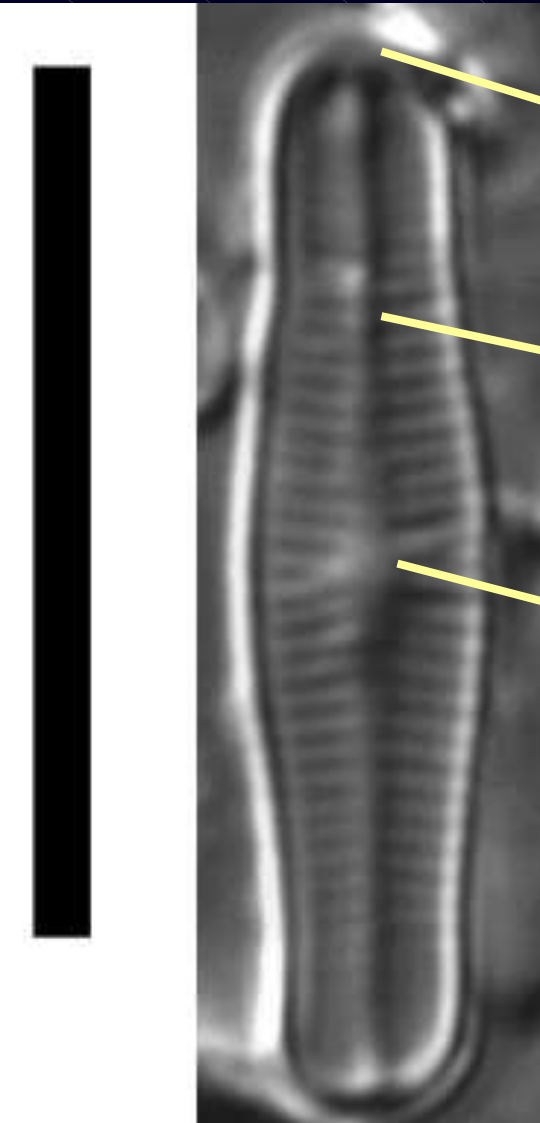
Lineair-elliptisch schaaltsjes
verdikt midden

breed afgeronde
voorgevormde uiteinden

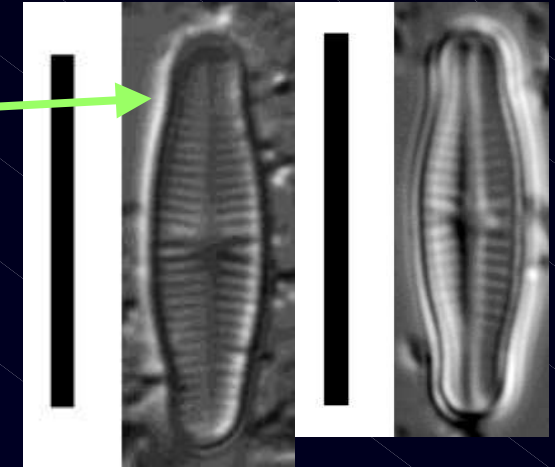
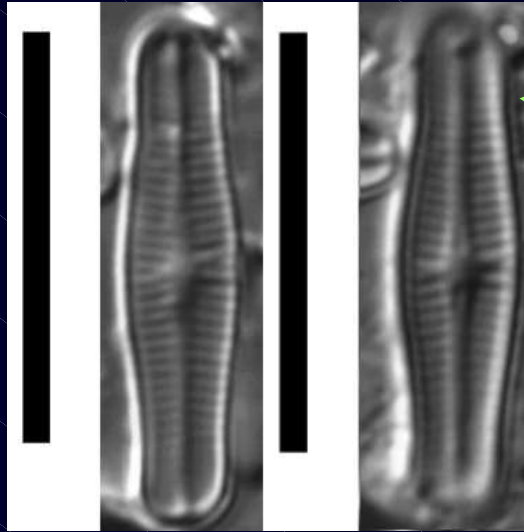
axiale zone smal

centrale zone
klein maar aanwezig

striatie patroon
vrij grof,
radiaat



Verskil met *A. saprophilum*



Minder 'dikke nek' →

Duidelijk kopjes

Zijaanzicht bepalend

L 9-16 μm
W 3-3.5 μm
S_{RL} 28-30 in 10 μm
S_R 28-30 in 10 μm

A. catenatum

L 8-15 μm
W 3-4 μm
S_{RL} 28 in 10 μm
S_R 28 in 10 μm

A. saprophilum

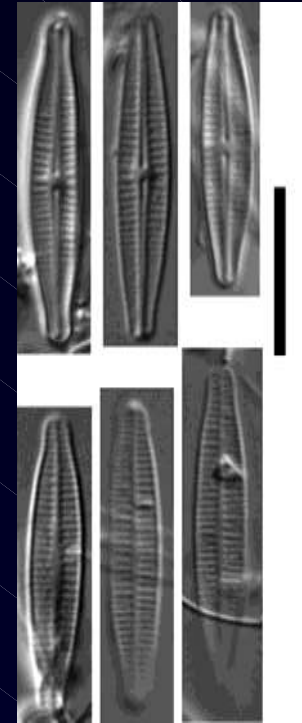
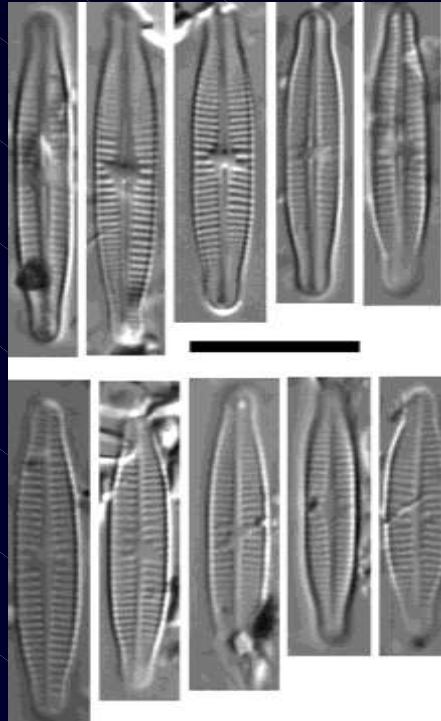
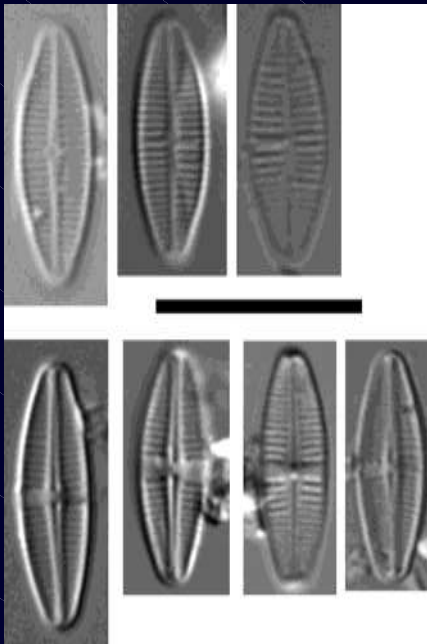
Ecologie

Krammer & Lange-Bertalot (1991):
voornamelijk in meren (plankton)

oorspronkelijk enkel in Oost- en Centraal-Europa
invasief in West-Europa

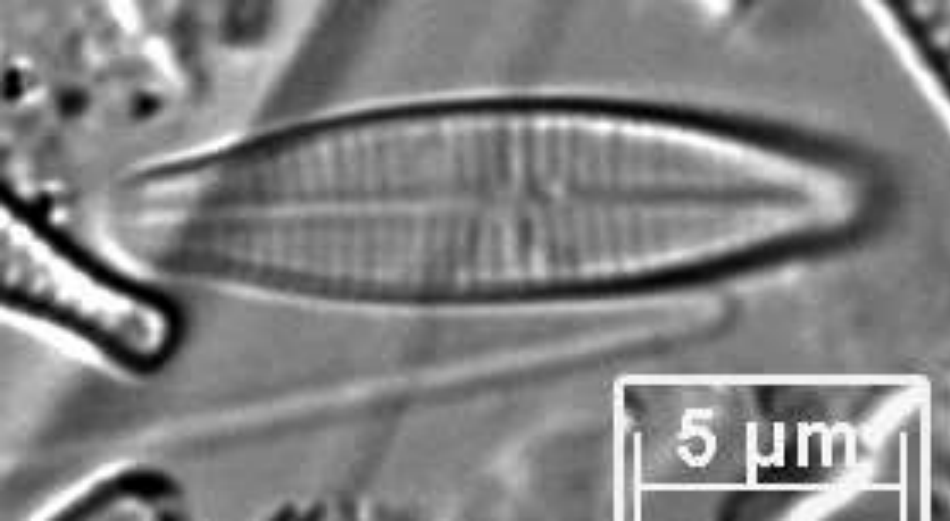
A. pyrenaicum-complex

Achnanthidium thienemannii
(Hustedt) Lange-Bertalot

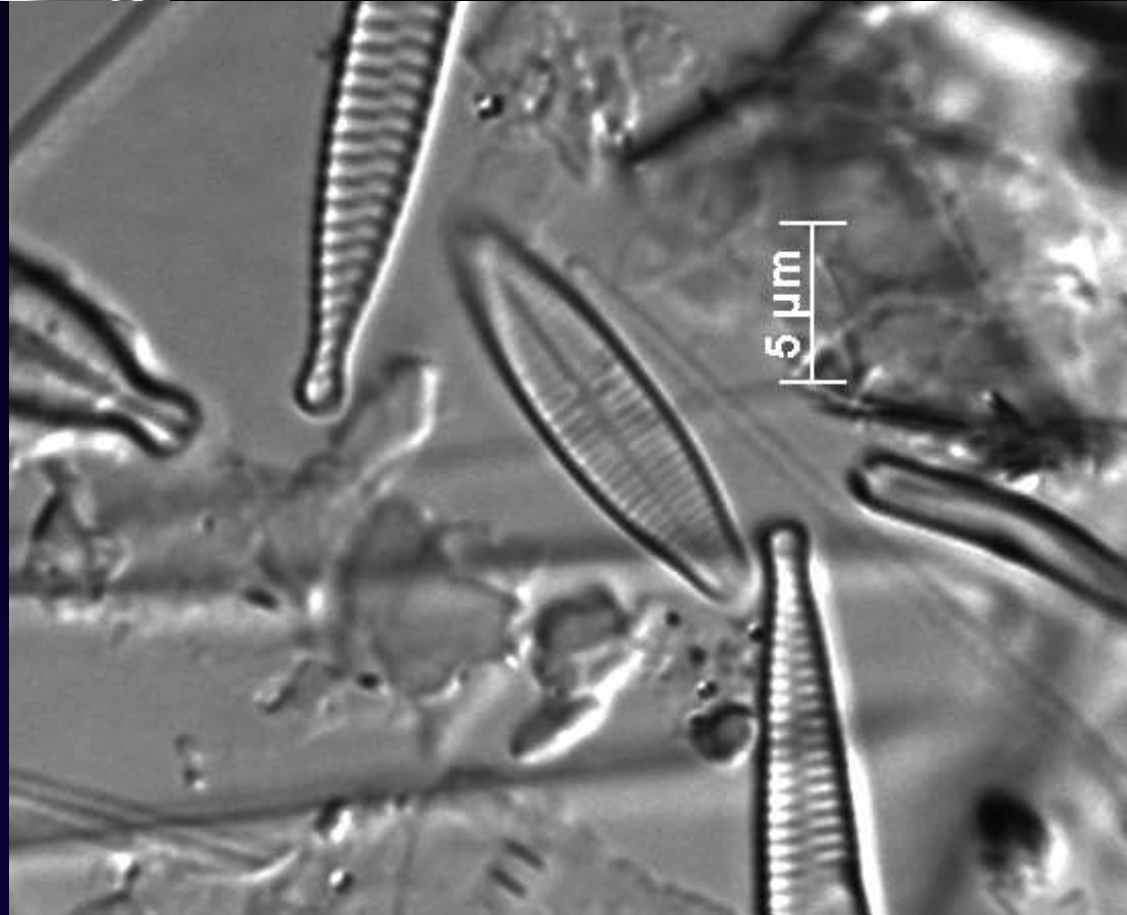


Achnanthidium pyrenaicum
(Hustedt) Kobayasi

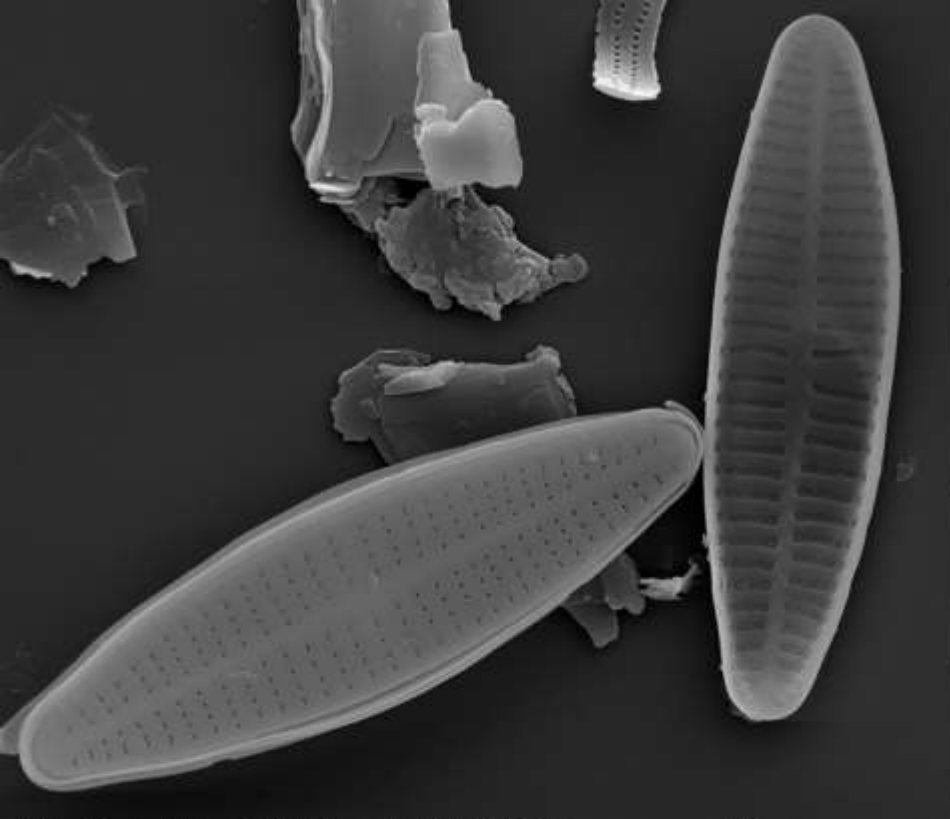
Achnanthidium gracillimum
(Meister) Lange-Bertalot



type material from Hustedt

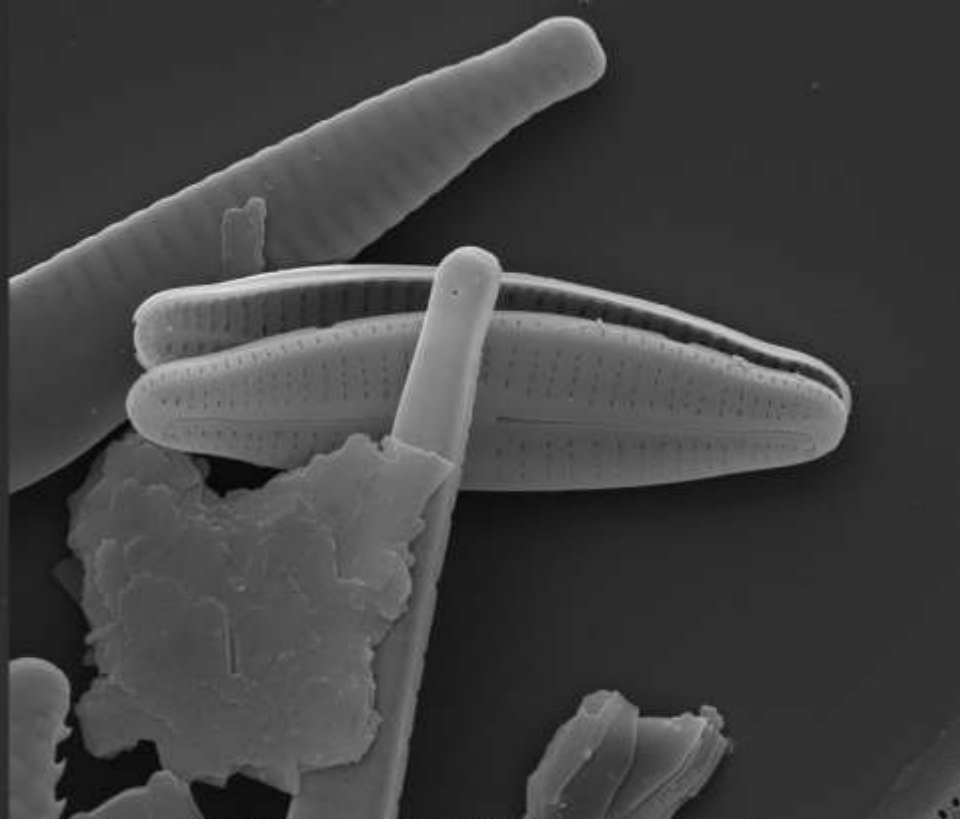


(many thanks to Friedel Hinz)



