**Figure S1.** Study site and location of sampling stations.
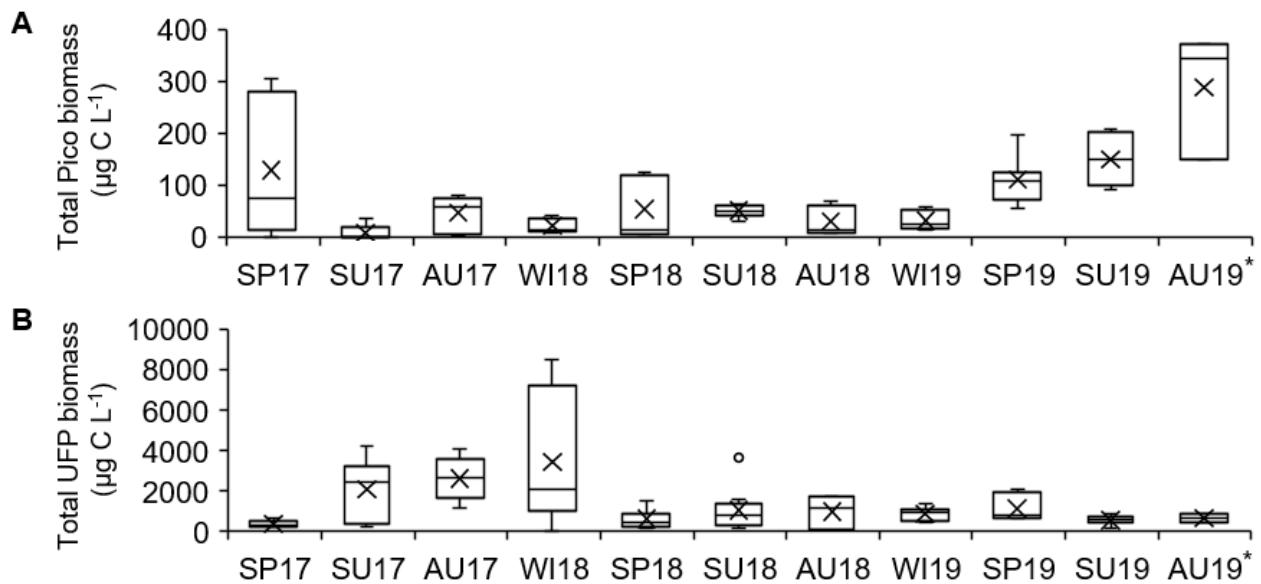
Figure S2. Inter-annual and seasonal dynamics of (A) Picophytoplankton (Pico) and (B) Utermöhl Fraction of Phytoplankton (UFP) total biomass in Cabras Lagoon throughout the study period (2017, 2018, 2019). *Autumn 2019 was represented only by October.
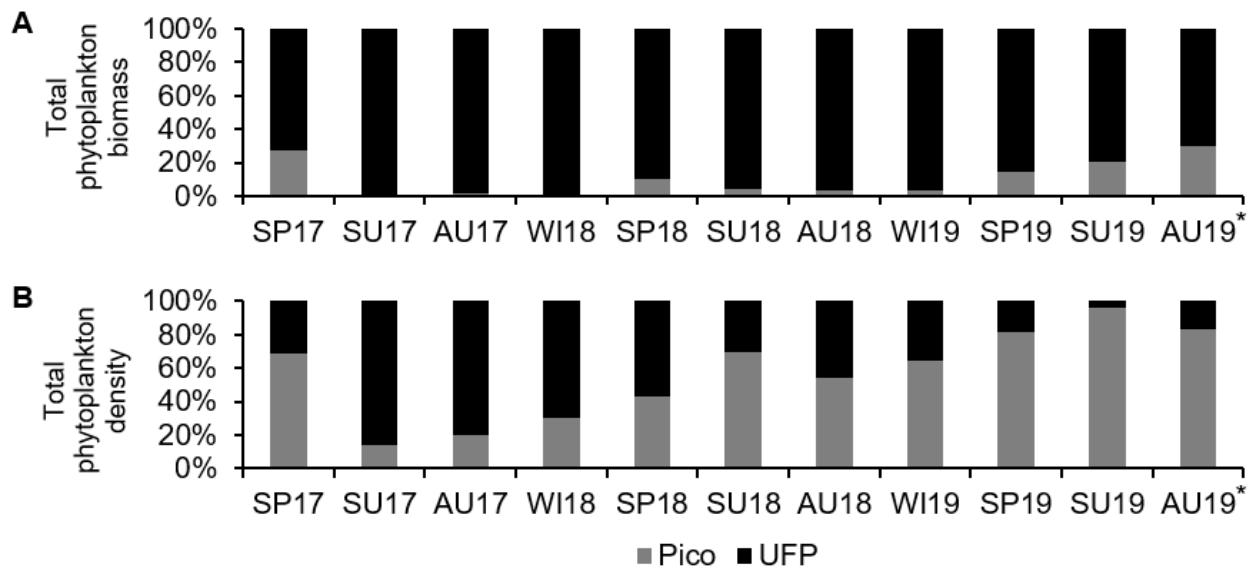
Figure S3. Picophytoplankton (Pico) and Utermöhl Fraction of Phytoplankton (UFP) contribution to (A) total phytoplankton biomass and (B) density in Cabras Lagoon throughout the study period (2017, 2018, 2019). *Autumn 2019 was represented only by October.
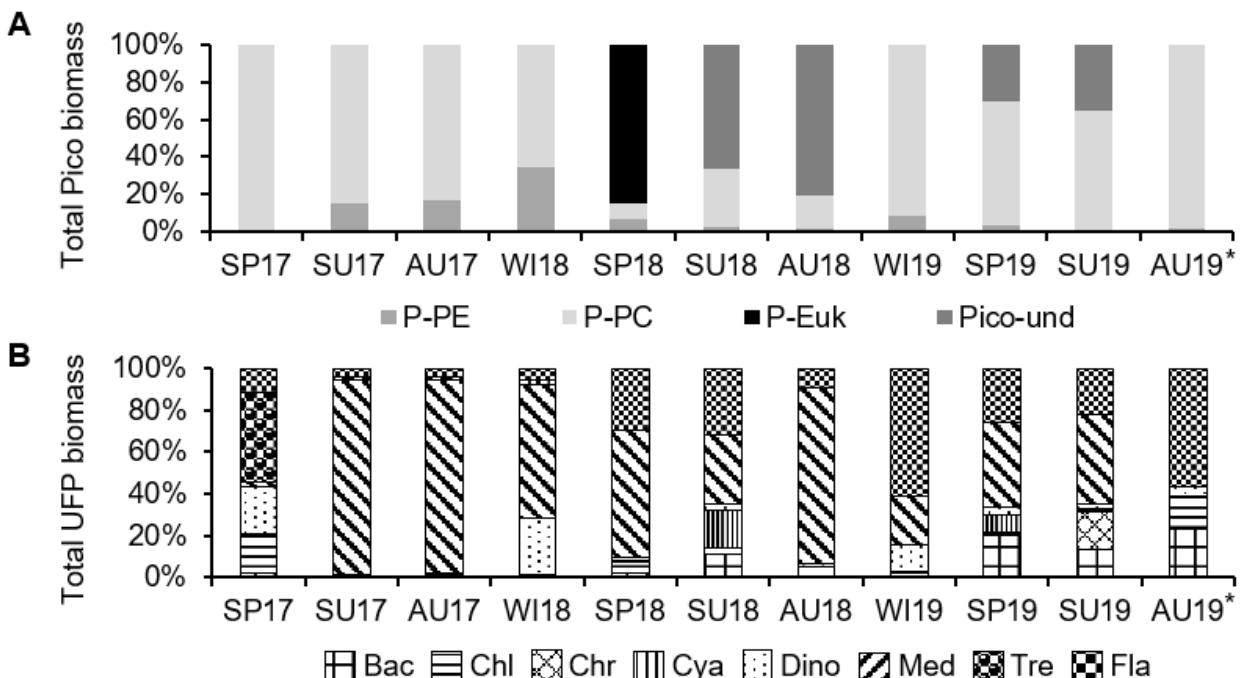
Figure S4. Contribution of (A) each Picophytoplankton (Pico) group to total picophytoplankton (Pico) biomass (P-PE, picocyanobacteria rich in phycoerythrin; P-PC, picocyanobacteria rich in phycocyanin; Pico-Euk, picoeukaryotes; Pico-und, picophytoplankton undetermined), and contribution of (B) each Utermöhl Fraction of Phytoplankton (UFP) group to total UFP biomass (Bac, Bacillariophyceae; Chl, Chlorophyceae; Chr, Chrysophyceae; Cya, Cyanophyceae; Dino, Dinophyceae; Fla, autotrophic nanoflagellates; Med, Mediophyceae; Tre, Trebouxiophyceae) in Cabras Lagoon along the study period (2017, 2018, 2019). *Autumn 2019 was represented only by October.
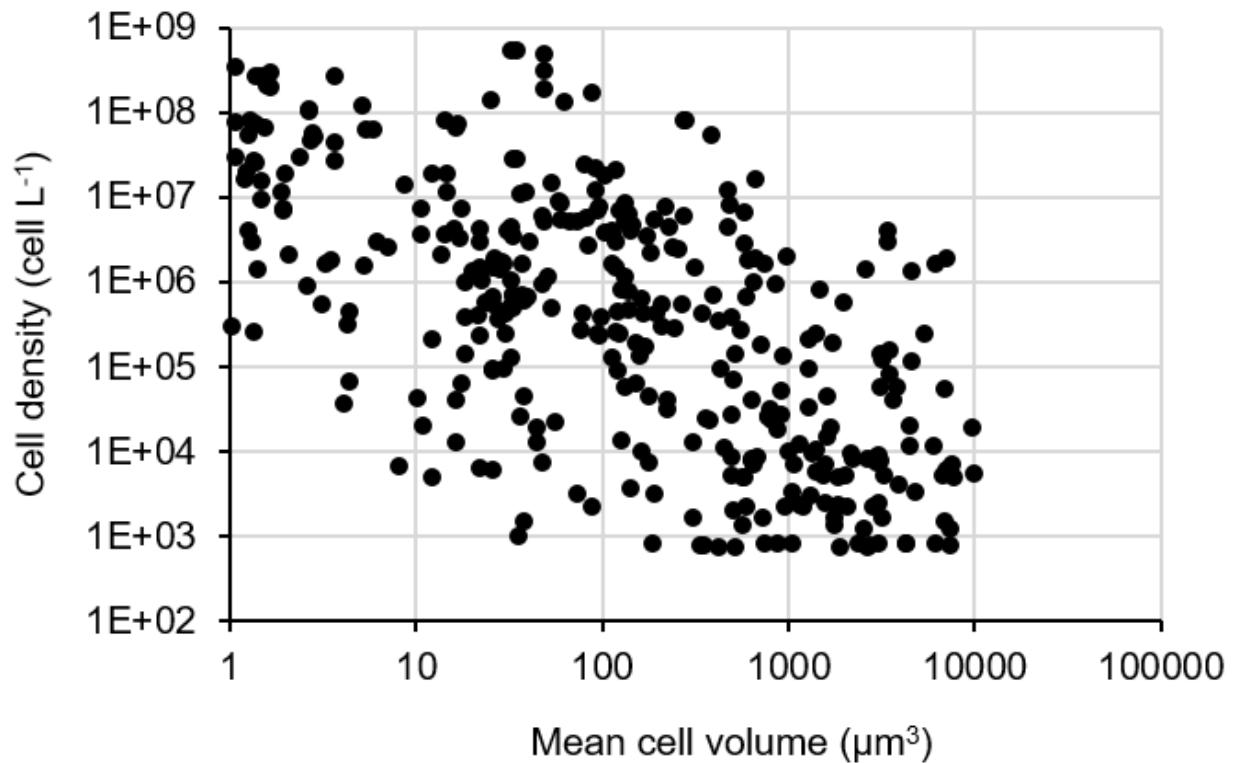
Figure S5. Scatterplot of mean cell volume (x axis) versus cell density (y axis) of each Utermöhl Fraction of Phytoplankton taxon recorded in Cabras Lagoon along the study period (2017, 2018, 2019).

