Zooplankton and Micronekton Active Flux

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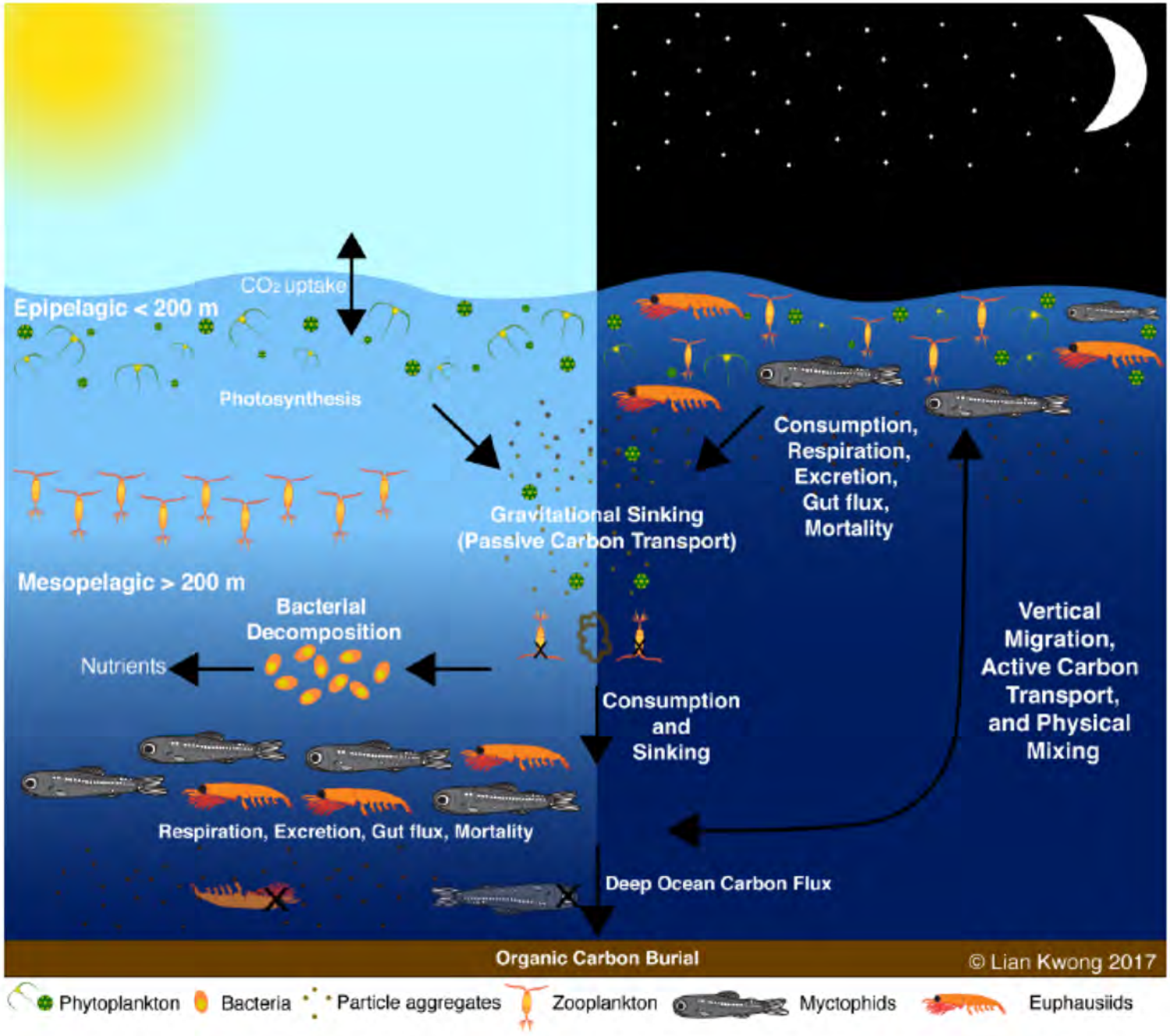
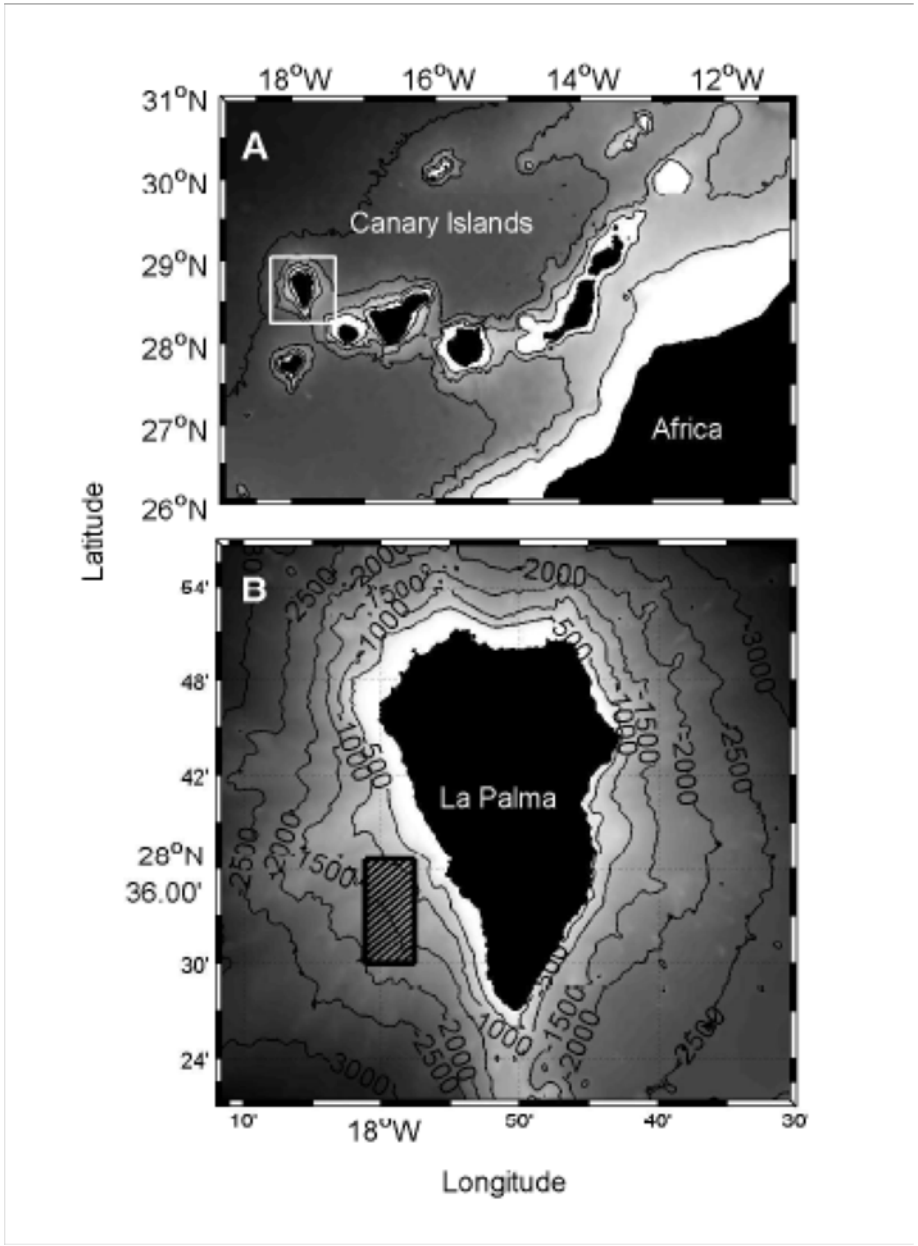
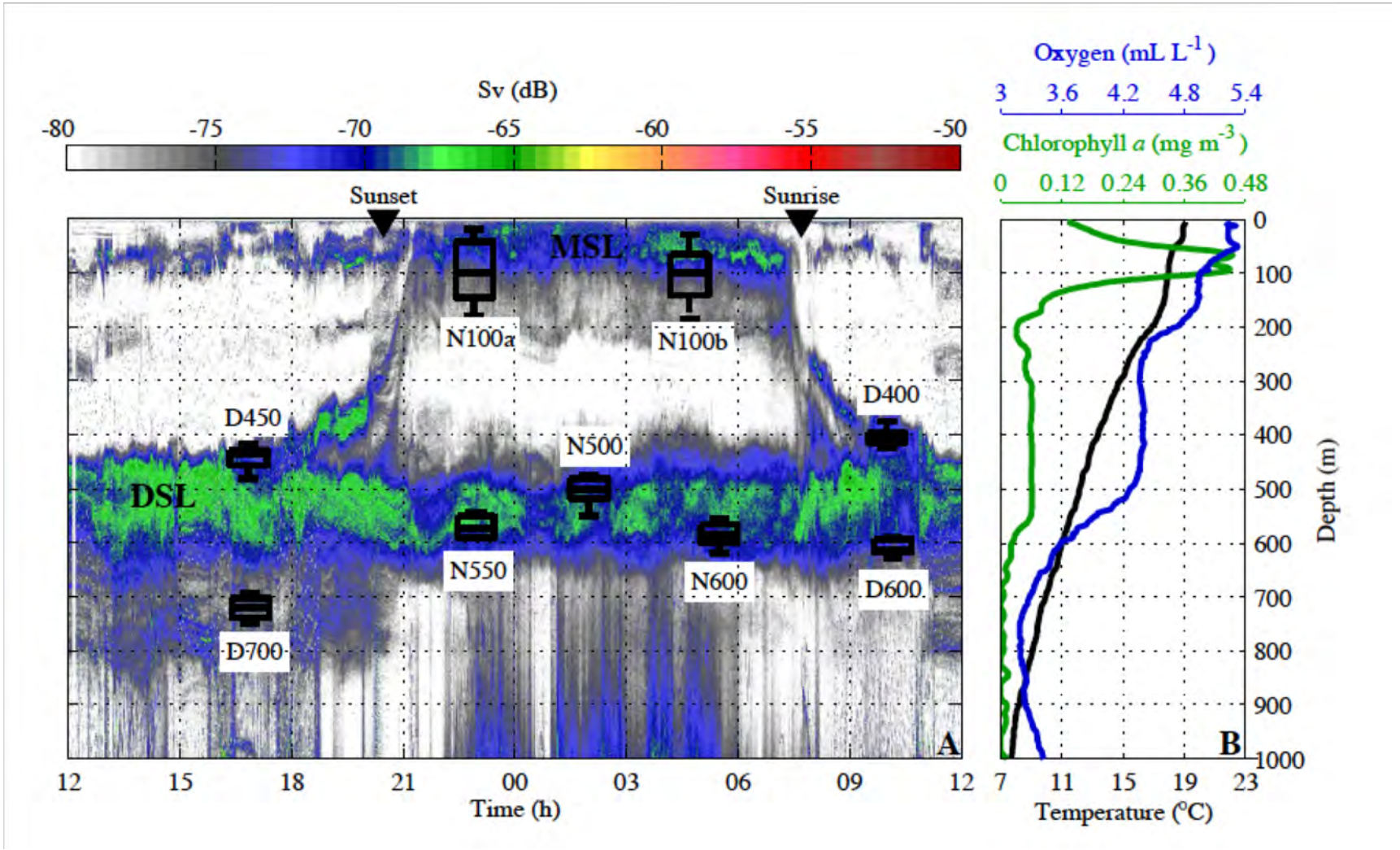
Islas Canarias



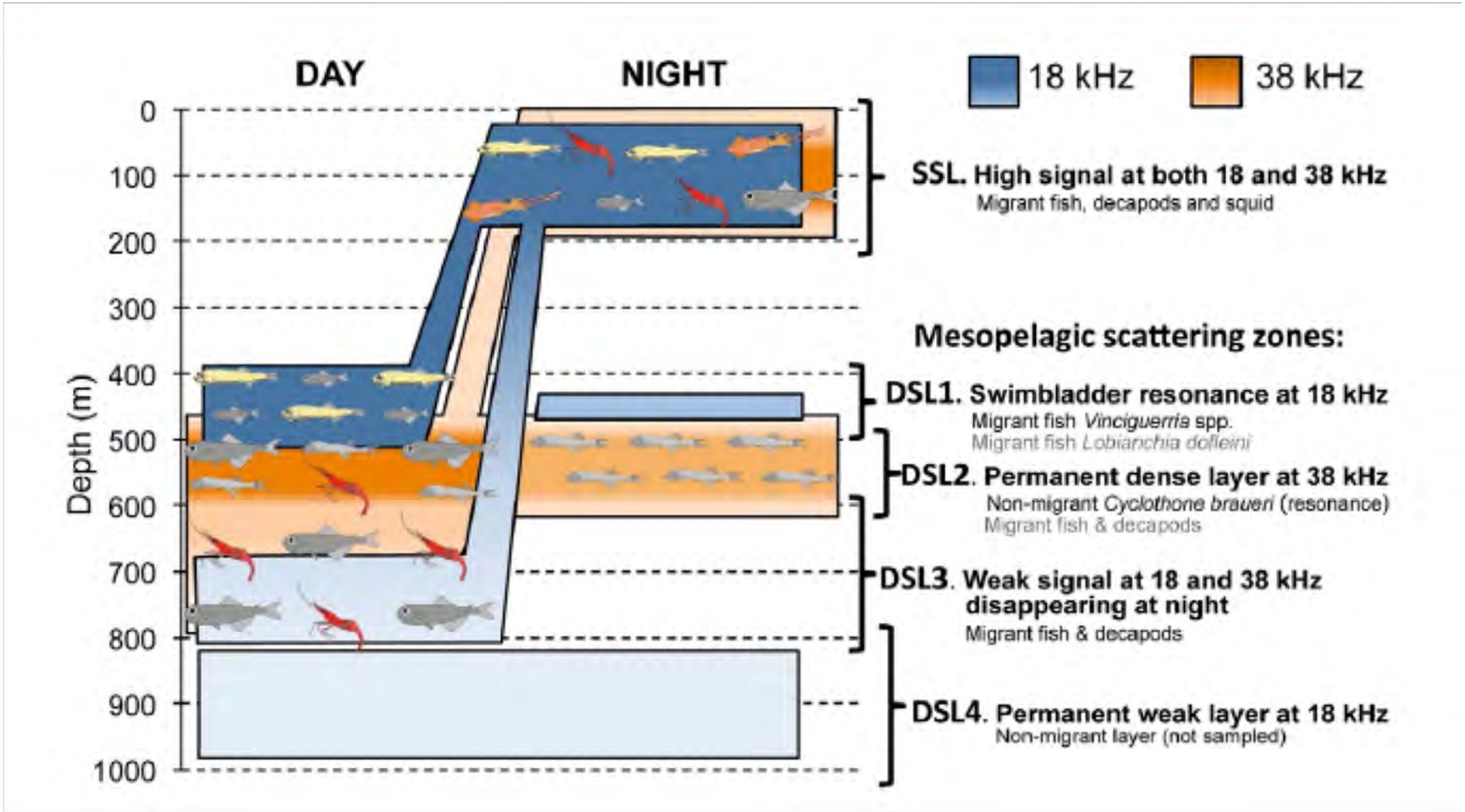
Kwong and Pakhomov (2017)



