Table DR1. Abundance and species richness of higher taxa in the studied quantitative samples.

Higher taxon	number of families	number of species	number of fossils
Demospongea	1	1	166
Scleractinia	3	4	540
Polychaeta	1	1	19
Cirripedia	1	2	395
Decapoda	1	1	34
Molluscs	62	138	36122
Echinodermata	1	1	3
Chondrichthyes	3	3	34
Osteichthyes	6	8	232
Total	**80**	**159**	**37545**

Table DR2. Number of samples in the four biofacies along with their environmental and stratigraphic affiliation.

Biofacies		Cluster 1 *Agapilia*	Cluster 2 *Granulolabium-Agapilia*	Cluster 3 *Nassarius-Turritella-Corbula*	Cluster 4 *Nassarius-Paphia-Loripes*
Total no. of samples		20	31	28	29
Water depth	intertidal	19	31	2	8
	subtidal	1	0	26	21
Sediment type	pelitic	14	17	23	6
	sandy	6	14	5	23
Position	W	17	16	25	19
	E	3	9	3	10
	Swell	0	6	0	0
Sequence	one	15	25	14	22
	two	5	0	14	7
Systems tract	TST1	2	23	11	20
	HST	13	8	4	2
	TST2	5	0	13	7

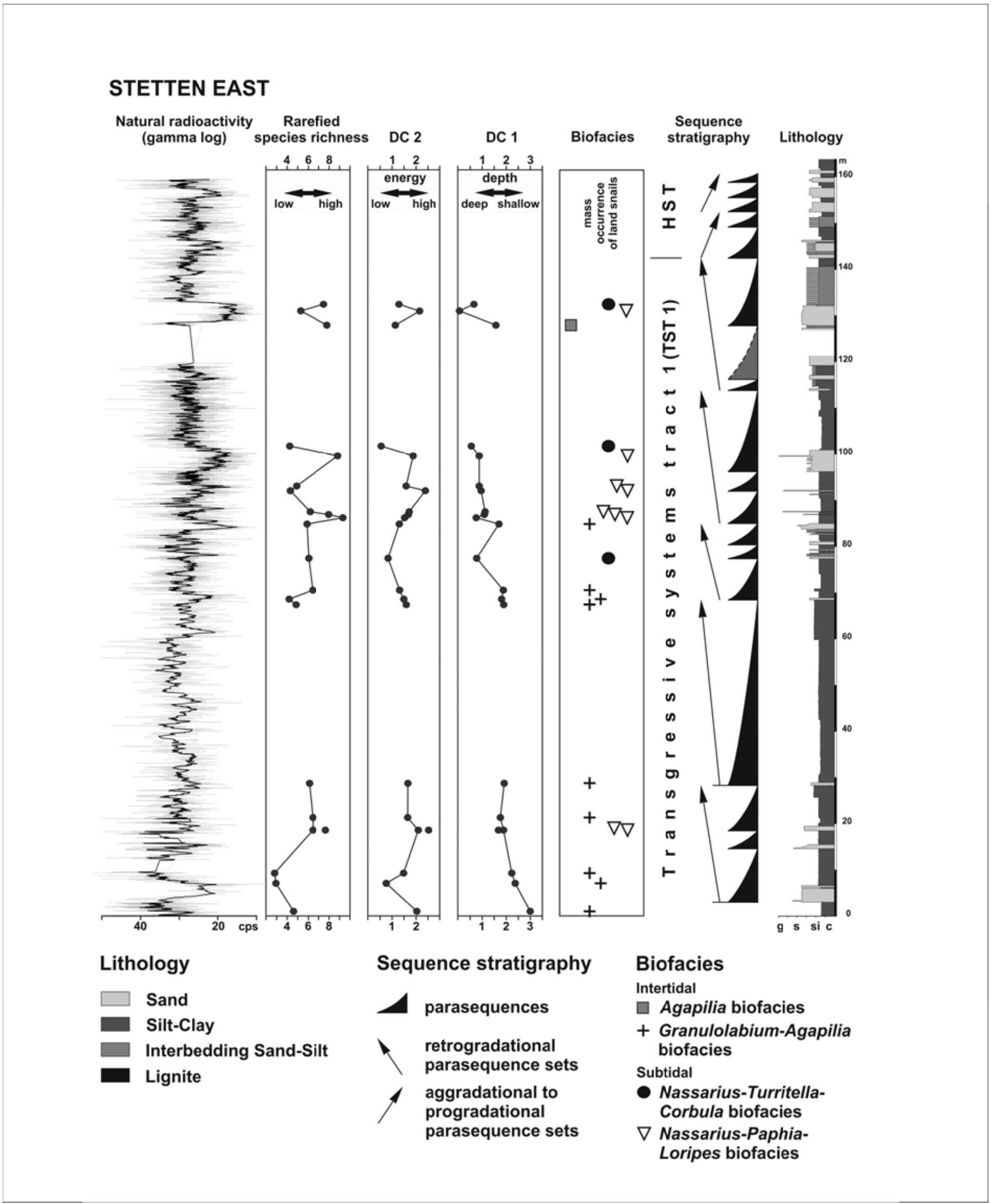

Figure DR 1. The proximal section Stetten East consists of TST1 and the lowermost part of the HST. It can be correlated by lithology and faunal content with the lower part of section Stetten West (see Fig. 1).