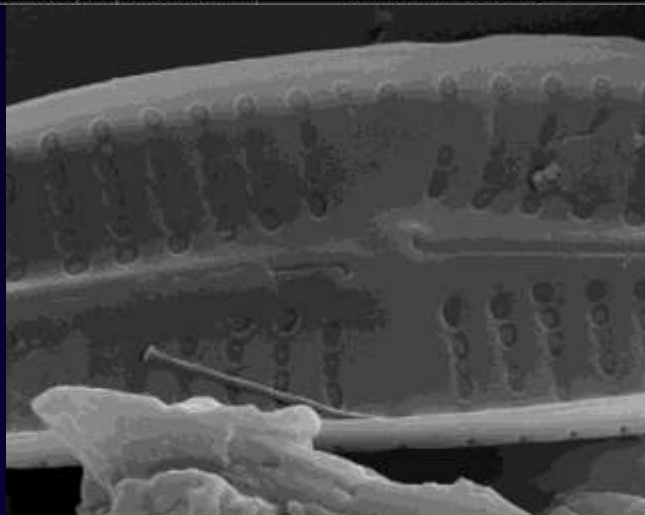
HV	Spot	WD	Tilt	Mag	Sig	Date	Time
10.0 kV	3.0	10.0 mm	0.8 °	15000x	SE	10/30/2009	12:09:09 PM

5.0µm
E809 Gave d'Ossau 2



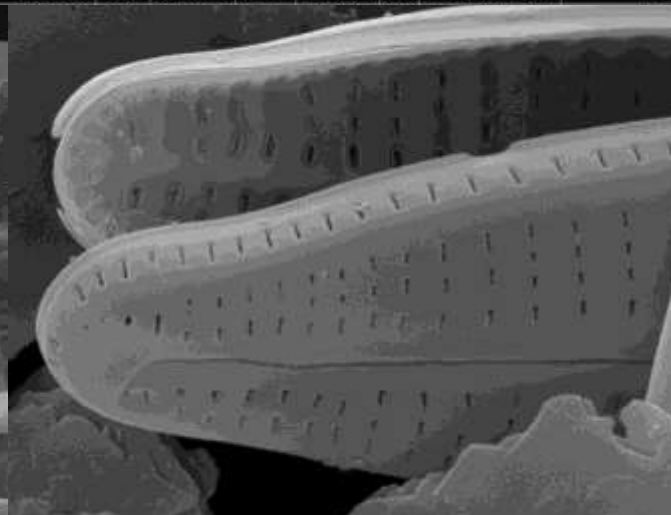
HV	Spot	WD	Tilt	Mag	Sig	Date	Time
10.0 kV	3.0	9.6 mm	0.6 °	15000x	SE	11/6/2009	11:16:27 AM

5.0µm
E809 Gave d'Ossau 2



HV	Spot	WD	Tilt	Mag	Sig	Date	Time
10.0 kV	3.0	9.2 mm	0.6 °	50000x	SE	11/6/2009	9:45:17 AM

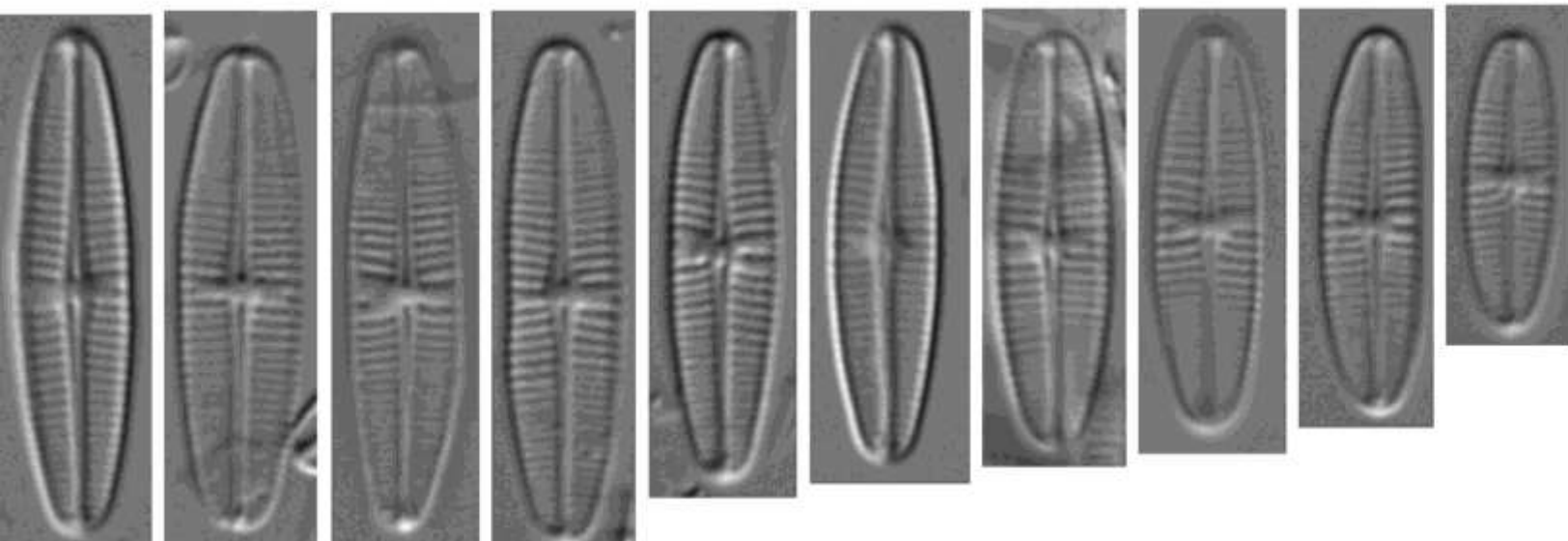
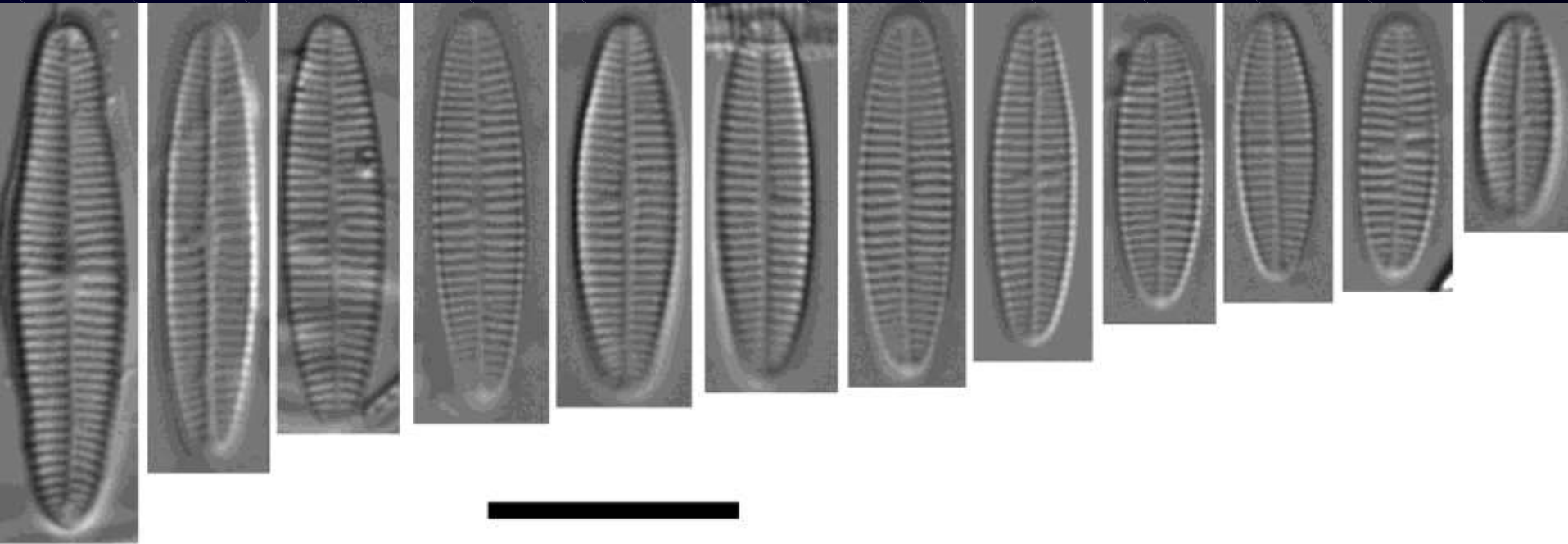
2.0µm
E809 Gave d'Ossau 2

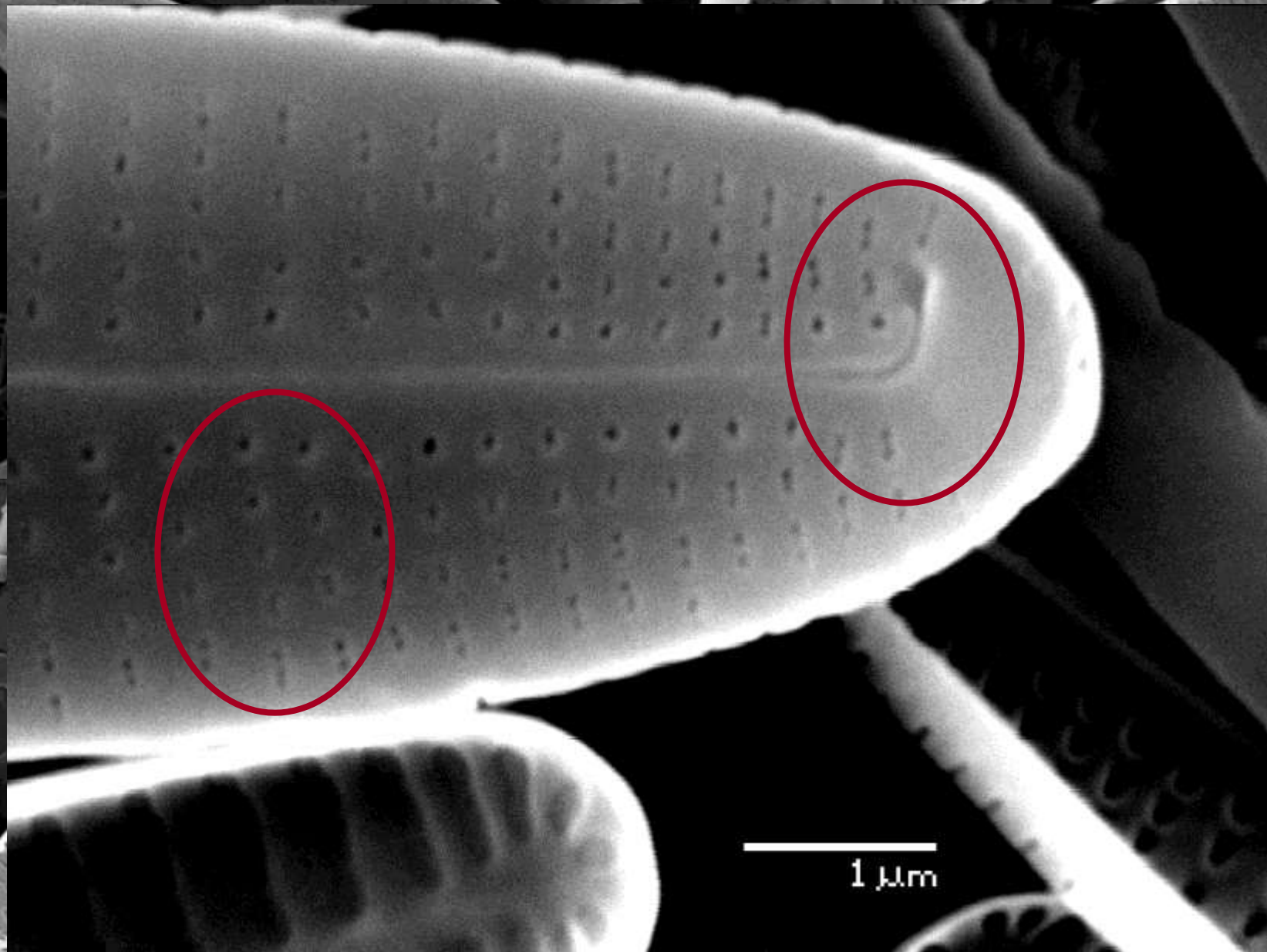


HV	Spot	WD	Tilt	Mag	Sig	Date	Time
10.0 kV	3.0	9.6 mm	0.6 °	50000x	SE	11/6/2009	11:18:12 AM

