Deep-sea pennatulacean corals in the Northwest Atlantic: a nursery for *Sebastes* spp. and a habitat for other species.

Dr. Sandrine Baillon

Webinar NOAA – 5 November 2014

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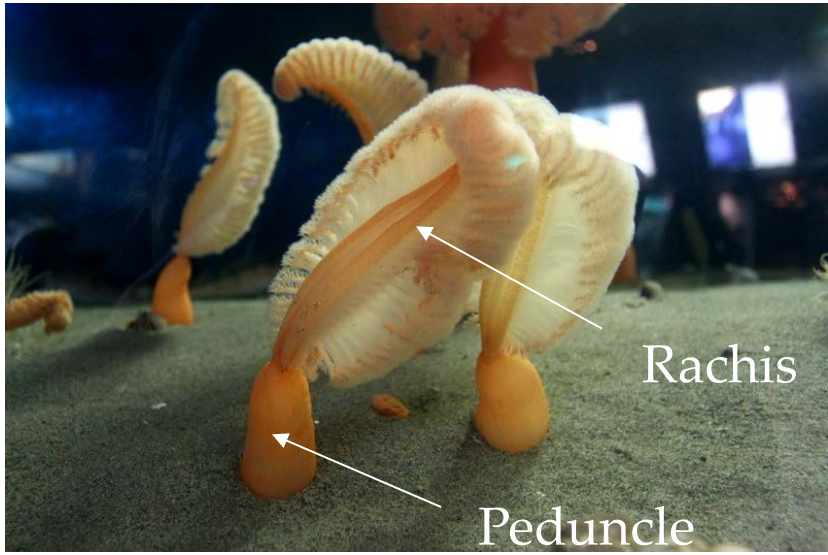
Pennatulaceans (sea pens)

- Soft coral
- Live from the surface to the abyss
- Mud and sand bottoms
- Field of sea pens and solitary forms



Pennatulacean and associated species

- Associated species = living in, on or close to the coral
- Few associated species described (Buhl-Mortensen et al., 2010)
- Sea pens: new structures on mud/sand bottoms

→ a great potential biohabitat

Objectives

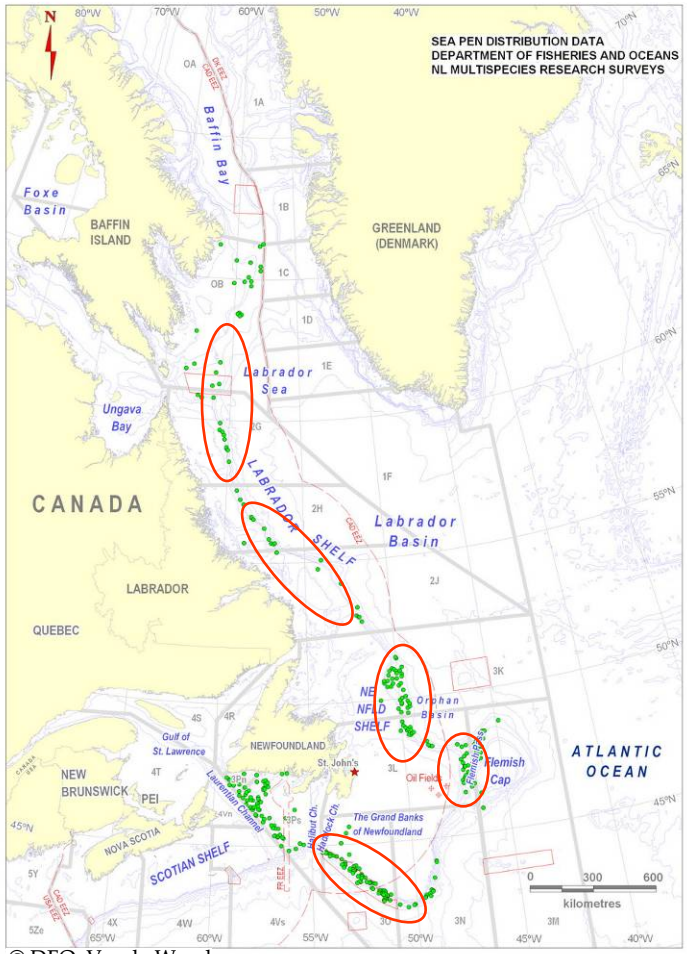
Develop a better understanding of sea pens as biogenic habitats