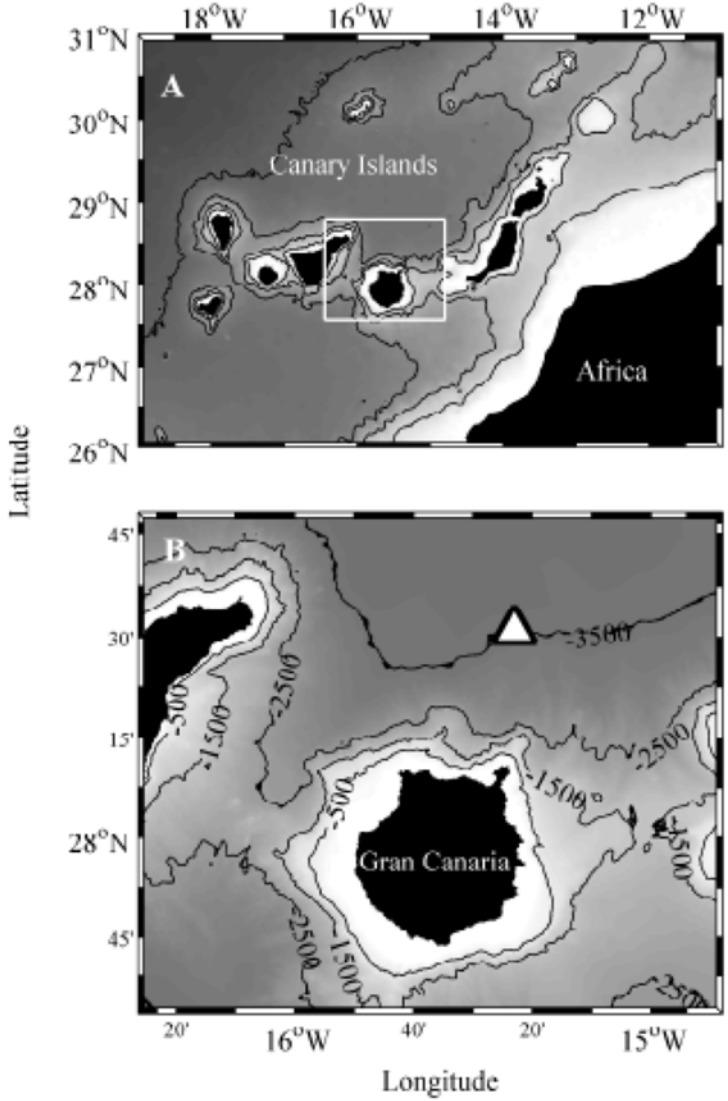
Ariza *et al.* (2016)



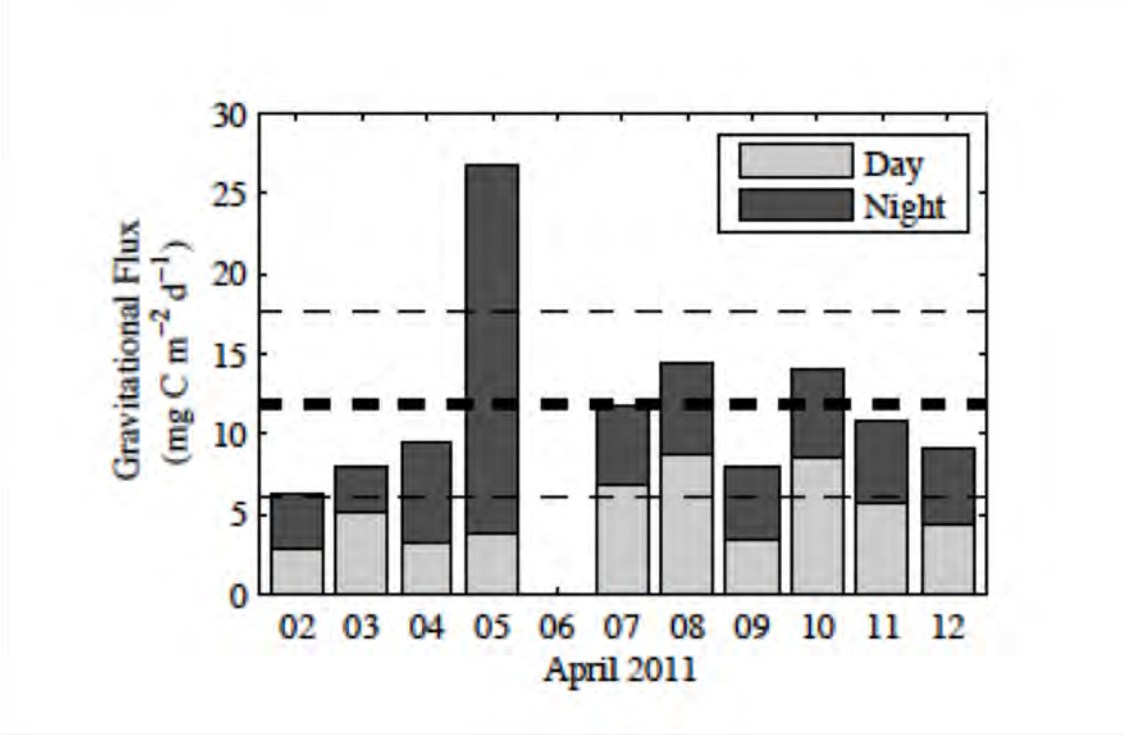
Ariza *et al.* (2016)



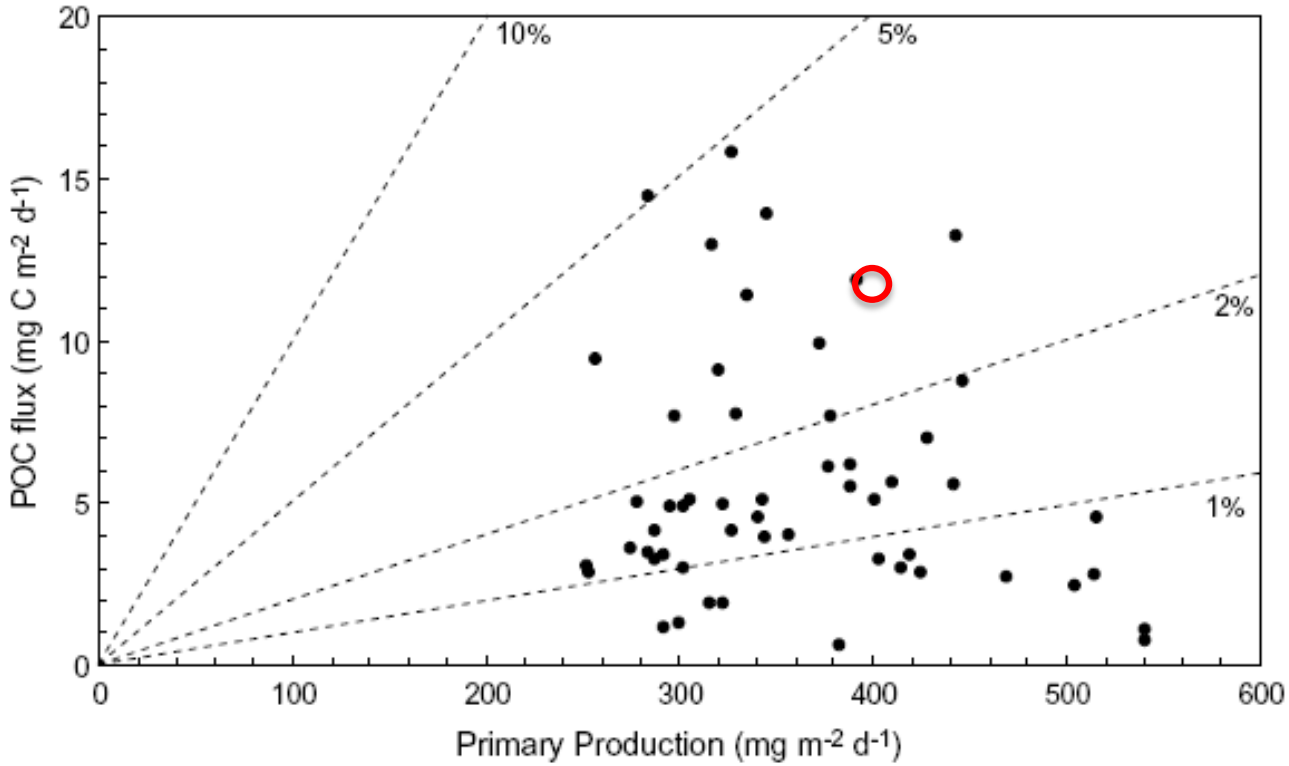
Ariza *et al.* (2016)



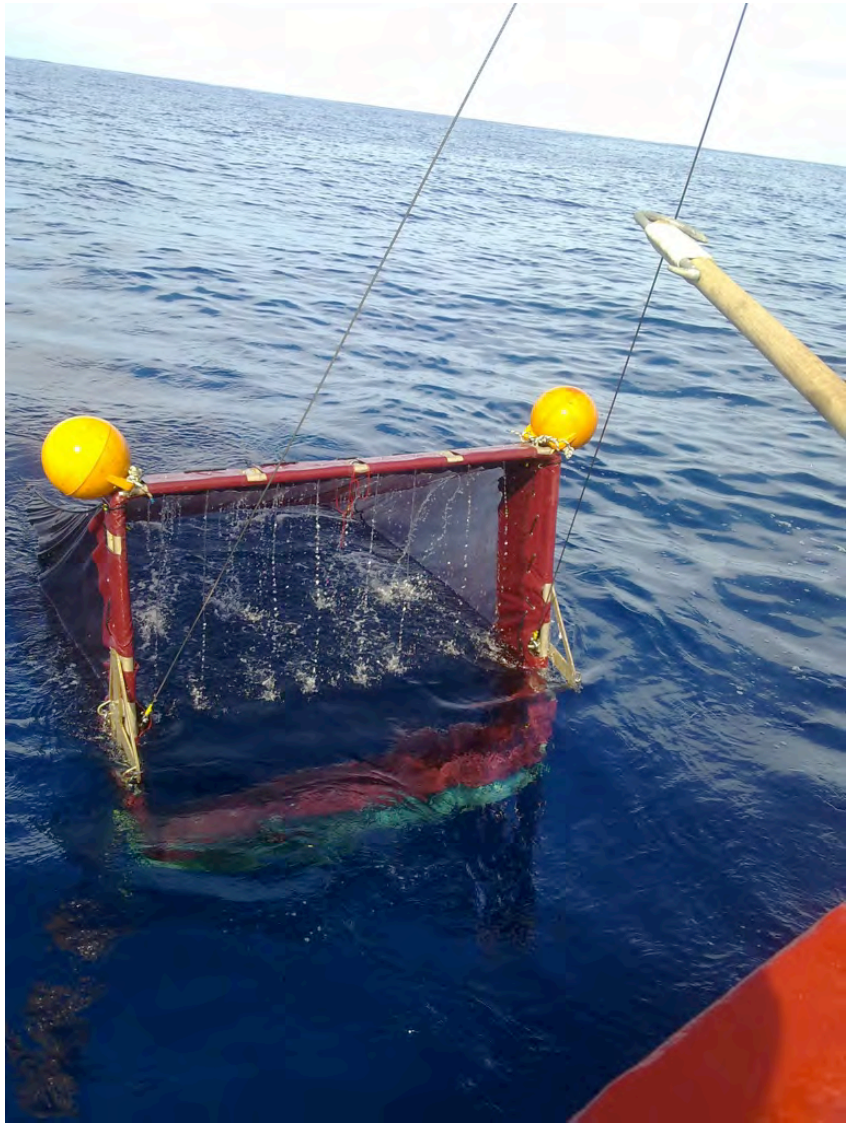
Ariza *et al.* (2015)



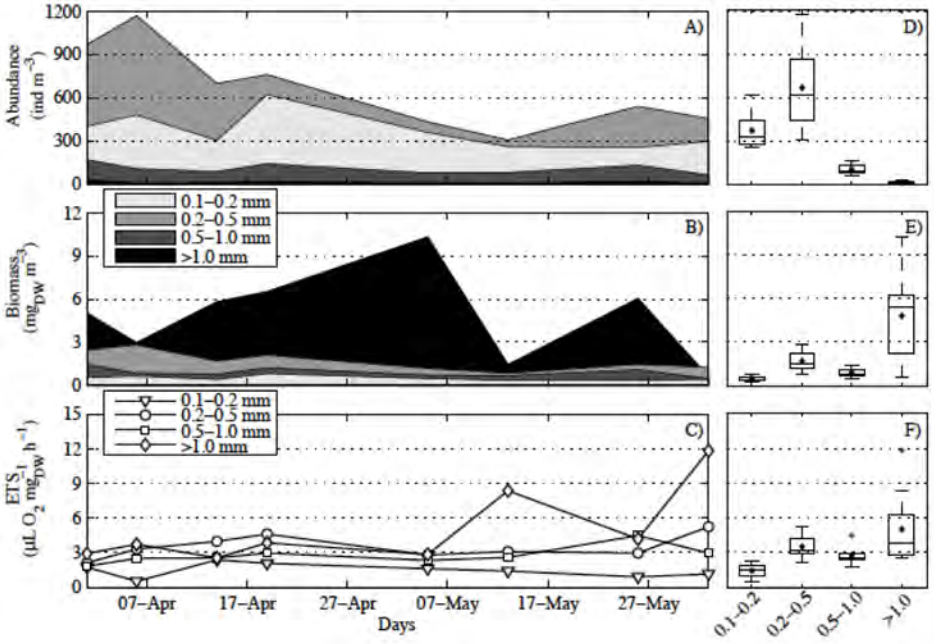
Ariza *et al.* (2015)



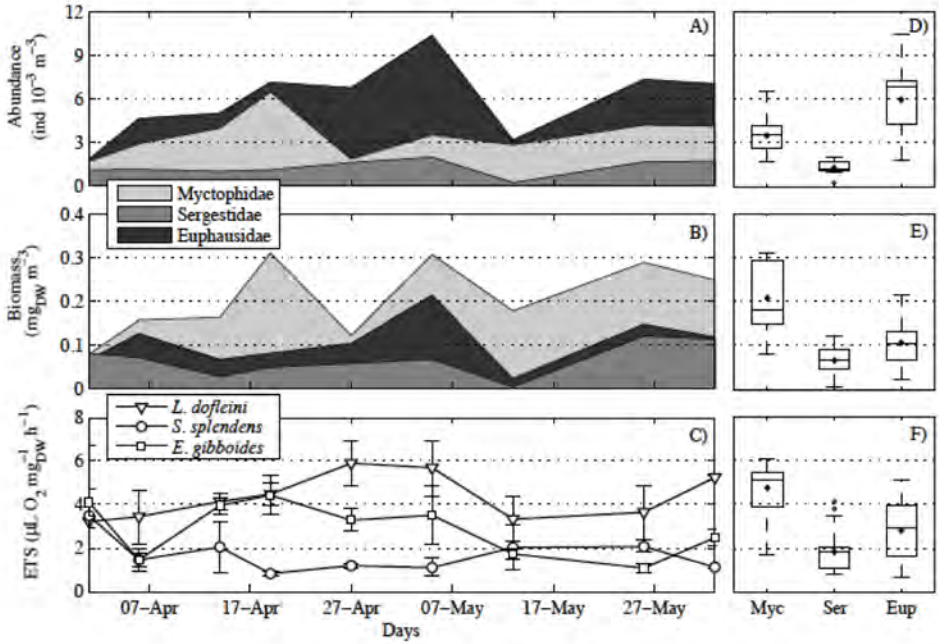
Neuer et al. (2007)