2.0µm
E809 Gave d'Ossau 2

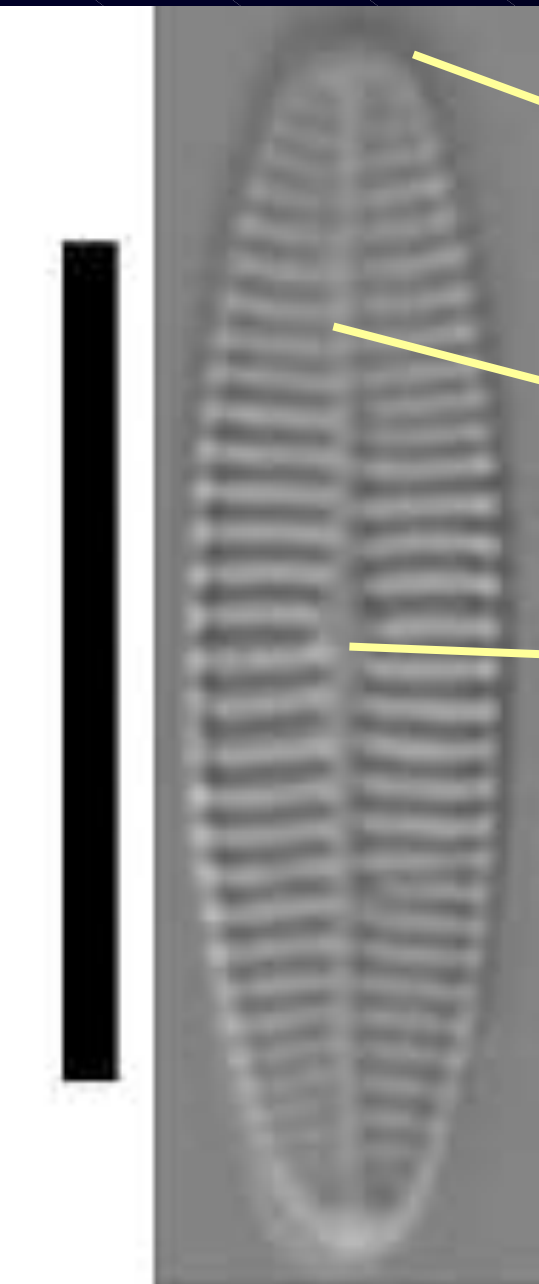
A. pyrenaicum (Hustedt) Kobayasi





2 μm

1 μm



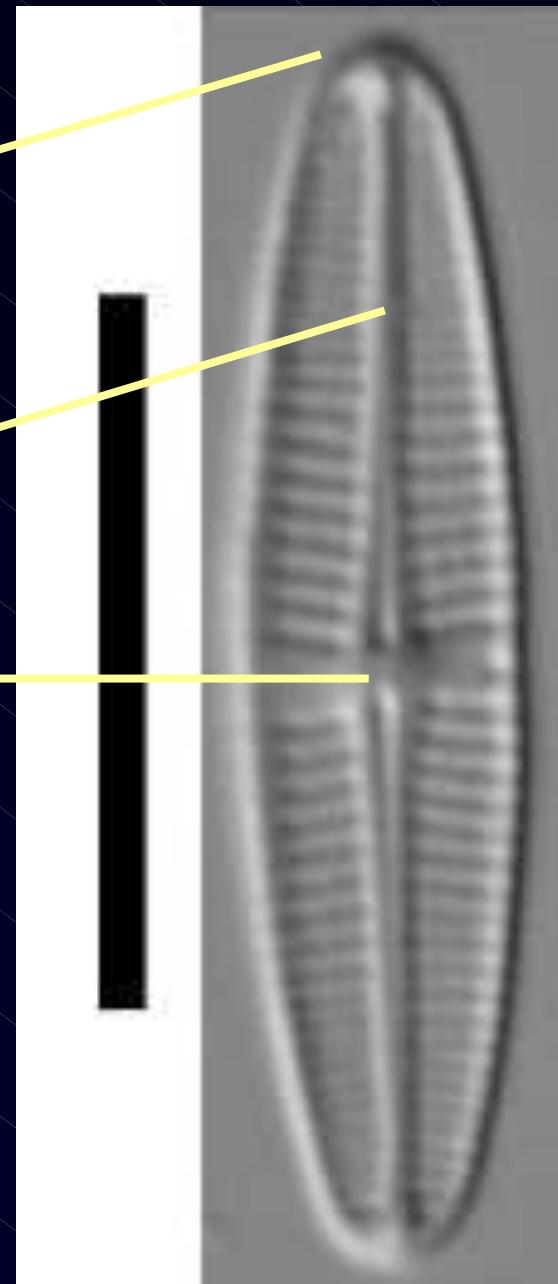
elliptische schaaltes
soms langgerekt

weinig uitgesproken
uiteinden

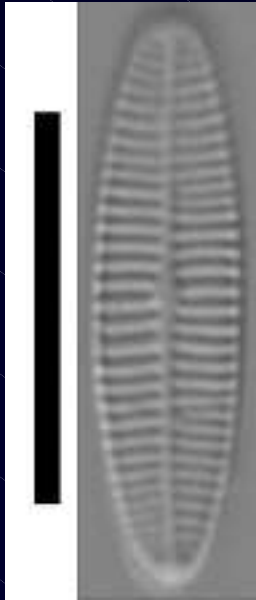
axiale zone smal

centrale zone
klein

striatie patroon
vrij grof



Vershil met *A. minutissimum*



minder striae per 10 μm

duidelijk meer elliptisch

Geen 'kopjes'

andere terminale raphe
(SEM)

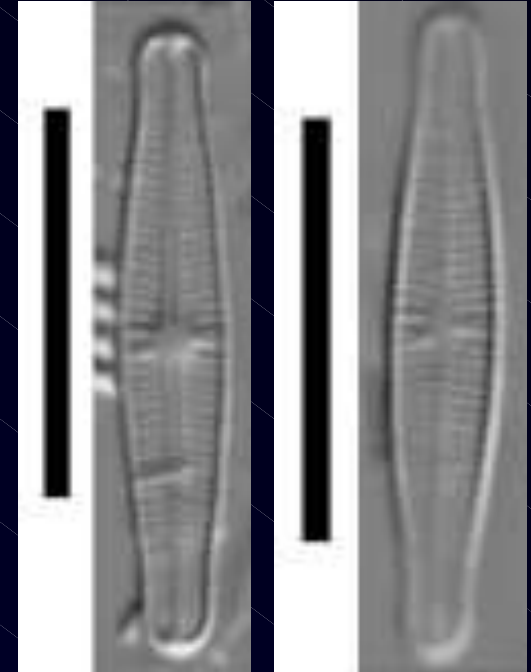
L 6-35 μm

W 3-6 μm

S_{RL} 20-27 in 10 μm

S_{R} 18-24 in 10 μm

A. pyrenaicum



L 5-25 μm

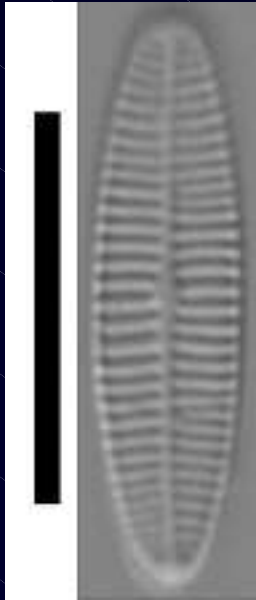
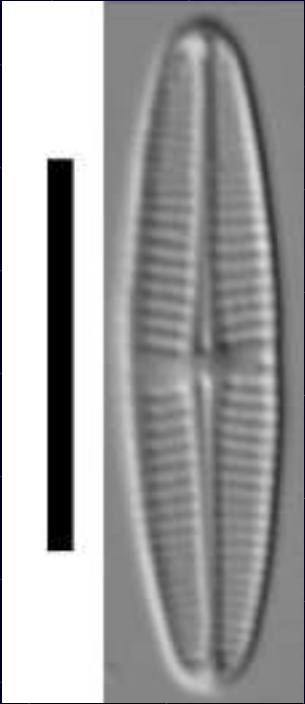
W 2.5-3.5 (4) μm

$S_{\text{RL}} \pm 30$ in 10 μm

$S_{\text{R}} \pm 30$ in 10 μm

A. minutissimum

Verschil met *A. eutrophilum*



minder striae per 10 μm

duidelijk meer elliptisch
Niet rhombisch

andere terminale raphe
(SEM)

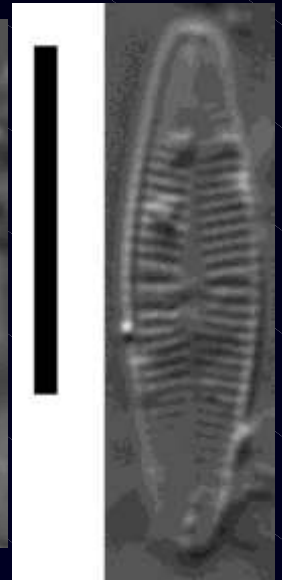
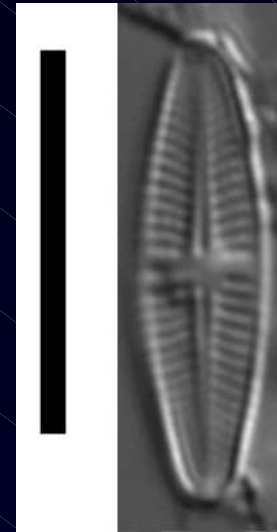
L 6-35 μm

W 3-6 μm

S_{RL} 20-27 in 10 μm

S_R 18-24 in 10 μm

A. pyrenaicum



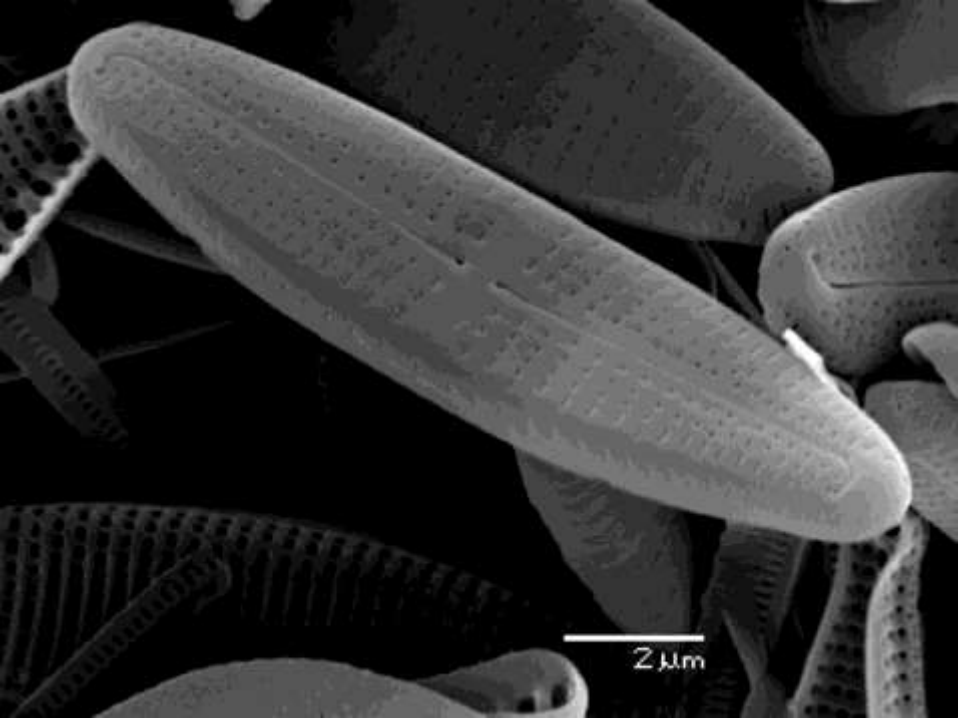
L 4-18 μm

W 3-4 μm

S_{RL} 24-27 in 10 μm

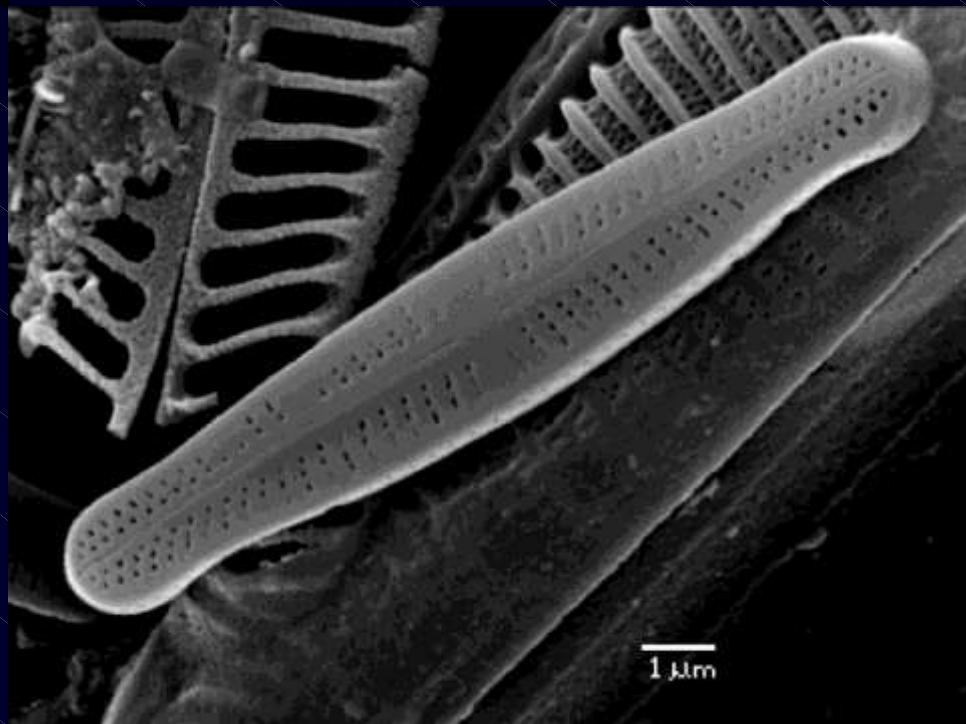
S_R 24-27 in 10 μm

A. eutrophilum



A. pyrenaicum

A. minutissimum



Ecologie

Krammer & Lange-Bertalot (1991):

oligotrofe tot mesotrofe, kalkrijke waterlopen met matige tot hogere elektrolythgehaltenes

Van Dam et al. (1994):

alkalifiel, zoet-brak, mesotrafent

Potapova (2006):

hoge conductiviteit (400-650 $\mu\text{S}/\text{cm}$) en pH (7.5-8.0), laag phosphorus gehalte ($\text{PO}_4 < 30 \mu\text{g}/\text{l}$) en opgeloste stof ($\text{BOD}_5 < 2.5 \text{ mg}/\text{l}$), variabele stikstofgehaltenes ($\text{NO}_3\text{-N } 0.0\text{-}3.4 \text{ mg}/\text{L}$, $\text{NH}_3\text{-N } 0.0\text{-}0.8 \text{ mg}/\text{l}$)

Ector (pers. comm.):

schone kalkrijke rivieren in Alpen, Pyreneeën

ALGEMENE SOORT

Achnantheidium thienemannii (Hustedt) Lange-Bertalot

Basionym: *Achnanthes thienemannii* Hustedt in Arc. Hydrobiol. (1942)

Synoniemen: *Achnanthes biasoletiana* var. *thienemannii* (Hust.) Lange-Bertalot

Beschrijving: schaaltes lineair, in het midden zwak concaaf
rostrate tot zwak capitate uiteinden

Valve lengte: 16-21 μm valve breedte: $\pm 3.5 \mu\text{m}$

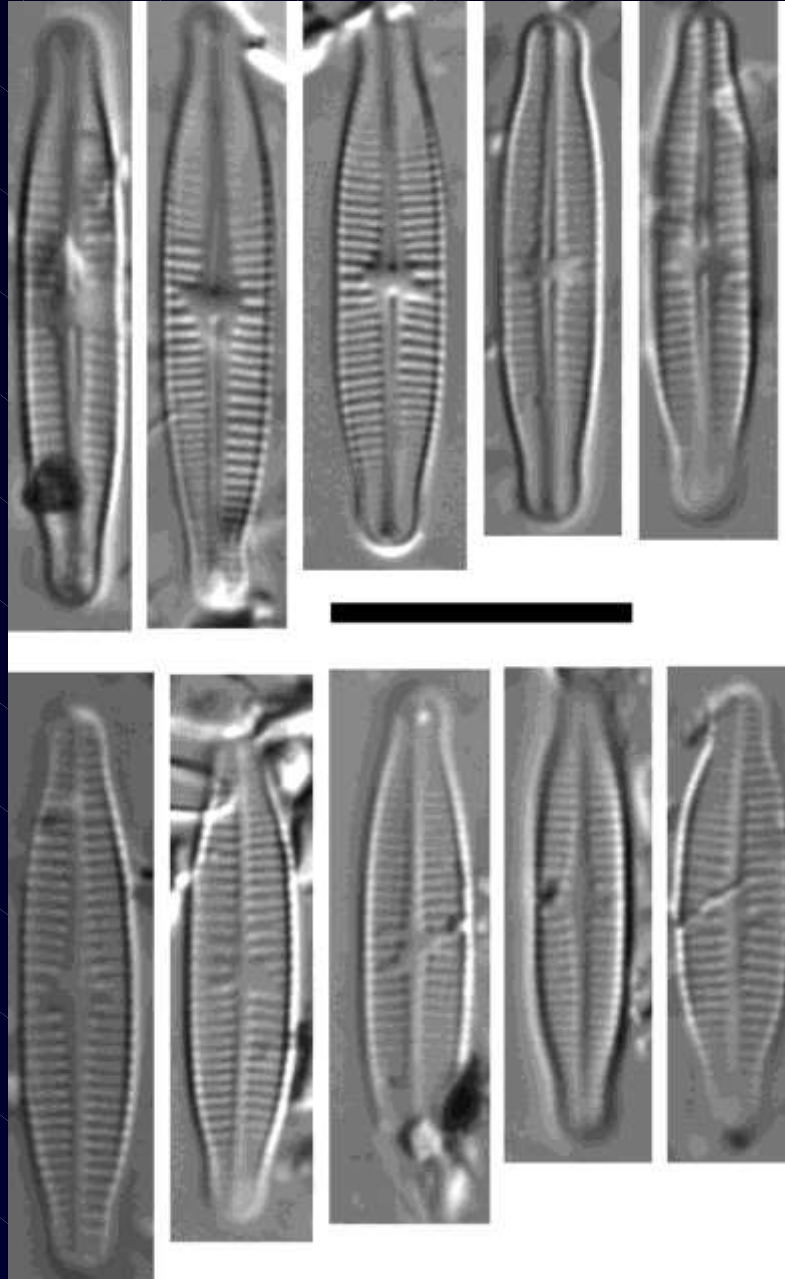
Axiale zone smal, lineair voor beide schaaltes, verbredend naar het
midden

