

## Supplementary Materials

### Supplementary Material 4. Foraminiferal distribution and surface salinity.

Supplementary Material 1. Occurrence of intertidal foraminifera in the White Sea. Cited data: x, not discriminated live or dead; L, observed live.

Species reported previously	Cited data set*						Interpretation/Modern taxonomy	Our data
	1	2	3	4	5	6		
<b>Rotaliid foraminifera</b>								
<i>Elphidium longipontis</i> Stschedrina; <i>Retroelphidium longipontis</i>	x	L	x	x	x	x	<i>Elphidium williamsoni</i>	Live
<i>Elphidium clavatum</i> Cushman; <i>Retroelphidium ex.gr. clavatum</i>		x		x	x	x	<i>Elphidium excavatum clavatum</i>	Live
<i>Elphidium subarcticum</i> Cushman; <i>Criboelphidium subarcticum</i>	x	x		x		x	<i>Elphidium albiumbilicatum</i>	Live
<i>Elphidium orbiculare</i> (Brady); <i>Criboelphidium orb.</i> ; <i>Haynesina orb.</i>	x	x			x	x	<i>Haynesina orbiculare</i>	Live?
<i>Elphidium bartletti</i> Cushman				x	x		possibly <i>Elphidium bartletti</i>	Absent
<i>Elphidiella frigida</i> Cushman					x		possibly <i>Elphidium frigidum</i>	Absent
<i>Buccella frigida</i> (Cushman)	x	x	x	x	x	x	<i>Aubignyna</i> sp.1	Live
<i>Buccella inusitata</i> Andersen				x			<i>Buccella tenerrima</i> or <i>Aubignyna</i> sp.1	Absent
<b>Miliolid foraminifera</b>								
<i>Miliammina fusca</i> (Brady)	x	x	x	x			<i>Miliammina fusca</i>	Live
<i>Miliammina fungidens</i> Mayer			x		x		possibly <i>Miliammina fusca</i>	Not differentiated
<i>Miliammina agglutinata</i> (Cushman)					x		<i>Siphonaperta agglutinata</i>	Absent
<b>Textulariid foraminifera</b>								
<i>Ammotium cassis</i> (Parker)		x		x			<i>Ammotium cassis</i>	Live
<i>Ammobaculites exiguis</i> Cushman & Brönnimann			x		x		<i>Ammobaculites exiguis</i>	Absent
<i>Turritellella shoneana</i> (Siddall)	x				x		<i>Reophax dentaliniformis</i> Brady	Dead
<i>Eggerella advena</i> (Cushman)			x	x	x		<i>Turritellella shoneana</i>	Absent
<i>Trochammina inflata</i> (Montagu) subsp. nov.	x			x		x	<i>Eggerella europea</i> (Christiansen)	Absent
<i>Trochamminula lobata</i> (Cushman)			x		x		<i>Trochammina inflata</i>	Dead
<i>Trochamminula fissuraperta</i> Stschedrina	x			x		x	<i>Trochamminula lobata</i>	Dead
<i>Trochamminisca cyclostoma</i> Stschedrina; <i>Jadammina cyclostoma</i>	x			x		x	<i>Jadammina macrescens</i>	Dead
<i>Jadammina polystoma</i> Bartenstein & Brand		x			x		<i>Jadammina macrescens</i>	Absent
<i>Jadammina macrescens</i> (Brady)		x			x		<i>Balticammina pseudomacrescens</i> or <i>Jadammina macrescens</i>	Dead
<b>Monothalamid foraminifera</b>								
<i>Webbinella</i> sp.	x							
<i>Hippocrepinella suboviformis</i> Mayer		L						
<i>Tholosina bulla</i> (Brady)			x					
							<i>Ovammina opaca</i> Dahlgren, 1962	Live
							<i>Hippocrepinella alba</i> Heron-Allen & Earland	Live
							<i>Bathysiphon</i> cf. <i>B. flexilis</i> Höglund	Live
							Undescribed saccamminid 1	Live
							Undescribed saccamminid 2	Live
							Undescribed allogromiid	Live

\* Cited data set and locality:

1. Stschedrina 1947; Stschedrina 1955; Stschedrina 1962 (Gridino Inlet, SW coast of outer Kandalaksha Bay).
2. Mayer 1962; Mayer & Korsun 2008 (Biological Station Moscow University, SW coast of inner Kandalaksha Bay).
3. Mayer 1980 (White Sea, not specified).
4. Lukina 1985a (Onega Bay, not specified).
5. Lukina 1985b (outer Chupa inlet, SW coast of Kandalaksha Bay).
6. Lukina 1988; Galtsova et al. 1989 (Sonostrov, SW coast of Kandalaksha Bay).