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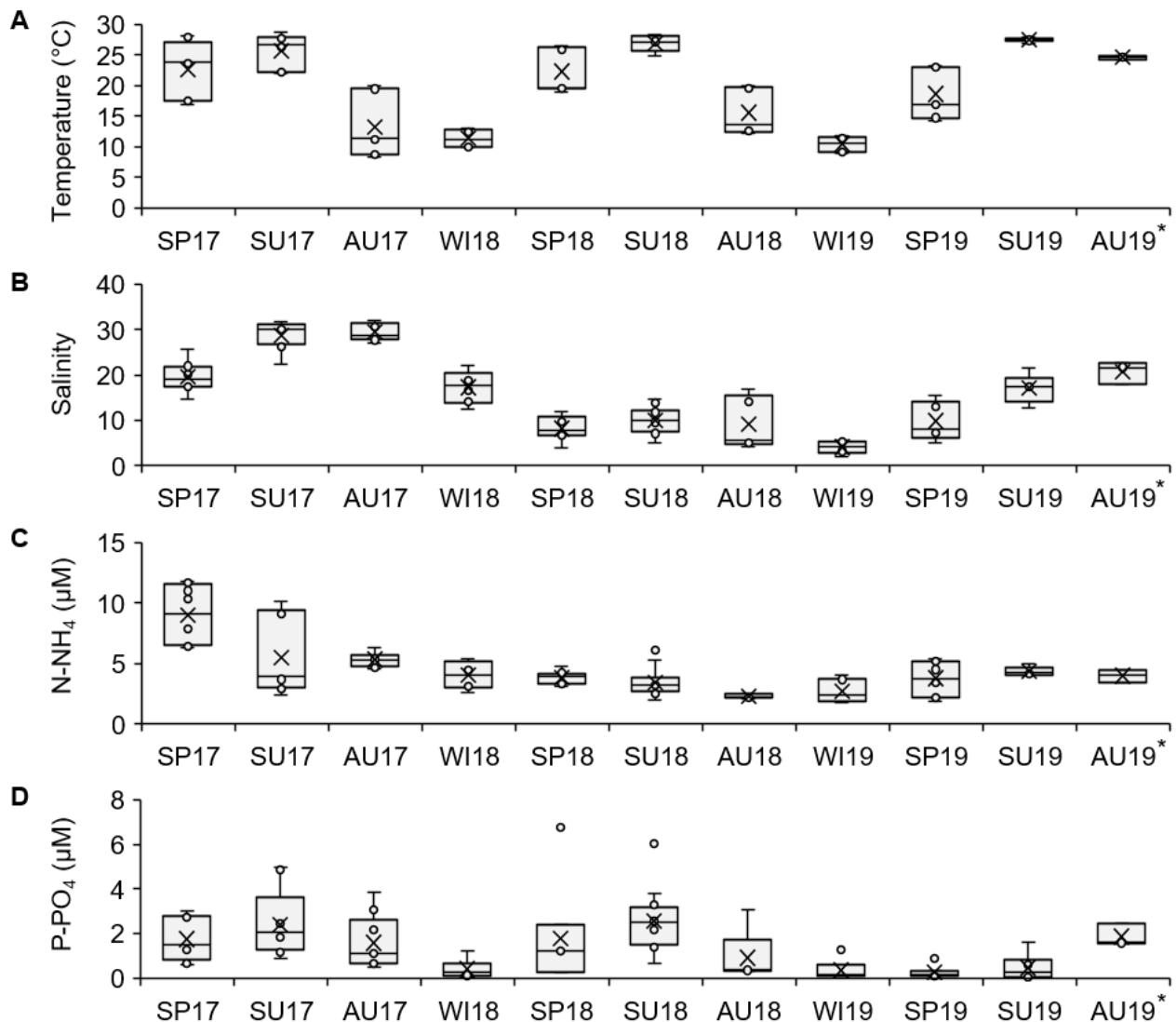
Figure S6. Inter-annual and seasonal dynamics of selected environmental variables (A,
temperature; B, salinity; C, ammonium, N-NH$_4$; D, orthophosphates, P-PO$_4$) in Cabras Lagoon
throughout the study period (2017, 2018, 2019). *Autumn 2019 was represented only by October.

