

OBSERVATIONS OF PLANKTONIC *NITZSCHIA* AND *NAVICULA* FROM THE SOUTHERN ADRIATIC SEA

Sunčica Bosak¹, Maja Mejdandžić¹, Carlos E. Wetzel², Petra Peharec Štefanić¹, Zrinka Ljubešić¹

¹University of Zagreb, Faculty of Science, Department of Biology, Rooseveltov trg 6, 10000 Zagreb, Croatia (suncica.bosak@biol.pmf.hr);

²Luxembourg Institute of Science and Technology (LIST), Environmental Research and Innovation Department (ERIN), 41 Rue du Brill, L-4422 Belvaux, Luxembourg

BACKGROUND

Diatoms belonging to the genera *Nitzschia* Hassall and *Navicula* Bory are well known and widely distributed in freshwater and marine environments, however, there are few reports on their occurrence in the marine plankton. These diatoms usually adhere to surfaces with their raphe system and do not possess particular morphological adaptations to planktonic existence. Although there are several species described from the water column, e.g. *Navicula directa* (W. Sm.) Bréb. or *Nitzschia bicapitata* Cleve their reported abundances are usually very low and there were not many studies dealing with these taxa. In routine observations of marine samples these diatoms are often not identified to species level and generally lumped into a large group of “unknown pennates” therefore there are scarce data available on their numbers or distribution.

SAMPLING AND ISOLATION

Samples were taken at BIOTA (Bio-tracing Adriatic Water Masses) cruise conducted from 8 – 10 March 2016 in open waters of southern Adriatic Sea at transect from Dubrovnik to 1000 m isobath (in direction 210°, stations P100 – P1000). 18 strains were picked and isolated from seawater samples and details are listed in Table 1.

MORPHOLOGICAL ANALYSIS

We were able to group our strains into three different *Nitzschia* and two *Navicula* morphotypes. Among these, *Nitzschia* sp. 1 was represented with 5 strains, and *Nitzschia* sp. 3 with 8 strains.

In addition to morphometric features (Table 2), morphotypes differed in valve-shape (linear-lanceolate, sigmoid or asymmetrical with/without capitate poles) and shape of the areolae.

Light and electron microscope images of five strains representing each of the identified morphotypes are presented below (Figs 1-6).

The planned future investigations will add the molecular information to the isolated strains, as the main goal of this research is to combine both morphological characteristics and DNA information in order to properly describe the small pennate taxa found in the plankton of the Adriatic Sea.

Table 1. List of diatom strains with isolation details and proposed taxonomical affiliation

Morphotype	Strain	Station and isolation depth
<i>Nitzschia</i> sp.1	BIOTAI-3	P150, 30 m
	BIOTAI-18	P600, 250 m
	BIOTAI-23	P600, 400 m
	BIOTAI-60b	P1000, 100m
	PMFBION2_29	P600 NET (0-20m)
<i>Nitzschia</i> sp.2	BIOTAI-36	P150, 30m
<i>Nitzschia</i> sp.3	BIOTAI-73	P600 NET (0-20m)
	BIOTAI-74	P300 NET (0-20m)
	BIOTAI-75	P600 NET (0-20m)
	BIOTAI-84	P150, 30m
	PMFBION3_4	P300 NET (0-20m)
	PMFBION1_39	P600 NET (0-20m)
	PMFBION2_29	P600 NET (0-20m)
	PMFBIONA1_20	P300 NET (0-20m)
<i>Nitzschia</i> sp. cf. <i>lorenziana</i>	BIOTAI-44	P150, 30m
<i>Navicula</i> sp.1	BIOTAI-46	P150, 30m
	BIOTAI-70	P1000, NET (0-20m)
<i>Navicula</i> sp.2	PMFBIONA4_3	P1000, NET (0-20m)