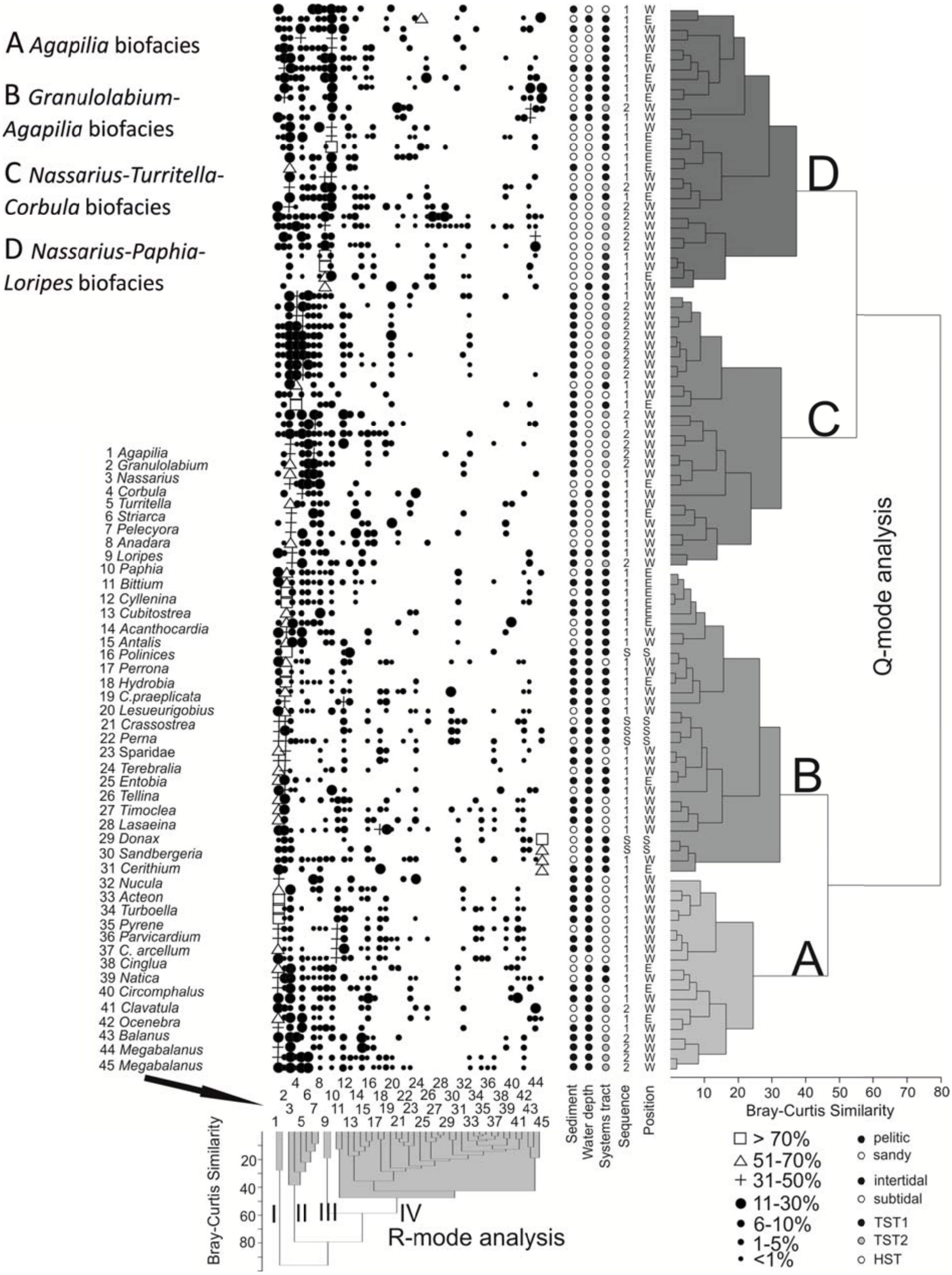

Figure DR2. Two-way cluster analysis of benthic assemblages.

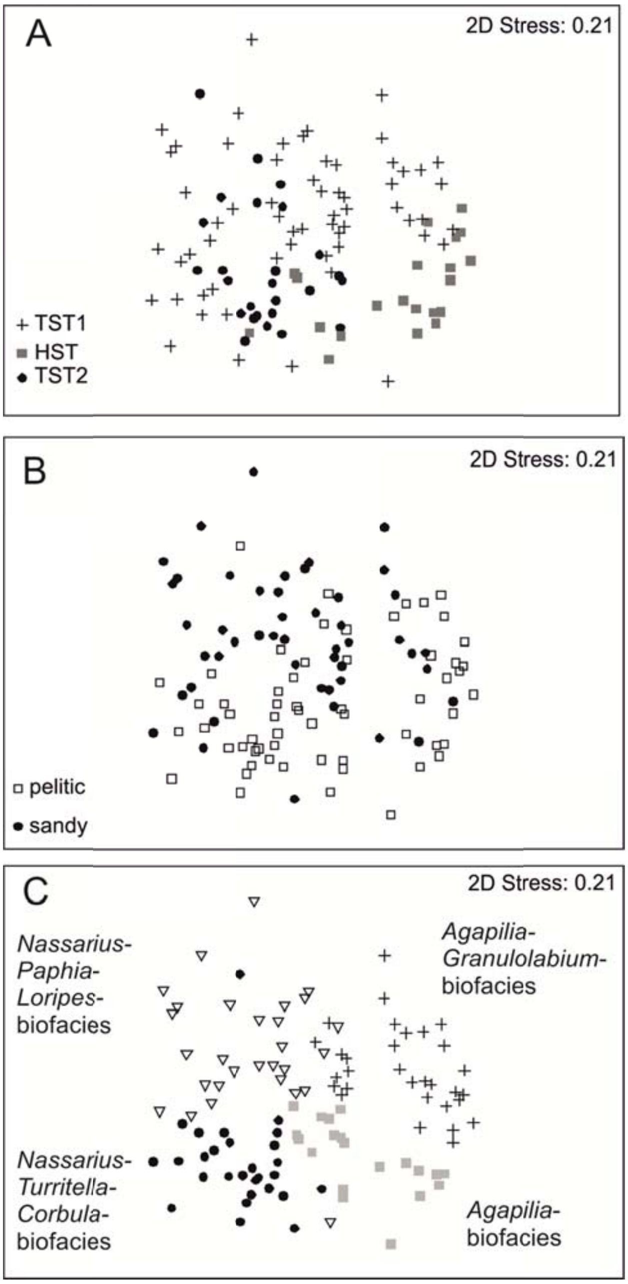

Figure DR3: Ordination plots of non-metric multidimensional scaling (nMDS). A. Distribution of samples in relation to systems tracts. B. Distribution of samples in relation to grain size of sediments. C. Distribution of samples in relation to biofacies.