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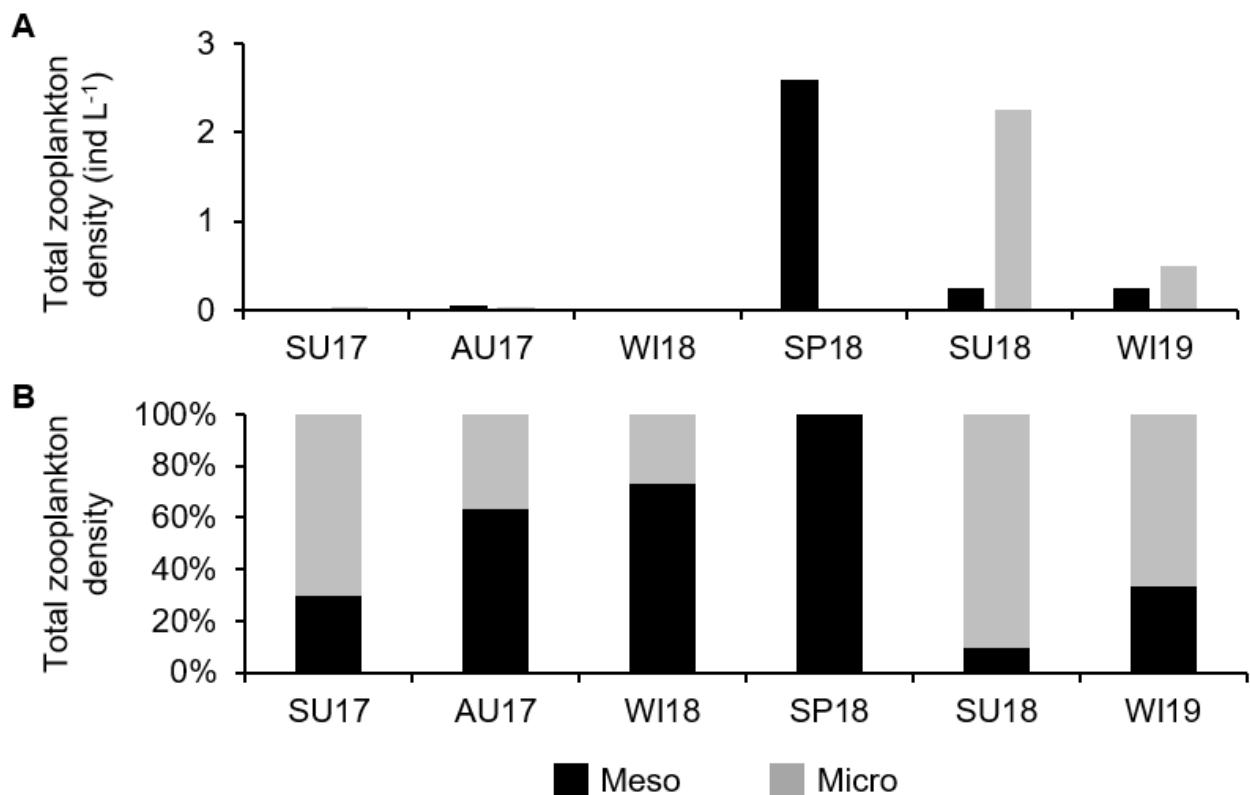
Figure S7. Inter-annual and seasonal dynamics of (A) Mesozooplankton (Meso) and (B)