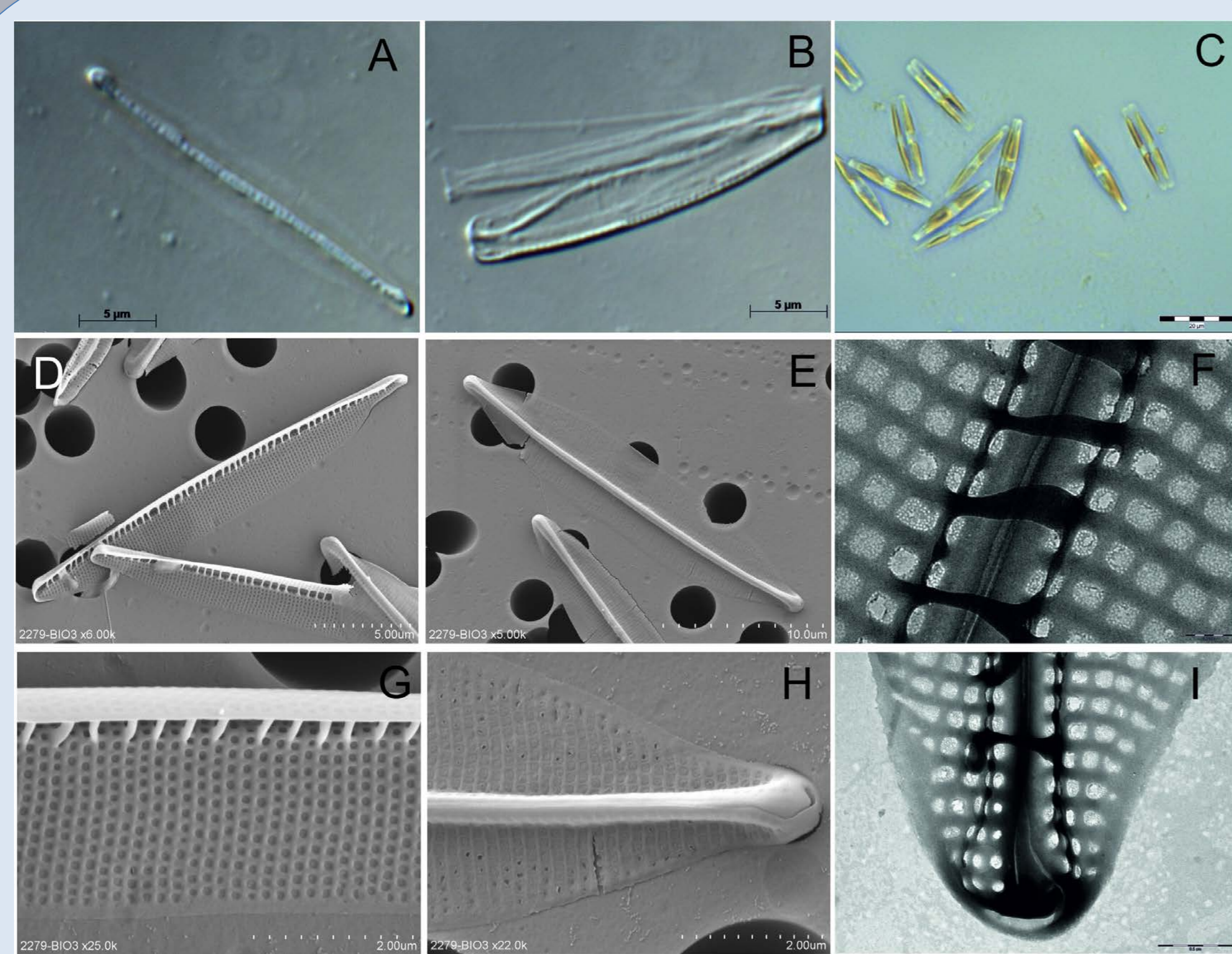


Fig. 1. LM, SEM and TEM micrographs of *Nitzschia* sp. 1, strain BIOTAI-3

