Appendix A. Dietary composition matrices for the *Zostera* and bare sediment ecosystem models in Mondego estuary for the three time periods. Values are proportions of the consumer diets (columns) made up by the prey (rows). No.: Compartment no.

		Cons	sumer	rs																												
No.	Prey	ഗ Zooplankton	 Amphithoe valida 	∠ Melita palmata		ь Mytilus sp.	5 Scrobicularia plana	1 Carcinus maenas	Crangon crangon	G Gibulia umbilicalis	Haminoea hydatis	5 Hydrobia ulvae	9 Littorina littorea	L Cyathura carinata	⊕ Idotea chelipes	G Lekanesphaera levii	8 Alkmaria romijni	∑ Aonides oxycephala	S Capitella capitata	S Chaetozone setosa	S Diopatra neapolitana	S Eteone flava	S Glycera tridactyla	2 Hediste diversicolor	& Heteromastus filiformis	& Lagis koreni	S Lumbrineris impatiens	≤ Nephthys spp.	& Pygospio elegans	& Streblospio shrubsolii	Nemertini	S Olinochaets
1	Phytoplankton	0.98			0.80	0.80	0.20										0.10							0.05					0.60			_
	Microphytobenthos	0.30	0.10	0.10	0.00					0.30	0.30	0.32	0.05		0.10	0.60	0.10							0.05			0.05	0.05	0.00			
	Green macroalgae			0.20		0.10	0.20	0.04	0.05			0.02	0.35		0.10	0.00								0.00			0.00	0.00				
	Zostera noltii		0.20	, 0.20	,			0.01	0.00	0.00	0.00		0.20		0.05												0.10					
	Zooplankton	0.02						0.06	0.10				0.20		0.00												0.10				0.005	_
	Ampithoe valida	0.02						0.04						0.05							0.01		0.06	0.002			0.001	0.006			0.005	
	Melita palmata								0.03					0.045							0.01		0.03	0.002			0.002				0.04	_
	Cerastoderma edule							0.02						0.0 10							0.01			0.009			0.034				0.04	
	Mytilus sp.								0.005												0.01		0.00	0.000			0.001	0.00			0.01	_
	Scrobicularia plana							0.06													0.01		0.05	0.007			0.035	0.024			0.03	
	Carcinus maenas								0.01					0.055							0.01		0.00	0.007			0.000	0.02			0.00	_
	Crangon crangon							0.14																								
	Gibulla umbilicalis							-	0.001																		0.02				0.005	_
	Haminoea hydatis							0.001																			0.014				0.005	
	Hydrobia ulvae							0.03													0.09		0.095	0.129			0.07				0.05	
	Littorina littorea							0.01	0.01															0.01			0.035				0.01	
	Cyathura carinata							0.03	0.04																		0.01				0.03	
	Idotea chelipes							0.005	0.005					0.01									0.01				0.001				0.01	
	Lekanesphaera levii													0.001																	0.001	
20	Alkmaria romijni								0.003					0.02									0.01					0.001				
21	Aonides oxycephala							0.001	0.001					0.001							0.01	0.20	0.01				0.001	0.001			0.005	_
22	Capitella capitata													0.004									0.005	0.001			0.002	0.012				
	Chaetozone setosa							0.018	0.013												0.04		0.06				0.001				0.03	_
24	Diopatra neapolitana								0.001														0.002					0.001			0.005	
25	Eteone flava								0.001														0.001								0.001	
26	Glycera tridactyla							0.02	0.01					0.009	1							0.05	0.01	0.015			0.002	0.024			0.04	
27	Hediste diversicolor							0.08	0.09					0.05								0.15	0.13				0.004	0.08			0.23	
28	Heteromastus filiformis							0.005	0.04					0.03	0.10							0.20	0.09	0.065			0.005	0.10			0.077	
29	Lagis koreni							0.001	0.002												0.01		0.001	0.002							0.005	
30	Lumbrineris impatiens							0.01	0.015														0.01					0.002			0.02	
31	Nephthys spp.							0.005	0.001														0.003	0.002			0.001	0.001			0.005	
32	Pygospio elegans																					0.10	0.001								0.001	
33	Streblospio shrubsolii													0.005							0.01	0.20	0.001	0.005			0.001				0.005	
34	Nemertini																						0.001	0.001			0.001				0.05	
35	Oligochaets							0.001	0.005					0.02	0.15								0.04	0.04			0.01	0.08			0.05	
36	Detritus		0.70	0.70	0.10	0.10	0.60	0.15	0.30	0.65	0.65	0.68	0.40	0.70	0.50	0.40	0.90	1.00	1.00	1.00	0.80	0.10	0.30	0.57	1.00	1.00	0.60	0.55	0.40	1.00	0.20	1.0
	Imports							0.18																								
	Sum	1.00	1.00	1 1 0	1 100	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0