Microzooplankton (Micro) total density and their contribution to total zooplankton density in

Cabras Lagoon throughout the study period (2017, 2018, 2019).

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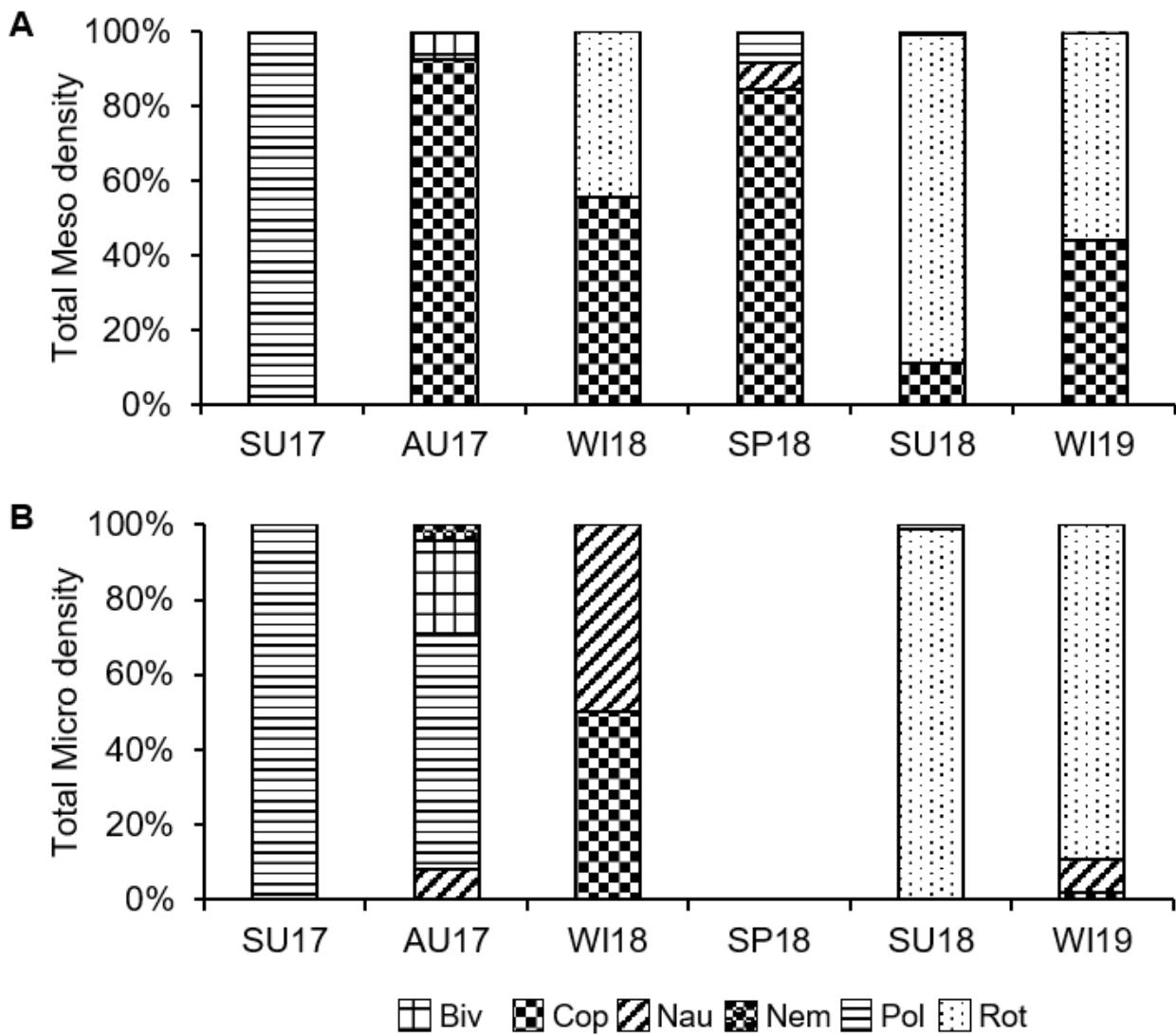
Figure S8. Contribution of (A) each taxon of Mesozooplankton (Meso) and of (B)
Microzooplankton (Micro) to total zooplankton density (Biv, Bivalvia veliger; Cop, Copepoda;
Nau, Crustacea Naupli; Pol, Polychaeta larvae; Rot, Rotifera; Nem, Nematoda) observed in Cabras
Lagoon throughout the study period (2017, 2018, 2019).

