Supplementary Material: Zooplankton-mediated fluxes in the Eastern Tropical North Atlantic

1 SUPPLEMENTARY TABLES AND FIGURES

1.1 Tables

Online supplementary table 1a: Metadata of the CTD profiles from CVOO.

Region	CTD filename	Date	Time	Latitude	Longitude
CVOO	met_097_1_002	2013-05-26	05:09:42	17.5663	-24.2835
CVOO	met_097_1_003	2013-05-26	23:57:16	17.5648	-24.2837
CVOO	met_105_1_016	2014-03-19	18:07:56	17.5830	-24.2832
CVOO	met_106_1_001	2014-04-19	22:39:51	17.6002	-24.2498
CVOO	met_106_1_002	2014-04-20	02:47:07	17.5997	-24.2500
CVOO	met_106_1_003	2014-04-20	05:45:52	17.5998	-24.2510
CVOO	met_119_1_001	2015-09-08	22:10:37	17.6122	-24.3330
CVOO	met_119_1_003	2015-09-09	17:18:19	17.6043	-24.2955
CVOO	met_130_1_001	2016-08-29	23:41:05	17.5822	-24.2835
CVOO	met_130_1_002	2016-08-30	04:27:32	17.5822	-24.2837
CVOO	met_130_1_003	2016-08-30	15:30:03	17.5828	-24.2840
CVOO	met_130_1_004	2016-08-30	19:05:01	17.7022	-24.2135
CVOO	met_130_1_006	2016-09-01	06:34:23	17.5833	-24.2837
CVOO	msm_022_1_001	2012-10-24	19:35:38	17.6065	-24.2497
CVOO	msm_022_1_002	2012-10-24	20:14:54	17.6065	-24.2497
CVOO	msm_022_1_003	2012-10-25	00:43:10	17.6063	-24.2505
CVOO	msm_022_1_004	2012-10-25	02:07:14	17.6063	-24.2505
CVOO	msm_022_1_005	2012-10-25	10:34:08	17.6068	-24.2505
CVOO	msm_022_1_006	2012-10-25	13:17:49	17.6083	-24.2525
CVOO	msm_022_1_104	2012-11-20	12:38:43	17.6167	-24.2330
CVOO	msm_022_1_105	2012-11-20	17:25:36	17.6255	-24.2123
CVOO	msm_022_1_106	2012-11-20	18:02:21	17.6255	-24.2123
CVOO	msm_022_1_107	2012-11-20	20:03:38	17.6255	-24.2123
CVOO	msm_022_1_108	2012-11-21	01:16:21	18.0057	-23.9898
CVOO	msm_022_1_109	2012-11-21	05:26:38	18.0005	-24.5005

Online supplementary table 1b: Metadata of the CTD profiles from cOMZ.