Zo	stera, 1999/00																										
		Cons	umers																								
No.	Prey	ഗ Zooplankton	 Amphithoe valida 	✓ Melita palmata	∞ Cerastoderma edule	ω Scrobicularia plana	Carcinus maenas	T Crangon crangon	Thaminoea hydatis	5 Hydrobia ulvae	5 Littorina littorea	G Cyathura carinata	of Idotea chelipes	1 Alkmaria romijni	G Capitella capitata	⊕ Chaetozone setosa	S Eteone flava	Glycera tridactyla	S Hediste diversicolor	S Heteromastus filiformis	\$ Lagis koreni	S Mediomastus fragilis	% Mista picta	2 Nephthys spp.	8 Streblospio shrubsolii	65 Nemertini	& Oligochaets
	Phytoplankton	0.98			0.80	0.20								0.10					0.05								
	Microphytobenthos		0.10	0.10	0.10	0.20			0.30	0.45	0.05		0.10						0.05					0.05			
3	Green macroalgae		0.20	0.20			0.04	0.05	0.05		0.50		0.20														
4	Zostera noltii										0.20		0.05														
5	Zooplankton	0.02					0.06	0.08																		0.005	
6	Ampithoe valida						0.02	0.02				0.006						0.03	0.001					0.005		0.01	
7	Melita palmata						0.005	0.000	5			0.001						0.001						0.001			
8	Cerastoderma edule						0.01	0.001										0.005	0.001					0.002		0.005	
9	Scrobicularia plana						0.11	0.16										0.14	0.069					0.05		0.08	
10	Carcinus maenas						0.05	0.01				0.04															
11	Crangon crangon						0.14	0.01																			
12	Haminoea hydatis						0.002																			0.005	
13	Hydrobia ulvae						0.023	0.05										0.03	0.07							0.05	
14	Littorina littorea						0.005	0.01																		0.005	
15	Cyathura carinata						0.015	0.06																		0.06	
	Idotea chelipes						0.001	0.001				0.001						0.01									
17	Alkmaria romijni							0.005				0.001						0.005						0.001			
	Capitella capitata											0.001						0.005						0.001			
	Chaetozone setosa							0.002											0.002					0.004		0.005	
-	Eteone flava							0.001											0.002					0.004		0.005	
	Glycera tridactyla							0.003				0.005							0.001					0.01		0.005	
	Hediste diversicolor						0.17					0.129					0.66						0.70			0.35	
	Heteromastus filiformis						0.002					0.03	0.10				0.15		0.04				0.15	0.09		0.10	
	Lagis koreni						0.001	0.001										0.001								0.005	
	Mediomastus fragilis																		0.001								
	Mista picta							0.001				0.001						0.01	0.001					0.001			
	Nephthys spp.						0.005	0.01											0.001					0.001		0.005	
-	Streblospio shrubsolii																0.04									0.005	
	Nemertini							0.001				0.005					0.05		0.001				0.05			0.05	
	Oligochaets							0.003				0.03					0.05	0.03	0.01				0.05			0.05	
31	Detritus	1	0.70	0.70	0.10	0.60	0.15	0.30	0.65	0.55	0.25	0.75	0.40	0.90	1.00	1.00	0.10	0.20	0.70	1.00	1.00	1.00	0.10	0.30	1.00	0.20	1.00
	Imports						0.18	0.06																			
	Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Zostera, 2001/02