Determine the level of association of the most common associated species

Pennatulaceans in the NW Atlantic

NW Atlantic coast:

- Sampling: Fisheries and Oceans Canada
- 60 species of cold-water corals
  - 16 sea pens



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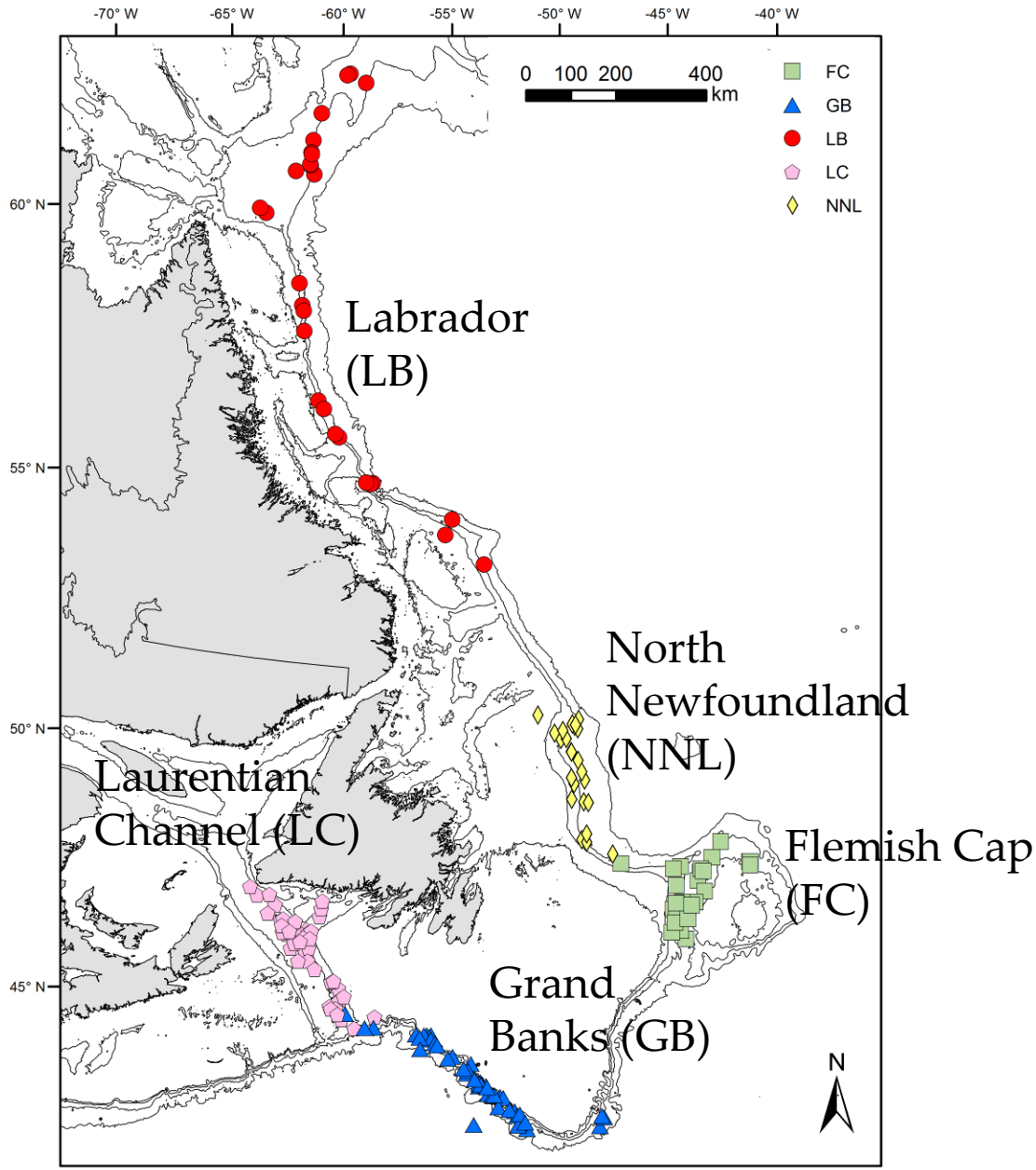
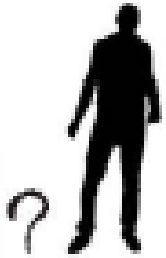
Sampling regions