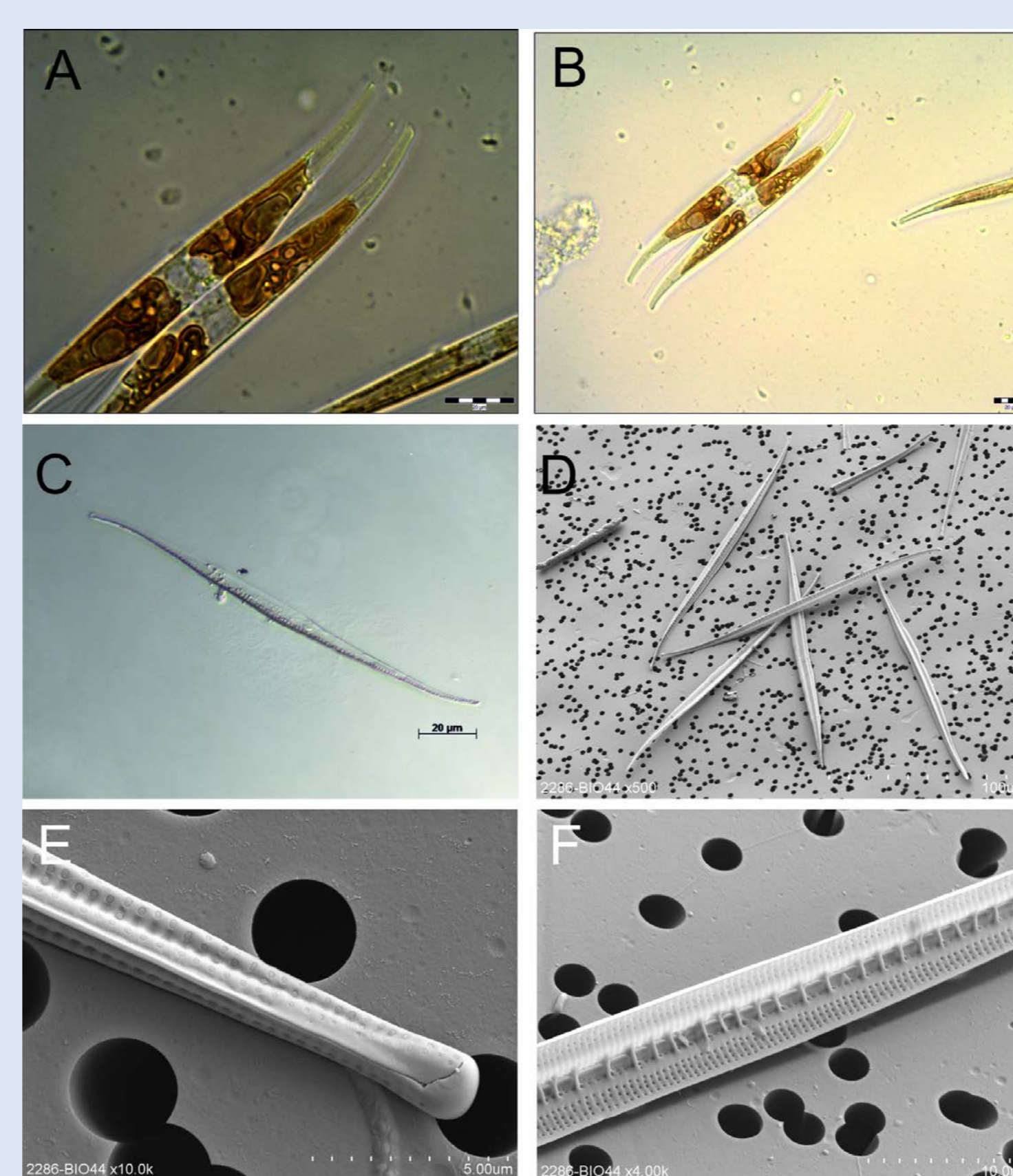


Fig. 2. LM and SEM micrographs of *Nitzschia* sp. cf. *lorenziana* strain BIOTAI-44