		Cons	umers																	
No.	Prey	ഗ Zooplankton	o Amphithoe valida	✓ Melita palmata	∞ Cerastoderma edule	o Scrobicularia plana	5 Carcinus maenas	1 Crangon crangon	5 Hydrobia ulvae	ರ Littorina littorea	L Cyathura carinata	1 Idotea chelipes	9 Alkmaria romijni	1. Capitella capitata	ଜ Hediste diversicolor	G Heteromastus filiformis	S Lagis koreni	5 Mista picta	S Streblospio shrubsolii	& Oligochaets
1	Phytoplankton	0.98			0.80	0.20							0.10		0.05					
	Microphytobenthos	0.00	0.10	0.10	0.10	0.20			0.32	0.05		0.10	0.10		0.04					
	Green macroalgae		0.15			00	0.04	0.05		0.40		0.15								
	Zostera noltii									0.20		0.05								
	Zooplankton	0.02					0.06	0.08												
	Ampithoe valida						0.001	0.001			0.001				0.001					
	Melita palmata							0.001			0.001				0.001					
	Cerastoderma edule							0.005							0.002					
9	Scrobicularia plana						0.11	0.14							0.055					
10	Carcinus maenas						0.06	0.01			0.07									
11	Crangon crangon						0.14	0.01												
12	Hydrobia ulvae						0.02	0.05							0.095					
13	Littorina littorea						0.002	0.001												
14	Cyathura carinata						0.01	0.04												
15	Idotea chelipes						0.001	0.001			0.001									
16	Alkmaria romijni							0.001			0.001				0.001					
17	Capitella capitata							0.011			0.007				0.005			0.02		
18	Hediste diversicolor						0.26	0.23			0.161							0.86		
19	Heteromastus filiformis						0.001	0.005			0.005	0.10			0.005			0.01		
20	Lagis koreni						0.001	0.001												
21	Mista picta						0.002								0.001					
22	Streblospio shrubsolii										0.001				0.002			0.005		
23	Oligochaets						0.001	0.003			0.002	0.15			0.002			0.005		
24	Detritus		0.75	0.75	0.10	0.60	0.10	0.30	0.68	0.35	0.75	0.45	0.90	1.00	0.74	1.00	1.00	0.10	1.00	1.00
	Imports						0.18	0.06												
	Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

bare sediment, 1993/94

		Cons	umers																			
		Zooplankton	Amphithoe valida	Melita palmata	Cerastoderma edule	Scrobicularia plana	Carcinus maenas	Crangon crangon	Haminoea hydatis	Hydrobia ulvae	Cyathura carinata	Idotea chelipes	Alkmaria romijni	Capitella capitata	Chaetozone setosa	Glycera tridactyla	Hediste diversicolor	Heteromastus filiformis	Pygospio elegans	Streblospio shrubsolii	Nemertini	Oligochaets
No.	Prey	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Phytoplankton	0.98			0.85	0.40							0.10				0.05		0.60			
2	Microphytobenthos		0.10	0.10	0.05	0.40			0.65	0.75		0.10					0.05					
3	Green macroalgae		0.75	0.75			0.08	0.06	0.10		0.015	0.70										
4	Zooplankton	0.02					0.06	0.1													0.005	
5	Ampithoe valida						0.03	0.02			0.001					0.03	0.03				0.05	
6	Melita palmata						0.03	0.03			0.001					0.04	0.02				0.04	
7	Cerastoderma edule						0.001	0.002								0.005	0.01				0.005	
8	Scrobicularia plana						0.08	0.09								0.08	0.058				0.04	
9	Carcinus maenas						0.06	0.01			0.003											
10	Crangon crangon						0.14	0.01														
11	Haminoea hydatis						0.001									0.01					0.005	,
12	Hydrobia ulvae						0.02	0.05								0.03	0.05				0.04	
13	Cyathura carinata						0.04	0.05													0.03	
14	Idotea chelipes						0.001	0.01								0.01					0.01	
15	Alkmaria romijni							0.01			0.004	0.05				0.095					0.09	
16	Capitella capitata															0.01	0.025					
17								0.001								0.01	0.001				0.005	
18	Glycera tridactyla						0.001	0.001								0.02	0.001				0.002	
19	Hediste diversicolor						0.095	0.084			0.001					0.28					0.26	
20	Heteromastus filiformis						0.01	0.04			0.001	0.05				0.11	0.05				0.098	
21	Pygospio elegans															0.03	0.002				0.01	
22	Streblospio shrubsolii															0.02	0.002				0.01	
23	Nemertini							0.001								0.01					0.05	
24	Oligochaets							0.001				0.05				0.01	0.001				0.05	
25	Detritus		0.15	0.15	0.10	0.20	0.15	0.35	0.25	0.25	0.974	0.05	0.90	1.00	1.00	0.20	0.65	1.00	0.40	1.00	0.20	1.00
	Imports						0.20	0.08														
	Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
																						