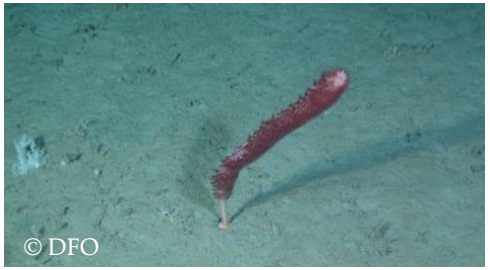


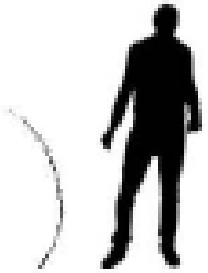
Species studied

Anthoptilum grandiflorum



Halipteris finmarchica

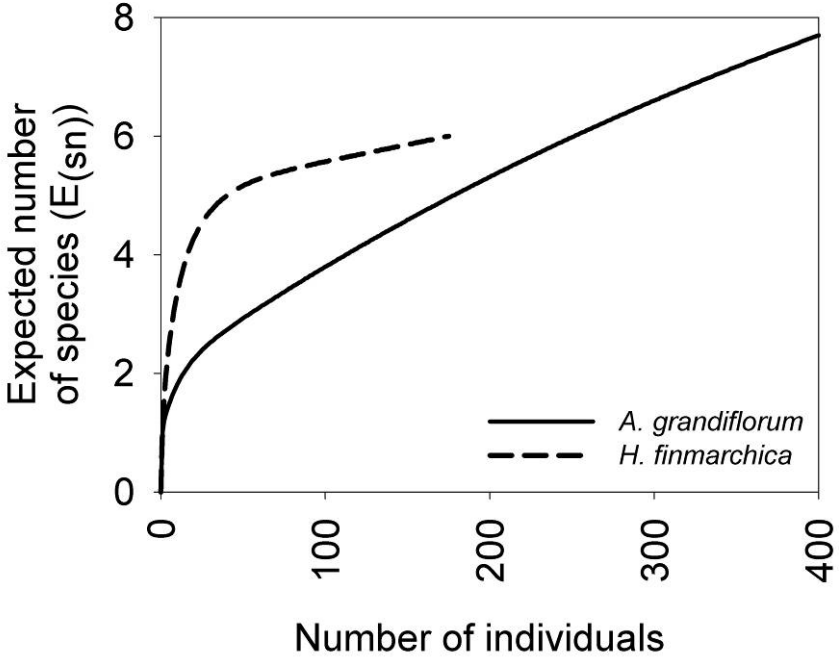




Biodiversity

A. grandiflorum (n= 253): 1647 individuals – 14 species

H. finmarchica (n= 92): 189 individuals – 6 species



Fewer associated species than other deep-sea corals

Anthoptilum grandiflorum

Associated species	Number of individuals	Prevalence (%)	Type of association
Actinopterygii			
Sebastes spp.	150	17.1	Free-living
Benthosema glaciale	1	0.4	Free-living
Lycodes esmarkii	1	0.4	Ectobiont
Crustacea			
Lamippe bouligandi	1478	66.2	Endobiont
Unidentified copepoda	4	1.7	Free-living
Acanthephyra pelagica	2	0.4	Free-living
Pandalus montagui	3	0.9	Free-living
Unidentified decapoda	7	1.7	Free-living
Amphipoda			
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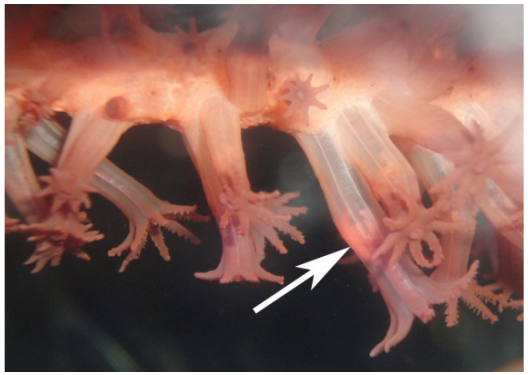
