http://app.pan.pl/SOM/app70-Lukowiak_etal_SOM.pdf

SUPPLEMENTARY ONLINE MATERIAL FOR

Comparison of Recent and sub-fossil sponge communities of West Antarctica

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Supplementary Online Material

Table S1. Core depths and estimated age of the samples.

Table S2. Presence-absence dataset
available at http://app.pan.pl/SOM/app70-Lukowiak_etal_SOM/TableS2.xlsx.

Table S3. PERMANOVA results based on presence and absence data.

R executable codes

Table S1. Core depths and estimated age of the samples (based on studies by Nascimiento et al. 2009).

Depth from the Surface [cm]	Years B.P.	Year [~] A.D.
0	0	2019-2020
10	29	1991-1990
20	57	1963-1962
30	86	1934-1933
40	114	1906-1905
50	143	1877-1886
60	171	1849-1848
70	200	1820-1819
80	229	1791-1790
90	257	1763-1762
100	286	1734-1733
110	314	1706-1705
120	343	1677-1676
130	371	1649-1648
140	400	1620-1619
150	429	1591-1590
160	457	1563-1562
170	486	1534-1533
180	514	1506-1505
190	543	1477-1476
200	571	1449-1448
210	600	1421-1420
220	629	1393-1392
230	657	1363-1362
240	686	1334-1333
250	714	1306-1305
260	743	1277-1276
270	771	1249-1248
280	800	1220-1219
290	829	1191-1190
300	857	1163-1162
310	886	1134-1133
320	914	1106-1105
330	943	1077-1176
338	966	1054-1053

Table S3. PERMANOVA results based on presence and absence data. First, the differences between cores were tested and then for each core, different groupings were tested in relation to the depth form the surface. Values in bold (**) were significantly different.

			R^2	p
Test 1	1a	282m (C388) × 423m (C140) – core 4 vs core 8	0.03346	0.0744
	2b	282m (C140) × 423m (C140) – core 4 vs core 8 but down to the same depth	0.06637	**0.0207***
Test 2 - Only in core 4	1	282m (C0-20; C30-70; C80-388)	0.07647	0.7073
	2	282m (grouped by each 2)	0.47831	0.4066
	3	282m (grouped by each 3)	0.34135	0.2773
	4	282m (grouped by each 4)	0.24226	0.3860
	5	282m (grouped by each 5)	0.20293	0.1564
	6	282m (grouped by each 6)	0.17986	0.0943
	7	282m (grouped by each 7)	0.15429	0.0554
Test 3 - Only in core 8	1	423m (C0-20; C30-70; C80-140)	0.17488	0.2886
	2	423m (grouped by each 2)	0.50472	0.2502
	3	423m (grouped by each 3)	0.32854	0.3544
	4	423m (grouped by each 4)	0.25330	0.3136
	5	423m (grouped by each 5)	0.14143	0.5572
	6	423m (grouped by each 6)	0.17052	0.3175
	7	423m (grouped by each 7)	0.09654	0.2359