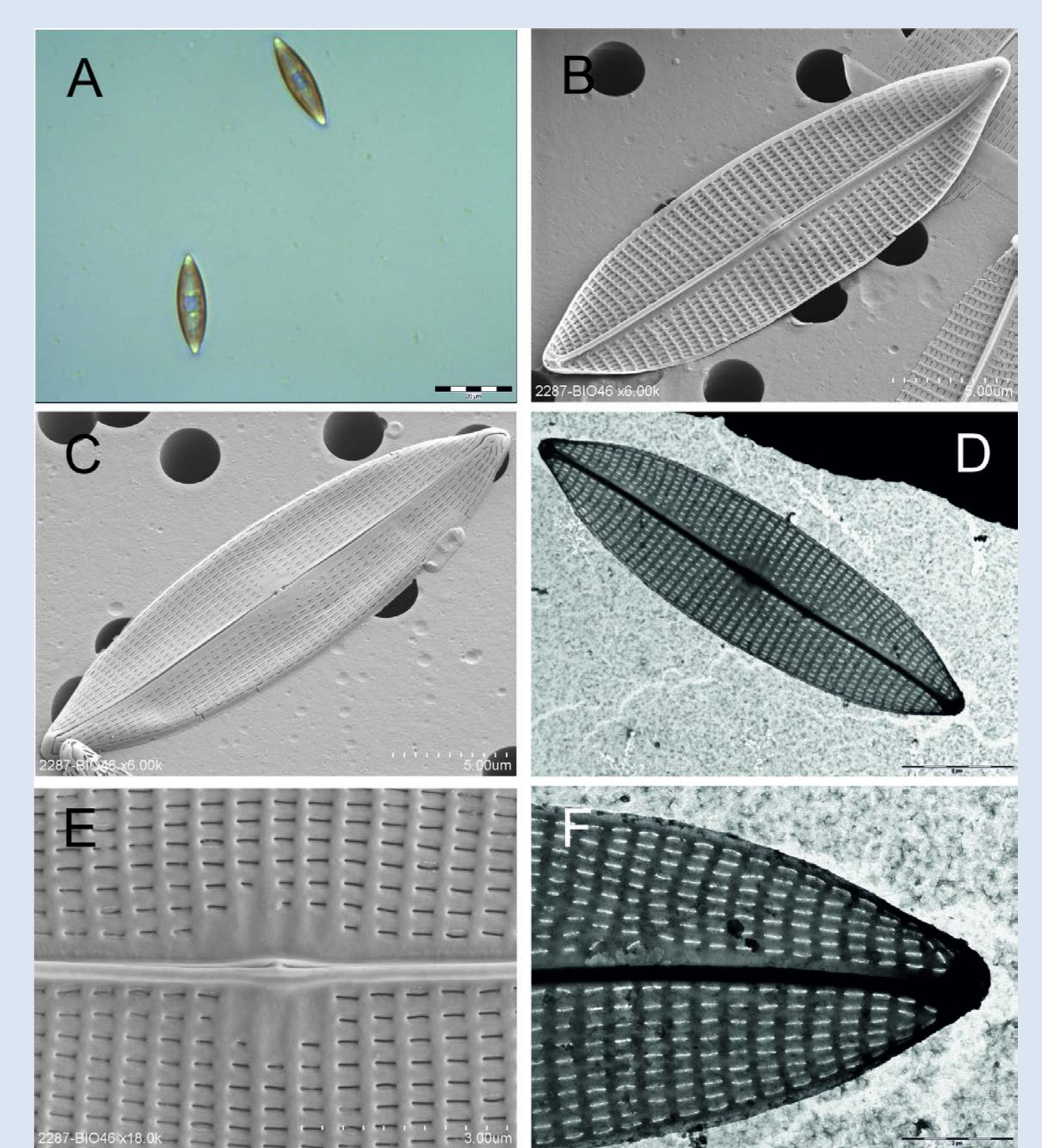


Fig. 3. LM, SEM and TEM micrographs of *Navicula* sp. 1, strain BIOTAI-70

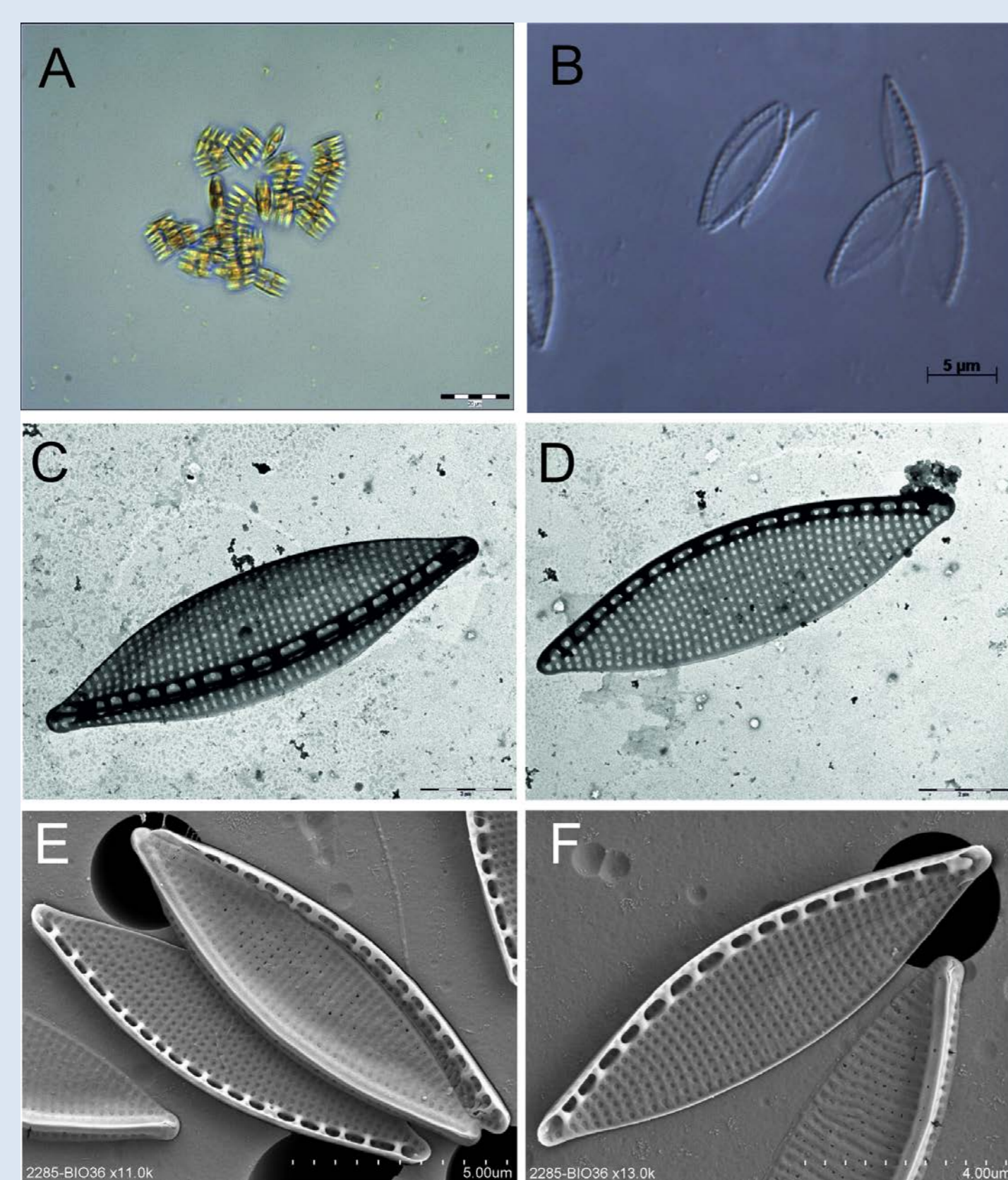


Fig. 4. LM, TEM and SEM micrographs of *Nitzschia* sp. 2 strain BIOTAI-36

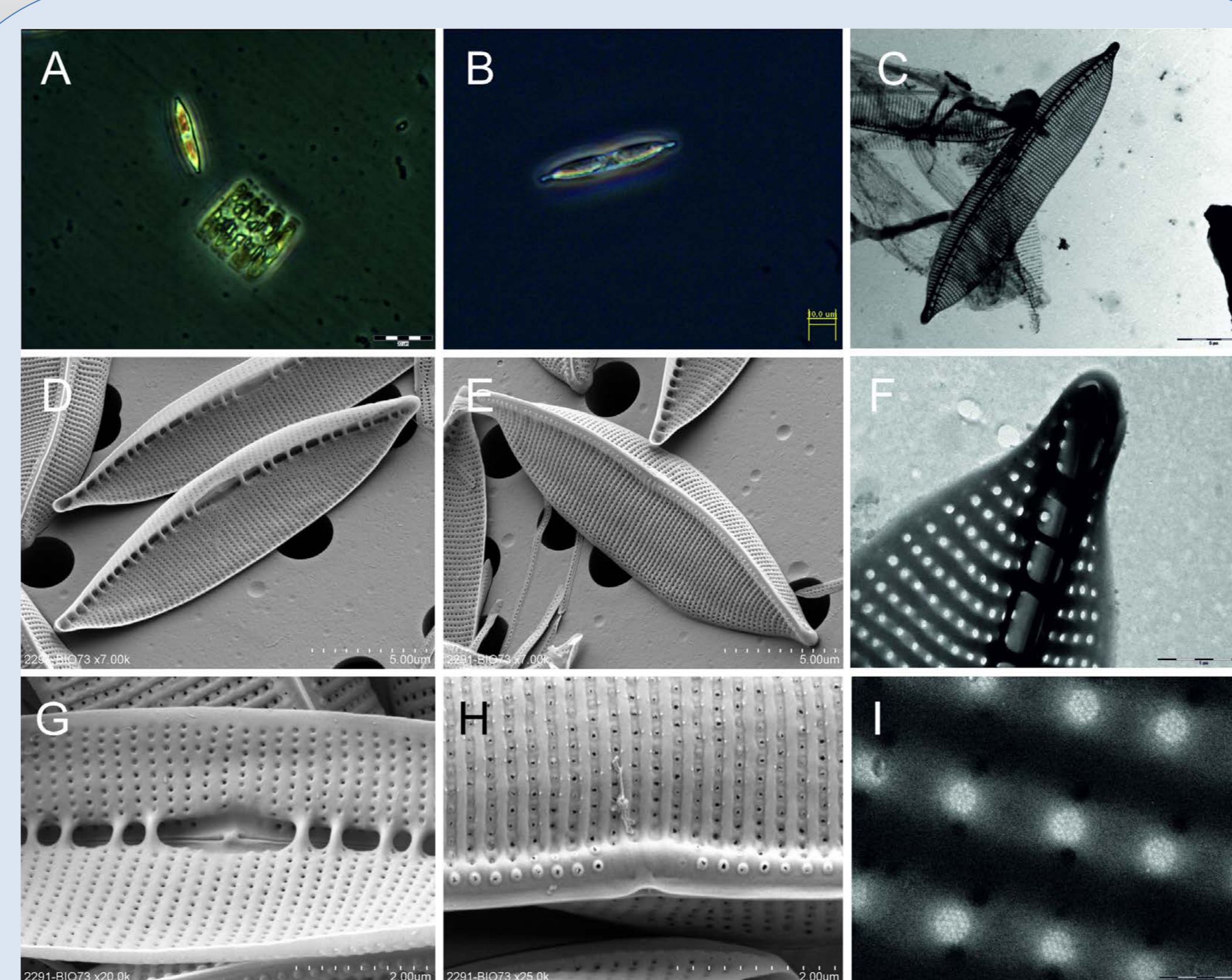


Fig. 5. LM, TEM and SEM micrographs of *Nitzschia* sp. 3, strain PMFBIONA1

