

between H. segmentalis and Nitzschia sect. Insignes should, however, be given further consideration.

#### 4.6.6.7 The section Scalares

This is the smallest section of Nitzschia, including as it does only one, or possibly two, species. The Scalares grouping was first recognised in 1862 by Grunow, who included within it N. scalaris, N. gigantea, N. insignis, N. virgata and N. smithii. Of these, N. insignis and N. smithii were subsequently transferred to the sect. Insignes (by Grunow, in Cleve & Grunow 1880) and N. virgata to Hantzschia (Grunow 1877). 'N. gigantea', based apparently upon Synedra gigantea Ehrenberg, which Synedra is illegitimate since a different species had previously been given the same name by Lobarzewsky (teste Kützing 1844), is not mentioned again after Grunow's 1862 paper. Perhaps this will turn out to be a second species of the section, but it will in any case require renaming. So far as I am aware, no other species has ever been referred to this group except N. scaligera (Grunow 1880), and this was soon transferred elsewhere (to the sect. Insignes; see Cleve & Grunow 1880). The Scalares were not given any definite rank when first described by Grunow (1862), but were later assigned sectional status (Grunow 1880).

N. scalaris has not been observed during the course of this study, but many details of the frustule morphology can be gleaned from the illustrations of Grunow (in Van Heurck 1880-5, Pl.60 f.14, 15), Peragallo & Peragallo (1897-1908, Pl.75 f.1, 2), Hustedt (in A.Schmidt Atlas, T.333 f.1-3) and Van der Werff & Huls (1957- ).

The valve of N. scalaris is long and straight - Hustedt (1930) gave dimensions of 150-500 x 18-28  $\mu\text{m}$ ., with 3-5 fibulae and 9-11 striae in 10  $\mu\text{m}$ . A type 1 valve construction is present, the poroids being easily visible using the LM. There does not appear to be a

marginal ridge. Grunow (in Van Heurck 1880-5, Pl.60 f.14c) has illustrated transapical sections of the valve (presumably worked out by careful focussing through the valve) which, if correct, demonstrate that the valve is fairly shallow and keeled (see section on terminology, Chapter 3).

The raphe, which is eccentrically situated on the valve, is unbroken centrally. This was established by Hustedt (1929) and is correlated with the absence of a 'central nodule' or any central constriction of the subraphe canal. The polar raphe endings are unknown: none of the illustrations show a thickening of the valve at the poles, which might have betrayed the presence of a helictoglossa. The raphe probably opens onto the crest of a ridge as in N. spathulifera (sect. Insignes) since most authors (except Peragallo & Peragallo) show a clear, non-porose outer zone to the keel (e.g. see Van der Werff & Huls 1957- , 'Nitzschia scalaris' C, D and E).

The fibulae are similar to those in the Insignes, each fibula representing a single subraphe costa and being extended transapically across the valve. The fibulae are variable in size, some extending further transapically than others, but none stretch to beyond the midline of the valve face. In no illustration is there any suggestion of flange-like developments of the fibulae like those present in the sect. Grunowia.

The mature cingulum appears to consist of at least three bands. The first bears short longitudinal striae, each containing 4-5 poroids (A.Schmidt Atlas, T.333 f.2; Van der Werff & Huls illustrate these striae as unbroken lines). There are approximately 1.5x as many of these striae as there are transapical striae on the valve. The second band bears shorter longitudinal striae, each containing only 2 poroids, while the third has only one transverse row of poroids (A.Schmidt Atlas, T.333 f.2).

The cytology of N. scalaris is unknown.

This species bears many resemblances to species of the sect.

Insignes. The coarseness of the valve structure, the raphe structure, and the fibula morphology all suggest a close relationship with that group: indeed, the Insignes and Scalares are probably insufficiently distinct to justify their separation.

#### 4.6.6.8 The section Grunowia

This is a small group, containing but eight described species, of which only two, N. sinuata and N. denticula, are commonly encountered or recognised. These were also the first taxa to be described, N. sinuata by W. Smith (1856), as 'Denticula sinuata', and N. denticula (as ?) by Rabenhorst (1853, teste W. Smith 1856): the latter, however, has a complex nomenclatural history which is examined further below.

N. kittonii was published by H. L. Smith in 1878, while N. moissacensis, described by Héribaud, followed in 1903 (teste Hustedt 1927a).

N. denticuloides and N. subdenticula were described by Hustedt (1942), and finally Cleve-Euler (1952) separated N. solgensis from N. denticula, in which it had previously been classified as the var. delognei.

These species are listed, with their dimensions etc. , in Table 17.

Smith (1856) gave an accurate drawing and description of the taxon now known as N. denticula, under the name 'Denticula obtusa Kütz.' (compare Smith's Pl. 34 f. 292 with Hustedt 1930, f. 780). Kützing (1844), however, gave Echinella obtusa Lyngbye as a synonym of Denticula obtusa, whose author citation should therefore be '(Lyngbye) Kütz.': Smith's citation is inaccurate. Smith (op. cit.), however, had studied the Lyngbye material of 'Echinella obtusa', from Greville's collection, and he stated that this 'is different from the present' (i.e. N. denticula) 'and in fact belongs to the genus Diatoma, the zigzag arrangement of the frustules being perfectly distinct.' Smith considered that Kützing's (1844) T. 17 f. 14 represented N. denticula (sensu Hustedt 1930).