R executable codes

```
##### Packages
library(vegan)
library(ggplot2)
library(dplyr)

##### Input file
setwd ("D:/Documents/R/win-library/3.5/Arquivos_input")
spi_per <- read.table(file = "Supp_Mat_Data_File_nMDS_permanova.txt", header = T)

##### PERMANOVA all. shallow C338 vs deep C140
dist.jac <- vegdist(spi_per[,10:36], method = "jaccard", binary = T)
sponge_per <- adonis2(dist.jac~spi_per$Depth, data = spi_per, permutations = 9999)

##### nMDS all.  shallow C338 vs deep C140
nmds_all <- metaMDS(dist.jac, trymax = 1000)
nmds_scores <- as.data.frame(scores(nmds_all))

Depth <- rep(c("280_m"),each = 35)
Depth <- append(Depth, rep(c("423_m"),each = 14))
nmds_scores$Depth <- Depth

#plot with GGPLOT2
grp.a <- nmds_scores[nmds_scores$Depth == "280_m",
][chull(nmds_scores[nmds_scores$Depth == "280_m", c("NMDS1", "NMDS2")]), ]
grp.b <- nmds_scores[nmds_scores$Depth == "423_m",
][chull(nmds_scores[nmds_scores$Depth == "423_m", c("NMDS1", "NMDS2")]), ]
hull_data <- rbind(grp.a,grp.b)

p1 <- ggplot() +
  geom_polygon(data = hull_data, aes(x = NMDS1, y = NMDS2, fill = Depth, group = Depth,
colour = Depth), alpha = .3) +
  geom_point(data = nmds_scores, aes(x = NMDS1, y = NMDS2, shape = Depth, colour =
Depth), size = 4) +
  stat_ellipse(data = nmds_scores, aes(x = NMDS1, y = NMDS2, colour = Depth), size=1) +
  ylab("nMDS2") +
  xlab("nMDS1") +
  theme_bw() +
  theme(legend.position = c(0.1, 0.17), panel.grid.minor = element_blank())

##### Cluster analysis
plot(as.dendrogram(hclust(dist.jac, method = "ward.D2")), ylab = "Height", xlab =
"Subsamples", ylim = c(0,2), edgePar = list(lwd = 2))

##### PERMANOVA shallow C140 vs deep C140
spi_per_c140 <- bind_rows(spi_per[1:15,], spi_per[36:49,])
dist.jac_c140 <- vegdist(spi_per_c140[,10:36], method = "jaccard", binary = T)
sponge_per_c140 <- adonis2(dist.jac_c140~spi_per_c140$Depth, data = spi_per_c140,
permutations = 9999)
```

```
##### nMDS shallow C140 vs deep C140
nmds_all_c140 <- metaMDS(dist.jac_c140, trymax = 1000)
nmds_scores_c140 <- as.data.frame(scores(nmds_all_c140))

Depth <- rep(c("280_m"),each = 15)
Depth <- append(Depth, rep(c("423_m"),each = 14))
nmds_scores_c140$Depth <- Depth

#plot with GGPLOT2
grp.a1 <- nmds_scores_c140[nmds_scores_c140$Depth == "280_m",
][chull(nmds_scores_c140[nmds_scores_c140$Depth == "280_m", c("NMDS1",
"NMDS2")]), ]
grp.b1 <- nmds_scores_c140[nmds_scores_c140$Depth == "423_m",
][chull(nmds_scores_c140[nmds_scores_c140$Depth == "423_m", c("NMDS1",
"NMDS2")]), ]
hull_data_c140 <- rbind(grp.a1,grp.b1)

p2 <- ggplot() +
  geom_polygon(data = hull_data_c140, aes(x = NMDS1, y = NMDS2, fill = Depth, group =
Depth, colour = Depth), alpha = .3) +
  geom_point(data = nmds_scores_c140, aes(x = NMDS1, y = NMDS2, shape = Depth,
colour = Depth), size = 4) +
  stat_ellipse(data = nmds_scores_c140, aes(x = NMDS1, y = NMDS2, colour = Depth), size
= 1) +
  ylab("nMDS2") +
  xlab("nMDS1") +
  theme_bw() +
  theme(legend.position = c(0.1, 0.17), panel.grid.minor = element_blank())

##### PERMANOVA only shallow (c388)
spi_per_sha <-spi_per[1:35,]
dist.jac_sha <- vegdist(spi_per_sha[,10:36], method = "jaccard", binary = T)

sponge_per_sha_n1 <- adonis2(dist.jac_sha~spi_per_sha$nested_1, data = spi_per_sha,
permutations = 9999)
sponge_per_sha_n2 <- adonis2(dist.jac_sha~spi_per_sha$nested_2, data = spi_per_sha,
permutations = 9999)
sponge_per_sha_n3 <- adonis2(dist.jac_sha~spi_per_sha$nested_3, data = spi_per_sha,
permutations = 9999)
sponge_per_sha_n4 <- adonis2(dist.jac_sha~spi_per_sha$nested_4, data = spi_per_sha,
permutations = 9999)
sponge_per_sha_n5 <- adonis2(dist.jac_sha~spi_per_sha$nested_5, data = spi_per_sha,
permutations = 9999)
sponge_per_sha_n6 <- adonis2(dist.jac_sha~spi_per_sha$nested_6, data = spi_per_sha,
permutations = 9999)
sponge_per_sha_n7 <- adonis2(dist.jac_sha~spi_per_sha$nested_7, data = spi_per_sha,
permutations = 9999)

##### PERMANOVA only deep (c140)
spi_per_dep <-spi_per[36:49,]
```

```
dist.jac_dep <- vegdist(spi_per_dep[,10:36], method = "jaccard", binary = T)

sponge_per_dep_n1 <- adonis2(dist.jac_dep~spi_per_dep$nested_1, data = spi_per_dep,
permutations = 9999)
sponge_per_dep_n2 <- adonis2(dist.jac_dep~spi_per_dep$nested_2, data = spi_per_dep,
permutations = 9999)
sponge_per_dep_n3 <- adonis2(dist.jac_dep~spi_per_dep$nested_3, data = spi_per_dep,
permutations = 9999)
sponge_per_dep_n4 <- adonis2(dist.jac_dep~spi_per_dep$nested_4, data = spi_per_dep,
permutations = 9999)
sponge_per_dep_n5 <- adonis2(dist.jac_dep~spi_per_dep$nested_5, data = spi_per_dep,
permutations = 9999)
sponge_per_dep_n6 <- adonis2(dist.jac_dep~spi_per_dep$nested_6, data = spi_per_dep,
permutations = 9999)
sponge_per_dep_n7 <- adonis2(dist.jac_dep~spi_per_dep$nested_7, data = spi_per_dep,
permutations = 9999)
```