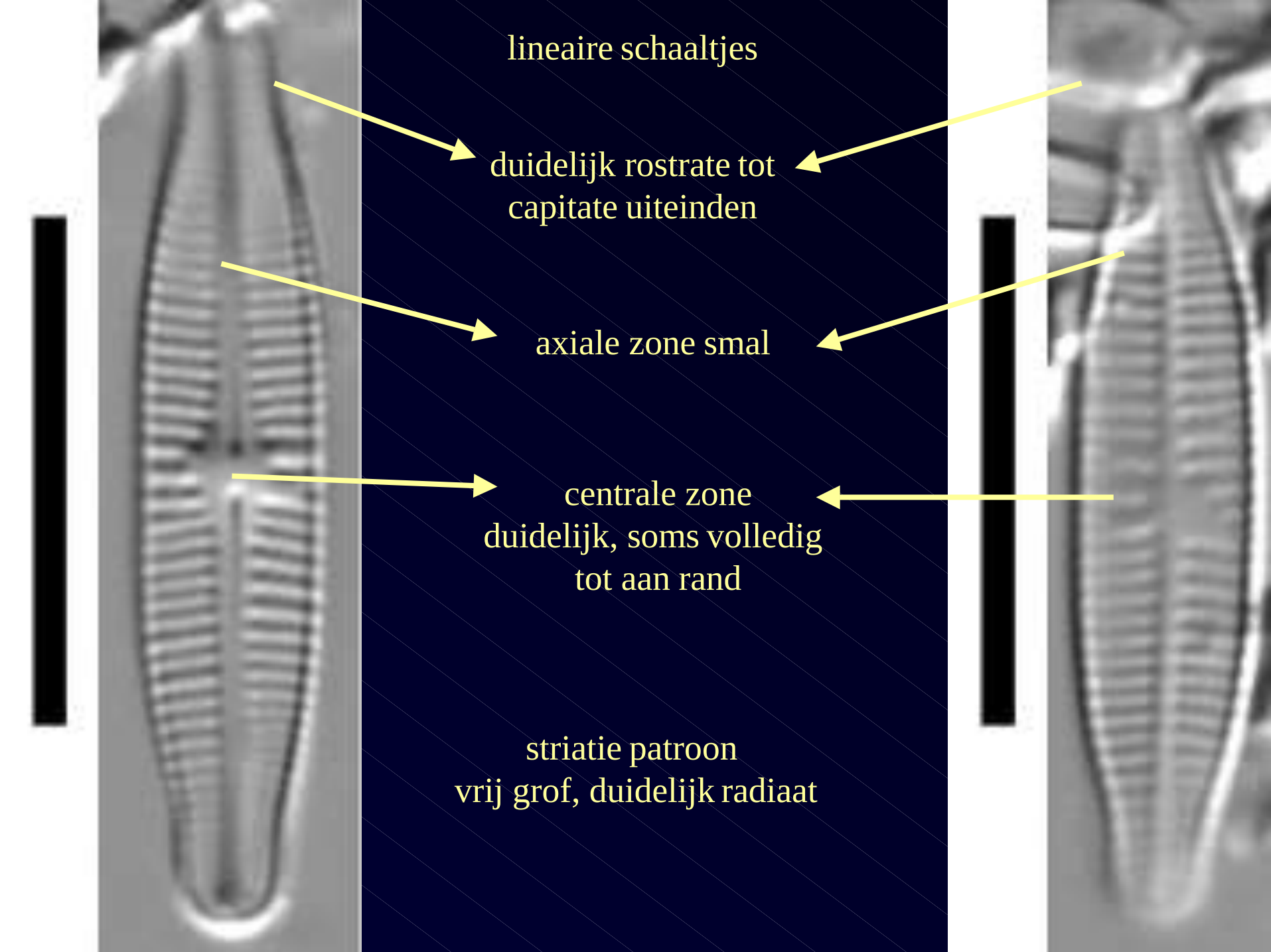
Centrale zone klein tot duidelijk aanwezig met enkele verkorte
striae, soms asymmetrisch

Striae op beide schaaltes duidelijk radiaat: 24-25 in 10 μm

Ultrastructuur: terminale raphe-uiteinden gebogen op het schaalte
maximaal 3-4 areolen per stria

Achnanthyidium thienemannii (Hustedt) Lange-Bertalot





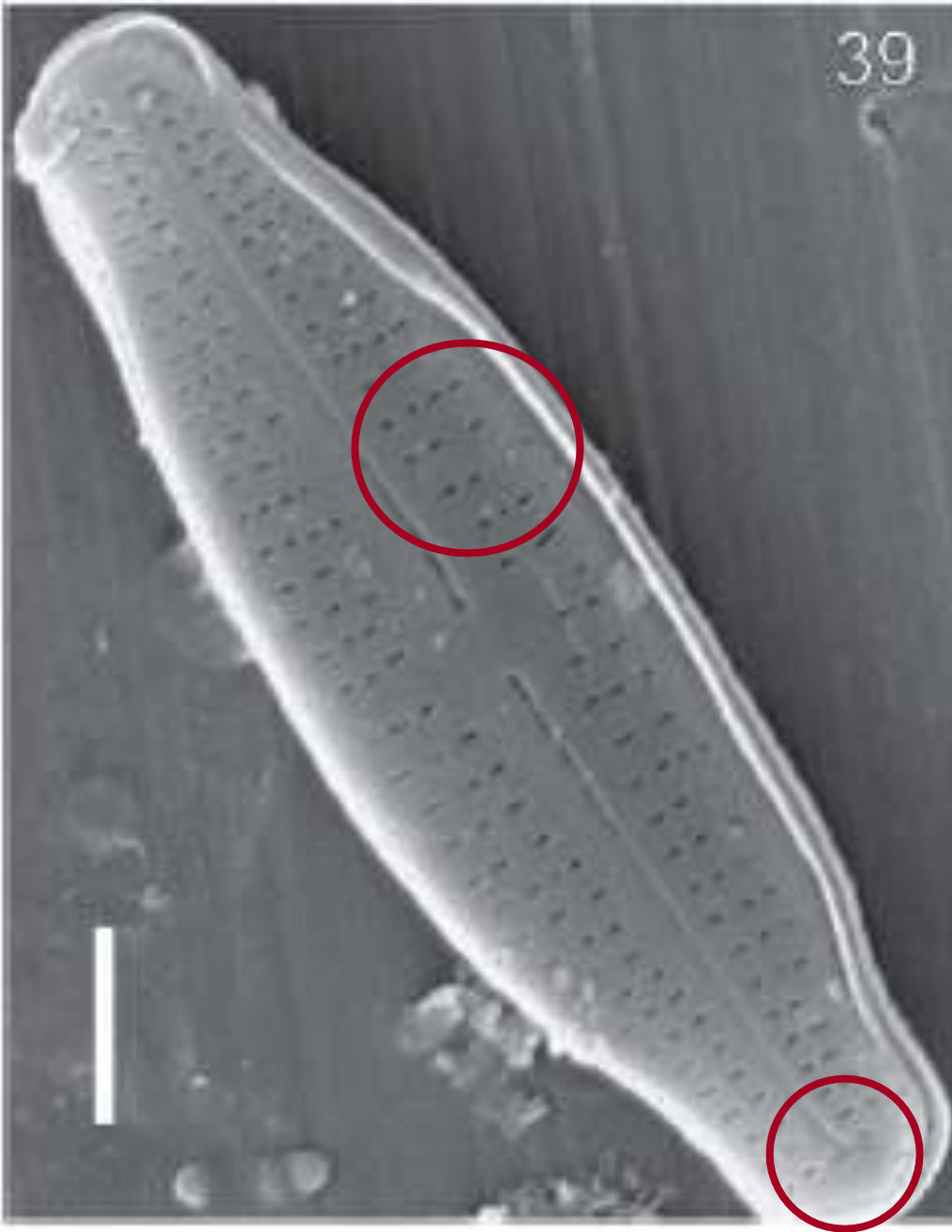
lineaire schaal

duidelijk rostrate tot
capitate uiteinden

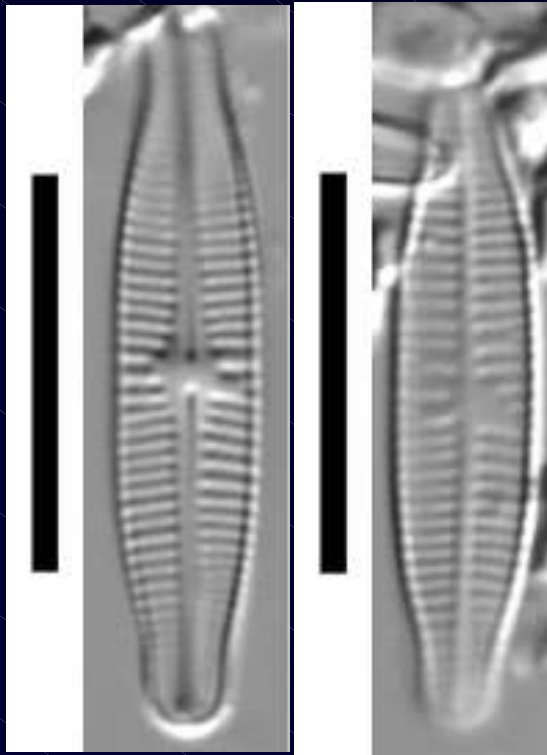
axiale zone smal

centrale zone
duidelijk, soms volledig
tot aan rand

striatie patroon
vrij grof, duidelijk radiaat

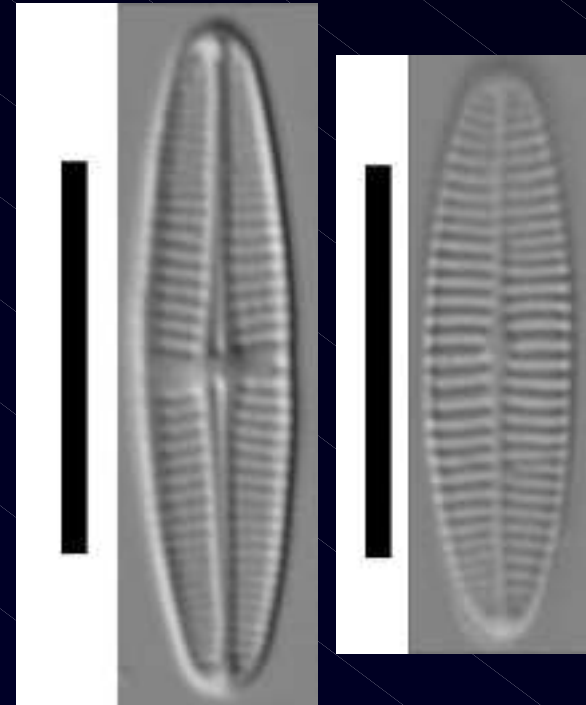


Verskil met *A. pyrenaicum*



A. thienemannii

duidelijk lineaire schaaltes
Duidelijk rostraat tot capitaat
Lager aantal areolen/stria
(SEM)



A. pyrenaicum

Ecologie

Krammer & Lange-Bertalot (1991):

oligotrofe tot mesotrofe, kalkrijke waterlopen met matige tot hogere elektrolythgehaltes

Potapova (2006):

relatief lage fosfaatgehaltes (PO_4 2-18 $\mu\text{g/L}$) en nitraatgehaltes ($\text{NO}_3\text{-N}$ 1-1.3 mg/L), ietwat verhoogde gehaltes organische stof (BOD_5 2.0-3.2 mg/L), en ammonium ($\text{NH}_3\text{-N}$ 0.1-1.5 mg/L).

Conductiviteit 137-412 $\mu\text{S/cm}$, pH 7.4-7.7

Jarlman (2002-2005):

enkel in uiterste noorden van Zweden (Abisko, Lapland), pH 7.45, conductiviteit <100 $\mu\text{S/cm}$, totaal N-gehalte 264 $\mu\text{g/l}$, totaal P-gehalte 4 $\mu\text{g/l}$

ZELDZAME SOORT

Achnanthidium gracillimum (Meister) Lange-Bertalot

Basionym: *Microneis gracillima* Meister in Kieselalgen der Schweiz (1912)

Synoniemen: *Achnanthes minutissima* var. *gracillima* (Meister) Lange-Bertalot
Achnanthidium alteragracillimum (Lange-Bertalot) Round & Bukht.