Region	CTD filename	Date	Time	Latitude	Longitude
cOMZ	met_097_1_024	2013-05-31	21:02:16	11.4993	-20.5000
cOMZ	met_097_1_031	2013-06-01	15:23:44	11.2490	-20.9998
cOMZ	met_097_1_033	2013-06-01	19:53:04	11.2497	-21.5003
cOMZ	met_097_1_043	2013-06-02	17:51:07	10.9990	-20.4997
cOMZ	met_097_1_061	2013-06-04	20:43:40	10.5002	-21.0003
cOMZ	met_097_1_064	2013-06-05	07:41:54	10.4997	-20.2498
cOMZ	met_097_1_092	2013-06-11	19:07:41	10.2502	-20.2497
cOMZ	met_097_1_122	2013-06-14	22:35:10	9.6252	-20.0013
cOMZ	met_097_1_147	2013-06-17	10:47:16	9.4995	-21.2507
cOMZ	met_097_1_160	2013-06-19	10:33:11	8.9998	-21.5003
cOMZ	met_105_1_048	2014-03-26	18:28:01	8.9995	-20.5002
cOMZ	met_105_1_050	2014-03-27	02:36:26	9.9992	-20.5002
cOMZ	met_105_1_070	2014-03-30	11:17:27	10.9993	-19.5002
cOMZ	met_105_1_071	2014-03-30	14:58:42	10.9990	-20.0002
cOMZ	met_105_1_073	2014-03-30	22:36:12	9.9993	-20.0002
cOMZ	met_105_1_075	2014-03-31	06:32:10	10.4987	-19.5003
cOMZ	met_105_1_081	2014-04-01	02:11:52	9.5000	-19.9998
cOMZ	met_105_1_105	2014-04-05	17:23:21	8.9995	-21.4998
cOMZ	met_105_1_124	2014-04-08	15:41:33	10.9993	-21.5003
cOMZ	met_106_1_015	2014-04-24	19:24:11	11.0360	-21.2215
cOMZ	met_106_1_016	2014-04-24	23:53:42	11.0360	-21.2235
cOMZ	met_106_1_017	2014-04-25	15:15:07	11.0097	-21.2080
cOMZ	met_119_1_012	2015-09-14	21:23:26	11.0295	-21.2100
cOMZ	met_130_1_032	2016-09-07	11:47:50	10.0000	-19.9990
cOMZ	met_130_1_035	2016-09-08	21:37:17	11.0315	-21.2140
cOMZ	met_130_1_036	2016-09-09	06:27:51	10.0020	-20.9977
cOMZ	met_130_1_037	2016-09-09	10:26:39	9.5012	-20.9988
cOMZ	met_130_1_038	2016-09-09	14:13:26	9.0000	-20.9992
cOMZ	msm_022_1_009	2012-10-27	18:24:31	10.9995	-21.2518
cOMZ	msm_022_1_010	2012-10-27	23:23:53	10.3398	-21.6523
cOMZ	msm_022_1_011	2012-10-27	23:45:01	10.3405	-21.6532

Online supplementary table 1c: Metadata of the CTD profiles from 5N.

Region	CTD filename	Date	Time	Latitude	Longitude
5N	met_106_1_028	2014-04-28	09:49:50	5.4993	-22.9997
5N	met_106_1_029	2014-04-28	21:30:58	4.4997	-22.9998
5N	met_106_1_030	2014-04-29	07:02:13	4.9842	-22.9993
5N	met_106_1_031	2014-04-29	12:50:37	5.0162	-22.9997
5N	met_106_1_032	2014-04-29	20:34:26	5.0250	-22.9830
5N	met_106_1_033	2014-04-29	22:57:33	5.0250	-22.9830
5N	met_119_1_025	2015-09-18	06:22:08	5.5000	-22.9497
5N	met_119_1_026	2015-09-18	14:03:27	4.9745	-22.9580
5N	met_119_1_027	2015-09-18	19:08:04	5.0163	-22.9998
5N	met_119_1_028	2015-09-19	01:48:05	4.9748	-22.9947
5N	met_119_1_029	2015-09-19	17:14:43	4.4962	-23.0000
5N	met_130_1_045	2016-09-11	14:07:56	5.0003	-22.9997
5N	met_130_1_047	2016-09-12	02:51:40	4.5010	-22.9997
5N	met_130_1_048	2016-09-12	08:39:05	4.0452	-22.9998
5N	msm_022_1_020	2012-10-29	22:30:30	5.4998	-22.9995
5N	msm_022_1_021	2012-10-30	00:51:09	5.4973	-22.9945
5N	msm_022_1_022	2012-10-30	11:54:32	5.0130	-22.9975
5N	msm_022_1_023	2012-10-30	17:37:40	4.9990	-22.9995
5N	msm_022_1_024	2012-10-30	22:39:37	5.0005	-22.9982
5N	msm_022_1_025	2012-10-31	00:58:43	4.9945	-22.9880
5N	msm_022_1_026	2012-10-31	04:26:52	4.5998	-23.4167
5N	msm_022_1_027	2012-10-31	15:38:10	4.5907	-23.4257
5N	msm_022_1_028	2012-11-01	01:37:17	4.5332	-22.4165
5N	msm_022_1_029	2012-11-01	04:00:36	4.5332	-22.4165
5N	msm_022_1_030	2012-11-01	13:18:26	4.5505	-22.4163
5N	msm_022_1_031	2012-11-01	15:56:11	4.5505	-22.4163
5N	msm_022_1_032	2012-11-01	20:30:05	4.0000	-23.0000
5N	msm_022_1_033	2012-11-02	02:03:57	4.4998	-22.9998
5N	msm_022_1_034	2012-11-02	07:13:51	4.9995	-22.9998
5N	msm_022_1_071	2012-11-13	10:15:31	4.9805	-22.9573

Online supplementary table 2: Mesozooplankton biomass ($mgC\ m^{-3}$) for day, night and the day-night difference (Delta) in each layer and for the three different sampling regions. Delta ttest indicates the p-value for the one-sided students t-test that the day-night difference is significantly different from zero.

