Quick-guide to common diatom genera in New Zealand fresh waters

**CENTRIC DIATOMS**

**Valves circular, raphe or axial area never present**

**Cells typically in filaments**

**Aulacoseira**

- **Valve view**
- **Girdle view**
- **Axial area** (clear area along centre of valve, with or without raphe)
- **Raphe** (pair of slits)
- **Central area** (clear area at centre)

**Melosira**

- **Cells usually solitary**

**Cyclotella**

- **Different pattern in the middle and edge of valve**

**Cyclostephanos**

- **Similar or continuous pattern from edge of valve to centre**

**PENNATE DIATOMS**

**Valves needle-shaped, spindle-shaped, or some other shape (including asymmetrical), with or without raphe**

**Cells usually solitary**

**A. cf. granulata. Planktonic. Very common in lakes.**

**M. varians. Very common in lowland rivers and streams.**

**TERMINOLOGY**

- **Valve**
- **Girdle**
- **Axial area** (clear area along centre of valve, with or without raphe)
- **Raphe** (pair of slits)
- **Central area** (clear area at centre)
- **Areolae** (holes or depressions)
- **Girdle** (made up of bands of silica)
- **Striae** (rows of areolae)

**NOTE:** this key works best when looking at acid-cleaned, mounted diatoms at x 1000. The coloured illustrations show live material, in which some of the diagnostic characters may be obscured.

**CONTINUED in part B**
Quick-guide to diatom genera

Part B
continued from Part A

Pennate diatoms

Valves elongated, elliptical or swollen bilaterally.
No raphe on either valve

Araphid diatoms

Septa present (internal projections from the girdle band)

Valves asymmetrically lengthwise

Costae present (internal thickened bands on the valve face)

Valves asymmetrically lengthwise

No septa present

No costae present

Raphe present on at least one valve

CONTINUED in part D

Tabellaria

Valve view

Live cells usually in girdle view, forming zig-zag chains
Common and widespread in oligotrophic lakes

Meridion

Fan-like colonies (girdle view)

Live cells in girdle view, forming zig-zag chains
Common and widespread in oligotrophic lakes

Diatoma

Valve views (2 species)

Live cells forming zig-zag chains (girdle view)
Widespread in rivers from oligotrophic (D. hiemale) to eutrophic (D. vulgaris)

Asterionella

Planktonic in lakes, where it forms star-like colonies

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Quick-guide to diatom genera
Part C
continued from Part B

Araphid diatoms
(continued)

No septa or costae, valves more or less symmetrical

YES

Valves linear or oval

YES

Valves centrally expanded

YES

Striae very thick

Striae fine, sometimes with individual areolae visible

Cells solitary, or forming radial or fan-like colonies (NB. Cells often joined side by side in twos)

Fragilariforma (part)

YES

Striae continuous across valve face (or axial area v. narrow)

Obvious axial area

Fragilaria

Cells in chains always in girdle view

F. crotonesis

Planktonic in alkaline, nutrient-rich lakes.

F. vaucheriae. Common in streams and lakes. Ill-defined species.

Staurosirella

S. leptostauron

Cells in short filaments. Occasionally seen in upland streams.

Fragilariforma (part)

F. cassieae

Cells in short zig-zag filaments. Occasionally seen in upland streams.

Synedra

Synedra ulna can be very large. Girdle view is oblong, sometimes seen in fan-like colonies (right). Common and widespread in lowland river periphyton.

Tabularia

Looks similar to Synedra but often slightly asymmetrical (fatter at one end). In high conductivity streams.