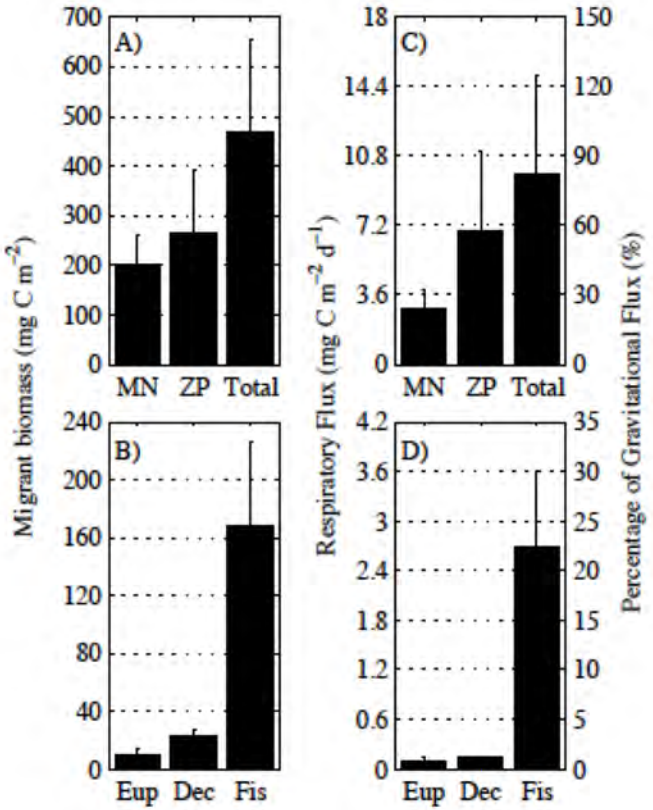
Zooplankton



Micronekton



Ariza *et al.* (2015)



Passive flux: 11.9 ±5.8 mgC·m^{-2}·d^{-1}

Resp. flux zooplankton: 3.4 ±1.9 mgC·m^{-2}·d^{-1}

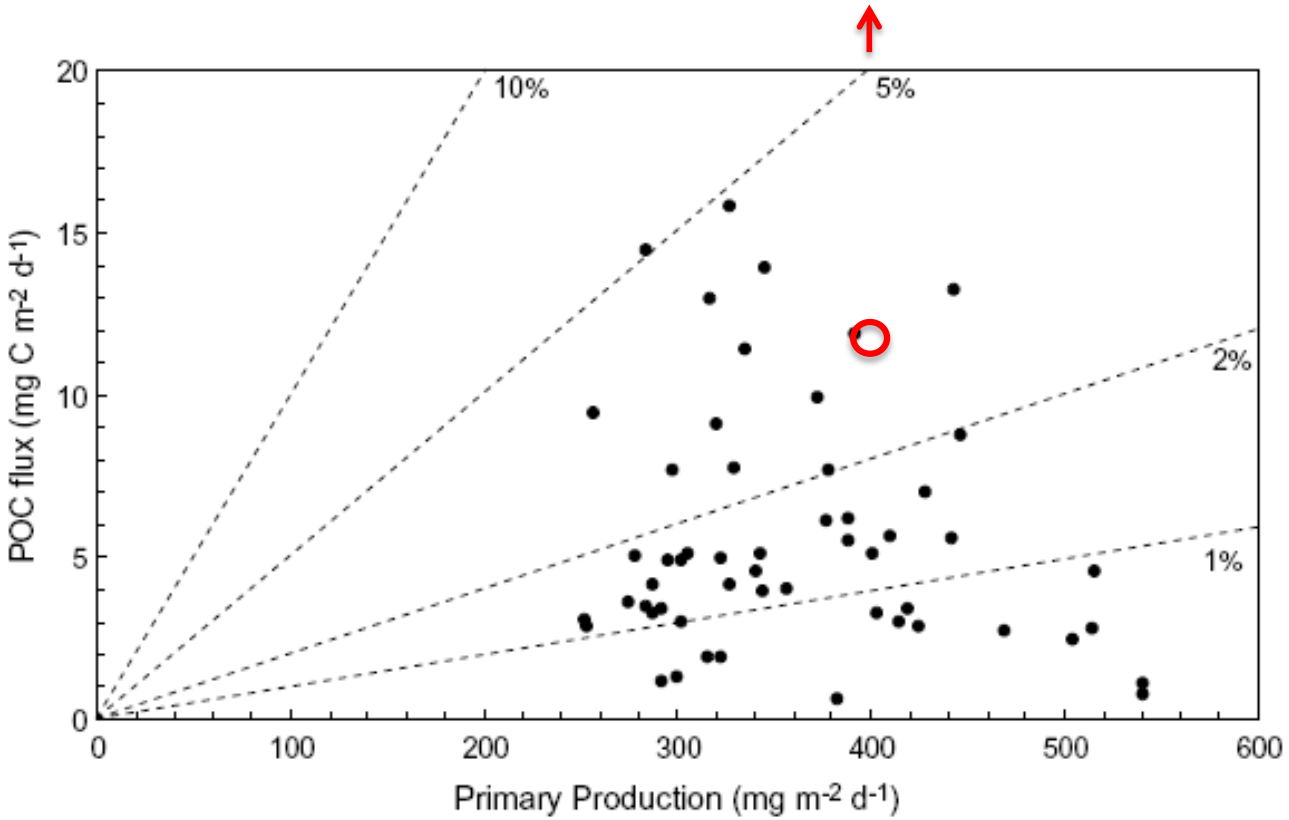
Respiratory flux micronekton: 2.9 ±1.0 mgC·m^{-2}·d^{-1}

Gut flux micronekton: 2.1 ±0.7 mgC·m^{-2}·d^{-1}

Excretion flux micronekton: 0.6 mgC·m^{-2}·d^{-1}

Mortality: 2.1 mgC·m^{-2}·d^{-1}

Ariza *et al.* (2015)

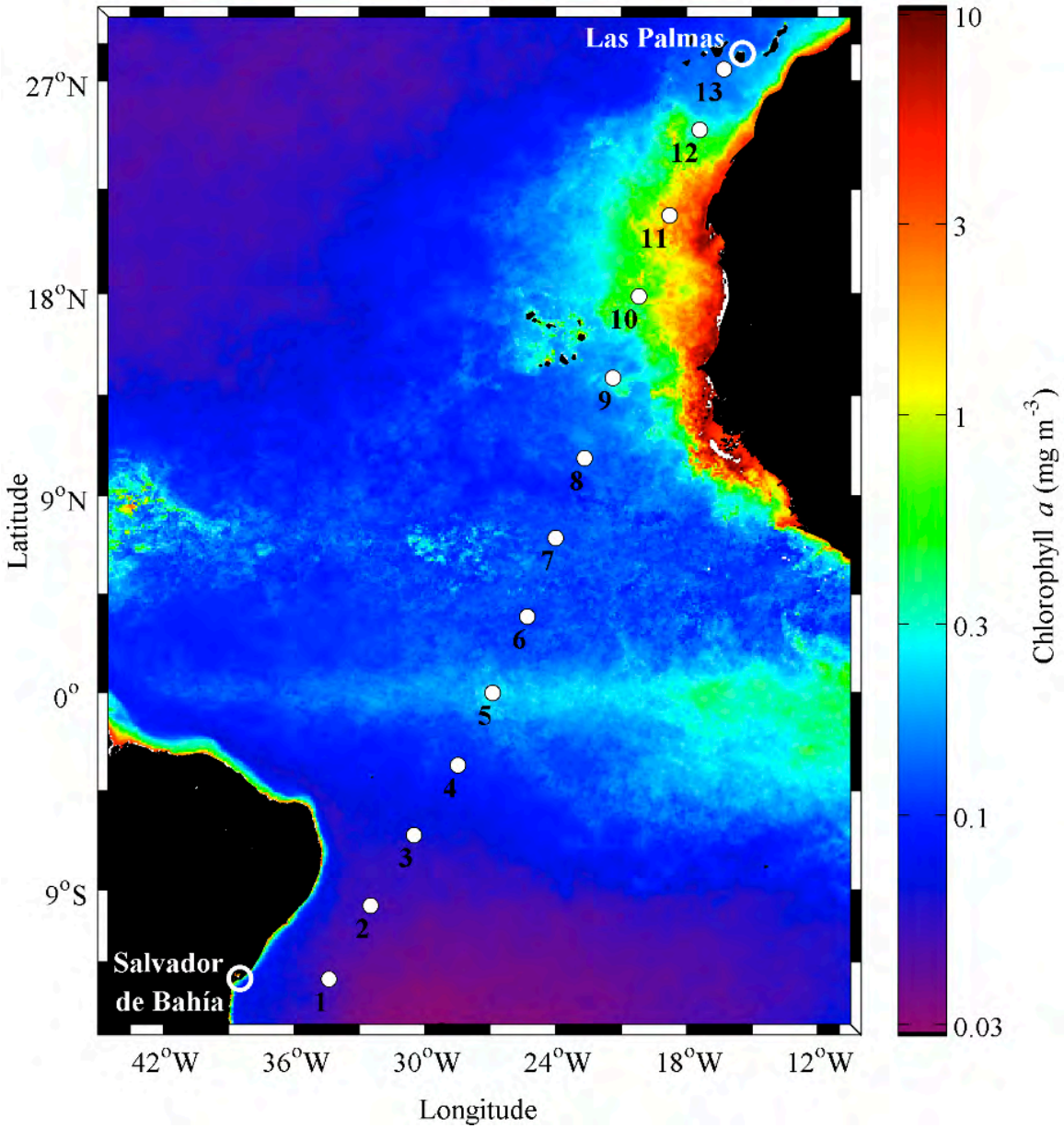


Neuer et al. (2007)

To our knowledge:

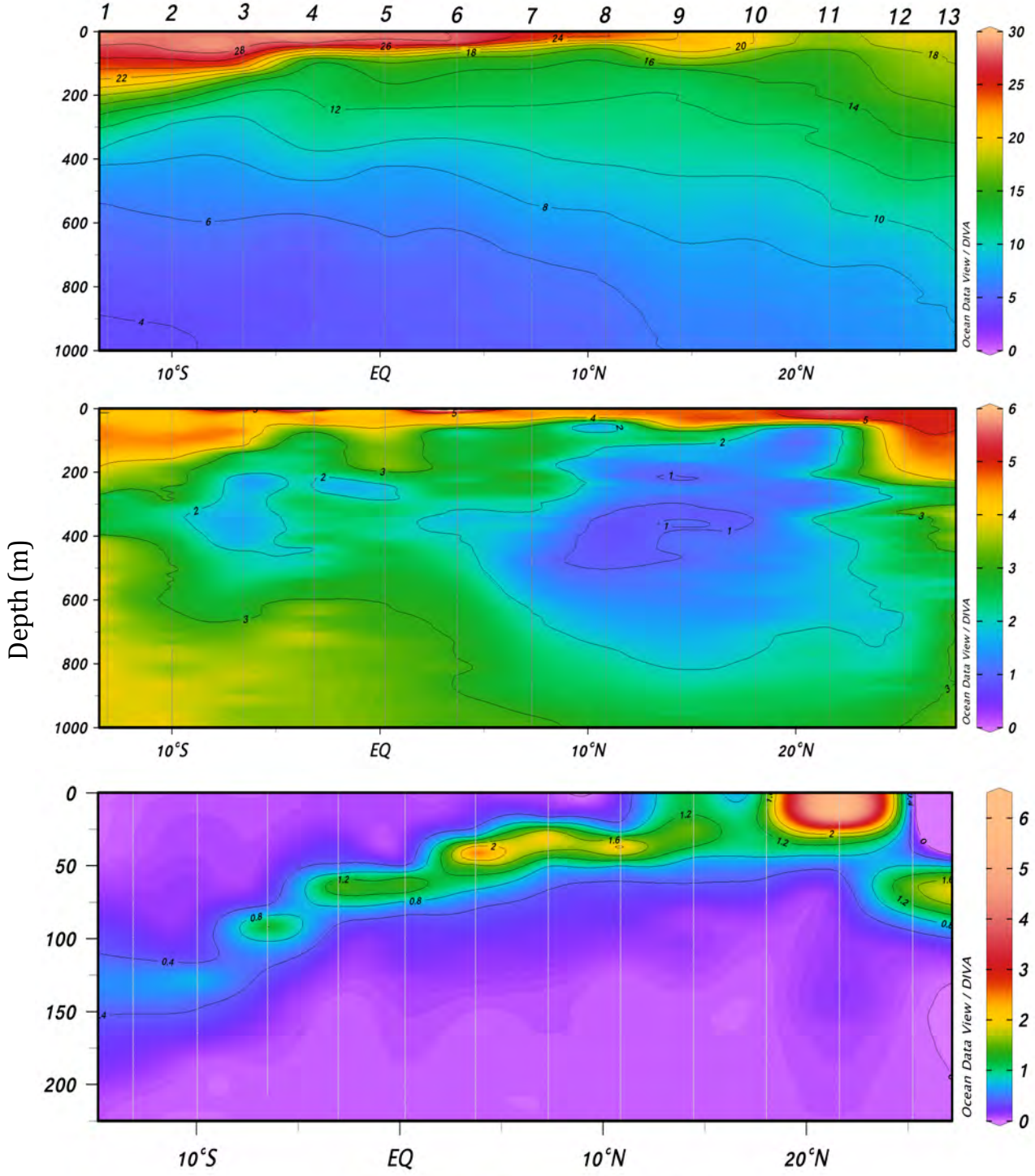
- Hidaka et al. (2001)
- Ariza et al. (2016)