Beschrijving: schaaltsjes lineair tot zeer smal lanceolaat
min of meer capitate uiteinden bij grote exemplaren, rostraat bij
kleinere exemplaren

Valve lengte: 8-44 μm valve breedte: 3.5-4.5 μm

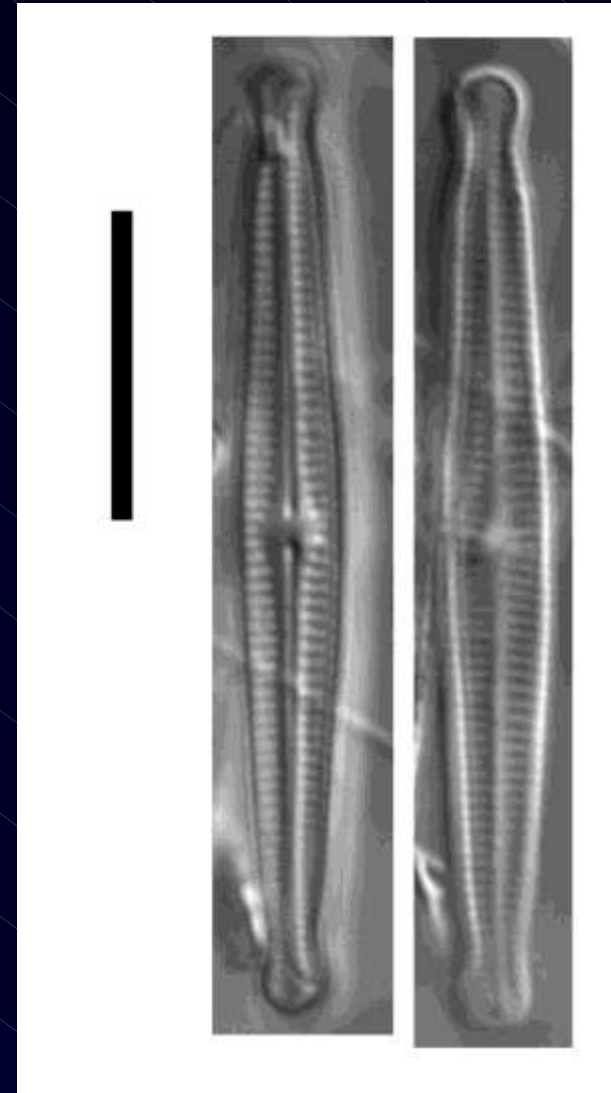
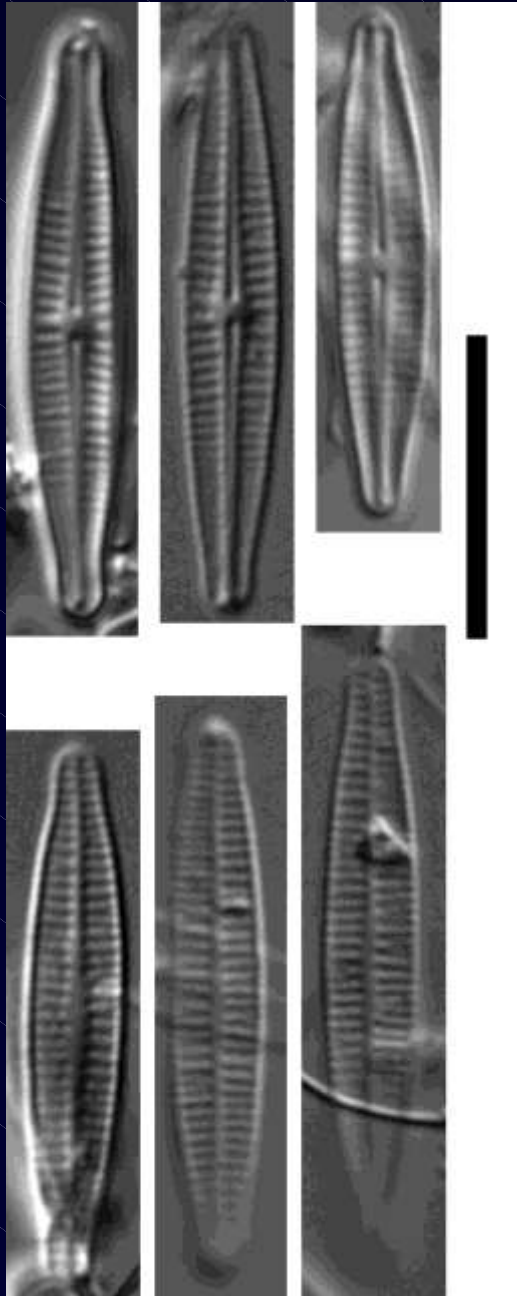
Axiale zone zeer smal, lineair voor beide schaaltsjes

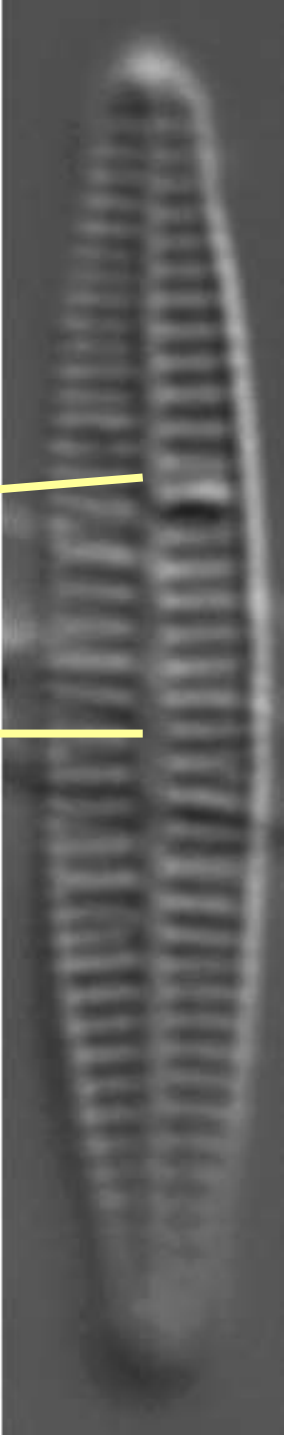
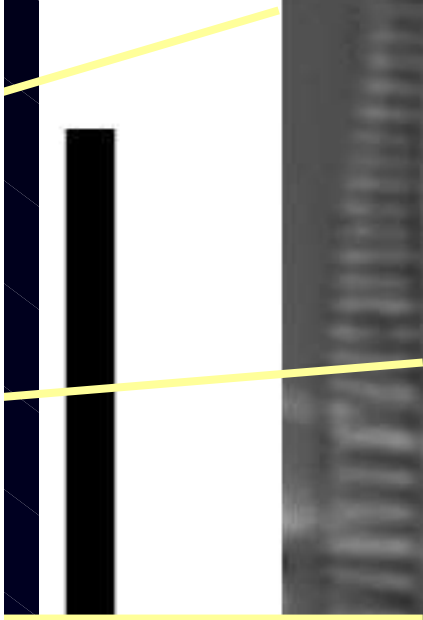
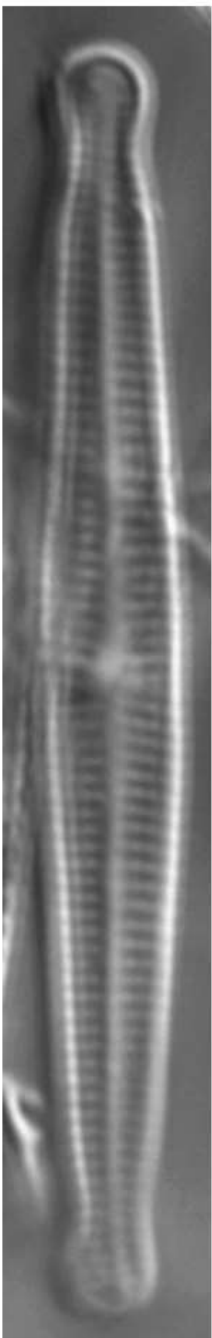
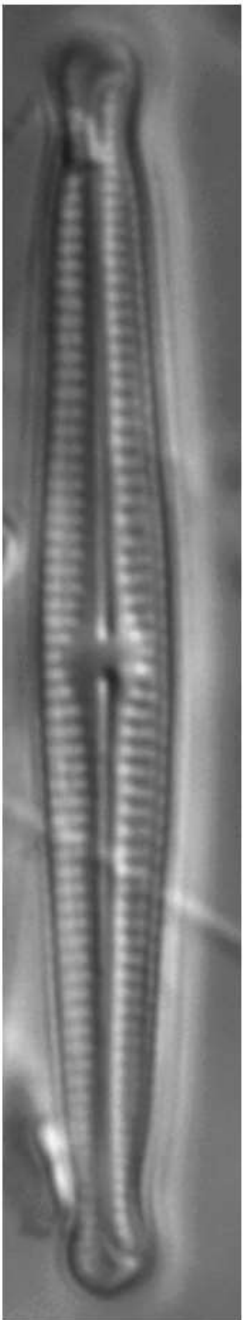
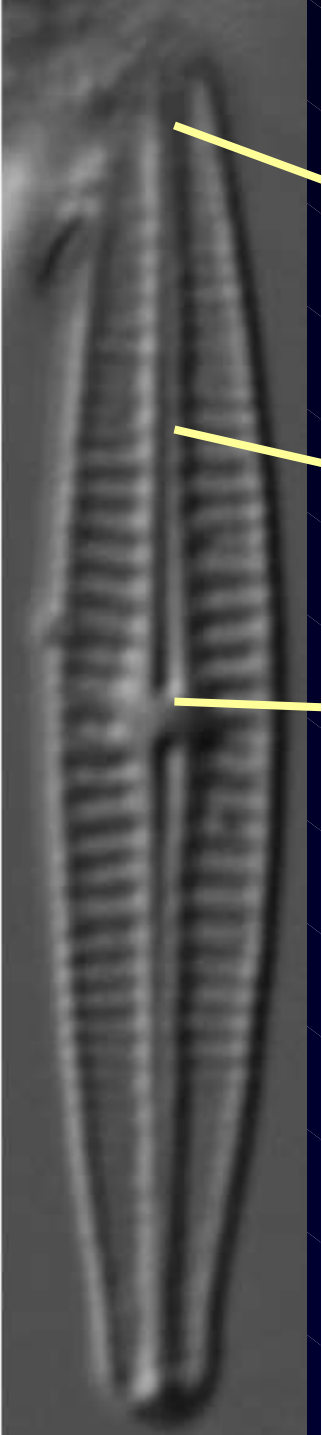
Centrale zone klein tot onbestaande, met soms enkele verkorte
striae, soms asymmetrisch

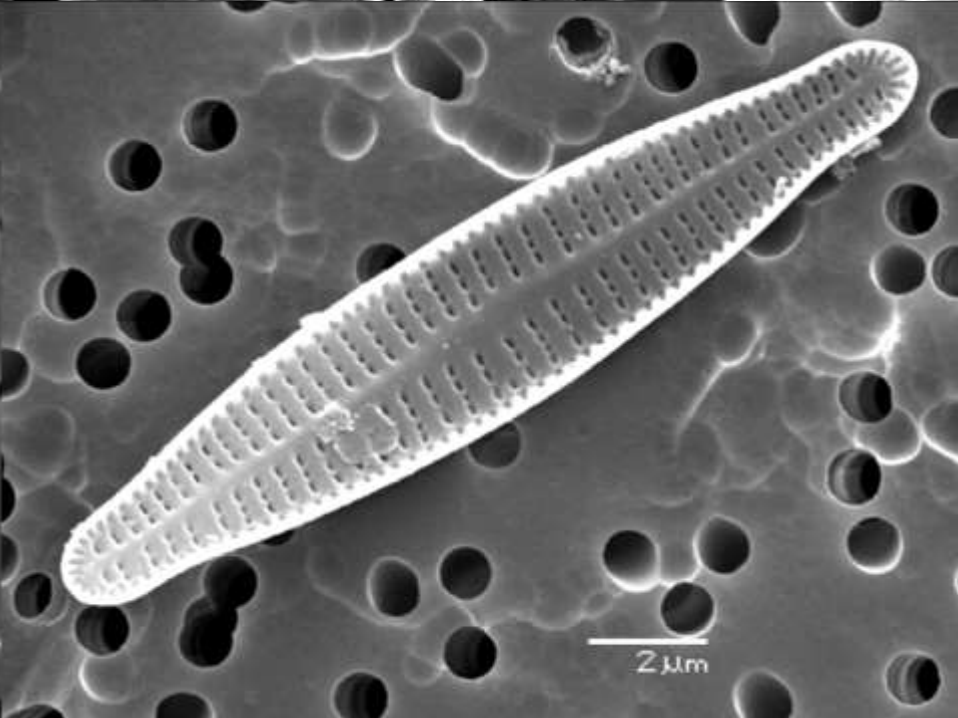
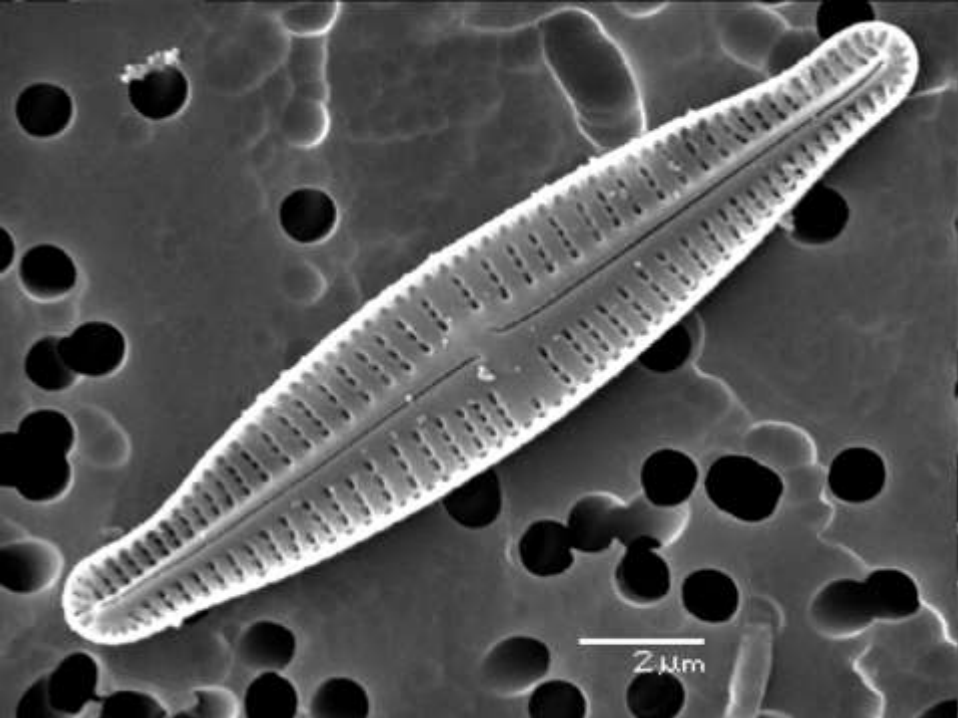
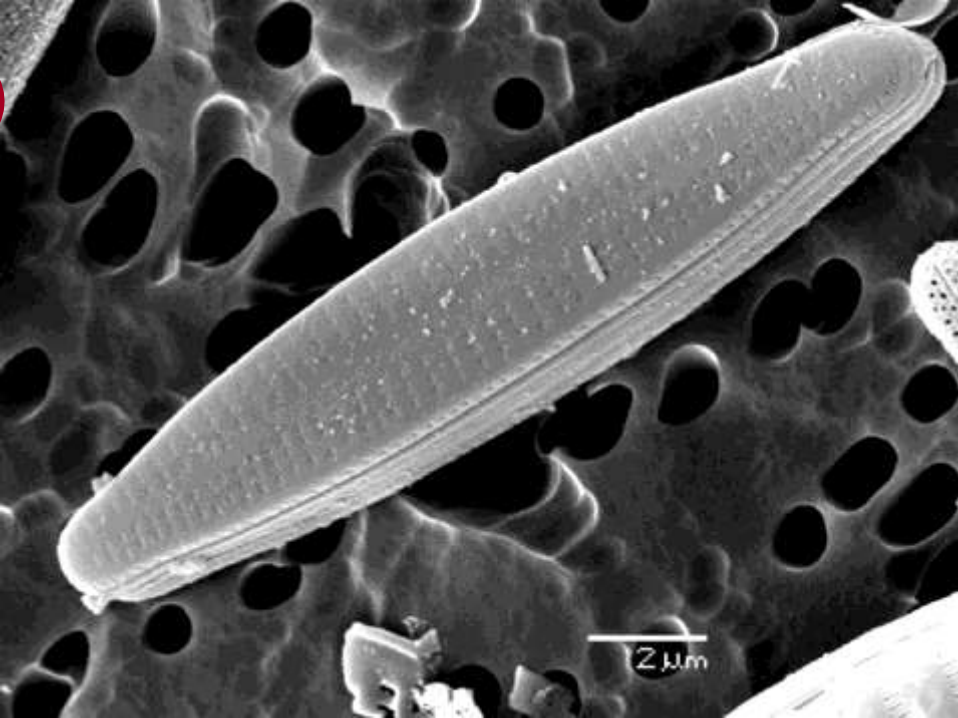
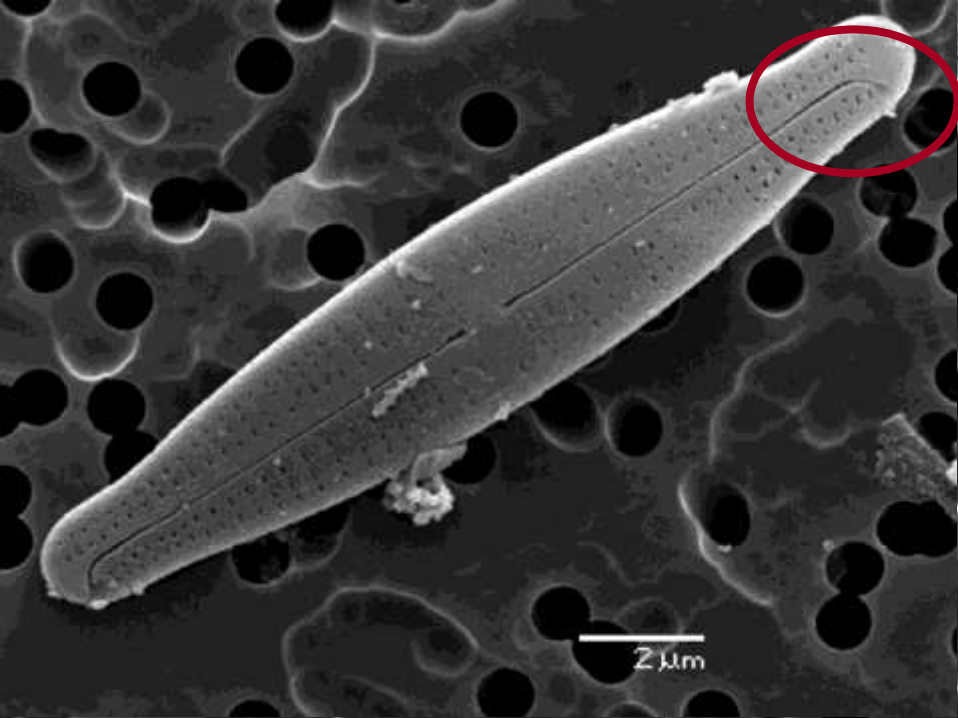
Striae op beide schaaltsjes vrij parallel: 22-25 in 10 μm

