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# Copepod faecal pellet transfer through the meso- and bathypelagic layers in the Southern Ocean in spring

**Anna Belcher et al.**

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**Table S1: Absolute number of FPs ($n_{FP}$) counted in sediment trap (ST) sample split and Marine Snow Catcher (MSC) samples. Three replicates were counted for ST samples and are presented as mean (standard deviation), where as all FPs collected in the MSC samples were counted. Krill FPs are not included.**

| Cruise | Site | Sampling Method | $n_{FP}$ |
|---|---|---|---|
| JR291 | P2 | MSC | 4 |
| | P2 | MSC | 9 |
| | P2 | MSC | 28 |
| | P3 | MSC | 15 |
| | P3 | MSC | 74 |
| JR304 | P3 | MSC | 120 |
| | P3 | MSC | 252 |
| | | | |
| Dec 2009 | P2 | ST | 422 (98) |
| | P3 | ST | 1156 (195) |
| Dec 2010 | P2 | ST | 564 (134) |
| | P3 | ST | 974 (238) |

**Table S2: Zooplankton abundance (ind. $m^{-2}$) from Bongo samples (200 µm mesh, 0-200 m) taken in the Scotia Sea, Antarctica during research cruises JR304 and JR291. Species in bold are those used to estimate size distributions of egested faecal pellets.**

| | JR291 | | | | JR304 | | |
|---|---|---|---|---|---|---|---|
| | P3 | | | | P2 | | |
| **Species and Stage** | E072 | E126 | E131 | E137 | E44 | E38 | E40 |
| ***Rhincalanus gigas male*** | 27 | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Rhincalanus gigas female*** | 712 | 383 | 356 | 329 | 55 | 7 | 465 |
| ***Rhincalanus gigas V*** | 219 | 164 | 164 | 246 | 0 | 0 | 383 |
| ***Rhincalanus gigas IV*** | 0 | 27 | 0 | 27 | 0 | 0 | 27 |
| ***Rhincalanus gigas III*** | 55 | 246 | 274 | 301 | 0 | 0 | 110 |
| ***Rhincalanus gigas II*** | 876 | 602 | 274 | 219 | 110 | 0 | 0 |
| ***Rhincalanus gigas I*** | 548 | 164 | 137 | 27 | 137 | 0 | 0 |
| ***Rhincalanus gigas nauplii*** | 110 | 876 | 1,314 | 438 | 1,971 | 5,256 | 25,405 |
| ***Calanoides acutus female*** | 82 | 137 | 164 | 192 | 0 | 301 | 82 |
| ***Calanoides acutus V*** | 1,615 | 2,436 | 2,135 | 2,190 | 164 | 0 | 274 |
| ***Calanoides acutus IV*** | 3,039 | 1,205 | 1,643 | 1,150 | 575 | 383 | 1,424 |
| ***Calanoides acutus III*** | 548 | 219 | 192 | 411 | 602 | 1,341 | 6,351 |
| ***Calanoides acutus II*** | 55 | 55 | 164 | 356 | 329 | 3,285 | 10,622 |
| ***Calanoides acutus I*** | 0 | 0 | 0 | 274 | 411 | 3,532 | 7,775 |
| ***Calanus simillimus male*** | 0 | 0 | 0 | 27 | 0 | 0 | 0 |
| ***Calanus simillimus female*** | 27 | 110 | 55 | 27 | 0 | 0 | 137 |
| ***Calanus simillimus V*** | 0 | 27 | 27 | 0 | 0 | 0 | 0 |
| ***Calanus simillimus IV*** | 0 | 27 | 82 | 82 | 0 | 0 | 0 |
| ***Calanus simillimus III*** | 0 | 27 | 0 | 27 | 0 | 0 | 110 |
| ***Calanus simillimus II*** | 0 | 27 | 82 | 246 | 0 | 0 | 0 |
| ***Calanus simillimus I*** | 0 | 55 | 164 | 274 | 0 | 0 | 0 |
| ***Calanus propinquus male*** | 0 | 0 | 0 | 27 | 0 | 0 | 0 |
| ***Calanus propinquus female*** | 27 | 0 | 27 | 0 | 0 | 0 | 27 |
| ***Calanus propinquus V*** | 110 | 55 | 55 | 27 | 0 | 0 | 0 |
| ***Calanus propinquus IV*** | 27 | 55 | 82 | 0 | 27 | 164 | 0 |
| ***Calanus propinquus III*** | 0 | 55 | 0 | 0 | 82 | 274 | 438 |