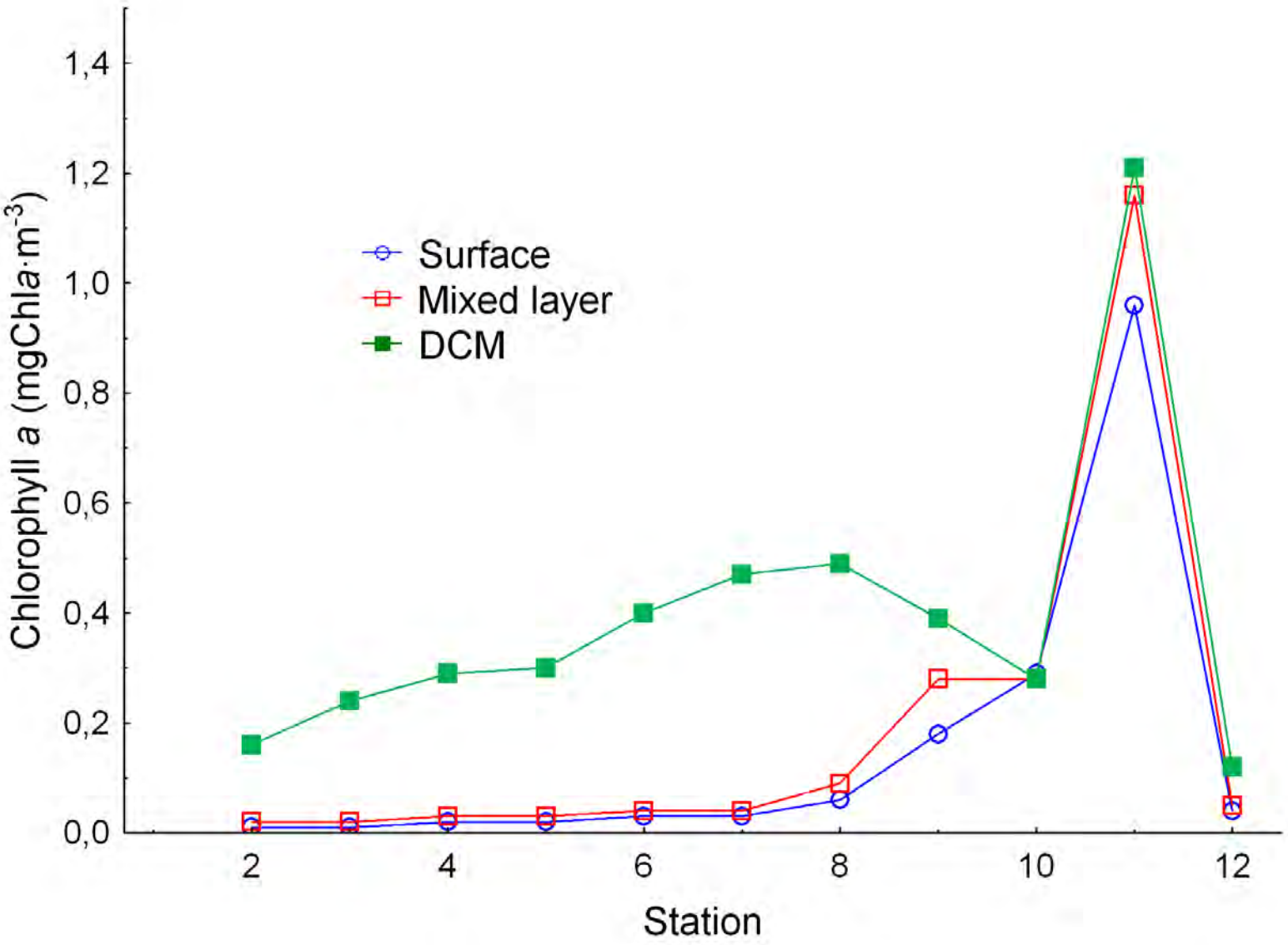
Migrants and **A**ctive **F**lux **I**n the **A**tlantic Ocean

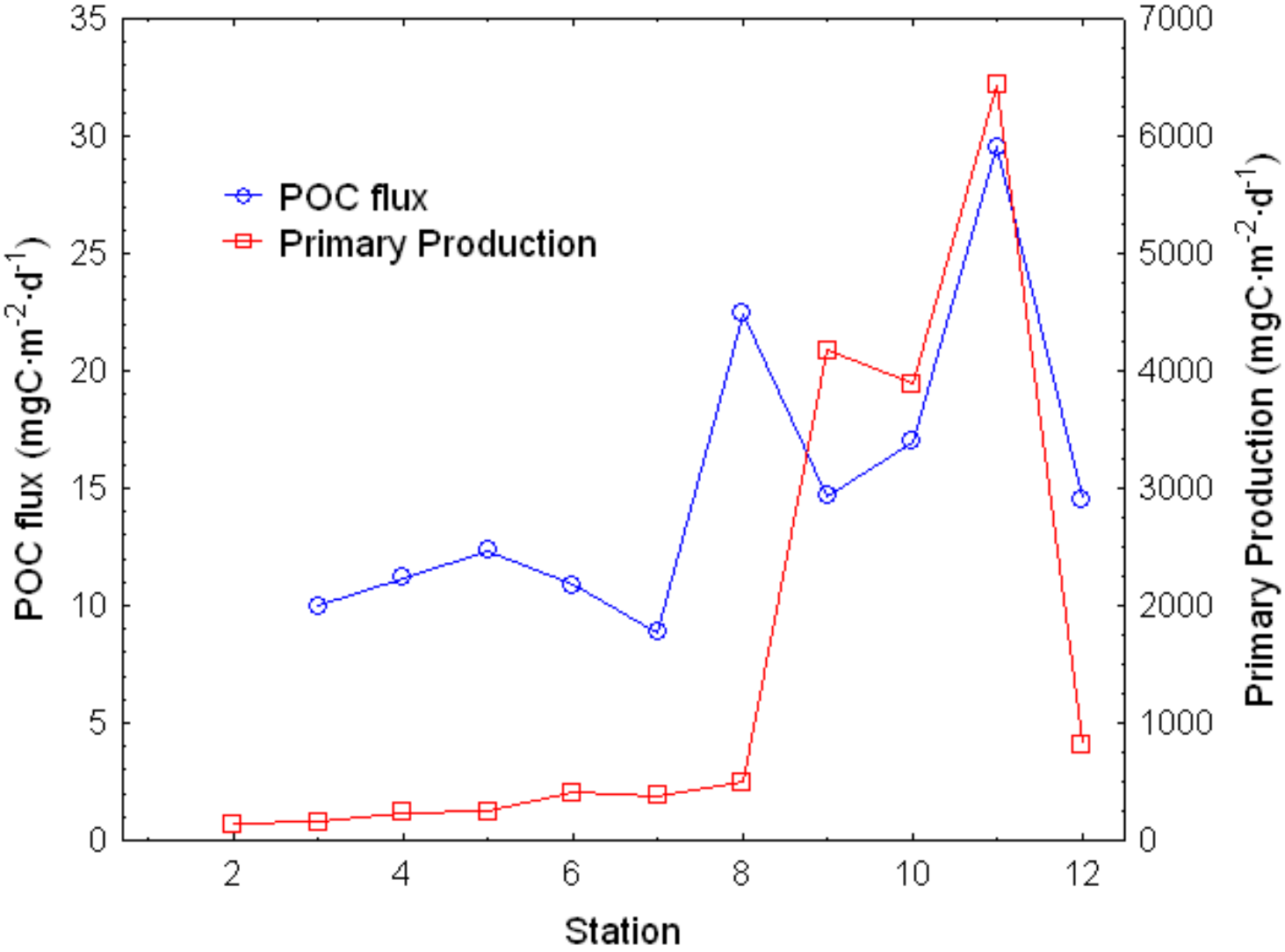


April 2015

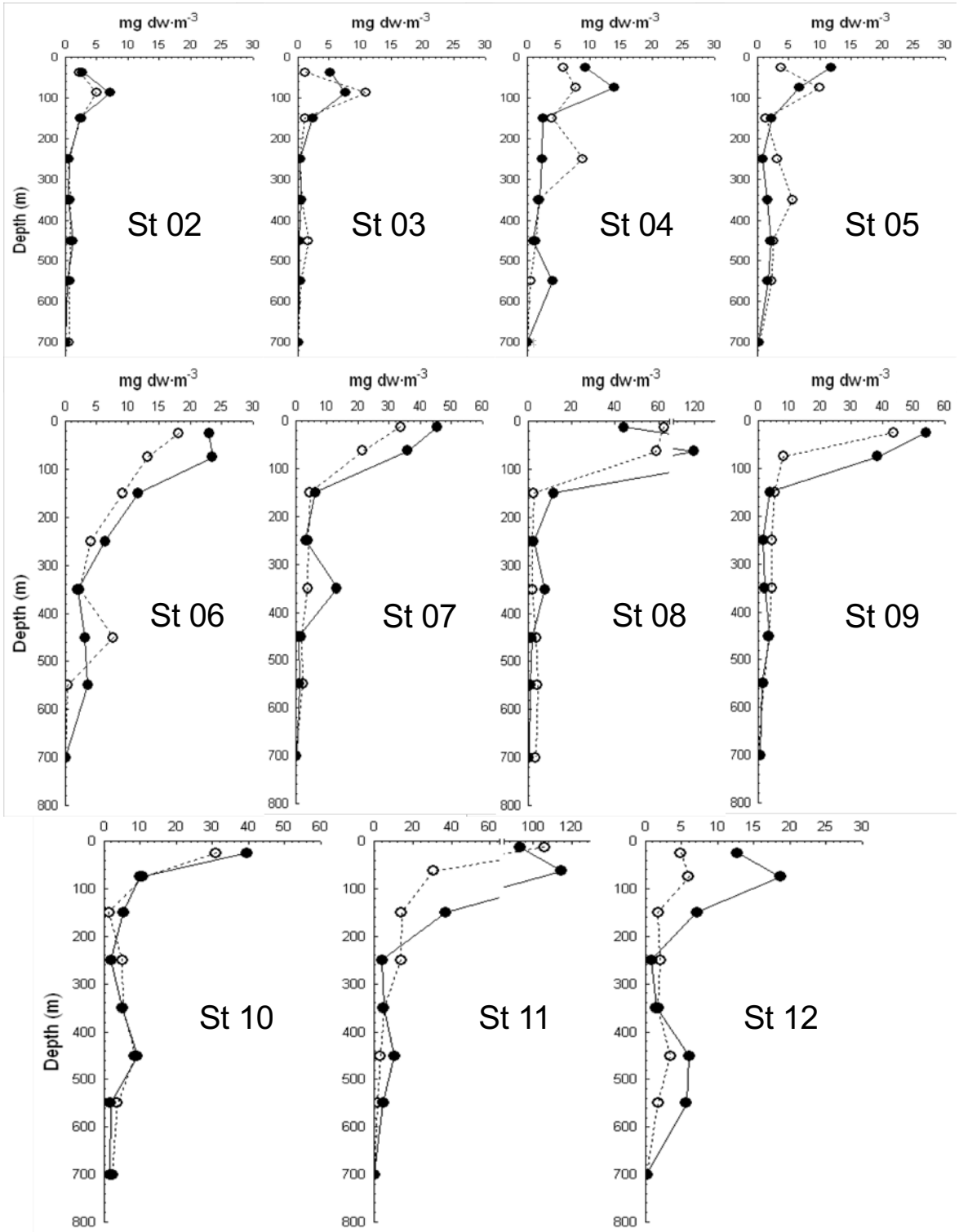
Hernández-León *et al.* (in prep.)

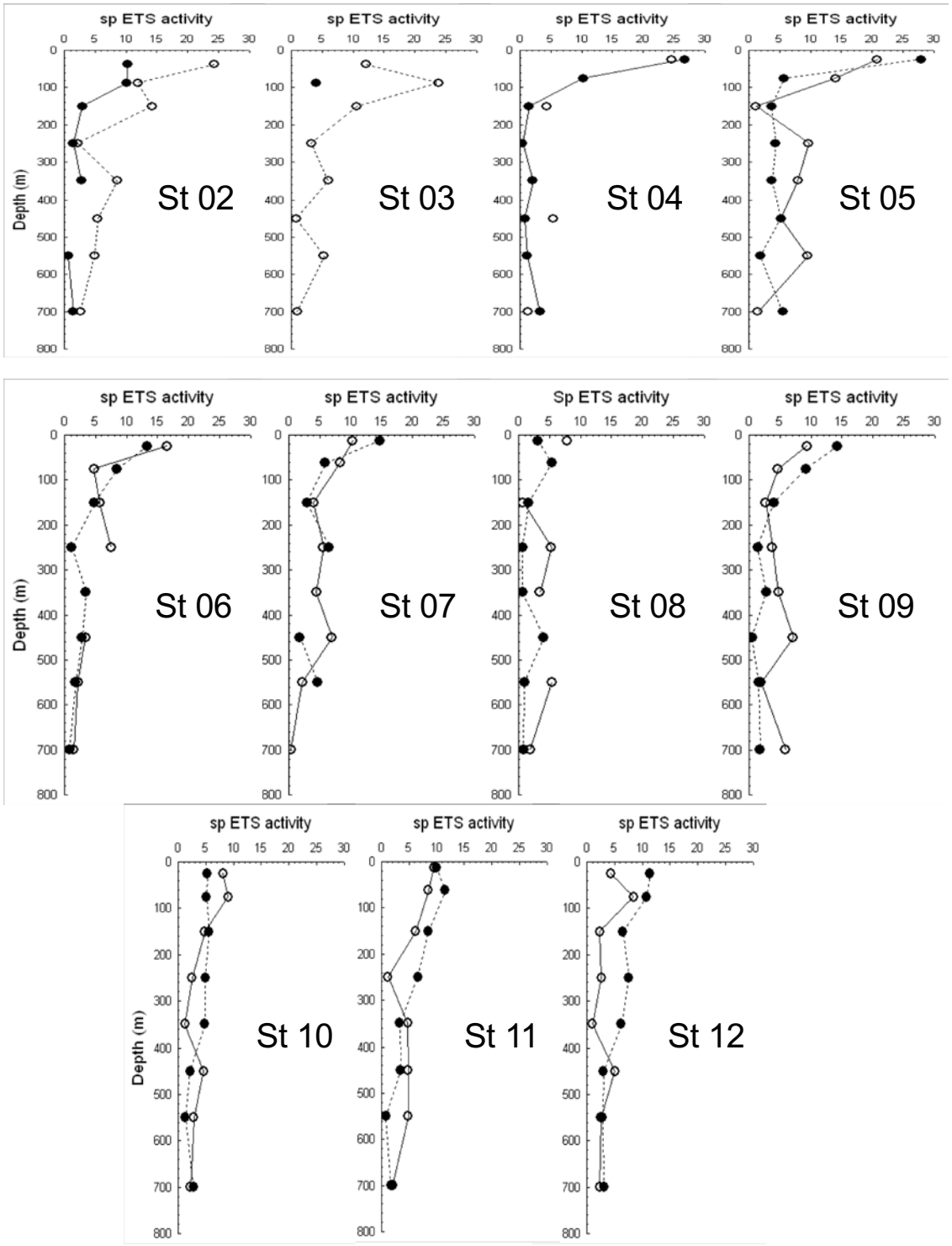

Depth (m)
1 2 3 4 5 6 7 8 9 10 11 12 13
0 200 400 600 800 1000
10°S EQ 10°N 20°N
Ocean Data View / DIVA
0 50 100 150 200