Ultrastructuur: terminale raphe-uiteinden gebogen op het schaaltsje
maximaal 3-4 areolen per stria

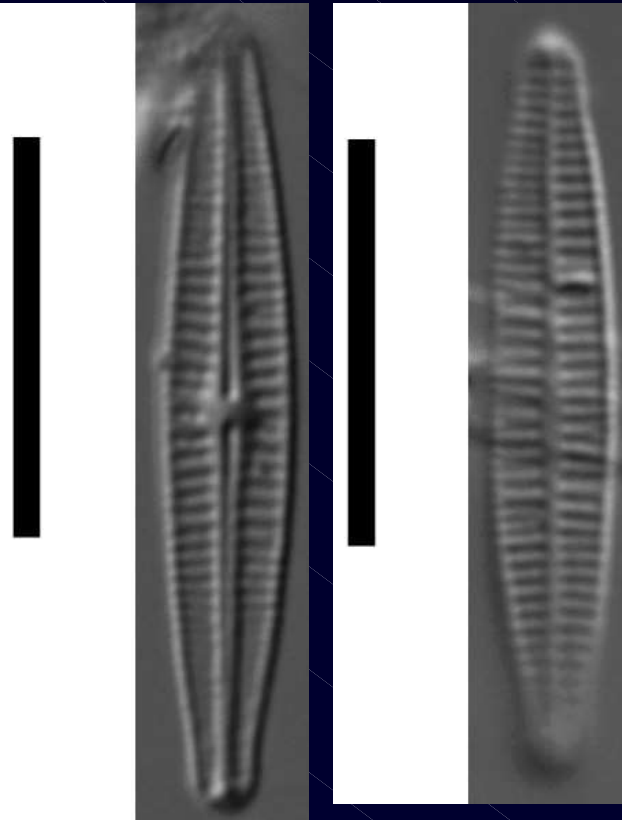
Achnanthyidium gracillimum (Meister) Lange-Bertalot







Verskil met *A. pyrenaicum*



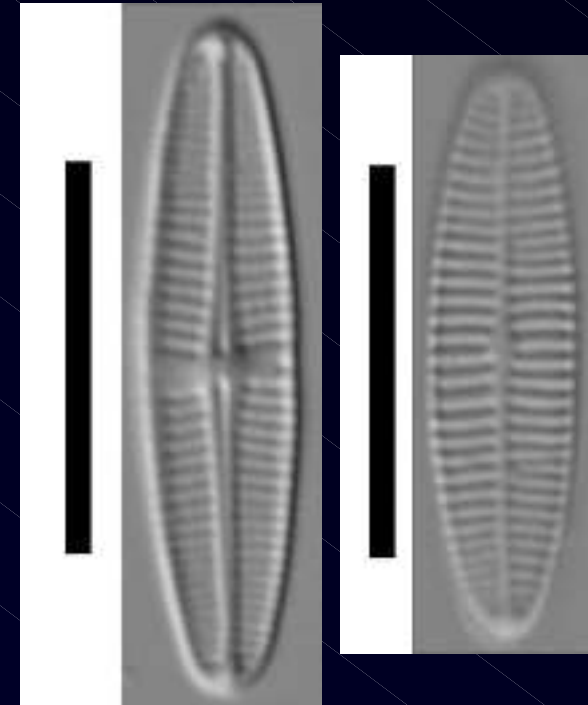
A. gracillimum

duidelijk lineaire-lanceolate
schaaltjes

Duidelijk rostraat tot capitaat

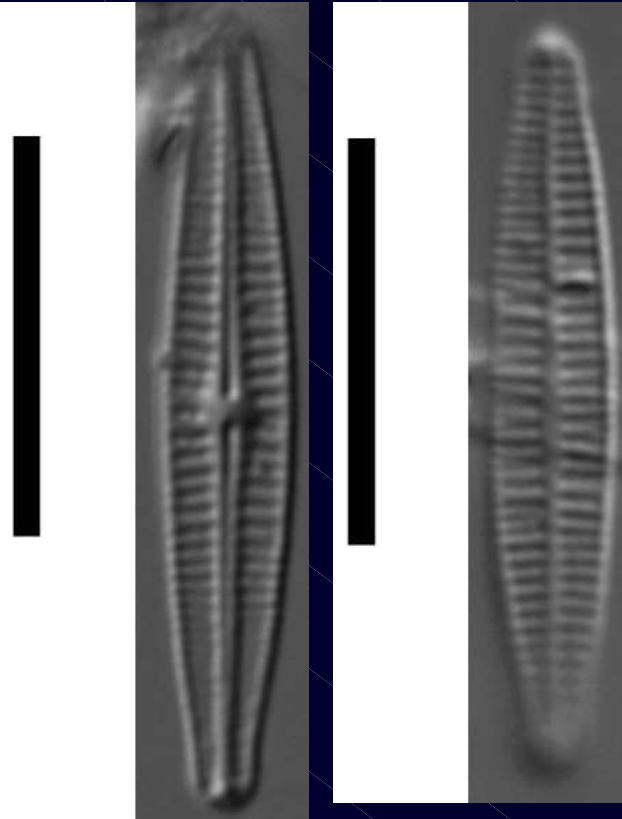
parallele striae

Lager aantal areolen/stria
(SEM)



A. pyrenaicum

Verskil met *A. thienemannii*

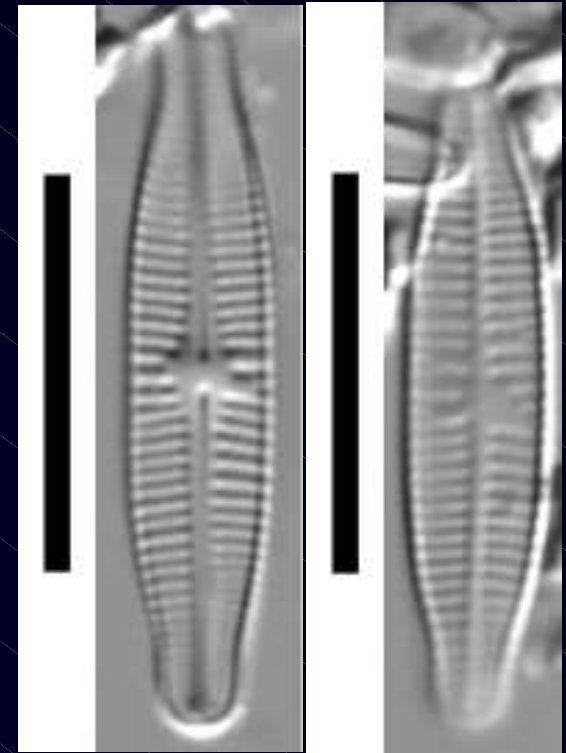


A. gracillimum

duidelijk lineaire-lanceolate
Schaaltjes

kleinere centrale zone

parallele striae



A. thienemannii

Ecologie

Krammer & Lange-Bertalot (1991):

oligotrofe, kalkhoudende waterlopen, vooral in bronnen in de kalkalpen

Van Dam et al. (1994):

alkalifiel, zoet-brak, oligotrafent

Ponader & Potapova (2007):

lage conductiviteit, nutrient-arm, ook in rivieren met mining-influence

ZELDZAME SOORT

Achnanthidium rivulare Potapova & Ponader

Beschreven van: New Hamshire, USA (2004)

Beschrijving: schaaltsjes langgerekt elliptisch

breed afgeronde, nooit (zeer, zeer zelden) voorgevormde uiteinden

Valve lengte: 5-21 μm valve breedte: 2.6-4.4 μm

Axiale zone zeer smal, zwak lanceolaat voor beide schaaltsjes

Centrale zone klein tot onbestaande

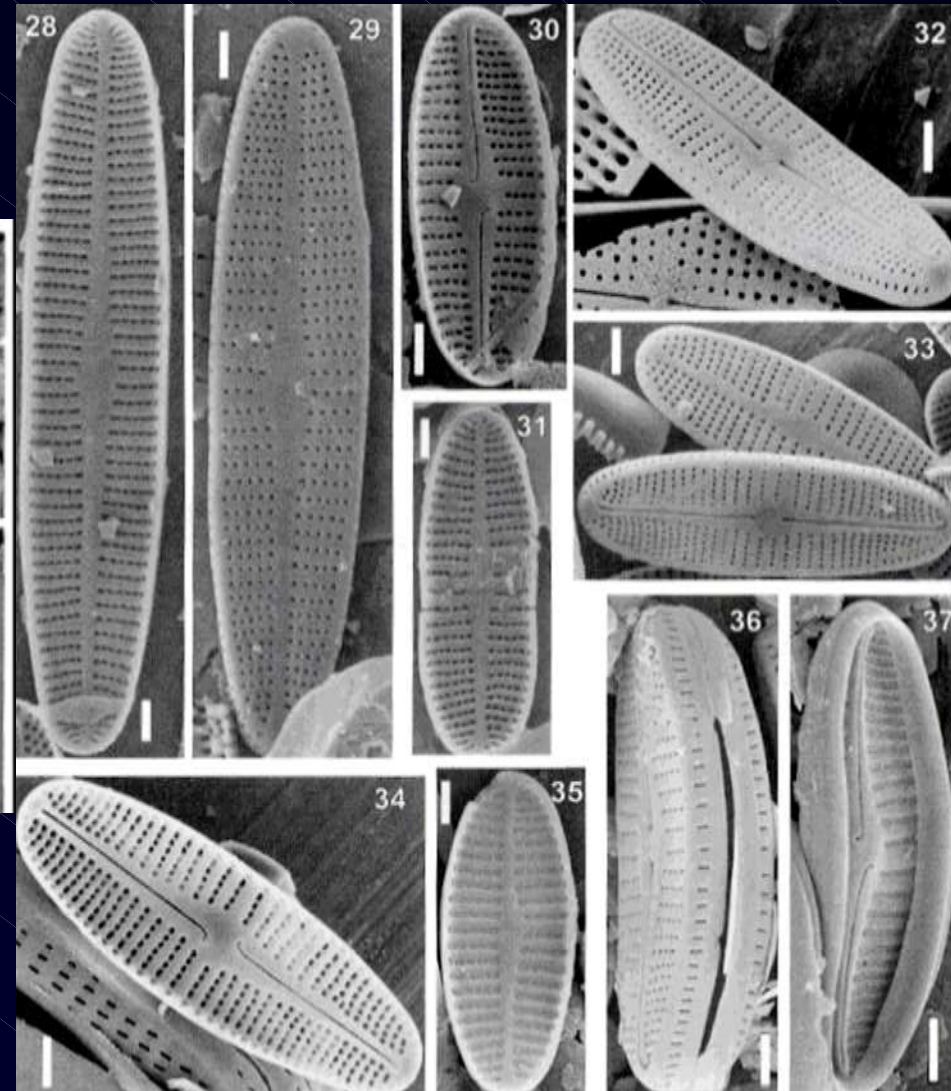
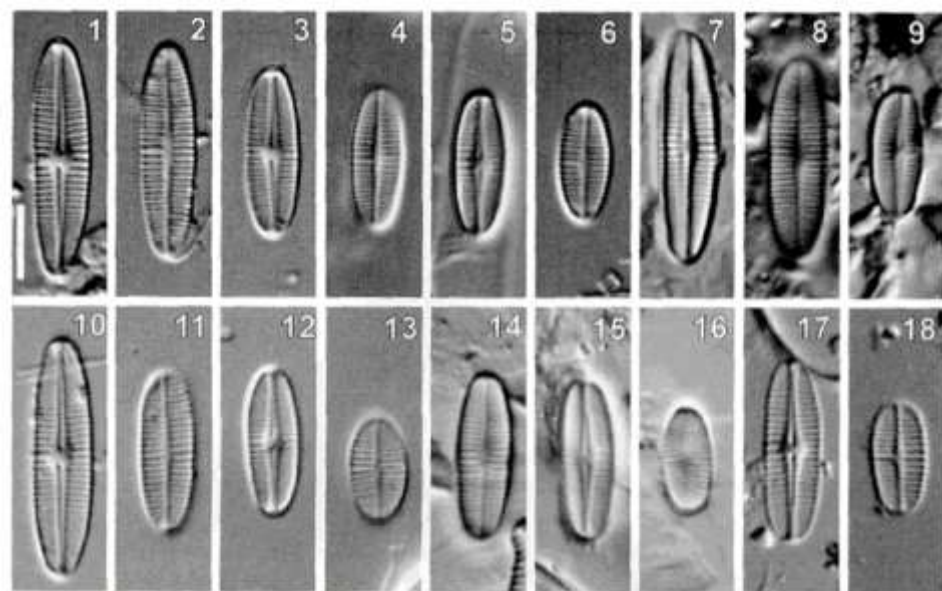
Striae op beide schaaltsjes parallel, duidelijk dichterbij elkaar bij
uiteinden