Region	Mid depth	Delta 1stQ	Delta 2ndQ	Delta 3rdQ	Delta ttest	Day 1stQ	Day 2ndQ	Day 3rdQ	Night 1stQ	Night 2ndQ	Night 3rdQ
5N	50 m	-1.677	-1.413	-1.327	0.01	1.665	1.82	2.485	3.078	3.147	3.409
5N	150 m	-1.566	-0.391	-0.22	0.12	0.389	0.413	0.42	0.61	0.81	1.853
5N	250 m	-0.163	0.046	0.192	0.58	0.399	0.408	0.44	0.242	0.248	0.57
5N	450 m	0.068	0.22	0.676	0.24	0.387	0.468	1.285	0.259	0.447	0.609
5N	800 m	-0.022	0.271	0.413	0.13	0.217	0.507	0.552	0.139	0.187	0.236
cOMZ	50 m	-4.495	-2.75	0.114	0.11	6.221	8.212	8.713	8.683	9.528	10.149
cOMZ	150 m	-0.946	-0.485	-0.148	0.04	0.434	0.533	0.671	0.818	0.955	1.392
cOMZ	250 m	0.024	0.075	0.251	0.18	0.382	0.648	0.78	0.412	0.444	0.476
cOMZ	450 m	0.421	0.707	0.819	0.0	1.41	1.704	1.821	0.711	0.865	1.213
cOMZ	800 m	-0.211	-0.101	-0.038	0.81	0.522	0.698	0.999	0.565	0.755	0.896
CVOO	50 m	-1.505	-0.847	-0.695	0.13	1.476	1.921	2.005	2.595	2.894	3.217
CVOO	150 m	-1.731	-1.184	-0.327	0.03	0.314	0.386	0.65	0.704	1.731	2.044
CVOO	250 m	-0.606	-0.007	0.054	0.27	0.379	0.412	0.711	0.335	0.609	1.108
CVOO	450 m	-0.303	0.259	0.358	0.77	0.88	1.097	1.273	0.757	0.838	1.259
CVOO	800 m	0.076	0.203	0.492	0.1	0.67	0.818	0.908	0.311	0.437	0.599

Online supplementary table 3: Crustacean contribution to total Well-preserved mesozooplankton in %.

Region	Day or Night	Mid depth	Percentage crustaceans
cOMZ	day	50	80
cOMZ	night	50	79
CVOO	day	50	54
CVOO	night	50	69
5N	day	50	83
5N	night	50	90
cOMZ	day	150	83
cOMZ	night	150	96
CVOO	day	150	70
CVOO	night	150	84
5N	day	150	75
5N	night	150	95
cOMZ	day	250	79
cOMZ	night	250	90
CVOO	day	250	71
CVOO	night	250	88
5N	day	250	80
5N	night	250	92
cOMZ	day	450	95
cOMZ	night	450	91
CVOO	day	450	95
CVOO	night	450	94
5N	day	450	99
5N	night	450	94
cOMZ	day	800	94
cOMZ	night	800	92
CVOO	day	800	94
CVOO	night	800	94
5N	day	800	95
5N	night	800	89

Online supplementary table 4: Mesozooplankton mortality ($mg\ C\ m^{-3}\ d^{-1}$) for day, night and the day-night difference (Delta) in each layer and for the three different sampling regions. Delta ttest indicates the p-value for the one-sided students t-test that the day-night difference is significantly different from zero.