## **Supplementary Material 2. The first descriptions of the foraminiferal species mentioned.**

*Ammobaculites exiguus* Cushman and Brönniman, 1948, p. 38, pl. 7, figs. 7, 8.  
*Ammotium cassis* (Parker): *Lituola cassis* Parker, in Dawson, 1870, p. 177, 180, fig. 3.  
*Aubignyna hamblensis* Murray, Whittaker and Alve, 2000, Fig. la–c,e, pl. 2.  
*Balticammina pseudomacrescens* Brönnimann, Lutze and Whittaker, 1989, pl. 1, figs. 1–5, pl. 2, fig. 1–9, pl. 3, fig. 1–4.  
*Bathysiphon flexilis* Höglund, 1947, p. 42, text-figs. 10, 11.  
*Buccella frigida* (Cushman): *Pulvinulina frigida* Cushman, 1922, p. 144.  
*Buccella inusiata* Andesen, 1952, p. 148, fig. 10a–11c. Remark. ‘*Buccella inusitata* Andersen, 1952, is considered to be a junior synonym of *B. tenerrima*’ (Bandy 1961).  
*Buccella tenerrima* (Bandy): *Rotalia tenerrima* Bandy, 1950, p. 278, pl. 42, fig. 3.  
*Cribroelphidium orbiculare* (Brady): *Nonionina orbicularis* Brady, 1881b, p. 415, pl. 21, fig. 5.  
*Cribroelphidium subarcticum* (Cushman): *Elphidium subarcticum* Cushman, 1944, p. 27, pl. 3, figs. 34a,b, 35.  
*Eggerella advena* (Cushman): *Verneuilina advena* Cushman, 1922, p. 141, pl. 1, fig. F.  
*Eggerella europea* (Christiansen): *Verneuilina advena* Cushman in Höglund, 1947, p. 185, pl. 13, fig. 11, text-fig. 169; *Verneuilina europeum* Christiansen, 1958, p. 66.  
*Elphidium albumbilicatum* (Weiss): *Nonion pauciloculum albumbilicatum* Weiss, 1954, p. 157, pl. 32: 1–2.  
*Elphidium bartletti* Cushman, 1933, p. 4, pl. 1, fig. 9.  
*Elphidium clavatum* Cushman: *Elphidium incertum* (Williamson) var. *clavatum* Cushman, 1930, p. 20, pl. 7, fig. 10.  
*Elphidium excavatum clavatum* (Cushman): *Elphidium incertum* (Williamson) var. *clavatum* Cushman, 1930, p. 20, pl. 7, fig. 10.  
*Elphidium frigidum* (Cushman): *Elphidiella frigida* Cushman, 1933, p. 5, pl. 1, fig. 8.  
*Elphidium hallandense* Brotzen, 1943. Remark. This is the senior synonym of *Elphidium subarcticum*.  
*Elphidium longipontis* Stschedrina, 1962, p. 59, fig. 8–10.  
*Elphidium orbiculare* (Brady): *Nonionina orbicularis* Brady, 1881b, p. 415, pl. 21, fig. 5.  
*Elphidium subarcticum* Cushman, 1944, p. 27, pl. 3, figs. 34a, b, 35.  
*Elphidium williamsoni* Haynes, 1973, p. 207, pl. 24:7, pl. 25:6, 9, pl. 27: 1–3.  
*Haynesina orbiculare* (Brady): *Nonionina orbicularis* Brady, 1881b, p. 415, Pl. 21, fig. 5.