Nematoda			
Unidentified nematoda	2	0.4	Free-living
Unidentified species			
Unidentified sp. 1	6	2.6	Endobiont
Unidentified sp. 2	2	0.9	Endobiont
Unidentified sp. 3	6	2.1	Endobiont
Unidentified sp. 4	1	0.4	Endobiont
Unidentified sp. 5	1	0.4	Endobiont

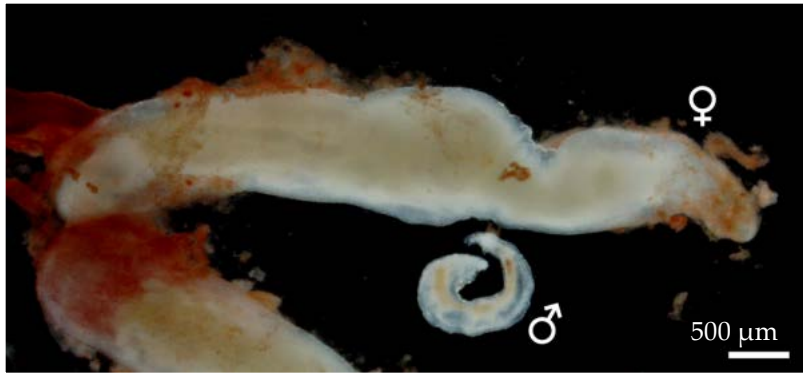
Halipteris finmarchica

Associated species	Number of individuals	Prevalence (%)	Type of association
Actinopterygii			
Sebastes spp.	17	4.3	Free-living
Cnidaria			
Stephanauge nexilis	28	16.0	Ectobiont
Unidentified Hydrozoa	1	1.1	Ectobiont
Crustacea			
Unidentified Corallovexiidae	112	29.8	Endobiont
Unidentified Lamippidae	7	7.5	Endobiont
Unidentified species			
Unidentified sp 7	10	4.3	Endobiont

Lamippe bouligandi

- Copepod
- First observation of the male + eggs/nauplii
- Observation of a potential decrease in fecundity in the infested polyps
- Feeds on host tissue and/or competes for host food