Rapheloos schaaltsje: 19-28 in 10 μm

Raphe schaaltsje: 19-25 in 10 μm

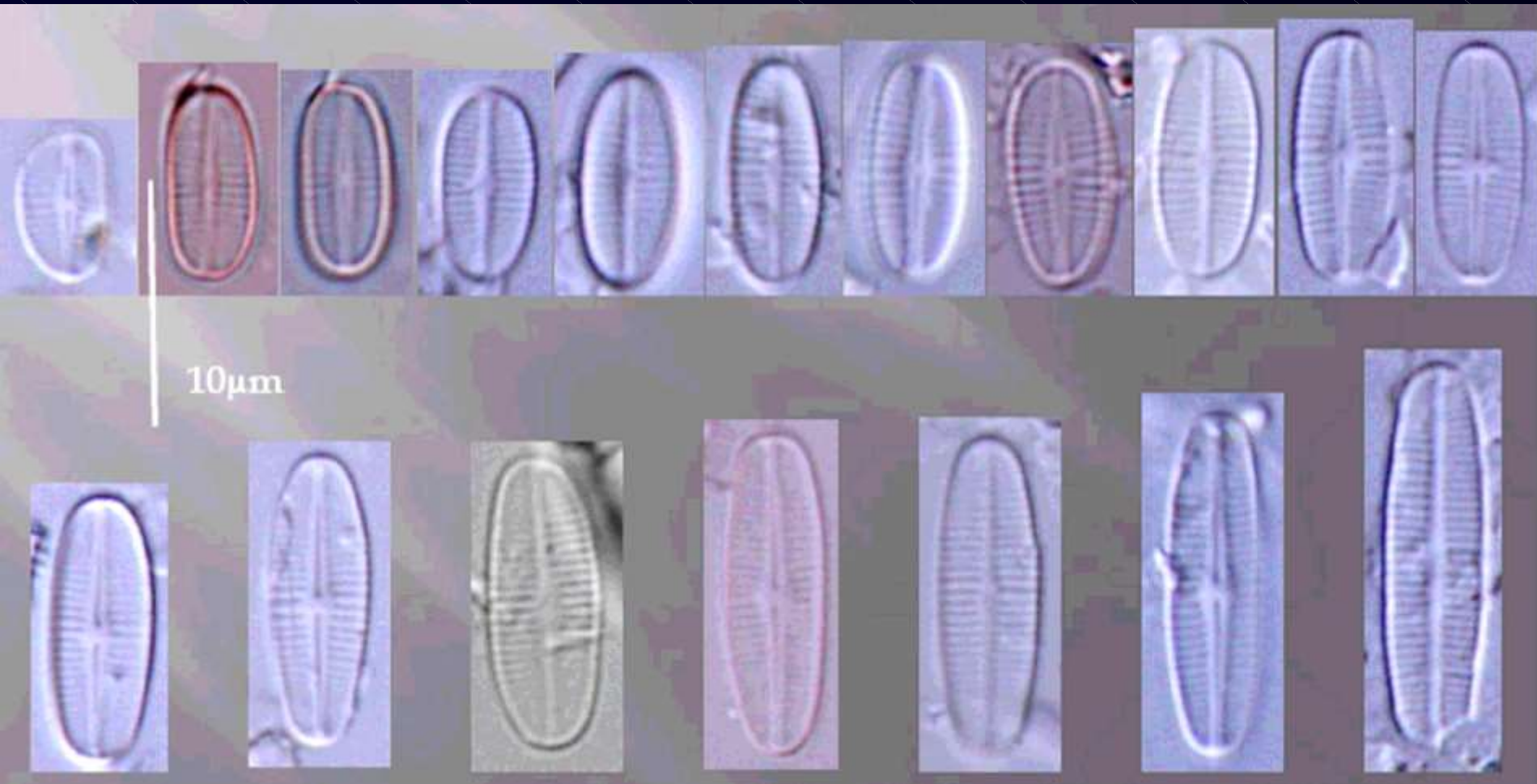
Ultrastructuur: terminale raphe-uiteinden gebogen op het schaaltsje
maximaal 3-4 areolen per stria

Type populatie van *A. rivulare*



Uit Potapova & Ponader (2006)

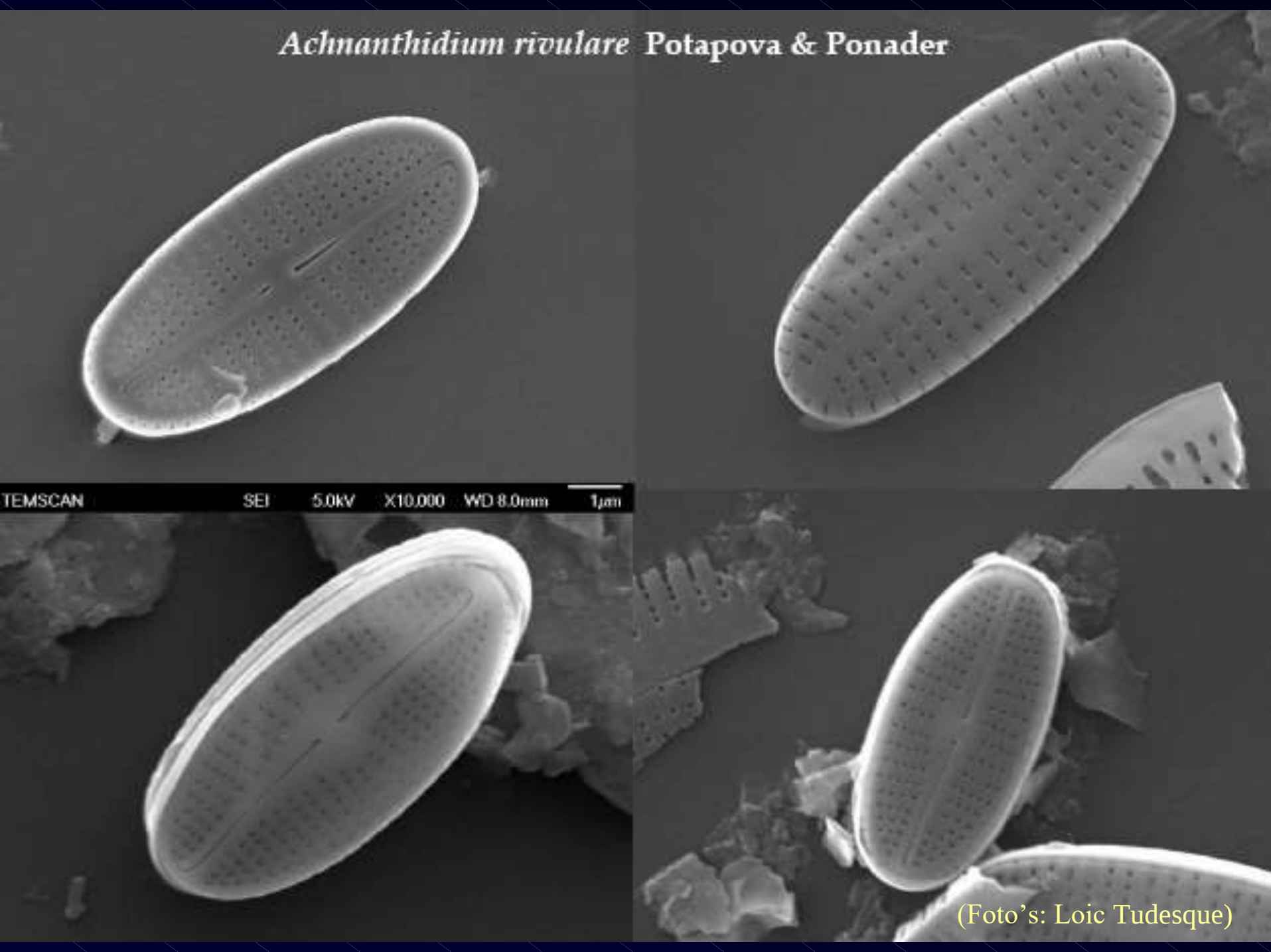
Achnanthidium rivulare Potapova & Ponader



(Arac: Ariège, Frankrijk)

(Foto's: Loic Tudesque)

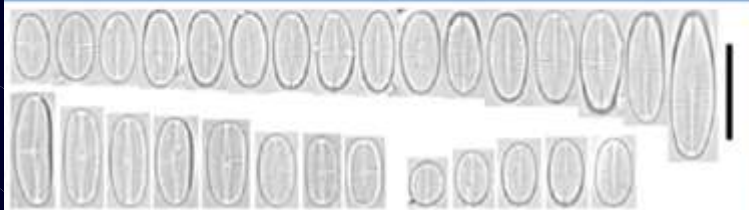
Achnanthidium rivulare Potapova & Ponader



(Foto's: Loic Tudesque)

Portuguese *A. rivulare*

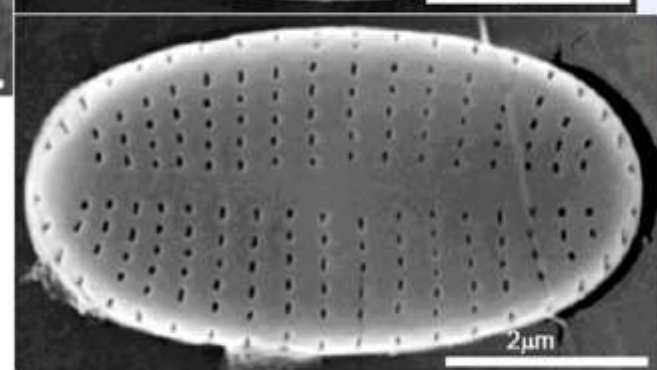
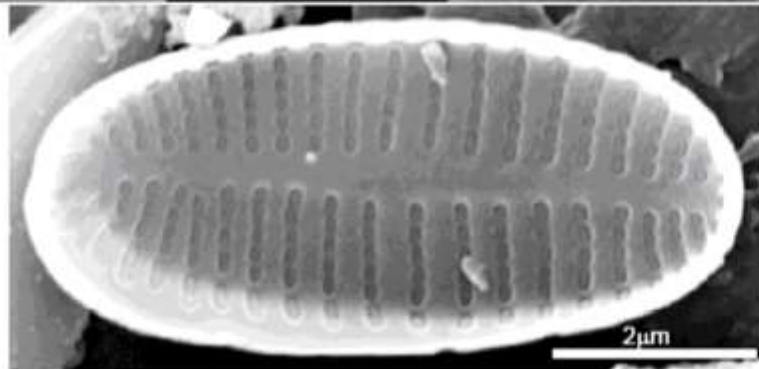
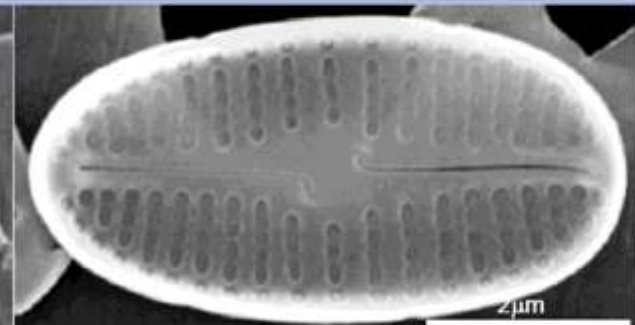
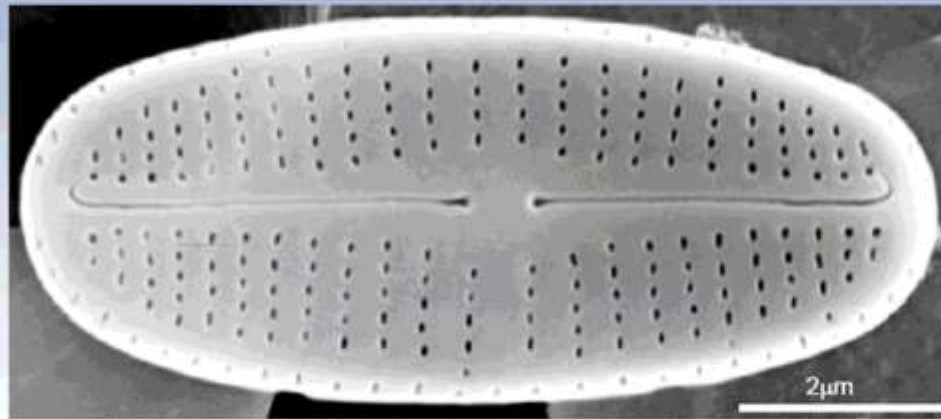
Achnantheidium rivulare Potapova & Ponader



Caravelas (Ribeira das Caravelas)

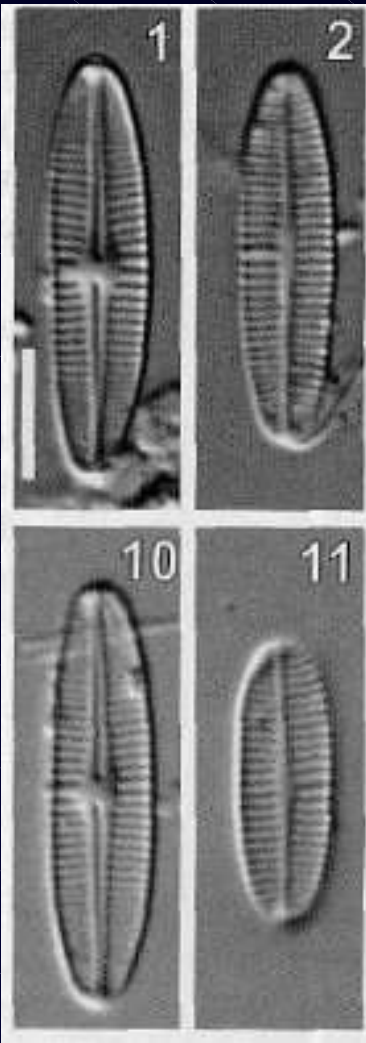


Tâmega 2 – Veral (Rio Tâmega)



Caravelas (Ribeira das Caravelas)

Verskil met *A. pyrenaicum*



L 5-21 μm
W 2.6-4.4 μm
 S_{RL} 18-28 in 10 μm
 S_{R} 18-25 in 10 μm

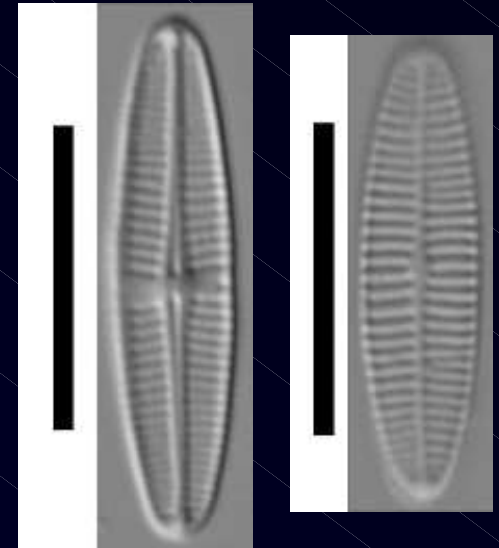
A. rivulare

Nooit
dorsiventraal-asymmetrisch

Meer afgerond, elliptisch

Areolen nooit zichtbaar in LM

Ecologie



L 6-35 μm
W 3-6 μm
 S_{RL} 20-27 in 10 μm
 S_{R} 18-24 in 10 μm

A. pyrenaicum

Ecologie

Potapova & Ponader (2004):

PH rond 6

voedselarm, weinig kalkrijke waterlopen (benthos in rivieren)

zeer lage optima voor fosfaat en nitraat

Ponader & Potapova (2007):

PH rond 7.3

tolerantie voor verhoogde voedselrijkdom

laag Ca-gehalte, hoog Cl-gehalte

Ector (pers. comment):