ba	re sediment, 1999/00																
		Cons	umers														
No.	Prey	→ Zooplankton	ഗ Melita palmata	ο Cerastoderma edule	✓ Scrobicularia plana	∞ Carcinus maenas	ω Crangon crangon	5 Hydrobia ulvae	U Cyathura carinata	5 Alkmaria romijni	င်္သ Capitella capitata	Hediste diversicolor	15 Heteromastus filiformis	Mediomastus fragilis	2 Pygospio elegans	Streblospio shrubsolii	و Oligochaets
1	Phytoplankton	0.98		0.85	0.25					0.10		0.05			0.60		
2	Microphytobenthos		0.15	0.05	0.40			0.75				0.08					
3	Green macroalgae		0.50			0.04	0.05										
4	Zooplankton	0.02				0.06	0.10										
5	Melita palmata					0.004	0.004					0.001					
6	Cerastoderma edule					0.001	0.001					0.001					
7	Scrobicularia plana					0.14	0.16					0.08					
8	Carcinus maenas					0.06	0.03		0.002								
9	Crangon crangon					0.18	0.04										
10	Hydrobia ulvae					0.004	0.02					0.01					
11	Cyathura carinata					0.05	0.04										
12	Alkmaria romijni						0.005		0.002								
13	Capitella capitata											0.003					
14	Hediste diversicolor					0.11	0.09		0.005								
15	Heteromastus filiformis					0.001	0.03		0.001			0.02					
16	Mediomastus fragilis											0.001					
17	Pygospio elegans											0.002					
18	Streblospio shrubsolii											0.001					
19	Oligochaets											0.001					
20	Detritus		0.35	0.10	0.35	0.15	0.35	0.25	0.99	0.90	1.00	0.75	1.00	1.00	0.4	1.00	1.00
	Imports					0.20	0.08										
	Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

ba	re sediment, 2001/02																
		Cons	umers														
No.	Prey	→ Zooplankton	о Corophium multisetosum	ο Melita palmata	L Cerastoderma edule	∞ Scrobicularia plana	ω Carcinus maenas	5 Crangon crangon	T Hydrobia ulvae	5 Cyathura carinata	ຽ Alkmaria romijni	The Capitella capitata	Glicera tridactyla	9 Hediste diversicolor	1 Heteromastus filiformis	8 Streblospio shrubsolii	ت Oligochaets
1	Phytoplankton	0.98			0.85	0.30					0.10			0.05			
2	Microphytobenthos		0.75	0.15	0.05	0.40			0.75					0.08			
3	Green macroalgae			0.45			0.04	0.05									
4	Zooplankton	0.02					0.06	0.1									
5	Corophium multisetosum						0.005						0.01				
6	Melita palmata						0.005	0.025					0.01				
7	Cerastoderma edule						0.001	0.001					0.002	0.001			
8	Scrobicularia plana						0.12	0.13					0.06	0.05			
9	Carcinus maenas						0.06	0.01		0.001							
10	Crangon crangon						0.14	0.01									
11	Hydrobia ulvae						0.008	0.02					0.02	0.01			
12	Cyathura carinata						0.03	0.05						0.004			
13	Alkmaria romijni							0.005		0.002			0.12	0.001			
14	Capitella capitata												0.04	0.001			
15	Glycera tridactyla						0.001	0.005					0.04				
16	Hediste diversicolor						0.184	0.155		0.045			0.29				
17	Heteromastus filiformis							0.001		0.001			0.14	0.001			
18	Streblospio shrubsolii							0.007					0.05	0.001			
19	Oligochaets							0.001		0.001			0.018	0.001			
20	Detritus		0.25	0.40	0.10	0.30	0.15	0.35	0.25	0.95	0.90	1.00	0.20	0.80	1.00	1.00	1.00
	Imports						0.20	0.08									
	Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00)

Appendix B. Model data sources from the Zostera and bare sediment ecosystems in

Mondego estuary for each time periods.