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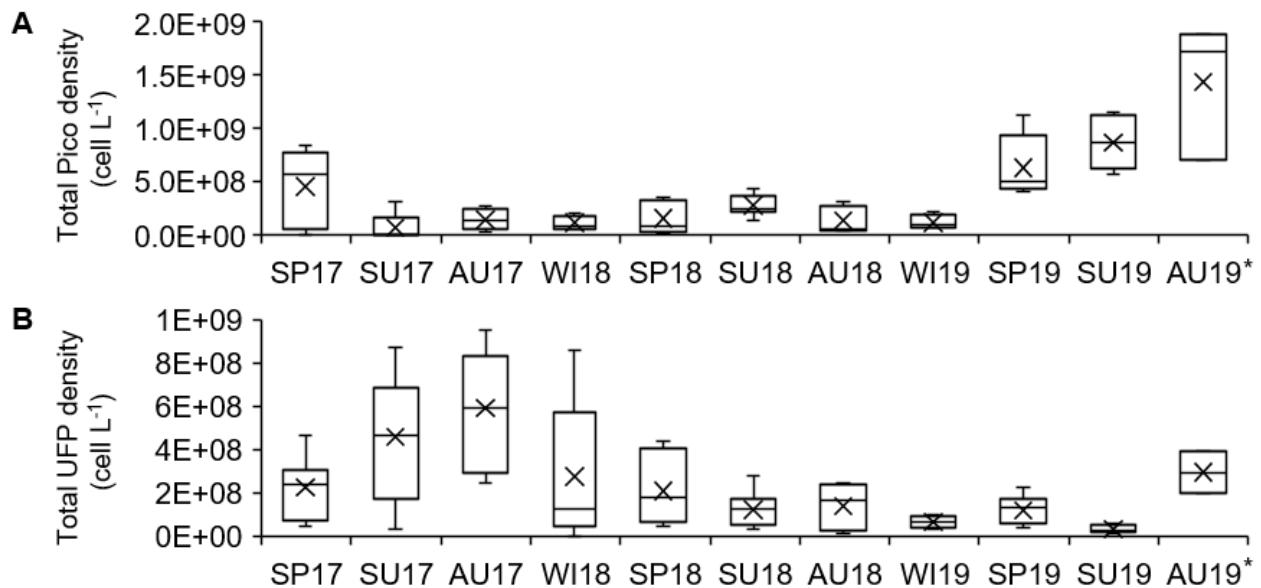
Figure S9. Inter-annual and seasonal dynamics of (A) Picophytoplankton (Pico) and (B) Utermöhl Fraction of Phytoplankton (UFP) total density in Cabras Lagoon throughout the study period (2017, 2018, 2019). *Autumn 2019 was represented only by October.