Region	Mid depth	Delta 1stQ	Delta 2ndQ	Delta 3rdQ	Delta ttest	Day 1stQ	Day 2ndQ	Day 3rdQ	Night 1stQ	Night 2ndQ	Night 3rdQ
5N	50 m	-0.162	-0.115	-0.073	0.01	0.258	0.311	0.386	0.531	0.54	0.546
5N	150 m	-0.025	-0.004	-0.004	0.18	0.044	0.048	0.057	0.052	0.056	0.084
5N	250 m	0.002	0.004	0.007	0.13	0.033	0.037	0.038	0.019	0.02	0.034
5N	450 m	0.003	0.005	0.008	0.05	0.021	0.025	0.041	0.015	0.019	0.024
5N	800 m	-0.0	0.002	0.003	0.3	0.007	0.011	0.011	0.006	0.008	0.009
cOMZ	50 m	-0.205	-0.094	0.02	0.2	0.651	0.848	0.889	0.907	0.922	0.944
cOMZ	150 m	-0.013	-0.006	0.002	0.17	0.039	0.046	0.059	0.055	0.059	0.061
cOMZ	250 m	0.003	0.007	0.012	0.04	0.028	0.046	0.054	0.024	0.028	0.031
cOMZ	450 m	0.009	0.011	0.014	0.0	0.055	0.062	0.073	0.028	0.039	0.05
cOMZ	800 m	-0.001	-0.001	-0.0	0.59	0.014	0.017	0.021	0.015	0.017	0.018
CVOO	50 m	-0.134	-0.067	-0.051	0.18	0.271	0.299	0.322	0.415	0.44	0.542
CVOO	150 m	-0.045	-0.019	-0.005	0.06	0.047	0.049	0.082	0.066	0.112	0.157
CVOO	250 m	-0.009	0.002	0.007	0.58	0.044	0.046	0.051	0.03	0.041	0.068
CVOO	450 m	0.005	0.007	0.009	0.12	0.052	0.057	0.07	0.037	0.046	0.056
CVOO	800 m	0.002	0.004	0.004	0.01	0.023	0.024	0.024	0.013	0.016	0.019

Online supplementary table 5: Mesozooplankton ammonium excretion ($\mu mol\ N\ kg^{-1}\ year^{-1}$) for day, night and the day-night (Delta) difference in each layer and for the three different sampling regions. Delta ttest indicates the p-value for the one-sided students t-test that the day-night difference is significantly different from zero.

Region	Mid depth	Delta 1stQ	Delta 2ndQ	Delta 3rdQ	Delta ttest	Day 1stQ	Day 2ndQ	Day 3rdQ	Night 1stQ	Night 2ndQ	Night 3rdQ
5N	50 m	-0.853	-0.536	-0.311	0.01	1.366	1.527	2.118	2.6	2.74	2.834
5N	150 m	-0.175	-0.033	-0.021	0.12	0.178	0.186	0.193	0.219	0.252	0.477
5N	250 m	-0.003	0.008	0.029	0.26	0.134	0.137	0.138	0.076	0.082	0.144
5N	450 m	0.011	0.019	0.05	0.1	0.081	0.096	0.204	0.057	0.086	0.094
5N	800 m	-0.0	0.011	0.012	0.22	0.023	0.047	0.05	0.019	0.029	0.032
cOMZ	50 m	-1.108	-0.52	0.04	0.18	3.341	4.443	4.767	4.693	4.785	5.095
cOMZ	150 m	-0.073	-0.03	0.003	0.12	0.164	0.193	0.257	0.245	0.255	0.289
cOMZ	250 m	0.011	0.033	0.052	0.04	0.112	0.188	0.241	0.101	0.112	0.144
cOMZ	450 m	0.038	0.046	0.059	0.0	0.233	0.25	0.29	0.114	0.157	0.203
cOMZ	800 m	-0.005	-0.005	-0.004	0.63	0.049	0.065	0.085	0.055	0.066	0.077
CVOO	50 m	-0.589	-0.33	-0.23	0.26	1.228	1.49	1.646	1.975	2.25	2.464
CVOO	150 m	-0.213	-0.116	-0.04	0.03	0.167	0.173	0.321	0.277	0.504	0.678
CVOO	250 m	-0.046	0.009	0.023	0.46	0.149	0.16	0.214	0.109	0.171	0.271
CVOO	450 m	0.018	0.025	0.035	0.15	0.206	0.233	0.28	0.154	0.183	0.226
CVOO	800 m	0.009	0.011	0.016	0.02	0.084	0.092	0.098	0.046	0.057	0.07

Online supplementary table 6: Mesozooplankton respiration ($\mu mol\ O_2\ kg^{-1}\ year^{-1}$) for day, night and the day-night difference (Delta) in each layer and for the three different sampling regions. Delta ttest indicates the p-value for the one-sided students t-test that the day-night difference is significantly different from zero.