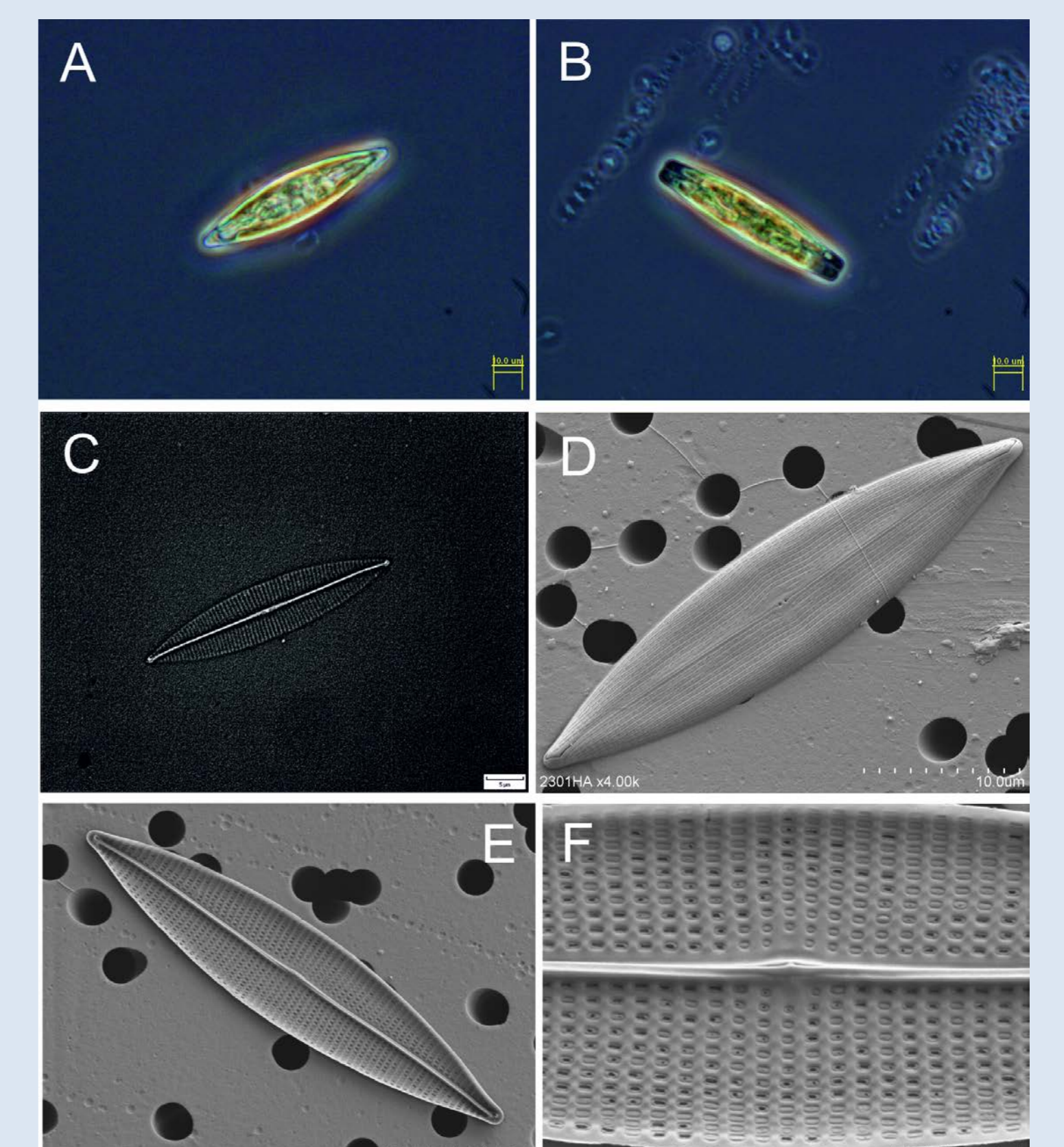


Fig. 6. LM and SEM micrographs of *Navicula* sp. 2 strain PMFBIONA4

Table 2. Morphometric data on selected strains

Species/strain	Length	Width	Fibulae/10 µm	Striae/10 µm	Areolae/1µm
<i>Nitzschia</i> sp. 1					
BIOTAI-3	21.9 - 26.9	2.8 - 3.9	23-24	48-59	6
<i>Nitzschia</i> sp. 2					