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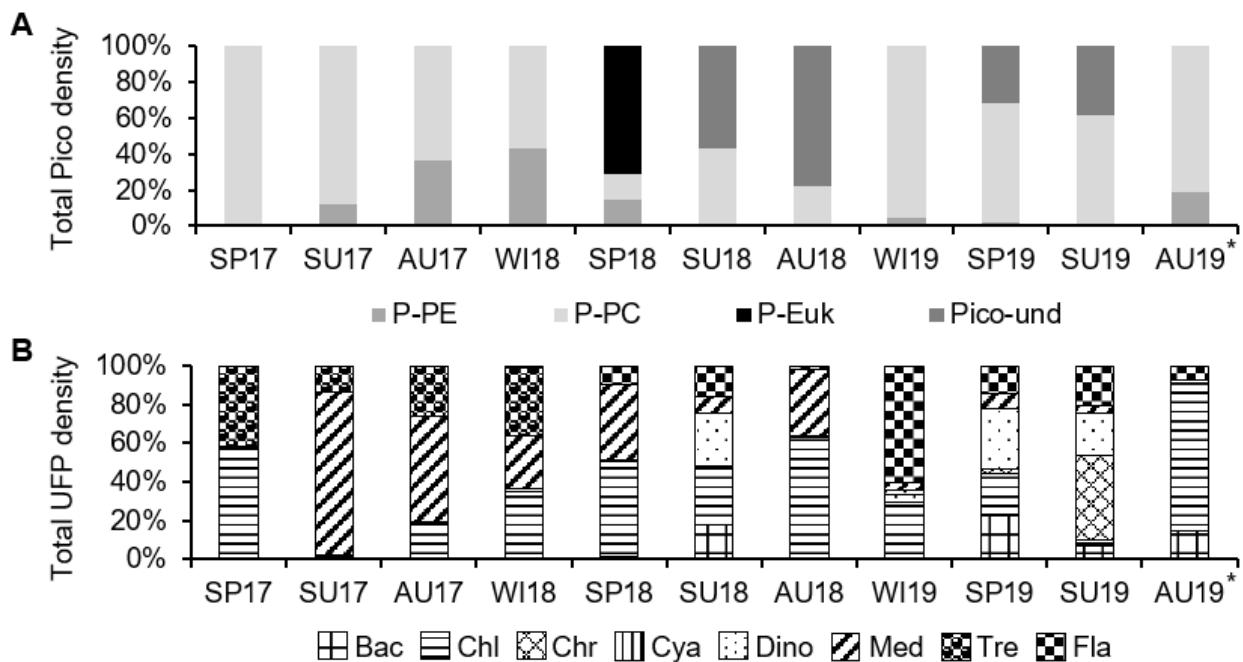
Figure S10. Contribution of (A) each Picophytoplankton (Pico) group to total Picophytoplankton (Pico) density (P-PE, picocyanobacteria rich in phycoerythrin; P-PC, picocyanobacteria rich in phycocyanin; Pico-Euk, picoeukaryotes; Pico-und, picophytoplankton undetermined), and contribution of (B) each Utermöhl Fraction of Phytoplankton (UFP) group to total UFP density (Bac, Bacillariophyceae; Chl, Clorophyceae; Chr, Chrysophyceae; Cya, Cyanophyceae; Dino, Dinophyceae; Fla, autotrophic nanoflagellates; Med, Mediophyceae; Tre, Trebouxiophyceae) in Cabras Lagoon along the study period (2017, 2018, 2019). *Autumn 2019 was represented only by October.
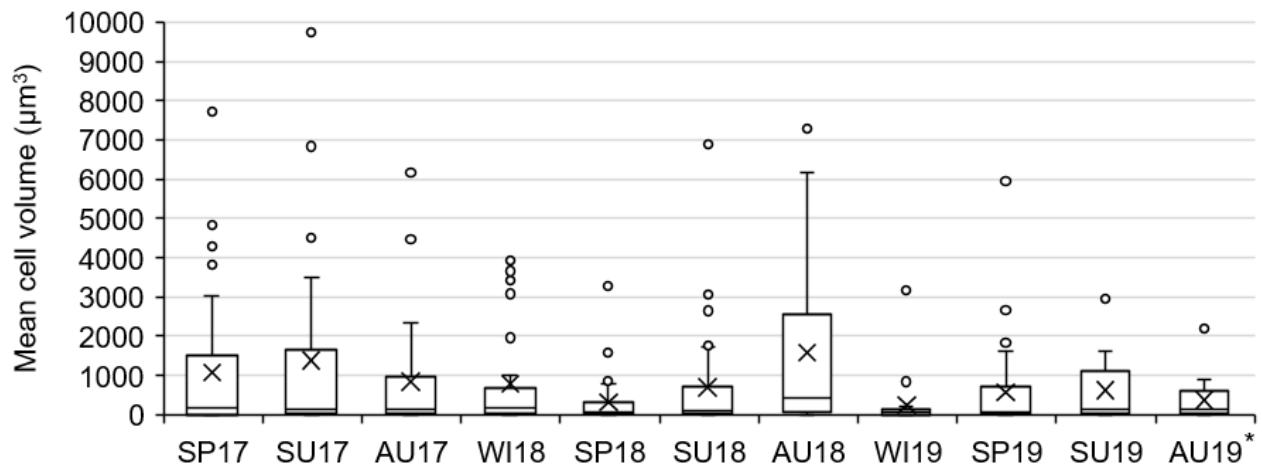
Figure S11. Inter-annual and seasonal dynamics of mean cell volume of all UFP taxa observed in Cabras Lagoon during the study period (2017, 2018, 2019). Taxa abundance is not included.

*Autumn 2019 was represented only by October.
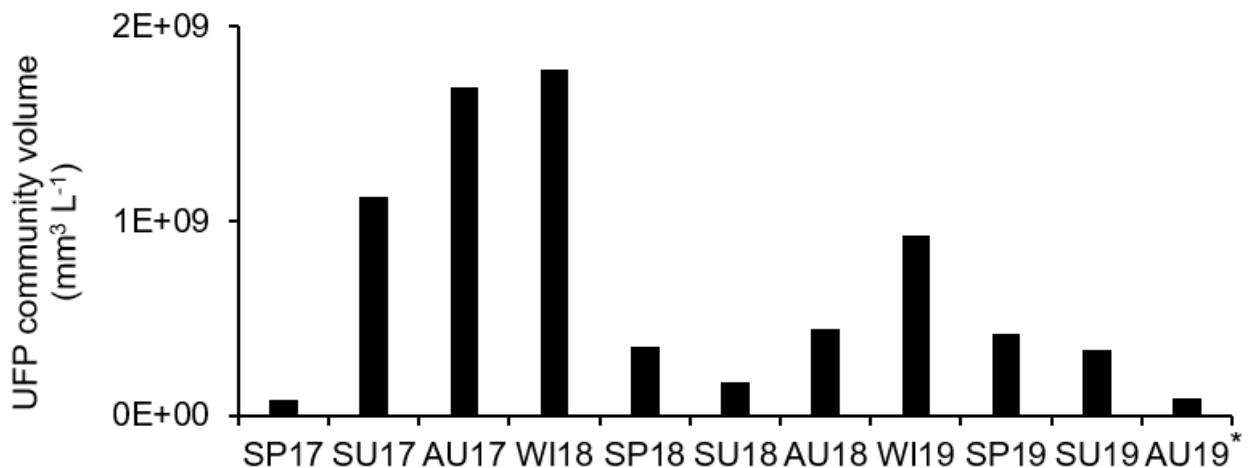
Figure S12. Inter-annual and seasonal dynamics of UFP community volume in Cabras Lagoon during the study period (2017, 2018, 2019). Weighted-average of volume of the entire UFP community is showed. *Autumn 2019 was represented only by October.

Table S1. Monthly mean and Standard Deviation (SD) of Picophytoplankton (Pico) and Utermöhl Fraction of Phytoplankton (UFP) cell density and biomass along the study period.