Region	Mid depth	Delta 1stQ	Delta 2ndQ	Delta 3rdQ	Delta ttest	Day 1stQ	Day 2ndQ	Day 3rdQ	Night 1stQ	Night 2ndQ	Night 3rdQ
5N	50 m	-9.254	-5.792	-4.489	0.01	12.295	15.575	20.546	27.159	29.362	29.524
5N	150 m	-1.554	-0.506	-0.272	0.13	1.667	1.804	2.021	2.211	2.816	4.451
5N	250 m	-0.064	0.122	0.37	0.25	1.384	1.459	1.463	0.724	0.803	1.539
5N	450 m	0.113	0.216	0.491	0.11	0.805	0.971	1.996	0.539	0.874	0.978
5N	800 m	0.001	0.104	0.165	0.14	0.264	0.493	0.583	0.167	0.253	0.285
cOMZ	50 m	-12.194	-6.667	-1.25	0.1	30.439	39.87	43.421	44.161	48.317	49.37
cOMZ	150 m	-0.892	-0.393	-0.061	0.07	1.686	1.891	2.479	2.461	2.774	3.414
cOMZ	250 m	0.157	0.377	0.542	0.03	1.203	1.951	2.309	1.059	1.158	1.351
cOMZ	450 m	0.477	0.647	0.778	0.0	2.757	2.81	2.901	1.157	1.555	1.906
cOMZ	800 m	-0.09	-0.046	-0.029	0.71	0.516	0.706	0.92	0.58	0.66	0.904
CVOO	50 m	-6.615	-3.557	-2.983	0.21	10.54	12.572	15.153	19.284	21.838	24.029
CVOO	150 m	-2.518	-1.451	-0.393	0.04	1.615	1.772	3.06	3.026	5.72	6.864
CVOO	250 m	-0.569	0.055	0.264	0.39	1.534	1.71	2.126	1.041	1.76	3.056
CVOO	450 m	0.127	0.324	0.362	0.37	1.973	2.391	2.849	1.539	1.715	2.623
CVOO	800 m	0.073	0.094	0.197	0.05	0.833	0.918	0.967	0.399	0.568	0.732

Online Supplementary Figure 1

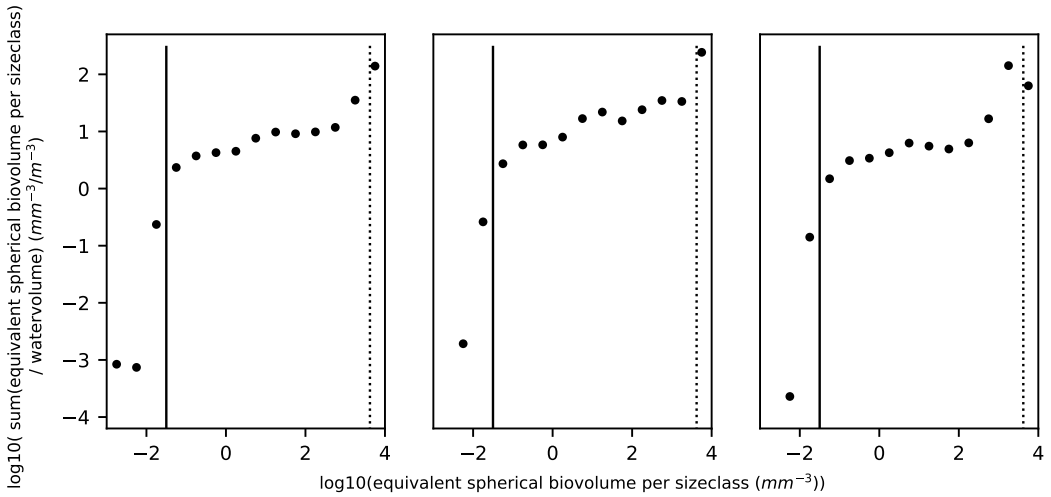

Figure S1: Analysis of the equivalent spherical volume size spectrum for the three different locations. The lower digital cut-off for the medium fraction is indicated with a solid vertical line. These objects were not retained quantitatively with the used $500\ \mu m$ gauze. The upper cut-off of the large fraction is indicated with a dotted line. These objects were not sampled quantitatively with the used Hydrobios Multinet, as they are too rare.