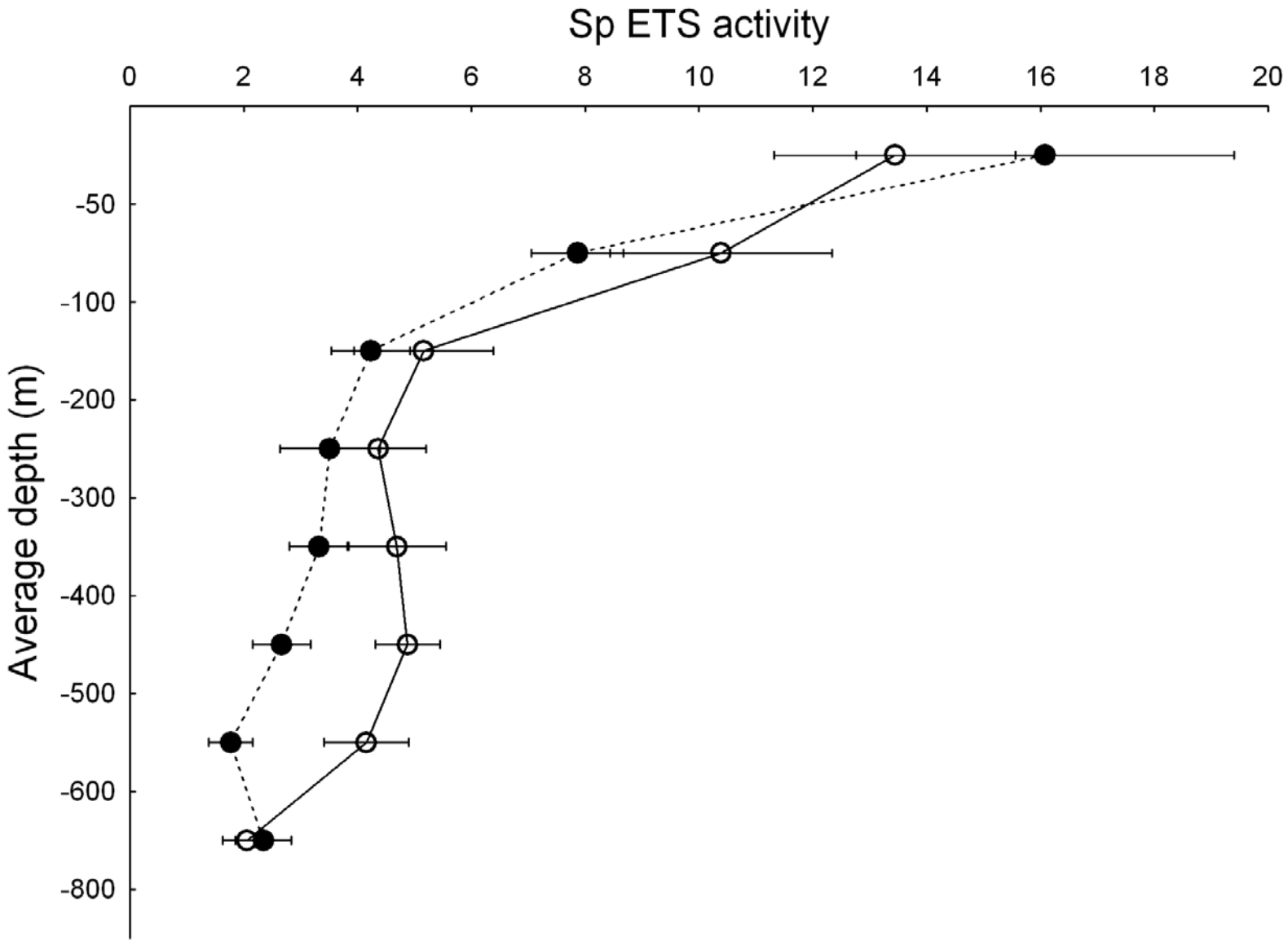

Chlorophyll a (mgChla·m-3)
1,4
1,2
1,0
0,8
0,6
0,4
0,2
0,0
Surface
Mixed layer
DCM
2
4
6
8
10
12
Station

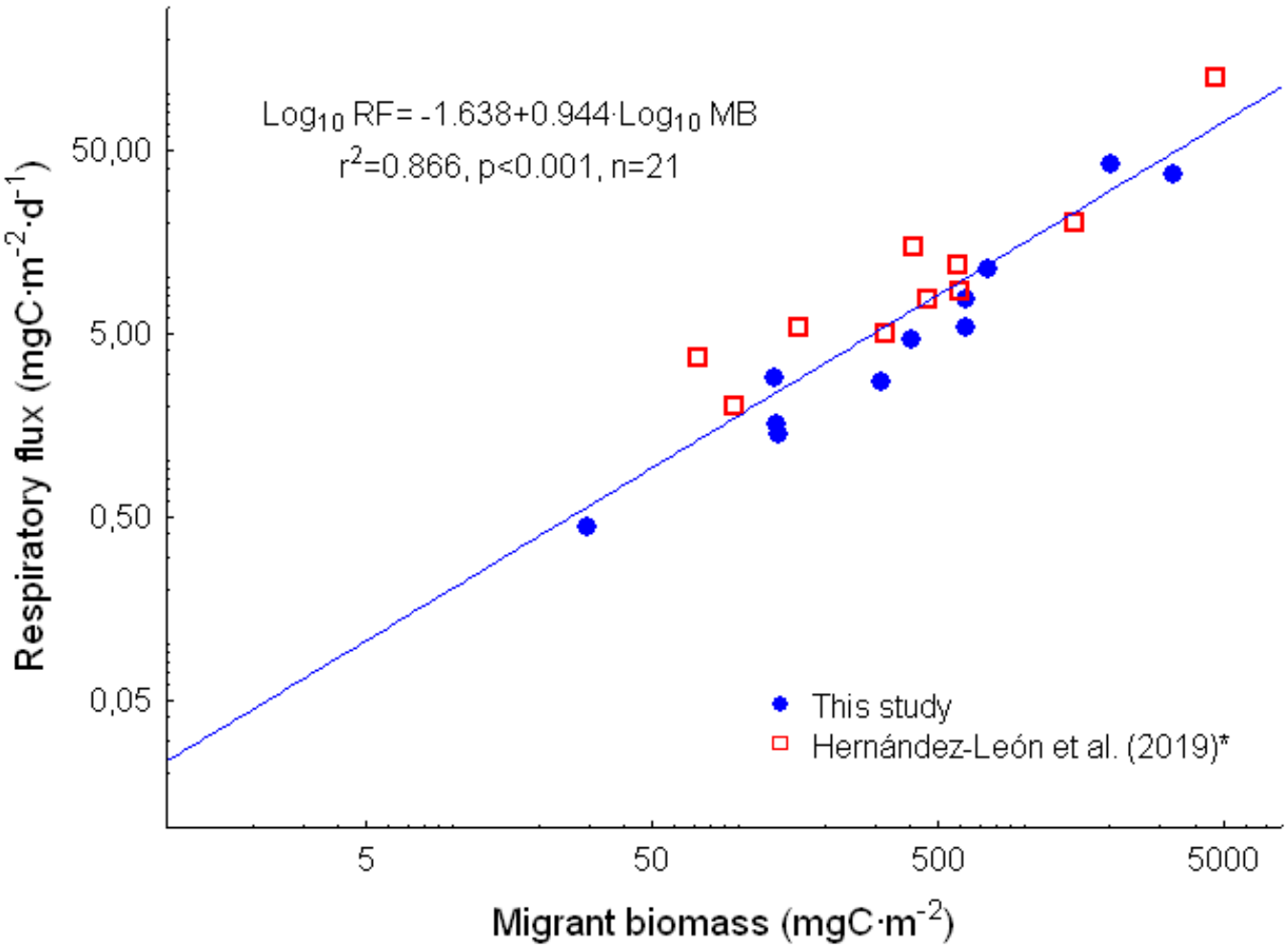

POC flux
Primary Production
POC flux (mgC·m-2·d-1)
Primary Production (mgC·m-2·d-1)
Station
0
5
10
15
20
25
30
35
0
1000
2000
3000
4000
5000
6000
7000
2
4
6
8
10
12

Mocness

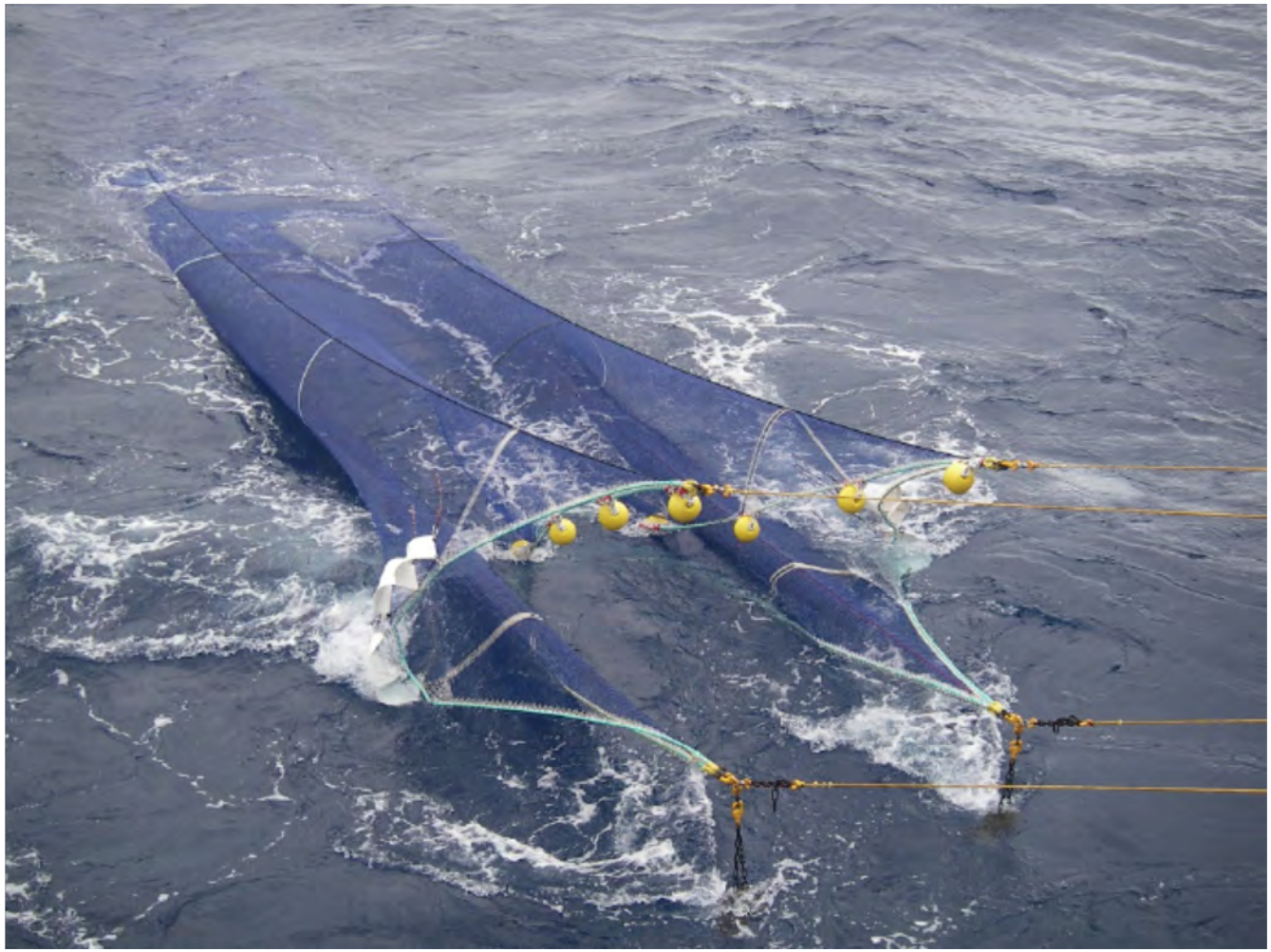

mg dw·m-3
Depth (m)
St 02
St 03
St 04
St 05
St 06
St 07
St 08
St 09
St 10
St 11
St 12

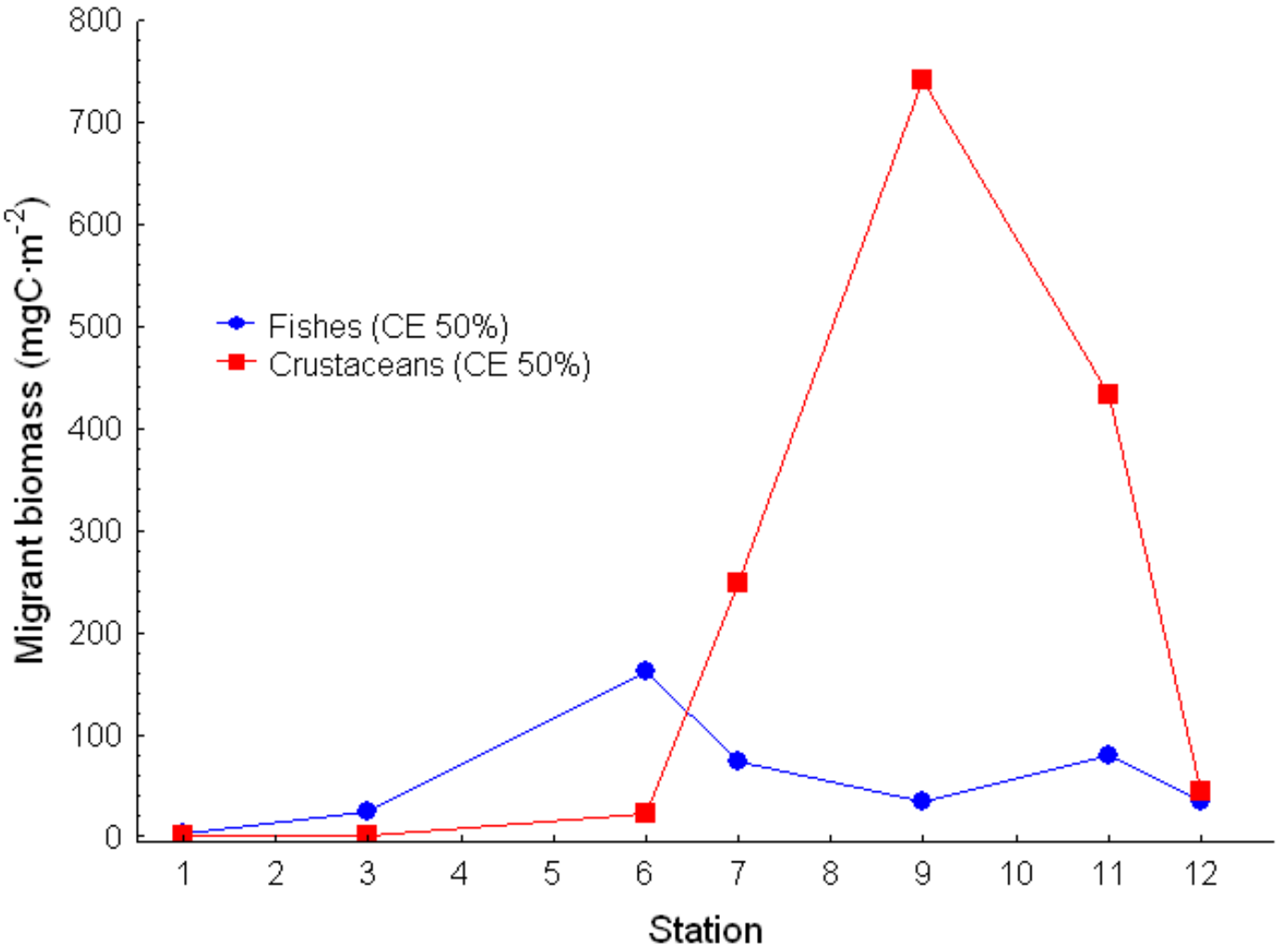

sp ETS activity
Depth (m)
St 02
St 03
St 04
St 05
St 06
St 07
St 08
St 09
St 10
St 11
St 12