*Hippocrepinella alba* Heron-Allen and Earland, 1932, p. 259, pl. 1, fig. 16–18.  
*Hippocrepinella suboviformis* Mayer, 1962, pp. 77–78, fig. 1.4.  
*Jadammina cyclostoma* (Stschedrina): *Trochammina cyclostoma* Stschedrina, 1955, pp. 7–9, fig. 2.  
*Jadammina macrescens* (Brady): *Trochammina inflata* (Montagu) var. *macrescens* (Brady), in Brady, 1870, p. 290, pl. 11, figs. 5a–c.  
*Jadammina polystoma* Bartenstein and Brand, 1938, p. 381, figs. 1a–c, 2a–l.  
*Miliammina agglutinata* (Cushman): *Quinqueloculina agglutinata* Cushman, 1917, no. 71, p. 43, pl. 9, fig. 2. See remark 1 to *Siphonaperta agglutinata*.  
*Miliammina fungidens* Mayer, 1962, p. 78, fig. 3.1, 3.2. *Miliammina fusca* (Brady): *Quinqueloculina fusca* Brady in Brady, 1870, p. 286, pl. 11, fig. 2.  
*Ovammina opaca* Dahlgren, 1962, p. 197, pl. 1.  
*Reophax dentaliniformis* Brady, 1884, p. 293, pl. 30, figs. 21, 22.  
*Retroelphidium excavatum* gr. *clavatum* (Cushman): *Elphidium incertum* var. *clavatum* Cushman, 1930, p. 20, pl. 7, fig. 10.  
*Retroelphidium longipontis* (Stschedrina): *Elphidium longipontis* Stschedrina, 1962, p. 59, fig. 8–10.  
*Siphonaperta agglutinata* (Cushman): *Quinqueloculina agglutinata* Cushman, 1917, no. 71, p. 43, pl. 9, fig. 2. Remark 1. The difference between *Miliammina* and *Siphonaperta* is the cement of the wall. In *Miliammina*, the ‘wall is rather thick, finely agglutinated on an organic base’, whereas *Siphonaperta* has a ‘wall with an agglutinated outer coating on a calcareous base’ (Mikhalevich & Kaminski 2008). The tests present in our samples dissolve in weak chloric acid and thus belongs to *Siphonaperta*. Remark 2. *Quinqueloculina agglutinata* Cushman, 1917 and *Quinqueloculina agglutinans* d’Orbigny, 1839 seem to be often mixed up in the literature, because of the similar spelling.  
*Tholosina bulla* (Brady): *Placopsilina bulla* Brady, 1881a, p. 51.  
*Trochammina inflata* (Montagu) subsp. nov. Mayer, 1962, p. 82, fig. 3, 4.  
*Trochammina inflata* (Montagu): *Nautilus inflatus* Montagu, 1808, p. 81, pl. 18, fig. 3.  
*Trochamminisca cyclostoma* Stschedrina, 1955, pp. 7–9, fig. 2.  
*Trochamminula fissuraperta* Stschedrina, 1955, pp. 5–7, fig. 1.  
*Trochamminula lobata* (Cushman): *Trochammina lobata* Cushman, 1944, pp. 18–19, pl. 2, fig. 10.  
*Turritellella shoneana* (Siddall): *Trochammina shoneana* Siddall, 1878, p. 46, figs. 1, 2.

**Supplementary Material 3. Occurrence of rotaliid foraminifera on beaches in the outer Chupa Inlet, western White Sea.**

E.will., *Elphidium williamsoni*; E.exc., *Elphidium excavatum clavatum*; E.alb., *Elphidium albiumbilicatum*. Semi-quantitative census data based on >250 µm size fraction: xxx = abundant, xx = common, x = rare.