Online Supplementary Figure 2

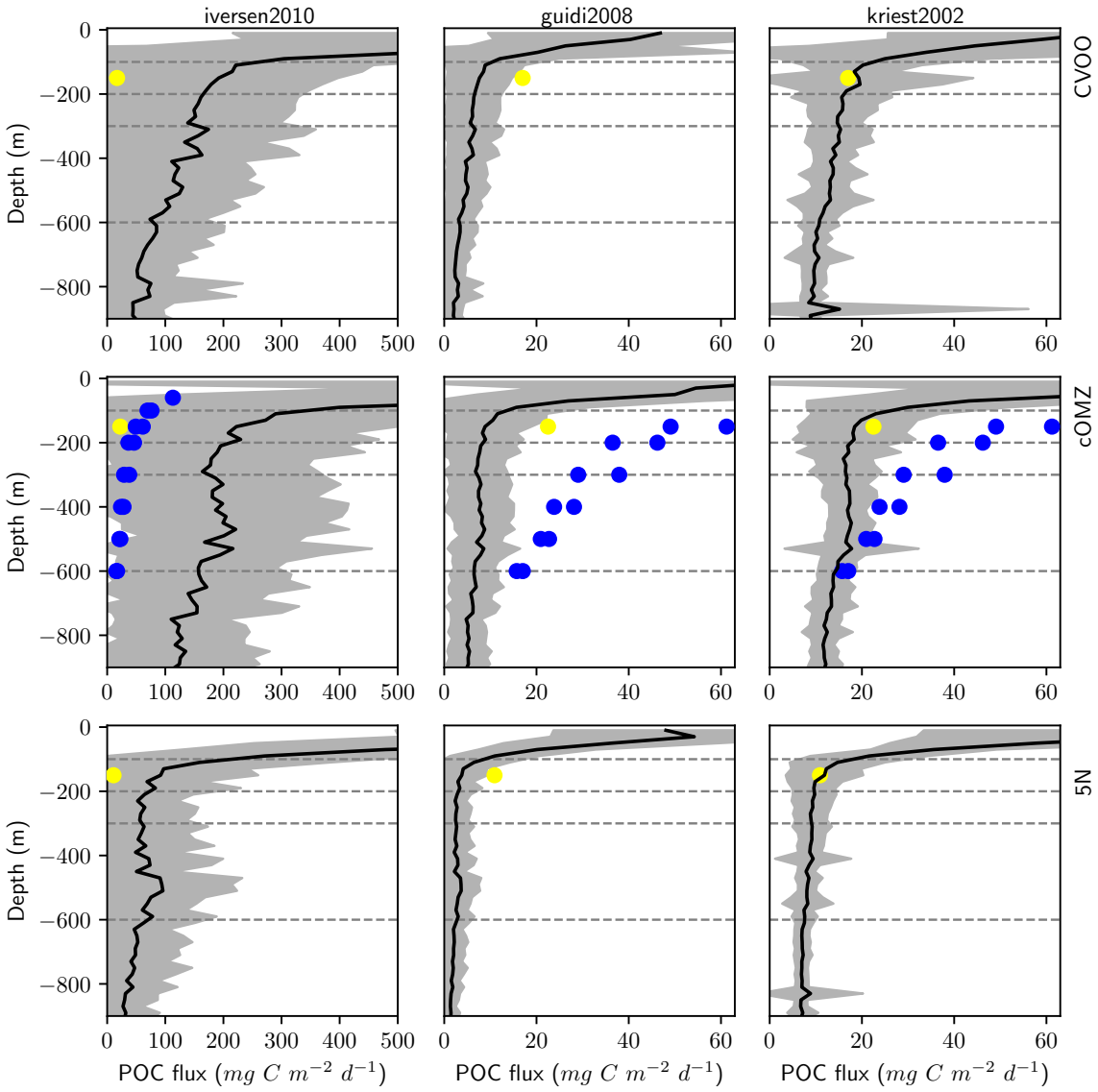

Figure S2: Comparison of POC flux estimates from UVP5 data using parameterizations by **?** (left column), **?** (middle column) and **?** (right column) Top panels: CVOO, Middle panels: cOMZ, Bottom panels: 5N. Grey shading indicates the standard deviation. Blue dots indicate sediment trap data from **?**, yellow dots indicate sediment trap data from **?**. Dashed lines indicate the depth levels of our multinet deployments.