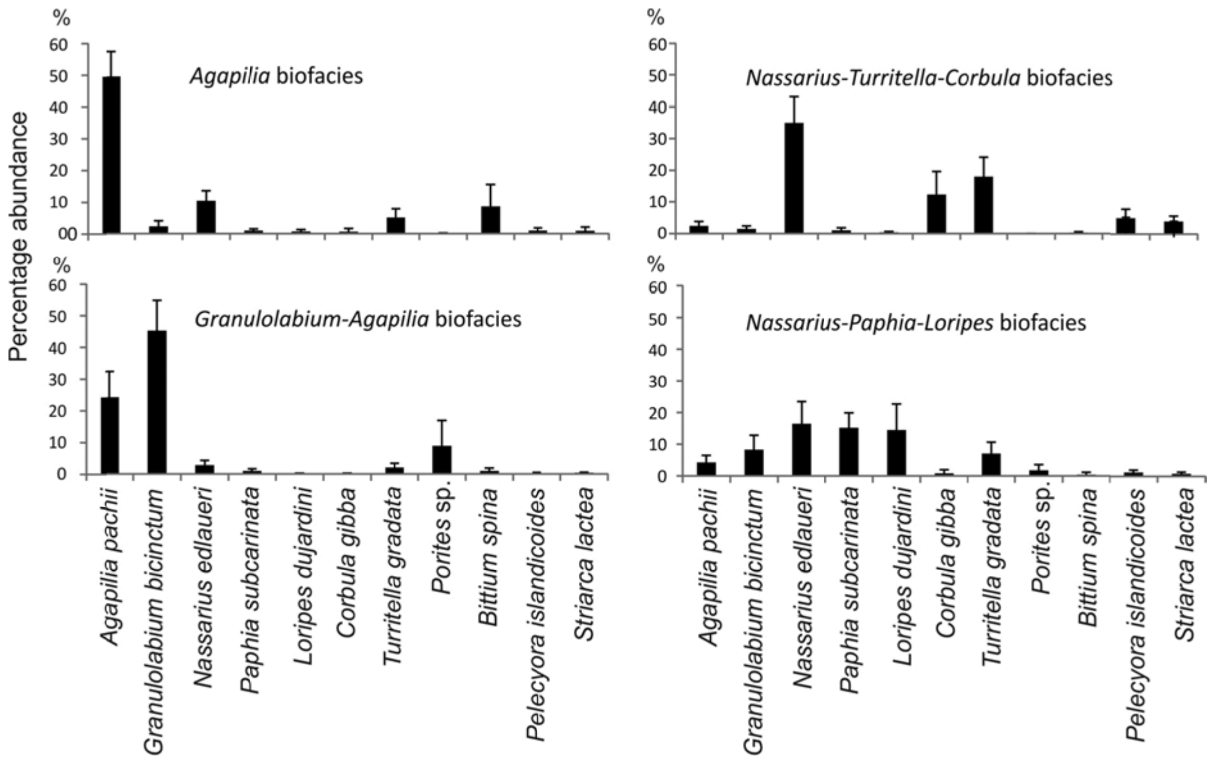

Figure DR4: The most abundant taxa in the four biofacies (after correction of data for disarticulation of bivalves).