| | JR291 | | | | JR304 | | |
|---|---|---|---|---|---|---|---|
| | P3 | | | | P2 | | |
| **Species and Stage** | E072 | E126 | E131 | E137 | E44 | E38 | E40 |
| ***Calanus propinquus II*** | 0 | 0 | 0 | 0 | 27 | 383 | 1,424 |
| ***Calanus propinquus I*** | 0 | 0 | 0 | 0 | 0 | 438 | 1,095 |
| ***Euchaeta antarctica V*** | 0 | 0 | 0 | 0 | 27 | 0 | 0 |
| ***Euchaeta antarctica IV*** | 0 | 0 | 0 | 0 | 27 | 0 | 0 |
| ***Euchaeta antarctica III*** | 55 | 55 | 110 | 110 | 0 | 164 | 219 |
| ***Euchaeta antarctica II*** | 110 | 164 | 739 | 0 | 0 | 0 | 438 |
| ***Euchaeta antarctica I*** | 0 | 82 | 274 | 438 | 0 | 0 | 0 |
| ***Euchirella rostrata/rostramagna*** | 0 | 0 | 27 | 0 | 0 | 0 | 0 |
| ***Haloptilus*** | 0 | 27 | 0 | 0 | 0 | 82 | 27 |
| ***Heterorhabdus*** | 0 | 27 | 27 | 0 | 55 | 0 | 0 |
| ***Eucalanus longiceps*** | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| ***Metridia gerlachei adult*** | 164 | 356 | 1,013 | 465 | 55 | 110 | 192 |
| ***Metridia lucens adult*** | 0 | 0 | 465 | 246 | 301 | 0 | 0 |
| ***Metridia male*** | 110 | 27 | 55 | 0 | 0 | 0 | 0 |
| ***Metridia I-III*** | 14,455 | 17,959 | 27,595 | 15,769 | 3,395 | 15,331 | 33,289 |
| ***Metridia IV-V*** | 2,847 | 3,066 | 3,504 | 5,256 | 767 | 0 | 1,752 |
| ***Pleuromamma rob.*** | 0 | 0 | 55 | 0 | 0 | 0 | 0 |
| ***Oithona similis*** | 121,768 | 137,099 | 122,206 | 123,082 | 30,552 | 68,769 | 184,843 |
| ***Oithona frigida*** | 876 | 3,504 | 3,066 | 438 | 986 | 2,628 | 0 |
| ***Oncaea*** | 10,074 | 9,198 | 16,207 | 4,818 | 14,783 | 4,818 | 12,264 |
| ***Scolecithricella minor*** | 903 | 712 | 1,040 | 1,314 | 110 | 137 | 0 |
| ***Scaphocalanus farrani*** | 0 | 0 | 27 | 0 | 0 | 0 | 0 |
| ***Scaphocalanus copepodites*** | 0 | 0 | 164 | 0 | 0 | 0 | 0 |
| ***Microcalanus*** | 1,314 | 2,628 | 8,760 | 2,190 | 876 | 7,884 | 7,008 |
| ***Ctenocalanus*** | 55,190 | 33,289 | 21,463 | 25,843 | 5,366 | 17,083 | 65,702 |
| ***Cteno/Micro copepodites*** | 0 | 0 | 0 | 0 | 2,628 | 0 | 3,504 |
| ***Clausocalanus laticeps*** | 630 | 164 | 438 | 438 | 0 | 110 | 0 |
| ***Clausocalanus copepodites*** | 0 | 438 | 438 | 0 | 0 | 0 | 876 |
| ***Drepanopus 1-3*** | 876 | 7,884 | 5,694 | 7,008 | 0 | 0 | 0 |
| ***Drepanopus 4-6*** | 0 | 876 | 438 | 0 | 0 | 0 | 0 |