Year	Month	Pico biomass ($\mu g\ C\ L^{-1}$)		UFP biomass ($\mu g\ C\ L^{-1}$)		Pico density (cells L^{-1})		UFP density (cells L^{-1})	
		mean	SD	mean	SD	mean	SD	mean	SD
2017	Apr	283.11	23.68	467.21	203.97	780991000	65314050	209082487	57005614
2017	May	49.58	43.91	380.77	88.10	381418964	337772492	361121080	93503524
2017	Jun	14.44	7.02	239.41	26.57	74050500	35983957	48010271	5227684
2017	Jul	0.51	0.55	331.18	104.40	2694667	2919321	127140366	106393133
2017	Aug	23.80	9.87	3250.69	900.22	219462667	83084098	665255110	203171395
2017	Sep	0.35	0.17	2739.57	877.50	2364667	1183821	585495999	177013234
2017	Oct	4.17	1.39	1946.84	729.65	46318333	15412427	277176639	35600155
2017	Nov	58.21	4.95	2522.07	1135.52	253126667	21592791	703475802	228155200
2017	Dec	75.47	3.73	3432.65	750.59	140499667	9654367	792653963	182476683
2018	Jan	36.66	6.21	5090.57	4489.67	186772000	32990774	446671249	431083904
2018	Feb	23.48	4.19	3457.99	2645.05	130154500	24269438	275264164	238673204
2018	Mar	10.30	2.18	1825.42	800.43	73537000	15548102	103857079	46262505
2018	Apr	116.02	10.63	600.64	359.61	327026667	27812580	341510943	142674679
2018	May	12.59	0.00	1550.09	0.00	82538000	0	227226937	0
2018	Jun	4.66	0.46	347.53	103.96	27385000	2681000	69694185	22347559
2018	Jul	50.87	13.25	497.11	317.62	367369333	124415674	206366308	75725256
2018	Aug	51.90	19.45	635.28	522.33	244253667	91527544	85169004	49407495
2018	Sep	48.59	2.43	2017.86	1460.19	234152333	11721269	78302159	45300967
2018	Oct	59.48	12.89	119.36	11.02	270376500	58605717	23417386	14298979
2018	Nov	34.49	7.54	834.53	162.96	161124750	35027382	119656444	27861275
2018	Dec	9.49	2.18	1549.69	314.90	51873000	11449046	215895503	41423571
2019	Jan	46.32	12.91	790.20	254.58	174454667	51140627	91439350	10472940
2019	Feb	15.08	0.76	953.45	498.31	72448000	4057000	42434557	9508238
2019	Mar	61.59	4.70	893.73	380.90	271210667	20808156	97067870	15800420
2019	Apr	108.09	8.64	834.00	263.50	469973333	37559312	151701184	22092601
2019	May	196.52	0.00	787.54	0.00	1122077000	0	224469556	0
2019	Jun	82.75	36.67	1571.29	761.32	625179333	276415289	52907763	12689590
2019	Jul	194.70	16.80	607.47	116.91	1078994667	94014513	47324314	14873037
2019	Aug	103.91	15.43	549.16	333.51	659733667	97974153	18358837	6422401

| 2019 | Sep | 195.94 | 68.30 | 610.81 | 269.43 | 1046958833 | 364488773 | 156776836 | 51717405 |
| 2019 | Oct | 287.98 | 121.18 | 672.46 | 205.35 | 1434184000 | 631003394 | 295194834 | 97012410 |

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		Tra (m)		Tem (°C)		Sal		N-NH$_4$ (µM)		N-NO$_3$ (µM)		N-NO$_2$ (µM)		P-PO$_4$ (µM)		Si-SiO$_4$ (µM)	
		mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
2017	Apr	0.33	0.03	17.41	0.40	16.71	1.83	11.50	0.41	0.60	0.09	0.00	0.01	0.83	0.38	315.49	23.37
2017	May	0.37	0.03	24.13	0.53	20.34	2.42	6.49	0.23	0.43	0.09	0.01	0.01	1.92	0.74	308.46	14.21
2017	Jun	0.38	0.02	28.03	0.07	22.90	3.78	9.09	1.77	0.36	0.12	0.07	0.03	2.86	0.18	308.57	9.69
2017	Jul	0.39	0.01	26.74	0.42	25.76	2.86	9.63	0.49	0.63	0.02	0.04	0.05	1.36	0.61	291.55	37.06
2017	Aug	0.53	0.15	28.21	0.48	29.30	2.60	3.21	0.93	0.59	0.09	0.02	0.02	4.08	1.43	39.52	6.86
2017	Sep	0.33	0.03	22.14	0.05	31.04	0.86	3.59	0.40	0.18	0.06	0.00	0.00	1.73	0.34	295.47	54.98
2017	Oct	0.42	0.02	19.73	0.25	30.71	1.78	4.92	0.23	0.48	0.13	0.00	0.00	1.85	1.72	271.45	82.97
2017	Nov	0.50	0.02	11.47	0.31	30.03	1.53	5.65	0.15	0.64	0.16	0.13	0.07	1.39	1.45	286.11	21.71
2017	Dec	0.44	0.08	8.63	0.21	27.79	0.89	5.42	0.86	3.20	3.84	0.09	0.17	1.45	0.63	262.74	23.06
2018	Jan	0.65	0.00	12.62	0.38	20.50	2.40	3.41	0.39	11.72	5.55	0.68	0.45	0.43	0.00	237.14	26.06
2018	Feb	0.54	0.14	10.01	0.11	16.80	2.80	4.37	1.49	5.85	8.02	0.11	0.19	0.45	0.66	49.98	68.47
2018	Mar	0.35	0.00	12.99	0.00	12.59	0.00	4.47	0.00	0.49	0.00	0.00	0.00	0.13	0.00	94.93	0.00
2018	Apr	0.33	0.03	19.39	0.30	10.73	1.08	3.62	0.45	0.30	0.05	0.00	0.00	0.28	0.05	135.99	35.50
2018	May	0.34	0.00	19.60	0.00	6.63	0.00	3.90	0.00	0.08	0.00	0.00	0.00	1.26	0.00	288.21	0.00
2018	Jun	0.35	0.05	26.22	0.35	6.16	1.94	4.11	0.75	0.46	0.17	0.10	0.08	3.44	2.93	442.15	39.49
2018	Jul	0.39	0.06	27.39	0.79	8.95	2.58	4.19	1.25	0.20	0.09	0.05	0.12	2.38	1.90	352.56	54.58
2018	Aug	0.57	0.06	27.71	0.47	10.74	3.61	2.57	0.66	0.29	0.21	0.04	0.04	3.18	0.69	340.16	32.88
2018	Sep	0.54	0.54	25.12	25.12	11.10	11.10	2.89	2.89	0.72	0.72	0.00	0.00	2.31	2.31	413.71	413.71