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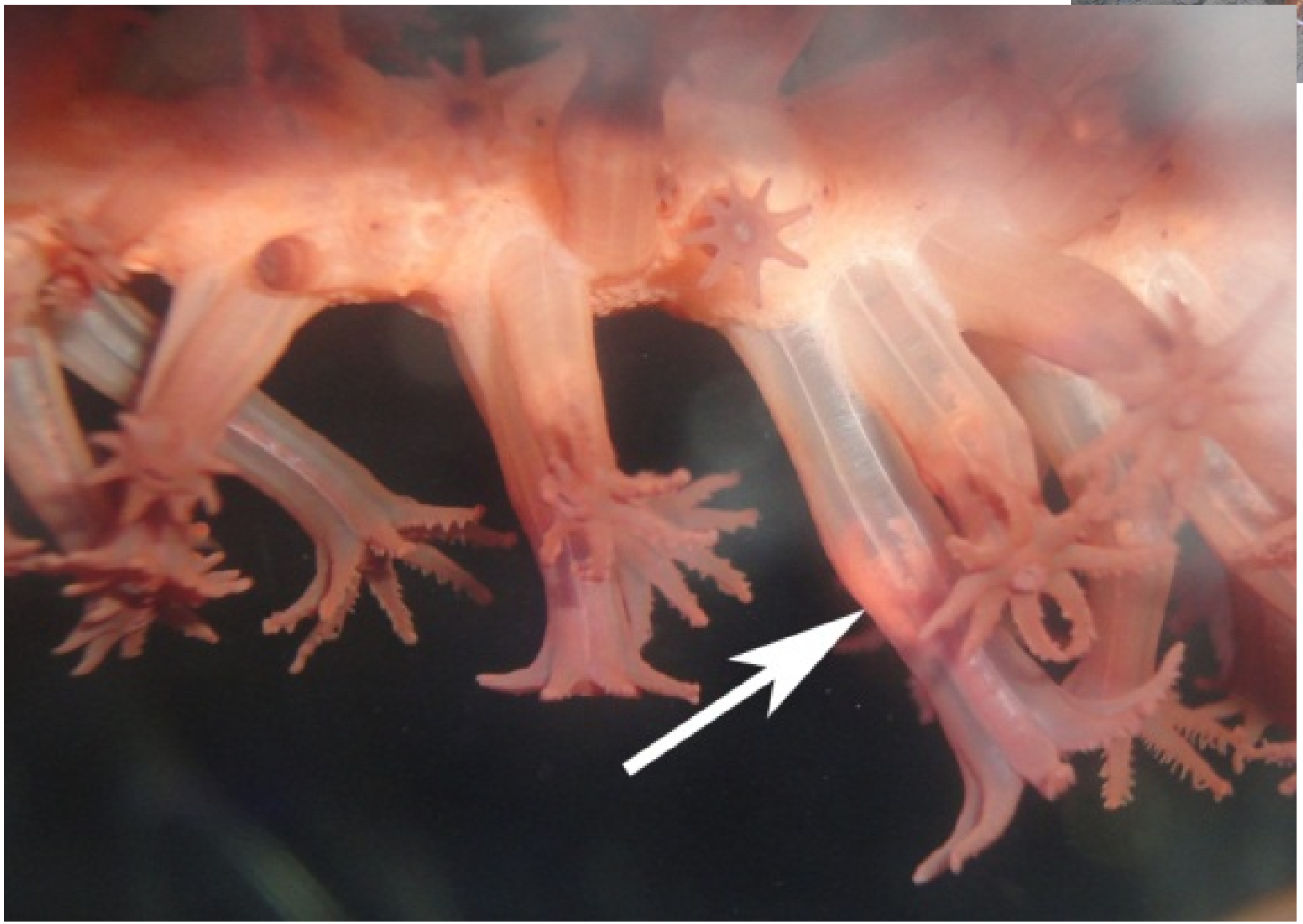

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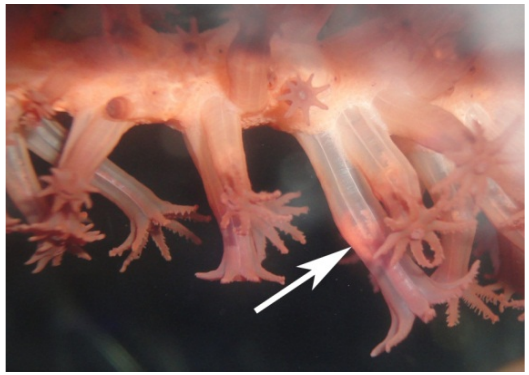
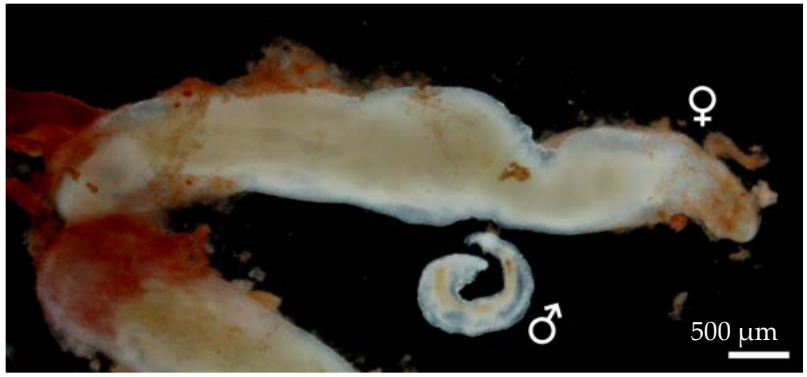
Parasitic species