Stn no.	Sample no.	Date Aug 2011	Habitat*	Sample**	E.will.	E.exc.	E.alb.	Remark
1	1	15	M, clayey mud, <i>Zostera</i>	~60 cm <sup>3</sup>	xx			
2	1	15	M, clayey mud, <i>Zostera</i>	~20 cm <sup>3</sup>	x			
	2	15	M, clayey mud, <i>Zostera</i>	~20 cm <sup>3</sup>				no rotaliids
3	1	15	L, sand, <i>Arenicola</i> , <i>Zostera</i>	40 cm <sup>3</sup>	xx			
	2	15	L, sand, <i>Arenicola</i> , <i>Zostera</i>	40 cm <sup>3</sup>	xxx			
4	1	16	M, sand, <i>Arenicola</i>	~60 cm <sup>3</sup>				no rotaliids
	2	16	M, sand, <i>Arenicola</i>	~60 cm <sup>3</sup>	x			
5	1	3	L, mud, <i>Zostera</i>	20 cm <sup>3</sup>				no rotaliids
	2	3	L, mud, <i>Zostera</i>	20 cm <sup>3</sup>				no rotaliids
6	1	3	L, sand, <i>Arenicola</i>	20 cm <sup>3</sup>	x			
	2	3	L, sand, <i>Arenicola</i>	20 cm <sup>3</sup>				no rotaliids
7	1	3	L, sand, <i>Arenicola</i>	20 cm <sup>3</sup>				no rotaliids
	2	3	L, sand, <i>Arenicola</i>	20 cm <sup>3</sup>				no rotaliids
8	1	3	U pool, sand covered with clay, <i>Hydrobia</i>	20 cm <sup>3</sup>				no rotaliids
9	1	3	U pool, organic debris, <i>Hydrobia</i> , diatom mat	~40 cm <sup>3</sup>				no rotaliids
10	1	6	L, sand, <i>Arenicola</i> , fil.green algae	20 cm <sup>3</sup>	x			
	2	6	L, sand, <i>Arenicola</i> , fil.green algae	20 cm <sup>3</sup>	x			
11	1	6	L, sand, <i>Arenicola</i> , <i>Zostera</i> , fil.green algae	20 cm <sup>3</sup>				no rotaliids
	2	6	L, sand, <i>Arenicola</i> , <i>Zostera</i> , fil.green algae	20 cm <sup>3</sup>				no rotaliids
12	1	7	L, sand between boulders, <i>Arenicola</i>	~80 cm <sup>3</sup>	x	x		
13	1	7	L, sand, <i>Arenicola</i> , mussel, fil.green algae	20 cm <sup>3</sup>				no rotaliids
14	1	4	L, sand, <i>Arenicola</i> , fil.green algae, <i>Zostera</i>	20 cm <sup>3</sup>				no rotaliids
15	1	4	L, muddy sand, <i>Arenicola</i>	20 cm <sup>3</sup>	xx	x		
16	1	7	L, mud, <i>Zostera</i> , fil.green algae	20 cm <sup>3</sup>				no rotaliids
	2	7	L, mud, <i>Zostera</i> , fil.green algae	20 cm <sup>3</sup>				no rotaliids
	3	7	L, mud, <i>Zostera</i> , fil.green algae	20 cm <sup>3</sup>				no rotaliids
	4	7	M, muddy sand, <i>Arenicola</i> , <i>Zostera</i> , fil.green algae	20 cm <sup>3</sup>				no rotaliids
	5	7	M, muddy sand, juvenile <i>Arenicola</i> , fil.green algae, <i>Zostera</i>	20 cm <sup>3</sup>				no rotaliids
17	1	7	L, muddy sand, mussel, fil.green algae	20 cm <sup>3</sup>				1 <i>Aubignyna</i> sp.
18	1	7	L, muddy sand, <i>Zostera</i> , fil.green algae	20 cm <sup>3</sup>	x			
19	1	7	L, mud, fil.green algae	20 cm <sup>3</sup>				no rotaliids
	2	7	L, muddy sand, <i>Zostera</i> , fil.green algae	20 cm <sup>3</sup>				no rotaliids
20	1	5	M, muddy sand, <i>Arenicola</i> , <i>Zostera</i> , mussel	20 cm <sup>3</sup>				no rotaliids
	2	5	M, muddy sand, <i>Arenicola</i> , <i>Zostera</i> , mussel	20 cm <sup>3</sup>				no rotaliids
	3	16	M, sand, mussel	~60 cm <sup>3</sup>	x		x	1 <i>Aubignyna</i> sp.
	4	16	M, sand, mussel	~60 cm <sup>3</sup>				no rotaliids
21	1	5	M, mud, <i>Zostera</i>	20 cm <sup>3</sup>				no rotaliids
	2	5	M, mud, <i>Zostera</i>	Zostera	x			
	3	16	L, mud, <i>Zostera</i>	fil.algae	xx			
	4	16	L, mud, dead fil.algae	fil.algae	xxx			
	5	16	L, mud, <i>Zostera</i>	~60 cm <sup>3</sup>	x			
22	1	16	M pool, mud, <i>Zostera</i>	~60 cm <sup>3</sup>	x		xx	
	2	16	M pool, mud, <i>Zostera</i>	~60 cm <sup>3</sup>			xx	
23	1	6	U pool, mud, <i>Fucus vesiculosus</i> only	~40 cm <sup>3</sup>	x			
24	1	6	L, mud, <i>Zostera</i>	20 cm <sup>3</sup>	x			
	2	6	L, mud, <i>Zostera</i>	20 cm <sup>3</sup>	x			
25	1	6	L, mud, <i>Zostera</i>	20 cm <sup>3</sup>				no rotaliids
	2	6	L, mud, <i>Zostera</i>	20 cm <sup>3</sup>				no rotaliids
26	1	6	L, sand, <i>Arenicola</i> , <i>Zostera</i> , mussel	20 cm <sup>3</sup>				no rotaliids
	2	6	L, sand, <i>Arenicola</i> , <i>Zostera</i> , mussel	20 cm <sup>3</sup>				no rotaliids
	3	6	L, sand, <i>Arenicola</i> , <i>Zostera</i> , mussel	Zostera				no rotaliids
27	1	5	M, sandy mud	20 cm <sup>3</sup>				no rotaliids
	2	5	M, sandy mud	20 cm <sup>3</sup>				no rotaliids
	3	11	M, sandy mud	20 cm <sup>3</sup>	x		x	
	4	11	M, sandy mud	20 cm <sup>3</sup>	x	x	x	
	5	11	M, sandy mud	20 cm <sup>3</sup>		xx		
28	1	5	L, sandy mud	~60 cm <sup>3</sup>	xx	x	xx	
	2	11	L, sandy mud	~20 cm <sup>3</sup>		xx	xx	
	3	5	L, sandy mud	~60 cm <sup>3</sup>	xxx	x	x	1 <i>H.orbiculare</i>