Cluster analysis

Q-mode cluster analysis resulted in four well-defined clusters, each representing a distinct biofacies (Fig. DR2). Cluster A (20 samples) is characterized by the *Agapilia biofacies* (Fig. DR4) and consists almost exclusively of samples from intertidal settings, more than two thirds are from pelitic sediments and three quarters are from the lower fourth order cycle. Two thirds of the samples here are from the HST, the rest belongs mostly to TST2 (Table DR2). Cluster 2 (31 samples) is characterized by the *Granulolabium-Agapilia* biofacies (Fig. DR2, Fig DR4). It consists of intertidal samples only, all belong to the lower fourth order cycle (including all samples from the Flysch swell), three quarters are from TST1, the rest from the HST, and almost half of the samples are from sandy sediments (Table DR2). Cluster 3 (28 samples) is characterized by the *Nassarius-Turritella-Corbula* biofacies (Fig. DR2, Fig. DR4). Virtually all samples here were classified as sublittoral, the great majority is from pelitic sediments and half belongs to the upper fourth order cycle. The majority of samples belong in roughly equal numbers to the two TSTs, only four are from the HST (Table DR2). Cluster 4 (29 samples) is characterized by the *Nassarius-Paphia-Loripes* biofacies (Fig. DR2, Fig. DR4). The majority of samples here is from sandy, subtidal settings and three quarters belong to the lower fourth order cycle. Samples are mostly from TST1, followed by TST2, only two are from the HST (Table DR2). R-mode cluster analysis revealed four clusters of taxa with similar distributions among samples (Fig. DR2).Cluster I consists of *Agapilia* and *Granulolabium*, two species of gastropods that strongly dominate cluster A (*Agapilia* biofacies) and B (*Granulolabium-Agapilia* biofacies) and are considered as indicators of intertidal environments. Cluster II consists of the gastropods *Nassarius* and *Turritella*, and the bivalves *Corbula*, *Striarca*, *Pelecyora* and *Anadara*, which are all typical components of cluster C (*Nassarius-Turritella-Corbula* biofacies) and can be considered as indicators of sublittoral and rather pelitic environments. Cluster III consists of *Loripes* and *Paphia*, two bivalve species which typically occur in samples of cluster D (*Nassarius-Paphia-Loripes* biofacies) and are considered as indicators of sublittoral sandy environments. Cluster IV consists of the remaining species, which are best characterized by their rather patchy distributions. Accordingly, most of these species occur in low mean abundances (<5%) in all biofacies. Exceptions are the coral *Porites*, which is abundant in cluster 2 and *Bittium*, which is abundant in cluster 1.