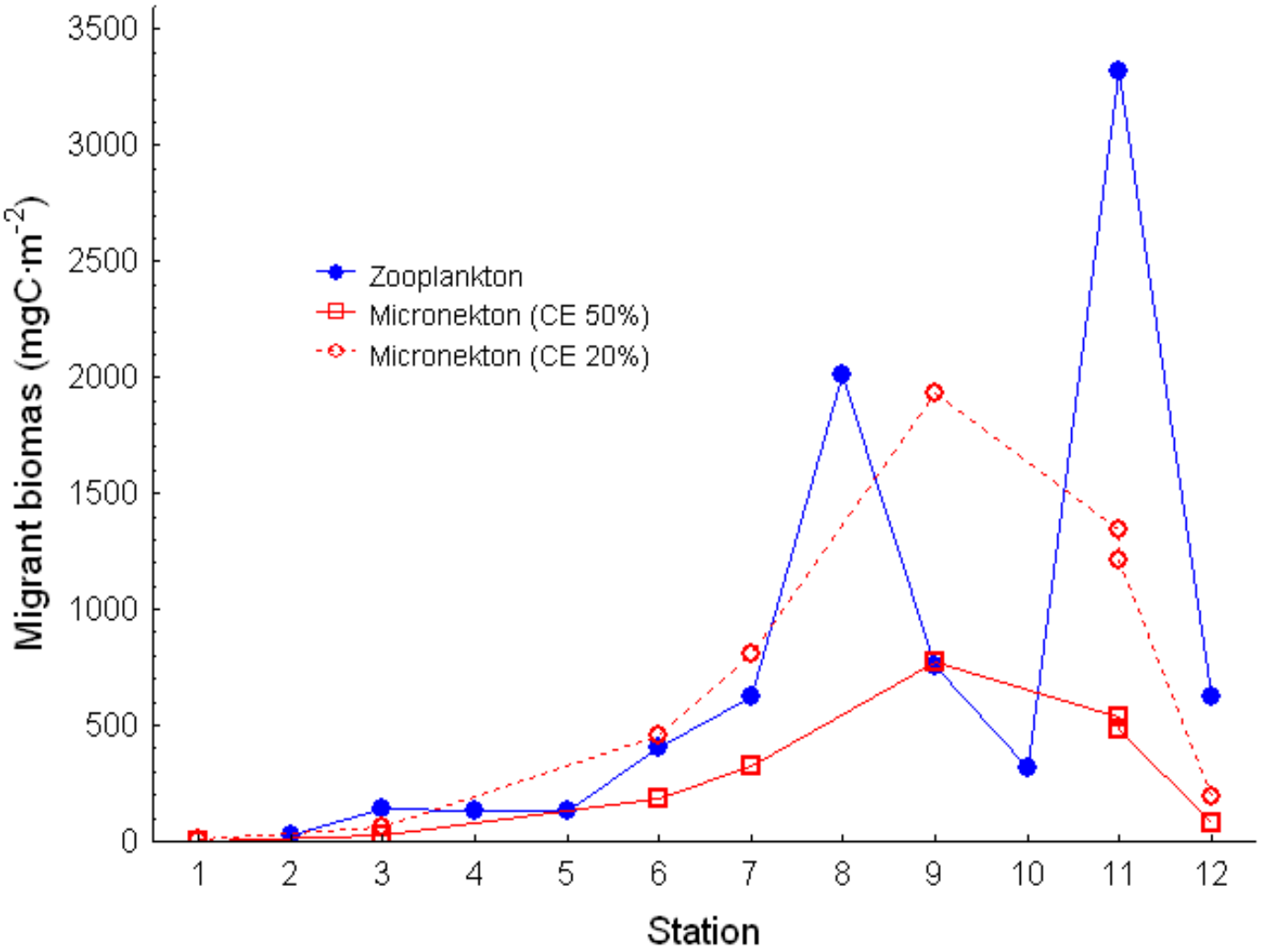

Sp ETS activity
0
2
4
6
8
10
12
14
16
18
20
Average depth (m)
-50
-100
-200
-300
-400
-500
-600
-800

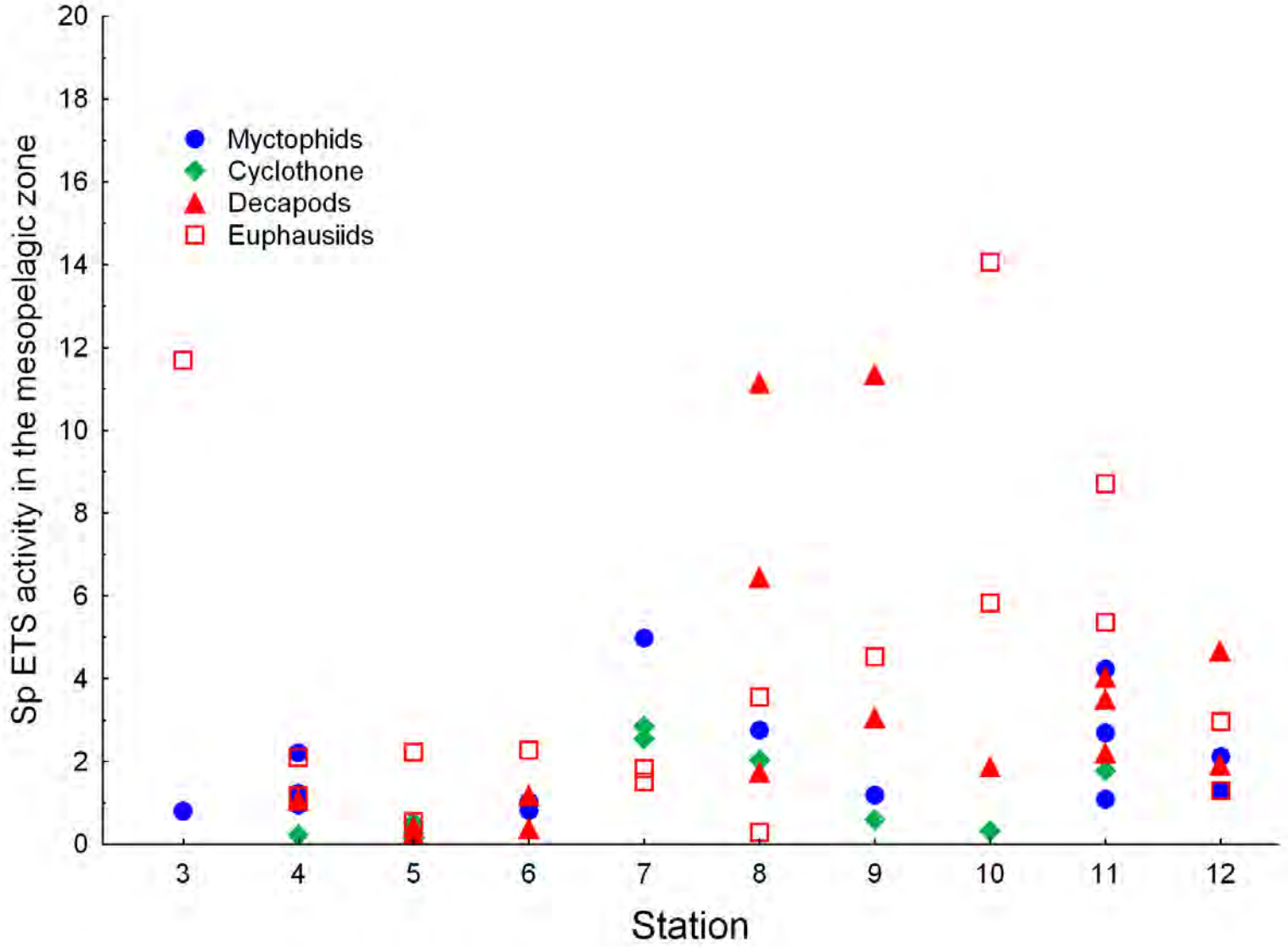

Log10 RF= -1.638+0.944·Log10 MB
r2=0.866, p<0.001, n=21
50,00
5,00
0,50
0,05
Respiratory flux (mgC·m-2·d-1)
5
50
500
5000
Migrant biomass (mgC·m-2)
This study
Hernández-León et al. (2019)*

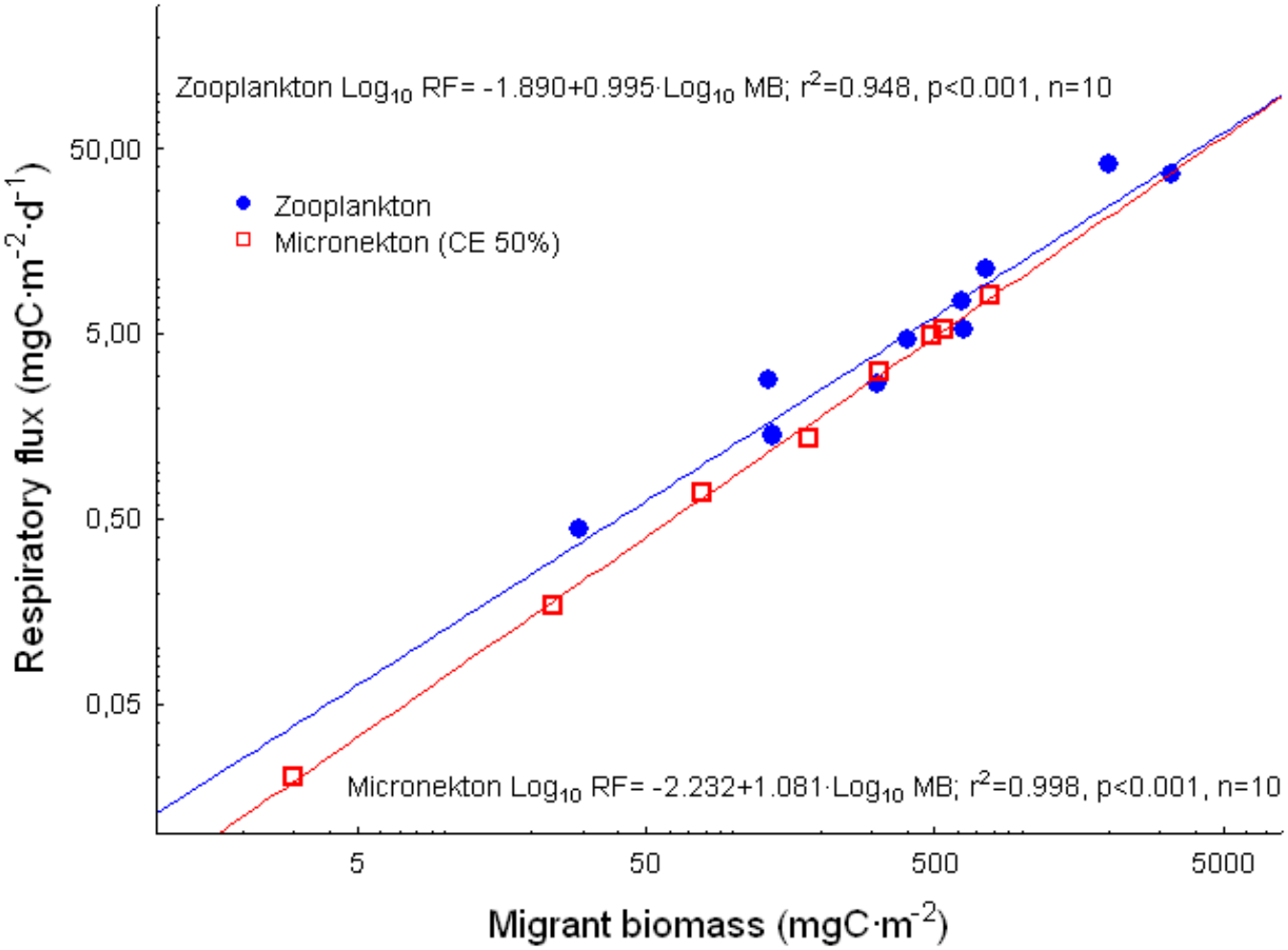
Mesopelagos




800
700
600
500
400
300
200
100
0
Migrant biomass (mgC·m-2)
Fishes (CE 50%)
Crustaceans (CE 50%)
1
2
3
4
5
6
7
8
9
10
11
12
Station


Migrant biomas (mgC·m-2)
3500
3000
2500
2000
1500
1000
500
0
Zooplankton
Micronekton (CE 50%)
Micronekton (CE 20%)
1
2
3
4
5
6
7
8
9
10
11
12
Station


Sp ETS activity in the mesopelagic zone
20
18
16
14
12
10
8
6
4
2
0
Myctophids
Cyclothone
Decapods
Euphausiids
3
4
5
6
7
8
9
10
11
12
Station


Zooplankton Log10 RF= -1.890+0.995·Log10 MB; r2=0.948, p<0.001, n=10
Zooplankton
Micronekton (CE 50%)
Micronekton Log10 RF= -2.232+1.081·Log10 MB; r2=0.998, p<0.001, n=10
Respiratory flux (mgC·m-2·d-1)
50,00
5,00
0,50
0,05
5
50
500
5000
Migrant biomass (mgC·m-2)

Total Active Flux from respiratory flux

In zooplankton:

- Mortality was estimated from growth assuming steady-state conditions in the mesopelagic zone (growth=mortality): equation of Ikeda and Motoda (1978) relating respiration and growth, and assuming gross growth (growth/ingestion) and assimilation efficiencies of 30 and 70%, respectively.

- Excretion was assessed using the values of Steinberg et al. (2000) making up 24% of the respired plus excreted carbon.