| | JR291 | | | | JR304 | | |
|---|---|---|---|---|---|---|---|
| | P3 | | | | P2 | | |
| **Species and Stage** | E072 | E126 | E131 | E137 | E44 | E38 | E40 |
| ***Racovitzanus*** | 0 | 27 | 0 | 0 | 0 | 0 | 0 |
| ***Calanus nauplii*** | 8,322 | 7,446 | 26,719 | 18,835 | 14,126 | 12,264 | 28,909 |
| ***Cyclopoi nauplii*** | 0 | 0 | 2,190 | 4,380 | 6,023 | 0 | 0 |
| *Thysanoessa calyptopes* | 1,205 | 0 | 1,752 | 0 | 329 | 1,424 | 1,697 |
| *Thysanoessa spp.* | 277 | 137 | 82 | 274 | 110 | 5,858 | 1,451 |
| *Euphausia frigida* | 86 | 27 | 0 | 0 | 0 | 0 | 0 |
| *Euphausia frigida calyptopis* | 110 | 0 | 0 | 438 | 0 | 411 | 770 |
| *Euphausia frigida furcilia* | 55 | 0 | 82 | 192 | 0 | 110 | 55 |
| *Euphausia triacantha calyptopis* | 0 | 0 | 0 | 0 | 0 | 0 | 27 |
| *Chaetognatha* | 1,314 | 958 | 1,040 | 931 | 137 | 356 | 1,560 |
| *Tomopteris* | 0 | 0 | 82 | 438 | 0 | 110 | 0 |
| *Pelagobia* | 1,752 | 438 | 1,314 | 3,504 | 1,971 | 6,570 | 5,256 |
| *Rhynchonerella bongraini* | 0 | 0 | 0 | 0 | 0 | 27 | 0 |
| *Themisto gaudichaudi* | 21 | 0 | 0 | 0 | 0 | 0 | 55 |
| *Ostracoda* | 14 | 164 | 548 | 356 | 137 | 356 | 301 |
| *Pteropoda* | 0 | 0 | 0 | 876 | 0 | 1,752 | 876 |
| *Limacina (large)* | 0 | 0 | 0 | 0 | 0 | 110 | 0 |
| *Spongiobranchea* | 0 | 27 | 0 | 0 | 0 | 0 | 0 |
| *Appendicularians* | 6,570 | 10,074 | 20,149 | 35,479 | 2,957 | 15,331 | 33,289 |
| *Siphonophora* | 0 | 55 | 329 | 110 | 0 | 0 | 0 |
| *Fish larvae* | 0 | 0 | 0 | 0 | 0 | 27 | 0 |
| *Medusae* | 0 | 55 | 0 | 0 | 0 | 0 | 0 |
| *Primno macropa* | 0 | 27 | 0 | 0 | 0 | 0 | 0 |

**Table S3: Sinking velocities and volumes of FPs (excluding krill FPs) collected in Marine Snow Catchers at P2 and P3 during research cruises JR291 and JR304.**