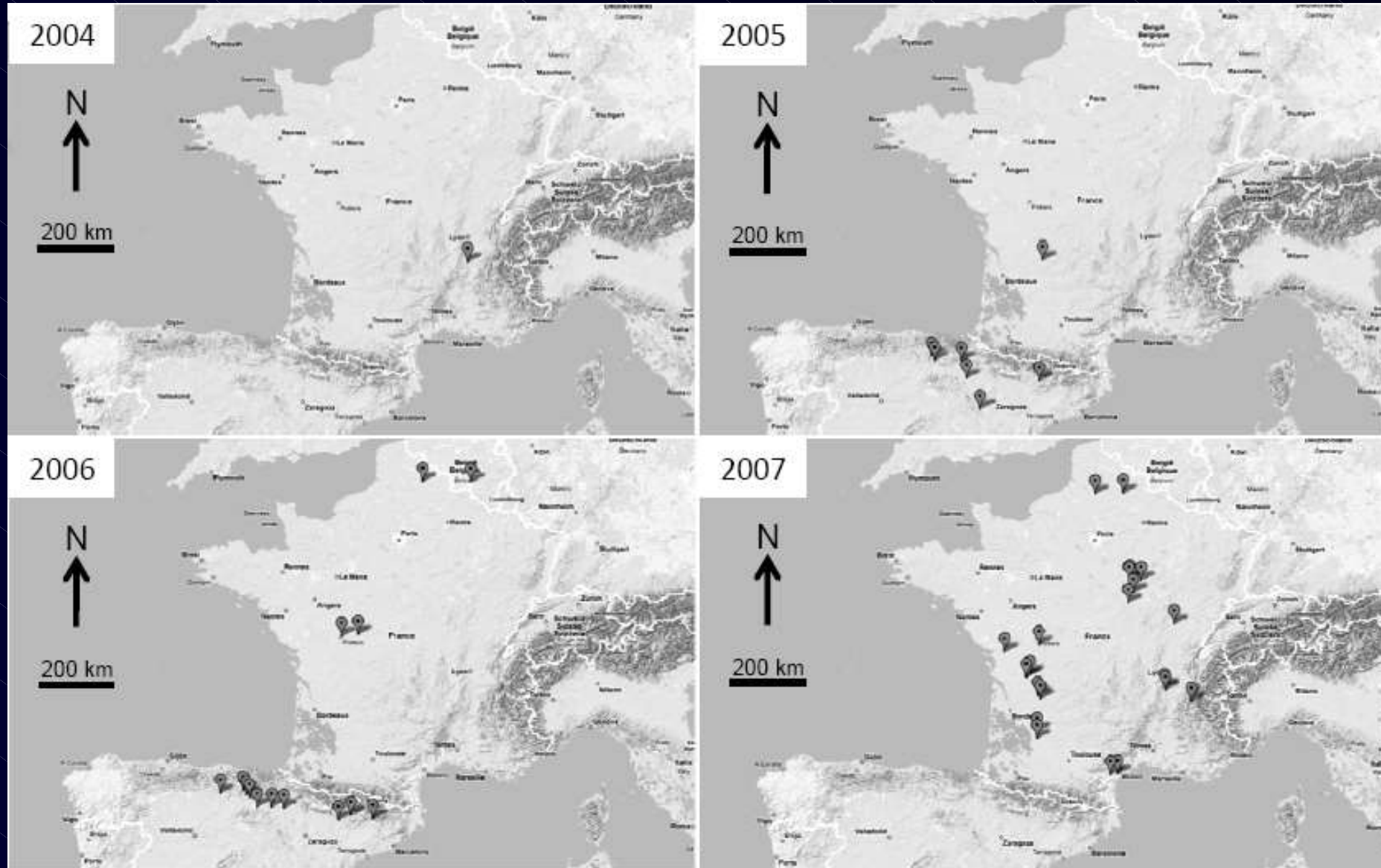
vaak abundant in het Centraal Massief

Vaak verward met *A. pyrenaicum*

Ondertussen ook in Europa aangetroffen (Zuid-Frankrijk)

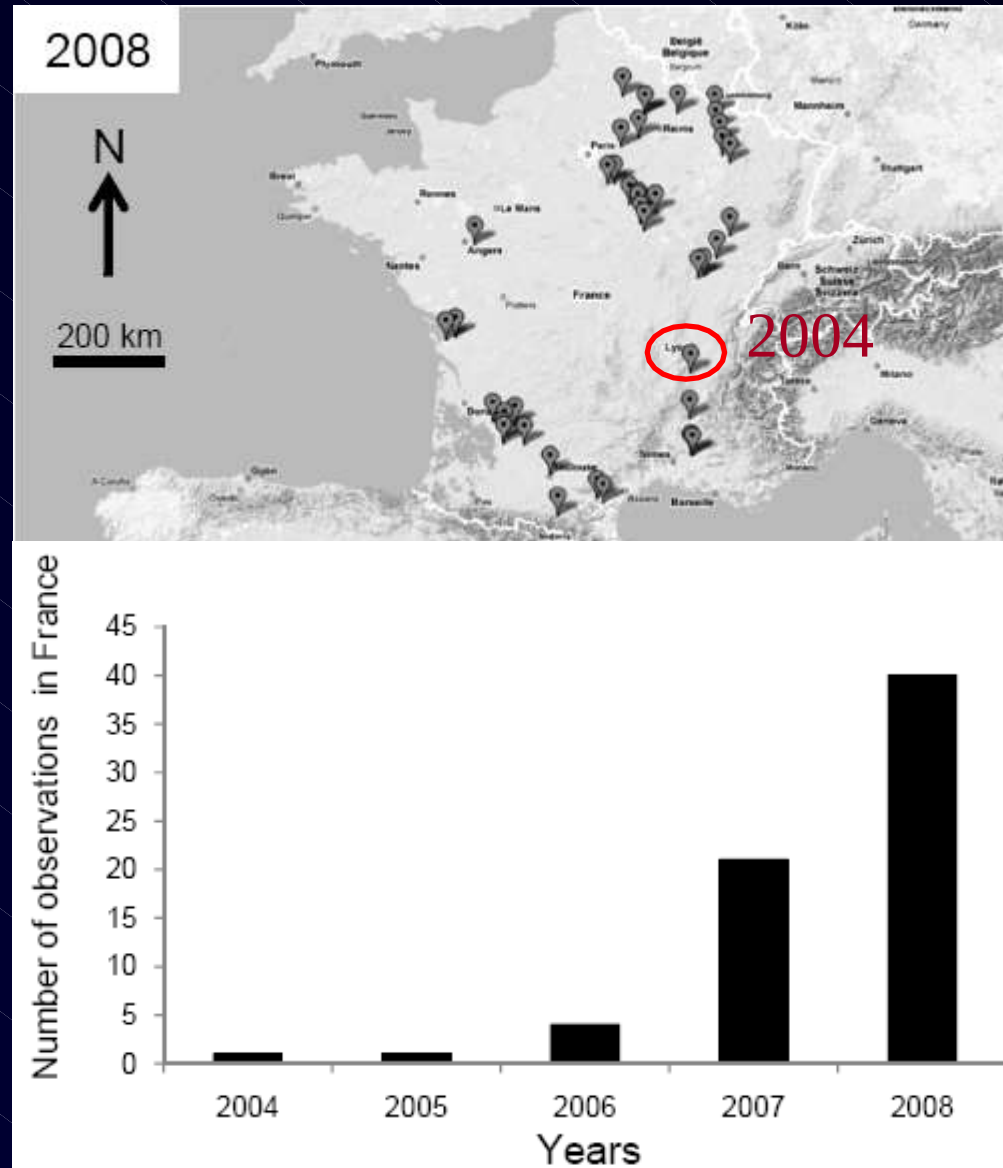
Achnantheidium druartii sp. nov. (Achnanthales, Bacillariophyta), a new species invading European rivers

Rimet F., A. Couté, A. Piuz, V. Berthon & J.C. Druart (*Vie & Milieu*, in press)



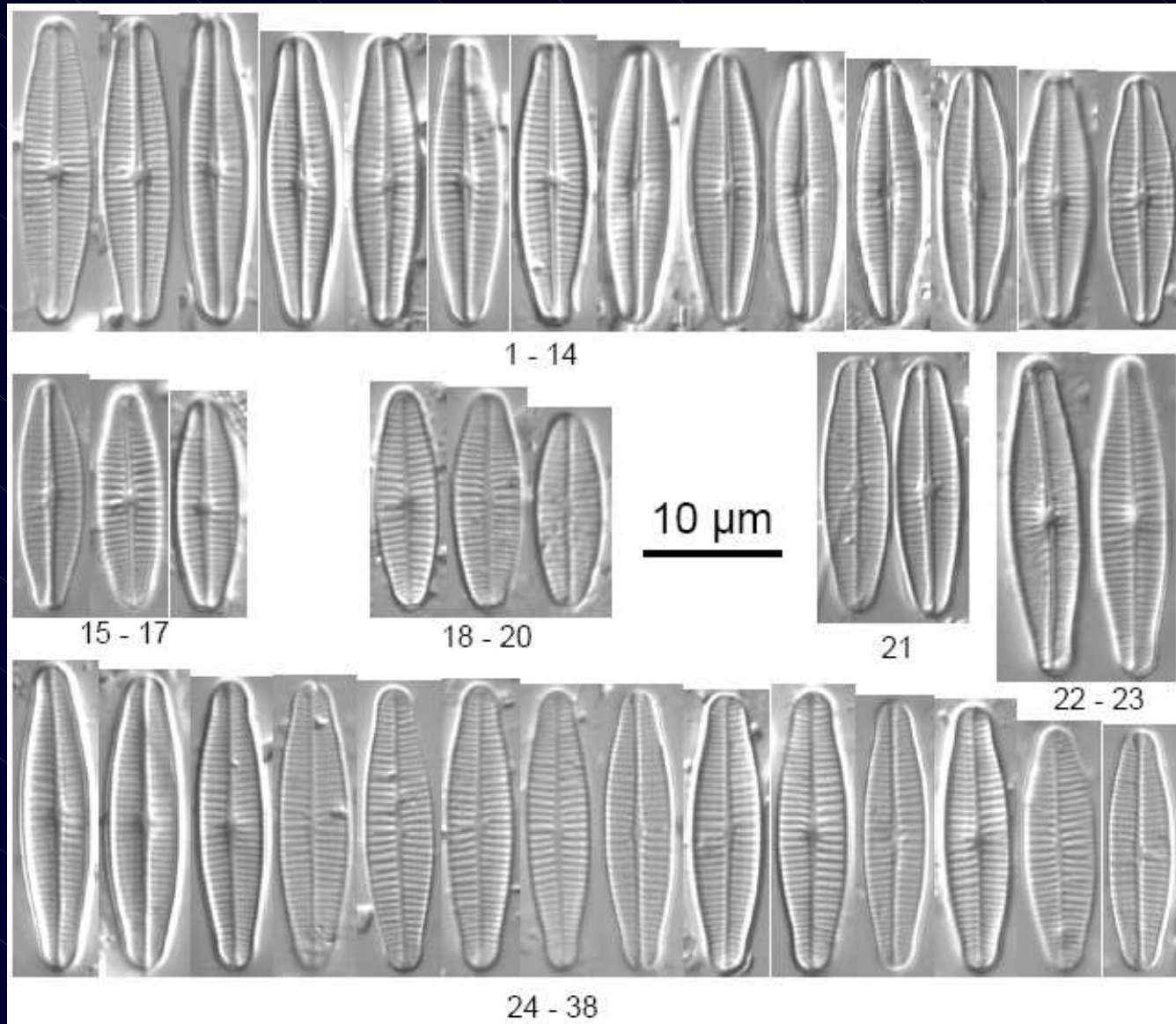
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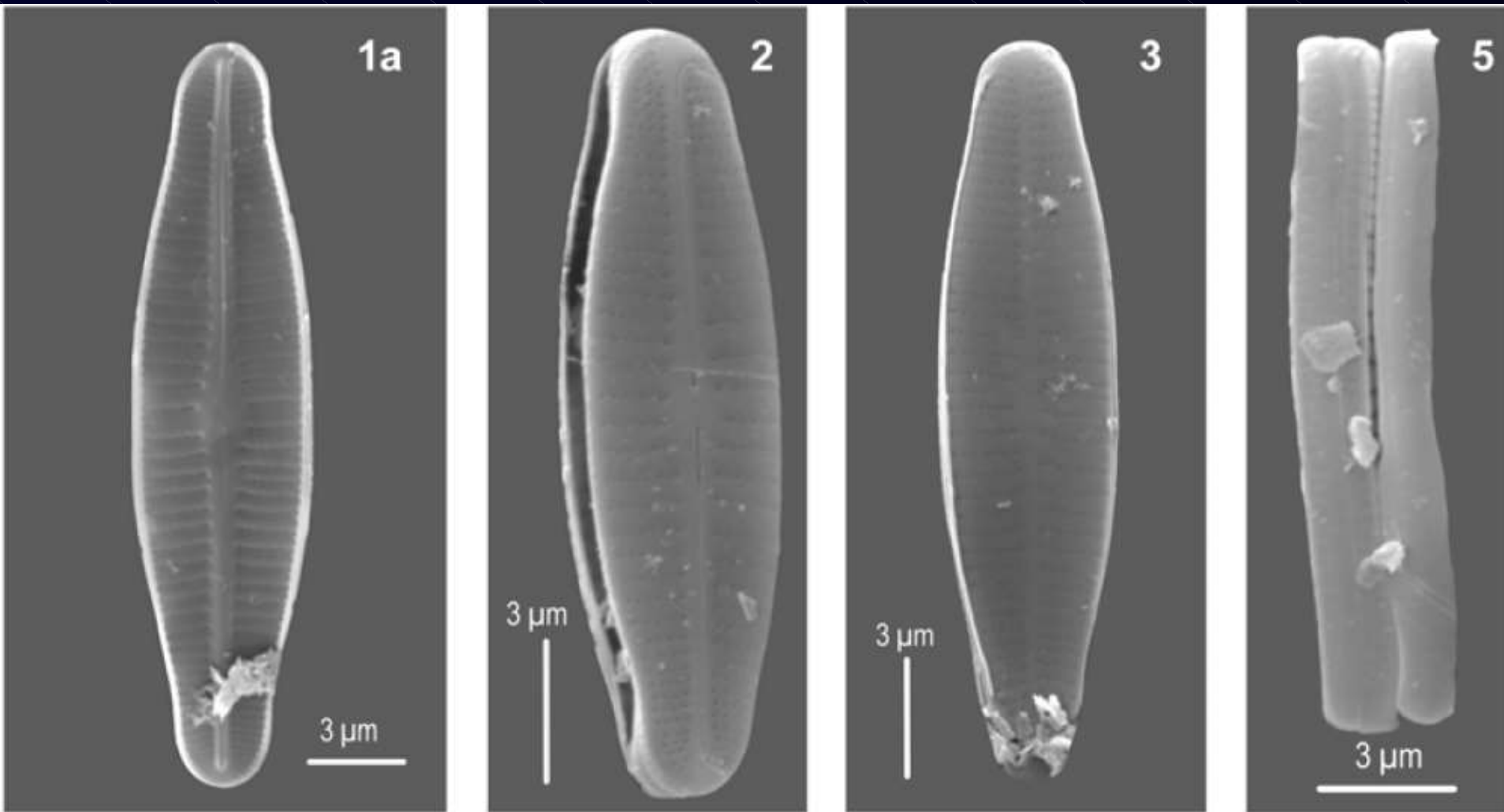
***Achnantheidium druartii* sp. nov. (Achnanthes, Bacillariophyta),
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a new species invading European rivers**

Rimet F., A. Couté, A. Piuze, V. Berthon & J.C. Druart (*Vie & Milieu*, in press)



Overzicht van de *A.minutissima*-groep

	<i>minutissimum</i>	<i>straubianum</i>	<i>lineare</i>	<i>caledonicum</i>	<i>eutrophilum</i>	<i>affine</i>	<i>saprophilum</i>
valve length (µm)	5-20 (25)	6-10	10-12	10-35	4-18	8-30	8-15
valve width (µm)	(2,5) 3-3,5 (4)	3,5-4	2-2,5	2,7-3,8	3-4	3,5-5	3-4
number of striae (in 10 µm)	± 30	26-29	30-35	30-33	24-27	22-24	28 (32)
valve shape	linear-elliptic to linear-lanceolate	elliptic to lanceolate-elliptic	linear to linear- elliptic	linear to linear- lanceolate	rhombic to rhombic-lanceolate	rhombic to rhombic-lanceolate	linear-elliptic
valve apices	protracted, capitate	broadly rounded, never protracted	non-protracted, rounded	broadly rounded, capitate	broadly rounded, non-protracted	acutely protracted	weakly protracted, broadly rounded, 'fat neck'
striation	radiate	parallel to weakly radiate	radiate to parallel	radiate	radiate	radiate	weakly radiate
central area	irregular, 1-2 shortened striae (R), elliptic to lanceolate (RL)	small to absent	absent (RL), fascia (R)	small to absent (RL), shortened striae (R)	absent (RL), striae more distant (R)	asymmetrical (RL), fascia (R)	absent (RL), shortened striae (R)

Dankwoord

Luc Ector

Ingrid Jüttner

Amelie Jarlman

René Le Cohu & Loic Tudesque

Myriam de Haan

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Omdat veel van het gepresenteerde materiaal eigendom is van verschillende instituten en personen, wordt het op prijs gesteld dat niets vermenigvuldigd wordt zonder uitdrukkelijke toestemming van Bart Van de Vijver (vandevijver@br.fgov.be).

Waarvoor Dank!