Supplementary Figure 3

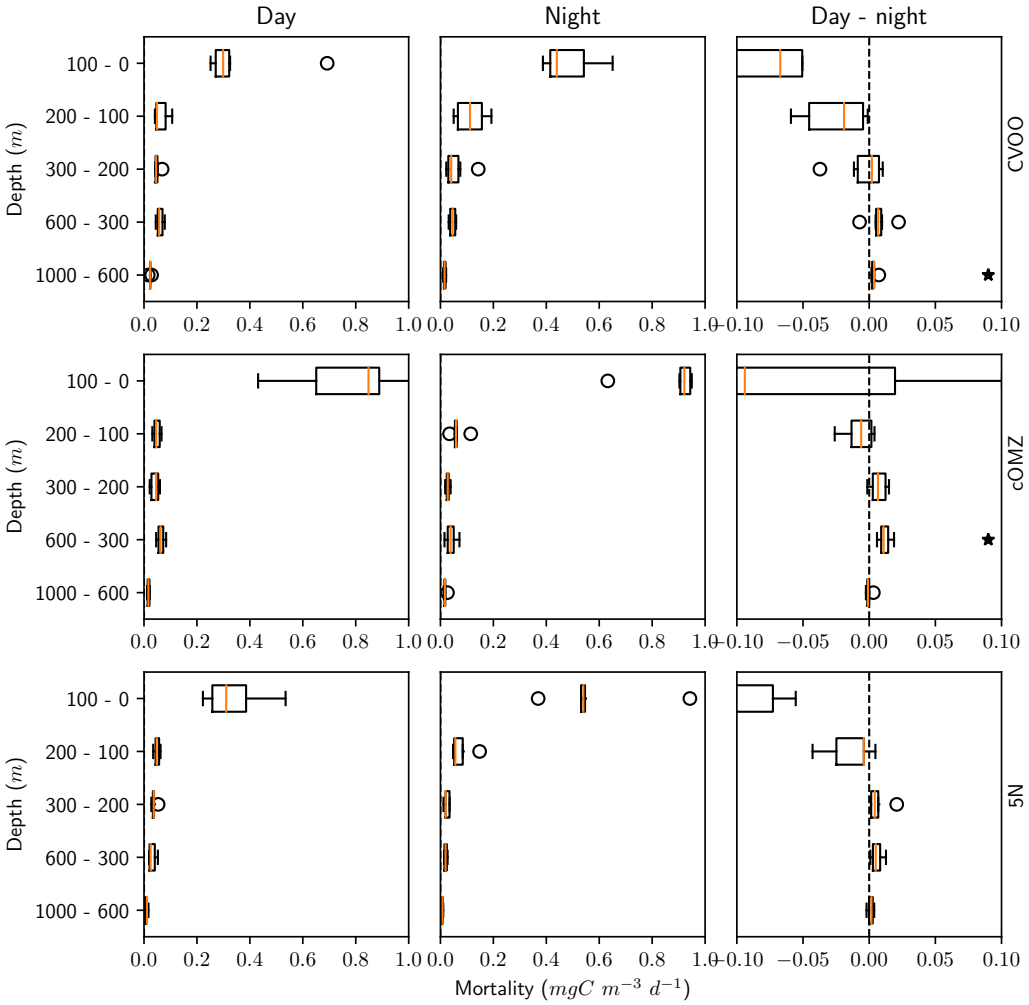

Figure S3: Mesozooplankton mortality for day, night and the day-night difference in each layer and for the three different sampling regions. An asterisk (*) denotes a significant difference (one-sided Students t-test, $p < 0.05$) of the day-night difference from 0.