| Site | FP volume ($mm^3$) | FP sinking velocity ($m\ d^{-1}$) | Site | FP volume ($mm^3$) | FP sinking velocity ($m\ d^{-1}$) |
|---|---|---|---|---|---|
| P2 | 0.040 | 144 | P3 | 0.010 | 75 |
| P2 | 0.031 | 270 | P3 | 0.027 | 57 |
| P2 | 0.008 | 52 | P3 | 0.002 | 48 |
| P2 | 0.040 | 144 | P3 | 0.026 | 87 |
| P2 | 0.031 | 135 | P3 | 0.002 | 51 |
| P2 | 0.057 | 134 | P3 | 0.005 | 68 |
| P2 | 0.019 | 342 | P3 | 0.014 | 49 |
| P2 | 0.011 | 382 | P3 | 0.028 | 92 |
| P2 | 0.072 | 247 | P3 | 0.023 | 106 |
| P2 | 0.044 | 101 | P3 | 0.009 | 24 |
| P2 | 0.007 | 193 | P3 | 0.091 | 92 |
| P2 | 0.017 | 116 | P3 | 0.066 | 140 |
| P2 | 0.035 | 207 | P3 | 0.012 | 57 |
| P2 | 0.002 | 246 | P3 | 0.006 | 65 |
| P2 | 0.016 | 61 | P3 | 0.010 | 62 |
| P2 | 0.001 | 120 | P3 | 0.006 | 64 |
| P2 | 0.003 | 98 | P3 | 0.002 | 47 |
| | | | P3 | 0.037 | 36 |
| | | | P3 | 0.031 | 53 |
| | | | P3 | 0.014 | 122 |
| | | | P3 | 0.021 | 36 |
| | | | P3 | 0.077 | 100 |
| | | | P3 | 0.018 | 62 |
| | | | P3 | 0.026 | 64 |
| | | | P3 | 0.013 | 79 |
| | | | P3 | 0.083 | 227 |
| | | | P3 | 0.286 | 203 |
| | | | P3 | 0.165 | 189 |
| | | | P3 | 0.007 | 100 |
| | | | P3 | 0.006 | 74 |
| | | | P3 | 0.005 | 13 |
| | | | P3 | 0.115 | 106 |
| | | | P3 | 0.021 | 60 |
| | | | P3 | 0.005 | 68 |
| | | | P3 | 0.018 | 79 |

| | | |
|---|---|---|
| P3 | 0.006 | 49 |
| P3 | 0.009 | 64 |
| P3 | 0.003 | 155 |
| P3 | 0.005 | 222 |
| P3 | 0.256 | 144 |
| P3 | 0.002 | 82 |
| P3 | 0.006 | 133 |