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Quick-guide to diatom genera

**Part D**

continued from Part B

Raphe present on one valve only

**YES**

**Monoraphid diatoms**

Round-oval shape, with different patterns on the two valves

Striae pattern similar on the two valves (though there may be other differences)

**YES**

No such depression

Large cells; narrow axial area on the raphless valve displaced to one side

**YES**

Small narrow cells, striae denser towards the poles than at the centre

Typically small cells (< 30 mm long), central raphe and axial areas

**Raphe**

present on both valves

NOTE: Most monoraphid genera have characteristic bent or curved valves in girdle view (see photos, right)

CONTINUED in part E

**Cocconeis**

Usually a thick rim on the raphe valve

No thick rim; striae extend to edge of valve

**YES**

**C. placentula.**

V. common. Lives in contact with substrate or on plants/algae.

**C. pediculus.**

Curved cell. Typically in high cond. waters

**Genera related to Achnanthidium**

An empty “depression” to one side on the rapheless valve

**YES**

Large cells; narrow axial area on the raphless valve displaced to one side

**YES**

Small narrow cells, striae more or less evenly spaced

More oval shaped cells, striae more or less evenly spaced

**Planothidium**

**Achnanthes**

Usually a thick rim on the raphe

**YES**

**Achnanthidium**

Widespread genus in rivers and lakes

**Rossithidium**

Note evenly spaced striae

**Girdle view; note slightly "bent" shape**

Widespread genus in rivers

**September 2019**
Quick-guide to diatom genera
Part E
continued from Part D

Raphe present on both valves

YES

Raphe extending to centre of valve on at least one valve

Raphe different lengths on the two valves.

YES

Raphe long on both valves

Valves not S-shaped, but symmetrical in either lengthwise, widthwise, or both

Valves more or less symmetrical lengthwise (but asymmetrical widthwise)

YES

Raphe short on both valves, to one side (most visible in girdle view, barely visible in valve view)

Biraphid diatoms

YES

Raphe visible as long or short lines (slits) on the valve surface of both valves

Raphe barely visible

Many species, valve shape and size very variable. Some species form chains (girdle view). Typically (but not always) in acid habitats

Valve heteropolar (the two ends markedly different widths)

Actinella

Heteropolar in both valve and girdle views.

A rare genus.

Eunotia

Many species, valve shape and size very variable. Some species form chains (girdle view). Typically (but not always) in acid habitats

Rhoicosphenia

Septa at valve poles. Curved in girdle view.

R. abbreviata; common in rivers.

Gyrosigma

Can be common in high conductivity waters

CONTINUED in part F

CONTINUED in part G

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Quick-guide to diatom genera
Part F
continued from Part E

Biraphid diatoms

YES

Raphe slits not obvious on valve surface (though a thick raphe canal may be visible)

YES

Gap in costae at the valve centre (looks like an axial area). Raphe marginal

YES

Costae present (internal projections from the valve face, appearing as dark lines)

YES

Raphe on opposite sides of the two valves

YES

Raphe marginal, or nearly marginal, in a canal enclosed by struts (fibulae) – dark dots in LM

YES

Raphe canal confined to the valve edge

YES

Raphe rotated to same side of frustule. Mush less common than Nitzschia

Stenopterobia

Only found in acidic habitats (e.g., bogs)

Surirella

Found in a wide range of habitat conditions.

Epithemia

E. sorex
Common epiphyte in lakes and lowland rivers.
Cyanobacterial endosymbionts.

Rhopalodia
R. novaezelandiae. Common in lake periphyton

Nitzschia
Many species, from very large to very small. Some characteristic of polluted conditions.
Note two chloroplasts; diagnostic.

Hantzschia
Raphe rotated to same side of frustule. Mush less common than Nitzschia

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Quick-guide to diatom genera
Part G
continued from Part E

Biraphid diatoms

Valves not bilaterally symmetrical

YES

For whole frustules, in valve view, both valves are visible lying side by side

YES

Striae very short ventrally

Ventral striae tend to be broken up and irregular

YES

Central raphe ends upwards

Central raphe ends bend downwards

YES

Valves almost bilaterally symmetrical

Amphora

Species from small to large. Striae may be indistinct

Eunophora

A rare genus, closely related to Eunotia. Found in bogs.

Encyonema

Common in rivers. Some species live in mucilage tubes

Cymbella

Common in rivers. Solitary, but can form extensive mucilage masses.

Reimeria

Reimeria sinuata is commonly encountered in mixed river communities but not usually abundant. A very small species.

Encyonopsis

Small to large species. Mostly found in acidic habitats.