BIOTAI-36	9.4 - 11.03	2.8 - 3.5	18-20	46-50	6
<i>Nitzschia</i> sp. cf. <i>lorenziana</i>					
BIOTAI-44	140.5 - 152.4	5.9 - 8.0	9-10	21-24	
<i>Nitzschia</i> sp. 3					
PMFBIONA1	18.6 - 22.5	3.6 - 5.4	18 - 20	40-44	6
<i>Navicula</i> sp. 1					
BIOTAI-70	23.9 - 25.5	6.4 - 7.6	/	19 -20	3
<i>Navicula</i> sp. 2					
PMFBIONA4	33.8-36.6	6.7-8.0	/	19-20	3-4

Found in field samples as single cells, but also adhering to plankton particles - „pseudo-benthic” habitat

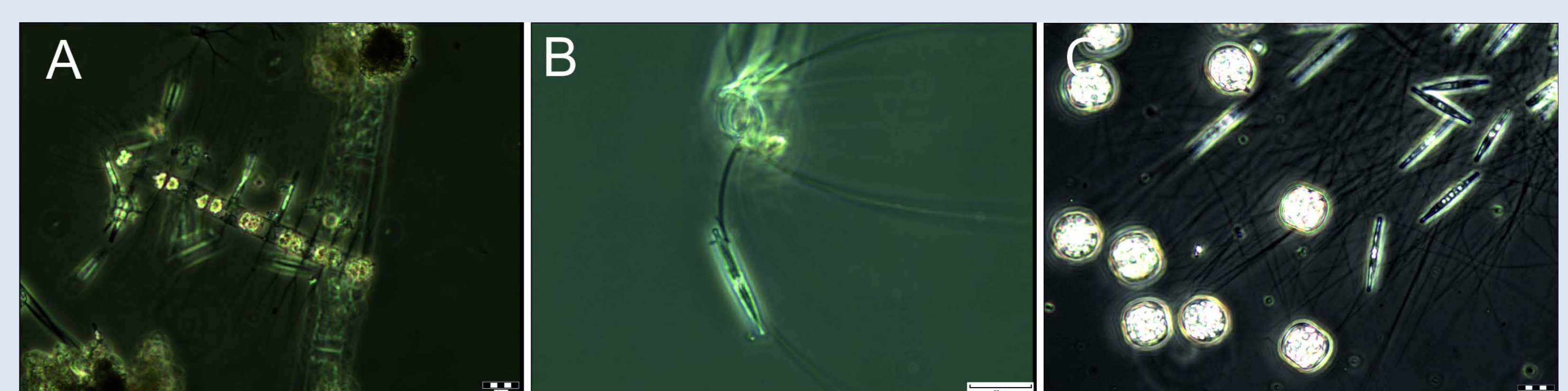


Fig. 7. *Nitzschia* sp. (probably sp.1) observed in natural net samples. A) Epiphytic growth of cells on *Bacteriatrum mediterraneum* setae. B) Cell attached to the seta of *Chaetoceros curvisetus*. C) Cells entangled with the threads of the *Thalassiosira* cf. *socialis* colony (photos by Anika Mijakovac and Lucija Kanjer)

ACKNOWLEDGMENTS

This work was supported by Croatian Science Foundation under the project BIOTA UIP-11-2013-6433, and project „Pennate diatoms in pelagic system of South Adriatic” funded by Croatian Academy of Science and Arts Foundation