Supplementary Material 3 (*Continued*)

Stn no.	Sample no.	Date Aug 2011	Habitat*	Sample**	E.will.	E.exc.	E.alb.	Remark
29	4	11	L, sandy mud	~20 cm <sup>3</sup>	x	x		
	5	5	L, sandy mud	~60 cm <sup>3</sup>	x		xx	
	1	5	M, sandy mud	~20 cm <sup>3</sup>				no rotaliids
	2	5	M, sandy mud	~20 cm <sup>3</sup>				no rotaliids
	3	11	L, sandy mud	20 cm <sup>3</sup>	x			
30	4	11	L, sandy mud	20 cm <sup>3</sup>	xx	x		
	1	5	L, mud, <i>Zostera</i>	~100 cm <sup>3</sup>	x			
31	1	10	M, mud	20 cm <sup>3</sup>		x		
32	1	10	M, sand topped with mud, <i>Plantago</i> , <i>Fucus vesiculosus</i> only	20 cm <sup>3</sup>		x		
	2	10	M, sand topped with mud, <i>Plantago</i> , <i>Fucus vesiculosus</i> only	20 cm <sup>3</sup>		xx		
	3	10	M, sand topped with mud, <i>Plantago</i> , <i>Fucus vesiculosus</i> only	20 cm <sup>3</sup>				no rotaliids
33	1	6	L, sandy mud, <i>Zostera</i>	20 cm <sup>3</sup>	xx	x		
	2	6	L, sandy mud, <i>Zostera</i>	20 cm <sup>3</sup>	xx	x	x	
34	1	6	L, sandy mud, <i>Zostera</i>	20 cm <sup>3</sup>				no rotaliids
	2	6	L, sandy mud, <i>Zostera</i>	20 cm <sup>3</sup>	x			
35	1	14	L, sand, <i>Arenicola</i> , fil.green algae, <i>Zostera</i>	~50 cm <sup>3</sup>				no rotaliids
	2	14	L, sand, <i>Arenicola</i> , fil.green algae, <i>Zostera</i>	~40 cm <sup>3</sup>		x		
	3	14	L, sand covered with mud, fil.green algae	~30 cm <sup>3</sup>	x		xx	
	4	14	L, sand covered with mud, fil.green algae	~30 cm <sup>3</sup>				no rotaliids
36	1	14	L, mud, fil.green algae	~20 cm <sup>3</sup>	x	x		
	2	14	L, mud, fil.green algae	~50 cm <sup>3</sup>	x	x	x	
37	1	14	L, mud, fil.green algae	~40 cm <sup>3</sup>	x	x	x	
38	1	14	L, mud, fil.green algae	~40 cm <sup>3</sup>	x			
39	1	14	L, mud, <i>Zostera</i>	~40 cm <sup>3</sup>	xxx	x	x	
	2	14	L, mud, <i>Zostera</i>	~40 cm <sup>3</sup>	xx			

\* The habitat is characterized by the level (L, lower intertidal; M, middle intertidal; U, upper intertidal), sediment type, and conspicuous organisms (fil.algae = filamentous algae).

\*\* Either the volume or the macrophyte name is shown in this column for sediment samples and seaweed samples, respectively.