Appendix DR1: Actualistic comparison of abundant taxa

The quantitatively most important taxon *Agapilia* is an extinct member of the neritid gastropods, a family which today is present in different habitats worldwide but mostly in intertidal rock and mangrove regions (subtropical and tropical) (Scott and Kenny, 1998). The quantitatively very important *Granulolabium* belongs to the potamidid gastropods, which today also live in the intertidal, in estuaries or sandy mudflats (Healy and Wells, 1998) and are known from temperate and tropical mudflats in the Indo-West Pacific (Ewers, 1963; Wells, 1984). Nassariid gastropods which occur globally from intertidal to shallow subtidal marine habitats (Cernohorsky, 1984) but mostly in estuarine and shallow marine (soft-substrate) environments of temperate and tropical zones (Harasewych, 1998) are also numerous. The two abundant species of this family in our study, *Nassarius edlaueri* and *Cyllenina ternodosa* were also recorded from coeval deposits from northern Korneuburg basin and are there interpreted as brackish-marine species, dwelling on intertidal mudflats to shallow sublittoral habitats (Zuschin et al., 2004). Cerithiid gastropods (“sand creepers”) are common in shallow marine water in subtropical and tropical zones globally and in different substrata like sand flats or mangroves (Healy and Wells, 1998), and the genus *Bittium* mainly occurs in vegetated marine environments (Bernasconi and Stanley, 1997; Olabarria et al., 1998; Schneider and Mann, 1991, Weber & Zuschin 2013). The brackish and freshwater species Hydrobiidae occur in different habitats like rivers or estuarine mudflats (Ponder and De Keyzer, 1998); they are for example typical components of inner tidal flat assemblages in the northern Adriatic Sea (Weber & Zuschin, 2013) and of tidal flats on the Atlantic coast of France (Poirier et al. 2010). Turritellidae are mostly common on sublittoral muddy-sandy bottoms (Healy and Wells, 1998); they were for example abundantly present in sublittoral muddy sediments of the northern Adriatic Sea (Sawyer & Zuschin 2010). Scaliolid gastropods like *Sandbergeria perpusilla* live in sandy-mud substrate in the intertidal and littoral (Healy and Wells, 1998) and are known from the subtropical and tropical Indo-West Pacific (Ponder, 1994). In the northern Red Sea, scaliolids are widely distributed, but most abundant in sublittoral muddy sediments (Janssen et al. 2011). The most abundant bivalve in our study is *Loripes*, a member of the Lucinidae which are known from the intertidal to the shallow subtidal (Reid and Slack-Smith, 1998; Taylor and Glover, 2006), typically harbour chemosymbionts (Berg and Alatalo, 1984; Reid and Brand, 1986; Reid and Slack-Smith, 1998; Johnson & Fernandez 2001) and are often associated with seagrass environments in warm waters (Barnes and Hickman, 1999; Johnson et al., 2002, Zuschin & Oliver 2003, van der Heide et al. 2012). The venerid bivalve *Paphia* occurs worldwide in different environments but mostly in the intertidal of tropical (Indo-Pacific) to temperate regions (Harte, 1998) and is known from subtidal habitats in the Mediterranean and the Red Sea (e.g. Poppe and Goto 1993, Zuschin and Oliver 2003). Corbulidae are shallow subtidal inhabitants in soft-bottom environments (Hrs-Brenko, 2006; Lamprell et al., 1998) and *Corbula gibba* lives in the coastal and estuarine subtidal (Holmes and Miller, 2006). Cardiidae (“heart cockles”) live mostly infaunal in shallow habitats (Rufino et al., 2010, Wilson, 1998) and the genus *Cerastoderma* prefers estuarine conditions in temperate regions (Boyden and Russel, 1972). Living *Cerastoderma* in the northern Adriatic Sea occur from the outer tidal flat to the shallow sublittoral, but its empty valves are frequently distributed across the tidal flat (Weber & Zuschin 2013). On the Atlantic coast of France, living *Cerastoderma* is restricted to the tidal flats, but its empty valves are transported into the sublittoral (Poirier et al. 2010). *Striarca* is a neotiid bivalve, and this family is today common in the intertidal and shallow sub-littoral (Stanley, 1970; Oliver, 1985). *Striarca lactea* occurs today in the sublittoral northern Adriatic Sea in shallow, sandy sediments (Weber & Zuschin 2013). The endobyssate arcid bivalve *Anadara* today lives in sublittoral environments, for example in the northern Red Sea (Zuschin & Oliver 2003) and northern Adriatic Sea (Sawyer & Zuschin 2010). *Porites* is very abundant in Miocene reefs of the Paratethys Sea (e.g., Riegl & Piller 2000, Reutter & Piller 2011) and among the main builders in modern coral reefs (e.g. Cortés et al. 1994, Grossman and Fletcher 2004, Macintyre et al. 1992). Quantitatively less important but environmentally indicative are clionids, balanids, decapods and goniasterids. Clionids are mainly limestone-boring sponges (Goreau and Hartman, 1963; Rützler, 1975) and often dominate shallow-water sponge associations (Rützler, 2002). *Balanus amphitrite* is an acorn barnacle (Desai and Anil, 2005) which lives in the intertidal (Thiyagarajan, 2010). The recent *B.amphitrite* is known from warm, tropical and *Balanus tinntinabulum* from temperate and tropical regions (Wöhrer, 1998). The unspecified decapod-claws could indicate a marine, soft-muddy environment (Müller, 1998). Goniasterid star fishes typically occur in shallow sublittoral habitats (Villier et al., 2004).

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