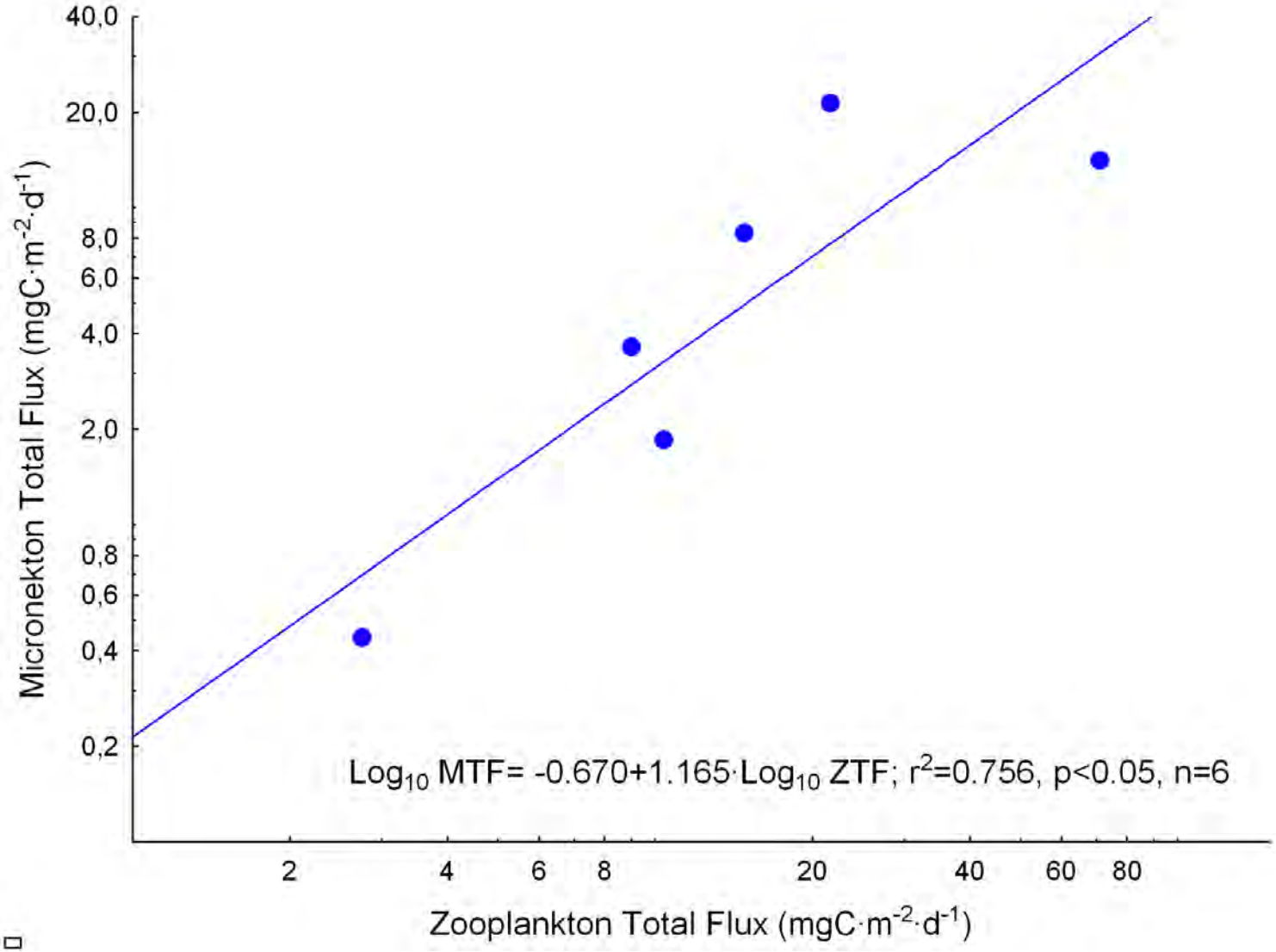
- Gut flux not considered. Gut passage time in zooplankton is short (<1h, Dam and Peterson, 1988), so we assume that fecal pellets are released in the epipelagic zone, and thus, included in the sediment trap data.

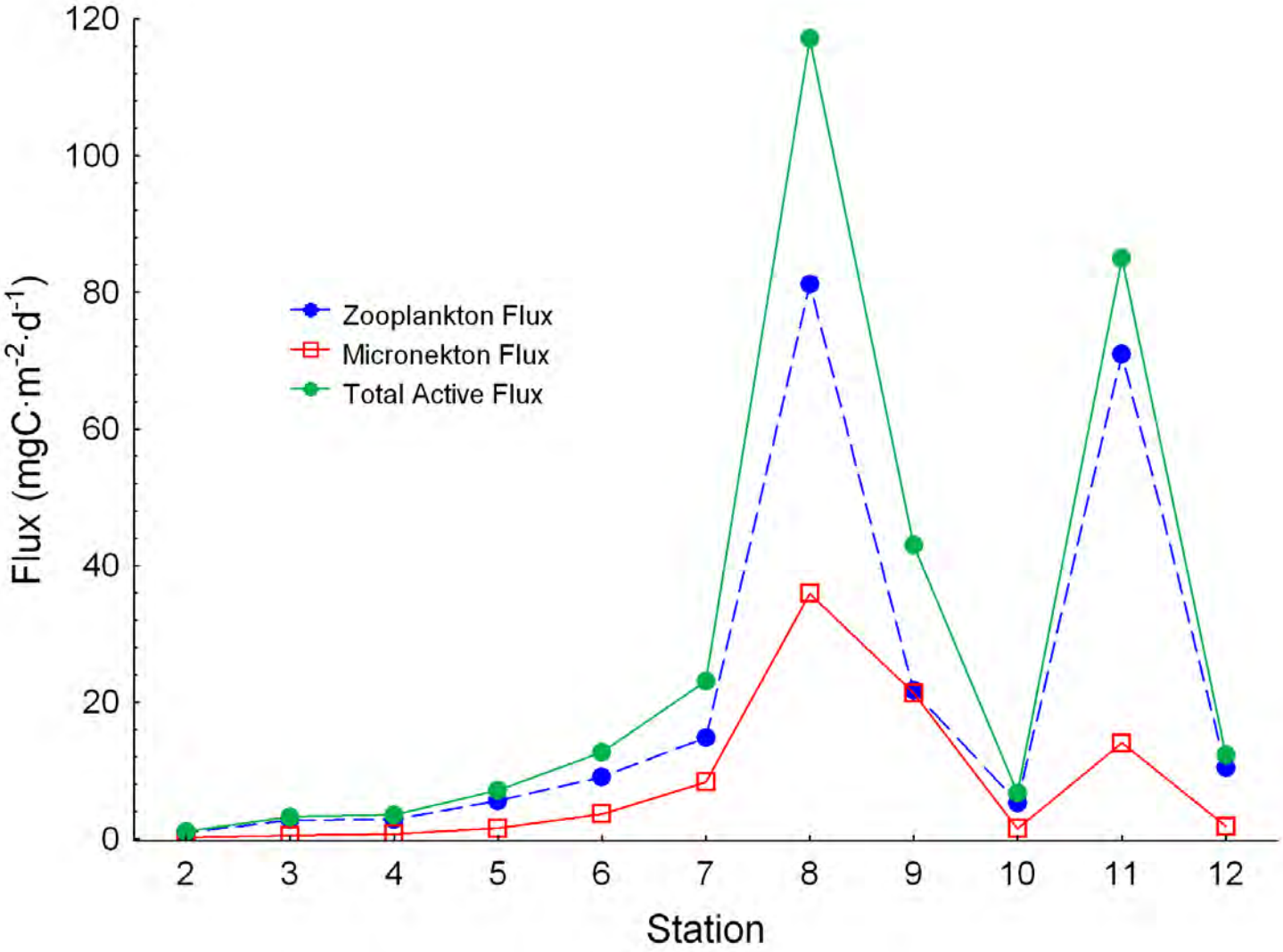
In micronekton:

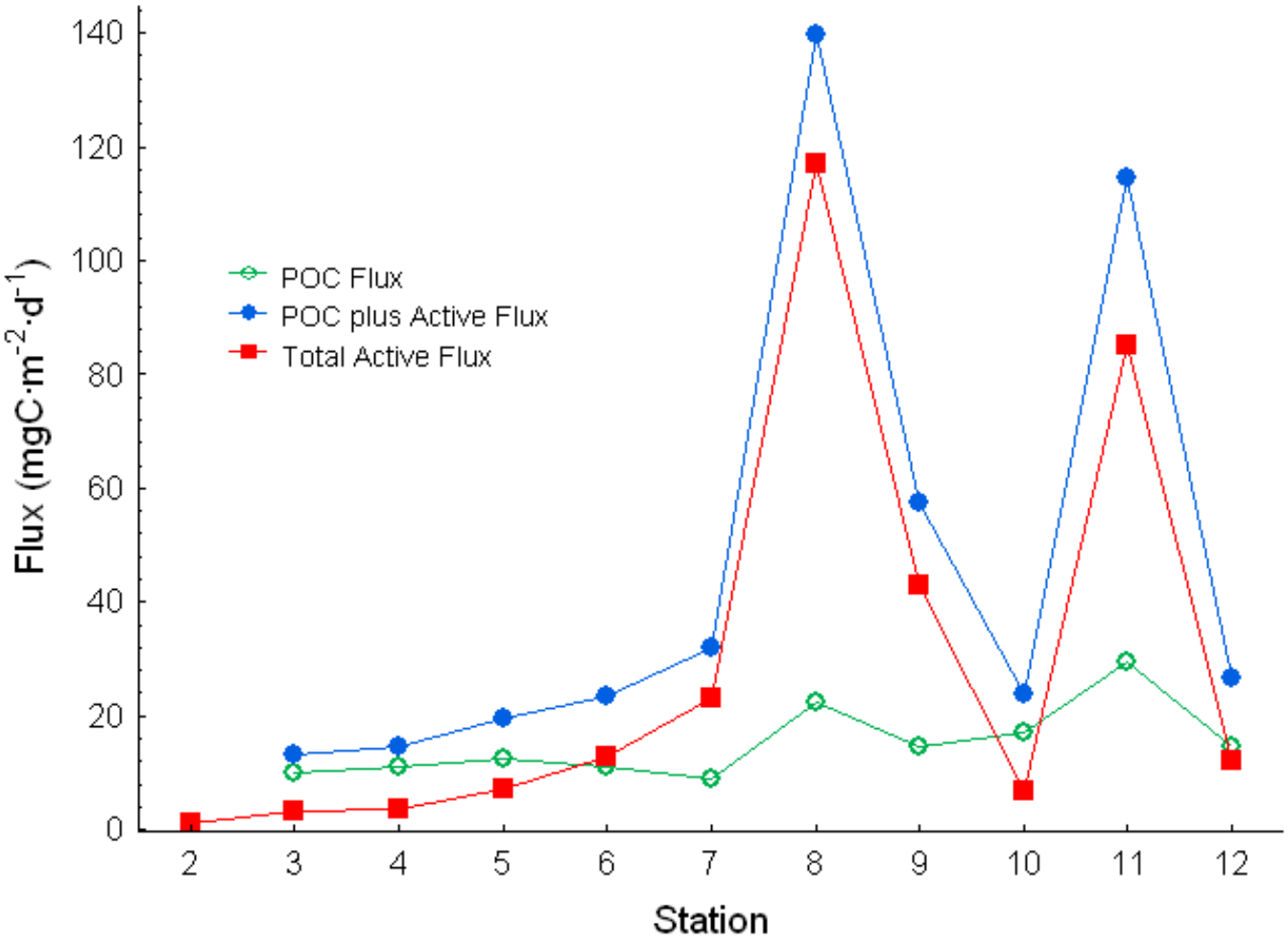
- Mortality was estimated from growth assuming steady-state conditions, and using the growth/metabolism ratio of 0.66 given by Brett and Groves (1979).

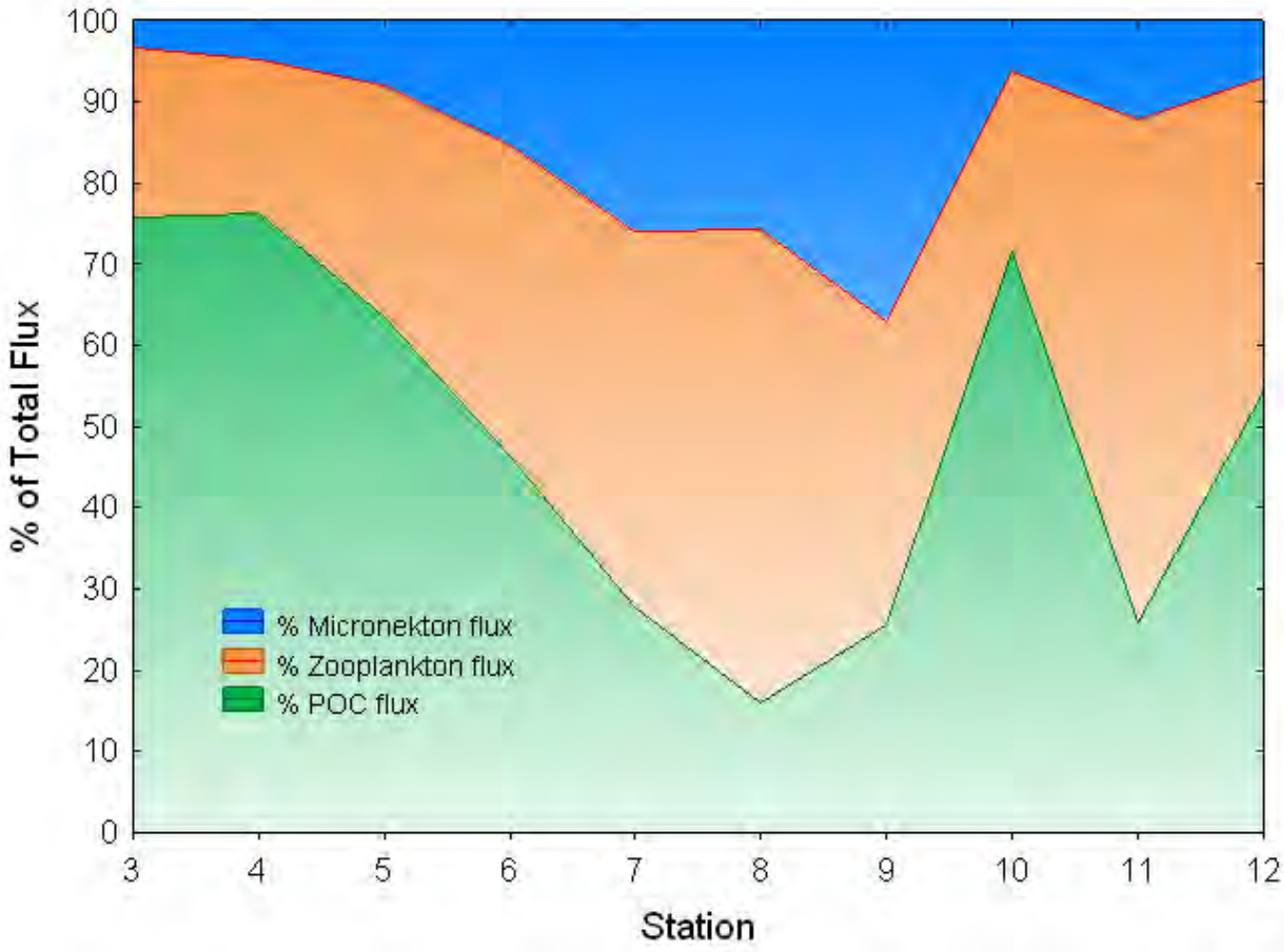
- Excretion was estimated as in zooplankton