CONTINUED in part H
Quick-guide to diatom genera
Part H
continued from Part G

**Biraphid diatoms**

- Valves bilaterally symmetrical
- Cells bilaterally symmetrical (or nearly so), but asymmetrical lengthwise
- A discontinuity visible in the striae, parallel to the valve edge
- Septa present (internal projections from the girdle)
- Septum across whole valve, 2 or 3 large holes centrally placed
- No septa present

**Gomphonemis**

- G. minuta var. cassieae. Common in hill-country rivers especially in low flows.
- Mucilage stalks. Girdle view.

**Didymosphenia**

- D. geminata. Invasive, stalked diatom first found in New Zealand in 2004.

**Gomphoneis**

- Septa on each side of the valve, forming chambers (locules)

**Diatomella**

- Valve view in two planes of focus showing raphe and septum.

**Mastogloia**

- Valve view in two planes of focus showing raphe and septum.
- Most species in brackish/marine habitats. A few in high conductivity fresh water.

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Quick-guide to diatom genera
Part I
continued from Part H

Biraphid diatoms
- Valves bilaterally symmetrical in both planes.
- Septa not present
- Raphe within an obvious thickened band
- Fine raphe with no obvious thickening around it

Frustulia
- Widespread. Especially common in acidic habitats.

Diploneis
- Most species marine. Freshwater species widespread in lakes, not usually very abundant.
- See also Sellaphora (Part J), which may have a somewhat thickened area around the raphe

Neidium
- Note characteristic four chloroplasts
- Species can be very large. Especially common in acidic habitats.

Pinnularia
- Many species, wide range of sizes, up to very large. Often common in acidic habitats.
- Girdle view

Stauroneis
- Some species very large; stauros typically obscured in live material.
- Areolae usually prominent in LM

Areolae usually prominent in LM

CONTINUED in part J
- No stauros; striae continuous along valve edge (though stria length may vary)
Quick-guide to diatom genera

Part J
continued from Part I

Biraphid diatoms

- Valves bilaterally symmetrical in both planes.
- No stauros

NOTE: when looking at live material it is often not possible to distinguish between these genera

CONTINUED in part K

Navicula

- Striae very clear and regular, areolae often visible. In live material, a pair of lateral chloroplasts
- Valves often relatively large (>30 μm) typical naviculoid shape

Placoneis

- Regular striae; chloroplast an x-shaped plate
- Striae irregural, or relatively fine

Brachysira

- Striae form irregular lines along the valve face
- Thickened clear areas at each pole

Sellaphora

- Striae fine
- Outer raphe ends hooked on valve face

Kobayasiella

- No polar thickened areas; striae fine to almost invisible
- Outer raphe ends hooked on valve face

Adlafia

- Striae usually visible, with wider spacing at the valve centre.

Cont. in part K

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Quick-guide to diatom genera
Part K
continued from Part J

Biraphid diatoms

Valves bilaterally symmetrical in both planes.

Frustules often form chains. Rounded ends. Short parallel striae.

YES

Valves typically very small (< 20 μm).

Cells not forming chains

Central area oblong, one stigma (hole) to one side, large areolae.

YES

No lateral stigma, areolae in striae not usually visible in LM

Prominent areolae at outer ends

YES

Valves often almost round, radial striae, outer raphe ends curved in opposite directions

YES

Cells usually basically oval to elliptical

Central area oblong, one stigma (hole) to one side, large areolae

YES

Very small forms with prominent striae

NOTE: Many other small naviculoid genera have been described from fresh waters. Often Scanning Electron Microscopy is required to verify their distinguishing features.

Diadesmis

Mostly in subaerial habitats such as damp moss. One larger species D. confervacea (not shown) can grow prolifically in warm, shallow streams.

Cavinula

Rare. In oligotrophic lakes.

Luticola

In subaerial habitats. Rare. A common Antarctic genus.

Geissleria

SEM required to see characteristic areolae in some species

Rare. In oligotrophic lakes.

Chamaepinnularia

Very difficult to confirm identity without very high magnification (SEM)