2018	Oct	0.68	0.04	19.79	0.23	15.47	1.82	2.35	0.24	0.39	0.00	0.01	0.02	0.40	0.04	271.34	10.83
2018	Nov	0.68	0.07	16.29	0.48	10.20	1.24	2.32	0.23	11.54	7.94	1.28	0.12	0.81	0.80	281.12	58.24
2018	Dec	0.68	0.10	12.79	0.73	4.93	0.67	2.29	0.22	22.69	15.87	2.56	0.22	1.22	1.57	290.89	105.64
2019	Jan	0.73	0.06	9.35	0.44	5.02	0.77	2.15	0.49	14.19	22.92	0.33	0.46	0.19	0.12	84.90	107.56
2019	Feb	0.53	0.14	11.61	0.21	3.14	0.97	3.25	1.06	10.89	17.62	0.26	0.46	0.49	0.69	63.54	94.03
2019	Mar	0.58	0.19	13.15	0.35	4.63	1.06	2.88	0.94	5.96	9.00	0.13	0.23	0.33	0.41	46.59	63.53
2019	Apr	0.62	0.23	14.69	0.49	6.12	1.15	2.51	0.82	1.03	0.38	0.00	0.00	0.18	0.13	29.63	33.04
2019	May	0.30	0.00	16.90	0.00	14.10	0.00	5.22	0.00	0.57	0.00	0.00	0.00	0.00	0.00	40.13	0.00
2019	Jun	0.49	0.06	23.08	0.13	12.19	3.84	4.57	0.80	0.91	0.16	0.05	0.06	0.42	0.39	149.42	32.63
2019	Jul	0.47	0.06	27.26	0.40	16.32	3.15	4.36	0.20	0.56	0.03	0.00	0.00	0.22	0.32	267.34	24.54
2019	Aug	0.45	0.00	27.71	0.19	17.87	3.38	4.38	0.54	0.43	0.18	0.00	0.00	0.71	0.77	342.01	36.70
2019	Sep	0.48	0.03	26.17	0.25	19.32	2.95	4.19	0.54	0.47	0.12	0.00	0.01	1.29	0.64	366.94	34.05
2019	Oct	0.51	0.06	24.63	0.31	20.77	2.52	3.99	0.54	0.51	0.05	0.01	0.01	1.86	0.52	391.87	31.41

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Table S3. Results (*t*-value and *p*-value) of the Generalized Linear Mixed-Effect Model (GLMM) applied on the Picophytoplankton (Pico) and Utermöhl Fraction of Phytoplankton (UFP) total cell density and on the Pico and UFP total biomass along the study period (2017, 2018, 2019) in Cabras Lagoon. The selected environmental variables (Tra, Secchi disk transparency; Temp, water temperature; Sal, salinity; N-NH$_4$, ammonium; N-NO$_3$, nitrate; N-NO$_2$, nitrite; P-PO$_4$, orthophosphate; Si-SiO$_4$, reactive silica) were used as fixed terms and months were used as random term. Significant effects (p<0.05) are in bold.

	Cell biomass				*Cell density*			
	Pico		UFP		Pico		UFP	
	t	*p*	*t*	*p*	*t*	*p*	*t*	*p*
Tra	-0.175	0.861	0.227	0.821	0.892	0.376	-0.374	0.710
Temp	0.499	0.620	**-2.518**	**0.015**	**2.159**	**0.035**	**-1.682**	**0.048**
Sal	**-1.709**	**0.043**	**6.319**	**0.000**	-1.398	0.168	**6.910**	**0.000**
N-NH$_4$	1.673	0.100	**-2.788**	**0.007**	1.159	0.252	**-2.456**	**0.017**
N-NO$_3$	0.139	0.890	-1.026	0.310	0.122	0.903	-1.172	0.247
N-NO$_2$	-1.263	0.212	1.490	0.142	-1.172	0.247	1.455	0.152
P-PO$_4$	**-2.699**	**0.009**	1.070	0.290	**-2.961**	**0.005**	**2.717**	**0.009**
Si-SiO$_4$	1.008	0.318	-0.176	0.861	0.916	0.364	0.108	0.914

Table S4. Total density (ind L^{-1}) and relative abundance (%) of main zooplankton groups detected in Cabras Lagoon.

	Mesozooplankton (>200 µm)						
	Copepoda N (%)	Crustacea naupli N (%)	Rotifera N (%)	Polychaeta larvae N (%)	Bivalvia veliger N (%)	Nematoda N (%)	Others N (%)
su17	0	0	0	0.01 (100)	0	0	0
au17	0.04 (90.9)	0	0	0	0.003 (7.2)	0	0.002 (1.9)
wi18	0.01 (55.6)	0	0.01 (44.4)	0	0	0	0
sp18	2.19 (84.6)	0.19 (7.2)	0	0.21 (8.2)	0	0	0
su18	0.03 (11.1)	0	0.21 (88.0)	0.002 (0.9)	0	0	0
wi19	0.11 (44.0)	0	0.14 (55.6)	0	0	0.001 (0.4)	0
	Microzooplankton (20-200 µm)						
	Copepoda N (%)	Crustacea naupli N (%)	Rotifera N (%)	Polychaeta larvae N (%)	Bivalvia veliger N (%)	Nematoda N (%)	Others N (%)
su17	0	0	0	0.03 (100)	0	0	0
au17	0	0.002 (8.3)	0	0.02 (62.5)	0.01 (25)	0.001 (4.2)	0
wi18	0.002 (50)	0.002 (50)	0	0	0	0	0
sp18	0	0	0	0	0	0	0
su18	0	0.01 (0.8)	2.21 (98)	0.03 (1.2)	0	0	0
wi19	0.009 (1.8)	0.04 (8.9)	0.44 (89.3)	0	0	0	0