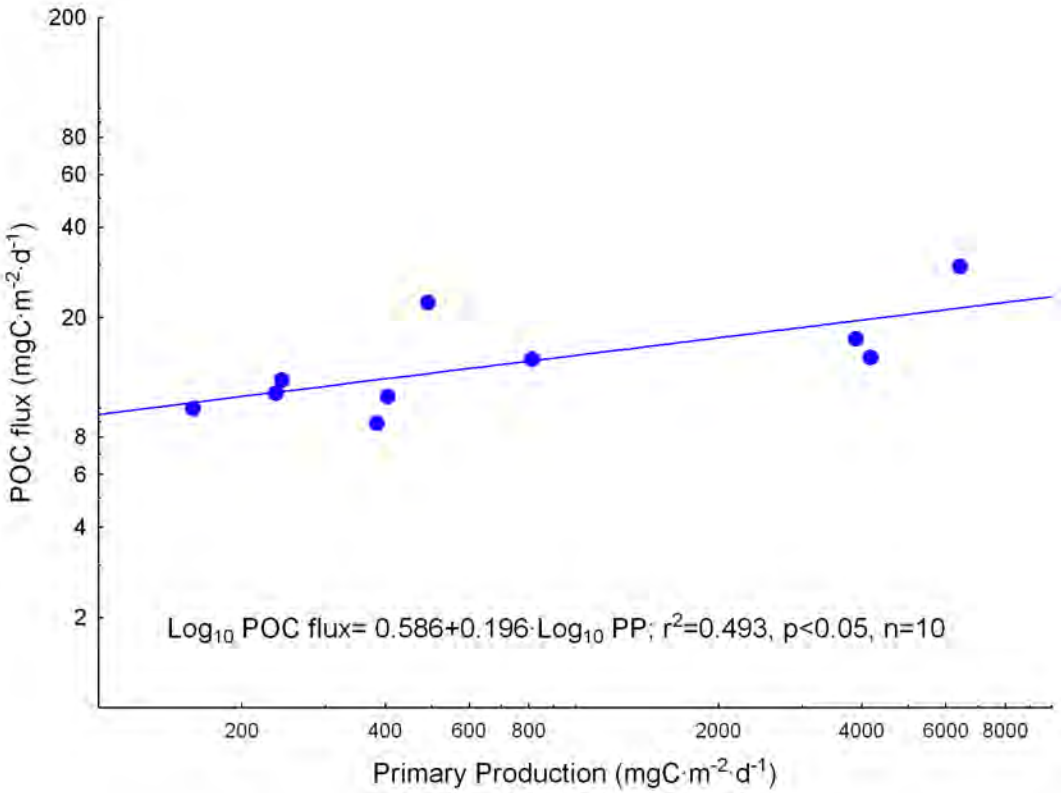
- Gut flux assuming that carnivorous organisms egest an amount equivalent to 40% of the respired carbon (Brett and Groves, 1979). We used an egestion equivalent to 80% of the respired carbon because of their residence at depth and their long gut passage time.

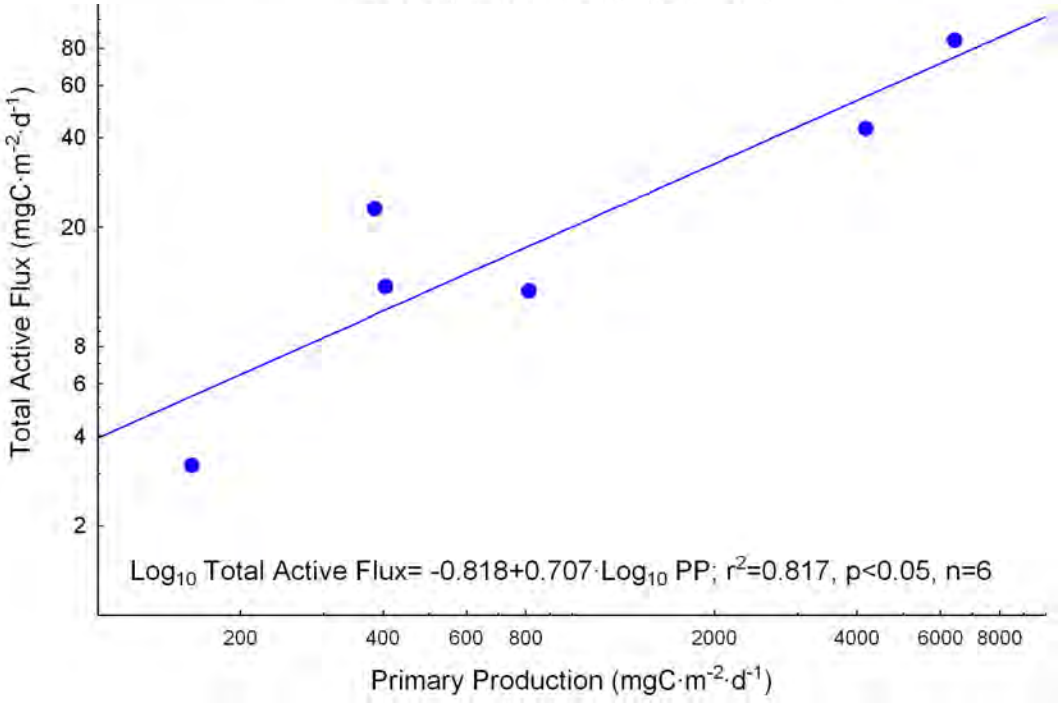

40,0
20,0
8,0
6,0
4,0
2,0
0,8
0,6
0,4
0,2
Micronekton Total Flux (mgC·m-2·d-1)
Log10 MTF= -0.670+1.165·Log10 ZTF; r2=0.756, p<0.05, n=6
2
4
6
8
20
40
60
80
Zooplankton Total Flux (mgC·m-2·d-1)


120
100
80
60
40
20
0
Flux (mgC·m-2·d-1)
Zooplankton Flux
Micronekton Flux
Total Active Flux
2
3
4
5
6
7
8
9
10
11
12
Station

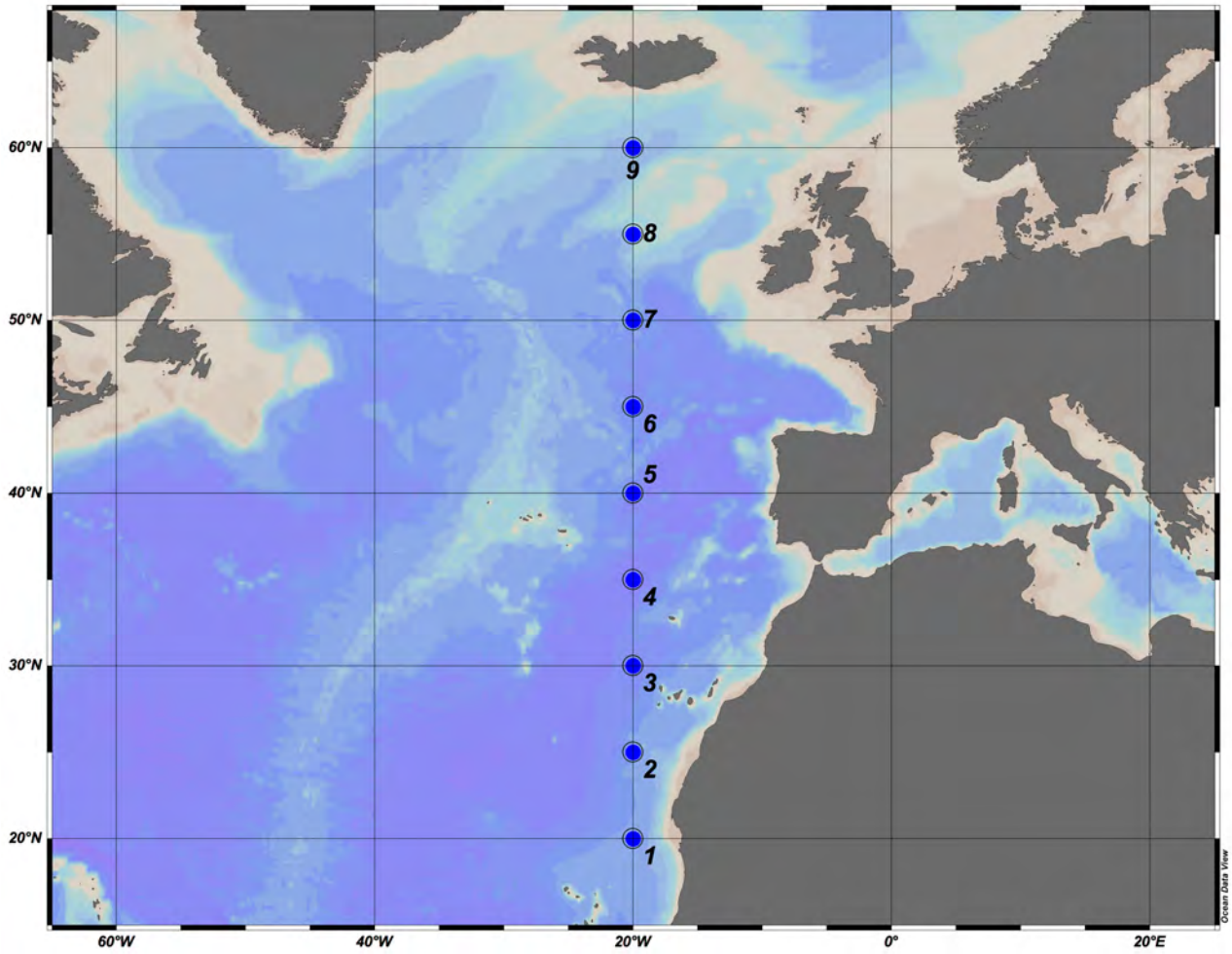

140
120
100
80
60
40
20
0
Flux (mgC·m-2·d-1)
POC Flux
POC plus Active Flux
Total Active Flux
2
3
4
5
6
7
8
9
10
11
12
Station

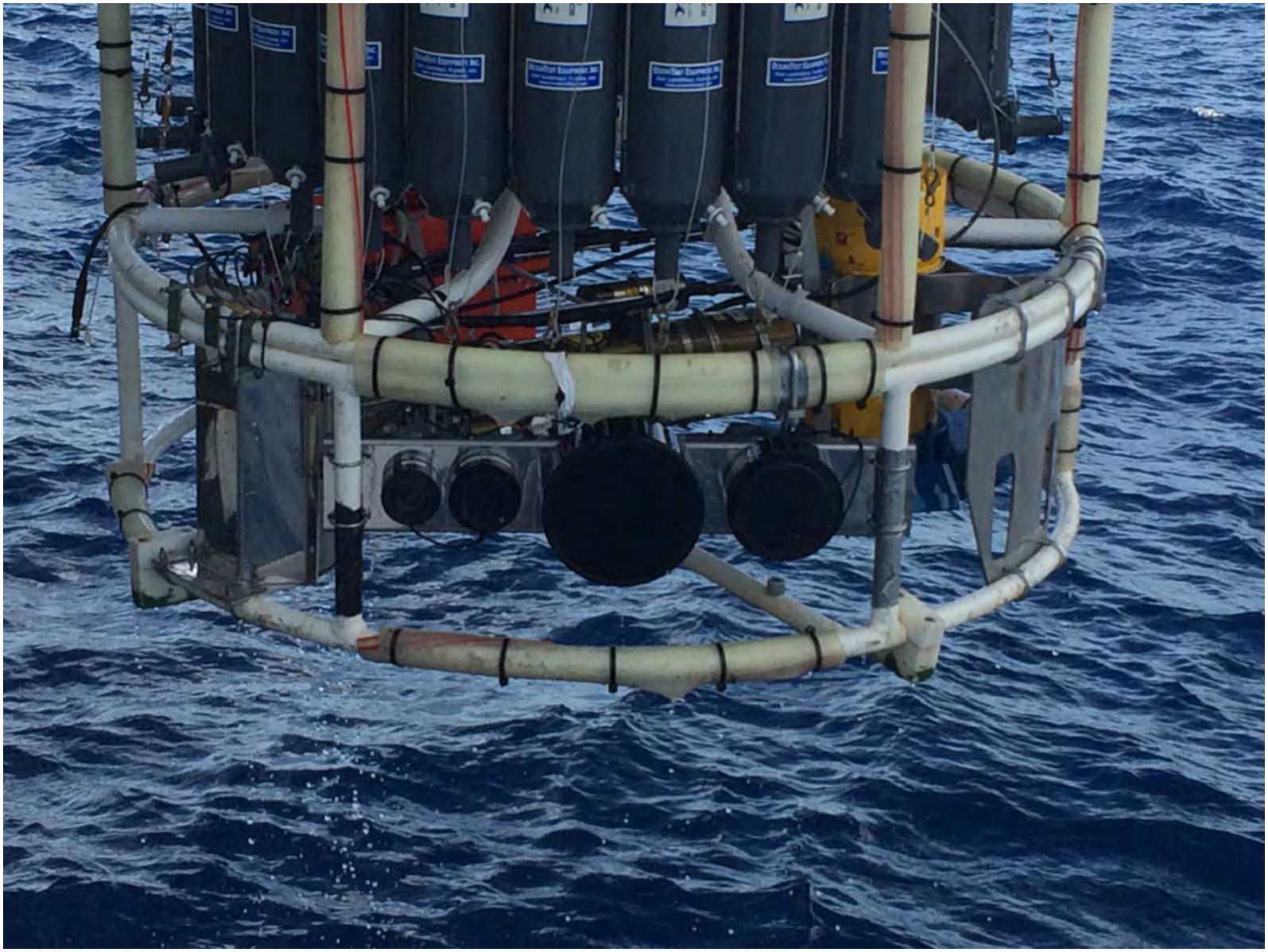

100
90
80
70
60
50
40
30
20
10
0
% of Total Flux
% Micronekton flux
% Zooplankton flux
% POC flux
3
4
5
6
7
8
9
10
11
12
Station


POC flux (mgC·m-2·d-1)
200
80
60
40
20
8
6
4
2
Log10 POC flux= 0.586+0.196·Log10 PP; r2=0.493, p<0.05, n=10
200
400
600
800
2000
4000
6000
8000
Primary Production (mgC·m-2·d-1)


Total Active Flux (mgC·m-2·d-1)
80
60
40
20
8
6
4
2
Log10 Total Active Flux= -0.818+0.707·Log10 PP; r2=0.817, p<0.05, n=6
200
400
600
800
2000
4000
6000
8000
Primary Production (mgC·m-2·d-1)

Bathypelagic cruise





Deep-Acoustic Zooplankton Fish Profiler

Thank you