Compartments	Parameter	Source
Phytoplankton	Biomass	Pardal (1998), Lillebø et al. (2005)
	C:Chl a ratio	Anderson and Williams (1998)
	P/B	Almeida et al. (2000), this study
Microphytobenthos	Biomass	this study
	C:Chl a ratio	de Jonge (1980)
	P/B	Brotas and Catarino (1995), Serôdio and Catarino (2000)
Green macroalgae	Biomass	Pardal (1998), this study
	P/B	Anibal (1998)
Zostera noltii	Biomass	Pardal (1998), this study
	P/B	Sand-Jensen (1975); Pérez-Lloréns and Niell (1993)
Zooplankton	Biomass	Azeiteiro (1999)
	P/B	Rosado-Salórzano and Próo (1998)
	Diet	Azeiteiro (1999), Baeta et al. (2009)
Ampithoe valida	Biomass	Pardal (1998), this study
Melita palmata	P/B	Pardal (1998), Grilo et al. (2009)
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Pardal et al. (2000), Baeta et al. (2009)
Corophium multisetosum	Biomass	this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Cunha et al. (2000), Baird et al (2004), Baeta et al. (2009)
Cerastoderma edule	Biomass	Pardal (1998), this study
Mytilus sp.	P/B	Dolbeth et al. (2003, 2007), this study
Scrobicularia plana	P/Q	Hostens and Hamerlynck (1994)
	Diet	Eklöf et al. (2005), Garcia-Arberas and Rallo (2002), Verdelhos et al.
		(2005), Baeta et al. (2009; submitted)
Carcinus maenas	Biomass	Pardal (1998), this study
Crangon crangon	P/B	Dolbeth et al. (2003), this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Oh et al. (2001), Baeta et al. (2006, 2009)
Gibulla umbilicalis	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Bode et al. (2006), Baeta et al. (2009)
Haminoea hydatis	Biomass	Pardal (1998), this study

	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Malaquias et al. (2004)
Hydrobia ulvae	Biomass	Pardal (1998), this study
	P/B	Dolbeth et al. (2007)
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Baeta et al. (2009; submitted)
Littorina littorea	Biomass	Pardal (1998), this study
	P/B	Dolbeth et al. (2003), this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Bode et al. (2006), Baeta et al. (2009)
Cyathura carinata	Biomass	Pardal (1998), this study
	P/B	Dolbeth et al. (2007)
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Ferreira et al. (2004), Baeta et al. (2009)
Idotea chelipes	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Bamber (2004), Baeta et al. (2009)
Lekanesphaera levii	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Mancinelli et al. (2005), Baeta et al. (2009)
Alkmaria romijni	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Bamber (2004), Baeta et al. (2009)
Aonides oxycephala	Biomass	Pardal (1998)
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Dauer et al. (1981)
Capitella capitata	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Gaston and Nasci (1988), Baeta et al. (2009)
Chaetozone setosa	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Oug et al. (1998)

Diopatra neapolitana	Biomass	Pardal (1998)
Вюрина неаронина	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Mangum et al. (1968)
Eteone flava	Biomass	Pardal (1998), this study
Lieone juvu	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet .	Oug et al. (1998), Volkenborn and Reise (2007)
Glycera tridactyla	Biomassa	Pardal (1998), this study
Hediste diversicolor	P/B	•
Heaisie aiversicolor		Dolbeth et al. (2007), this study
	P/Q	Hostens and Hamerlynck (1994)
Haraman Clicania	Diet	Garcia-Arberas and Rallo (2002), Baeta et al. (2009)
Heteromastus filiformis	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Volkenborn and Reise (2007), Baeta et al. (2009)
Lagis koreni	Biomass	Pardal (1998)
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Mistri et al. (2001)
Lumbrineris impatiens	Biomass	Pardal (1998)
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Hily et al. (2008)
Mediomastus fragilis	Biomass, P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Rakocinski et al. (1997)
Mista picta	Biomass, P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Solis-Weiss et al. (2004)
Nephtys hombergii	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Beukema (1991), Volkenborn and Reise (2007), Baeta et al. (2009)
Streblospio shrubsolii	Biomass	Pardal (1998), this study
Pygospio elegans	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Mazik and Elliott (2000), Volkenborn and Reise (2007), Baeta et al.

(2009)

	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	McDermott and Roe (1985), Thiel and Reise (1993)
Oligochaeta	Biomass	Pardal (1998), this study
	P/B	this study
	P/Q	Hostens and Hamerlynck (1994)
	Diet	Giere (1975)
Detritus	Biomass	Pardal (1998, 2004)
	(O.M in the sediment)	

Pardal (1998), this study

Biomass

Nemertini