**Supplementary Figures**

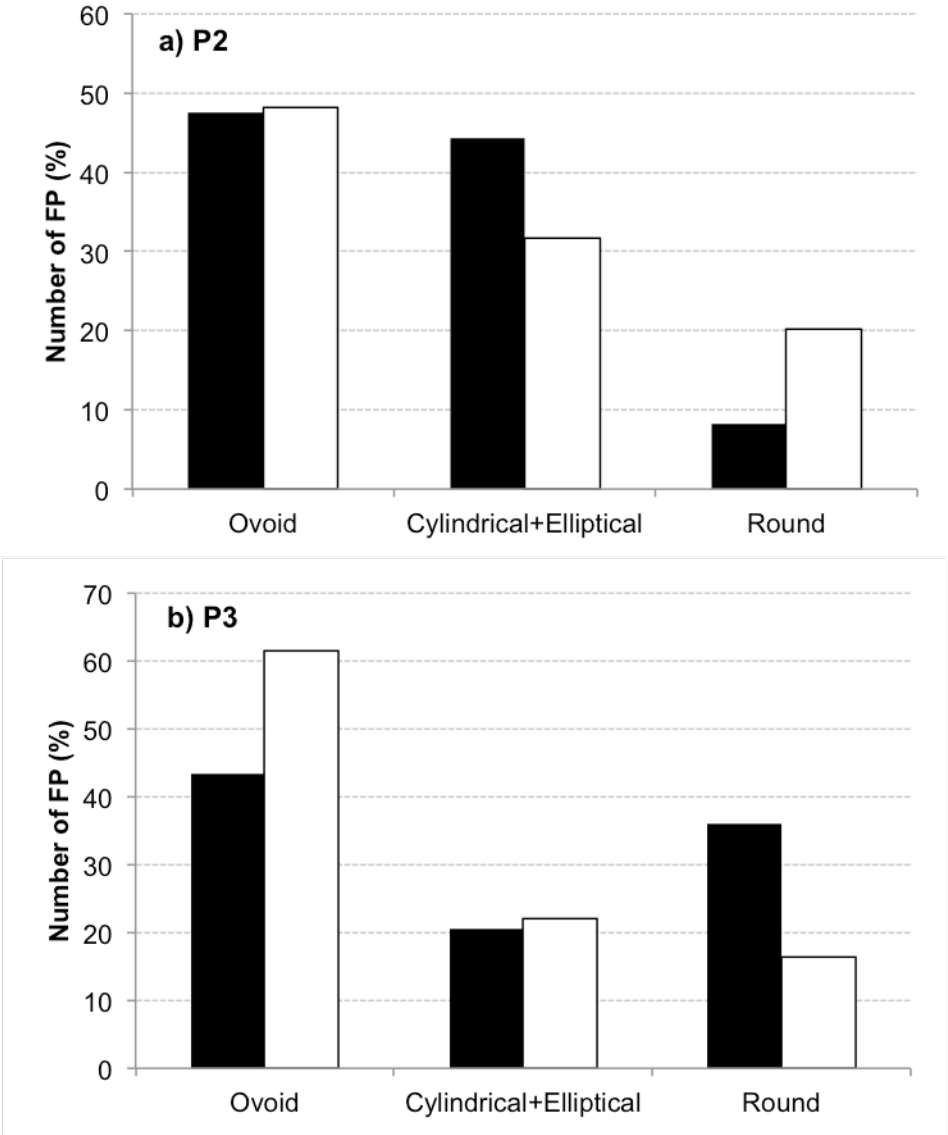


**Figure S1: Comparison of sediment trap faecal pellet (FP) morphologies measured in this study (2013 and 2014, black) with those measured historically (2009 and 2010, white) at a) P2 and b) P3. Both studies are means of November and December data. The percent (%) of FPs in each category is broadly consistent between study years (paired t-test p>0.5) providing support for our use of historical data for size comparisons with Marine Snow Catcher data collected in 2013 and 2014.**

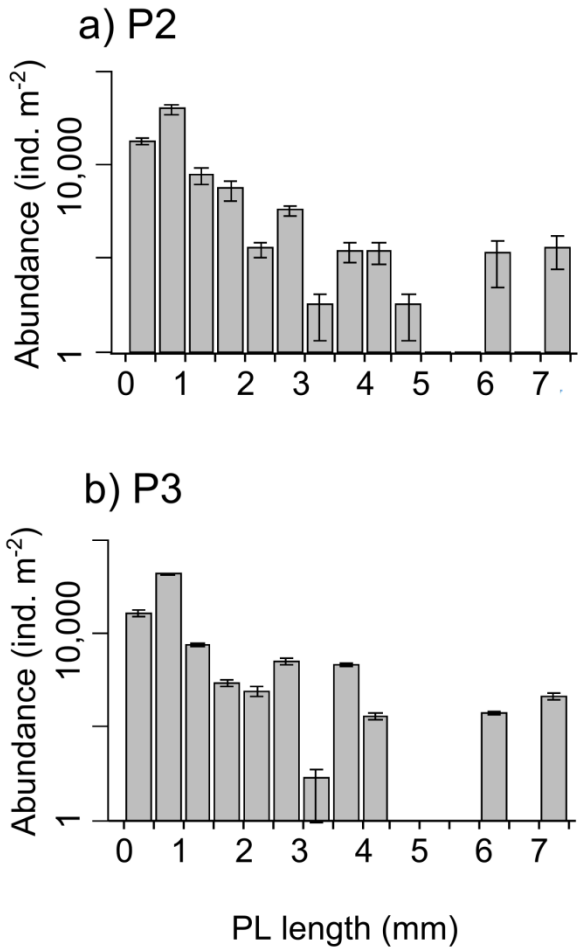


**Figure S2: Mesozooplankton abundances in the Scotia Sea. Average (±SE) abundance (ind. $m^{-2}$) from Bongo net tows (0-200 m, 200 µm mesh) taken during cruises JR291 and JR304 for a) P2 and b) P3. Note the log scale on the y axis.**