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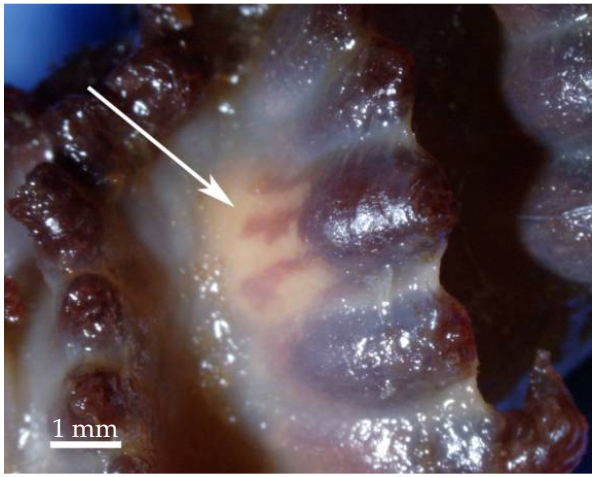
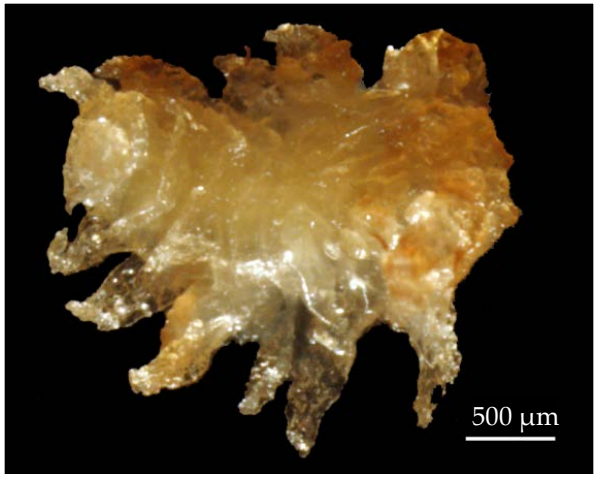
Halipteris finmarchica

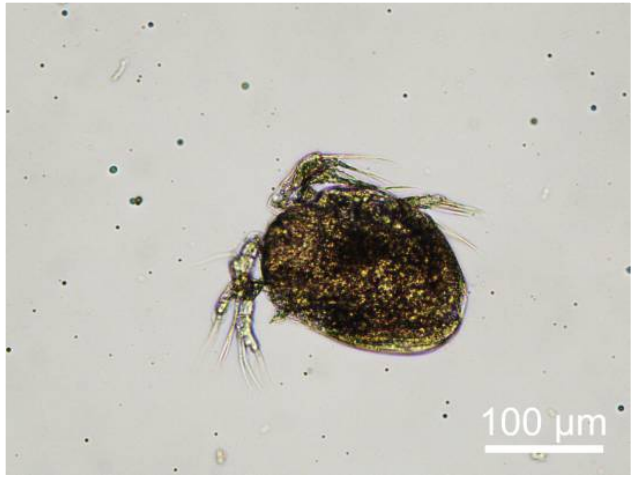
Unidentified Corallovexiidae

- Copepod
- Female + male + eggs/nauplii larvae
- Inhibits gametogenesis
- Feeds on host tissue and/or competes for host food

Parasitic species







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Unidentified species			
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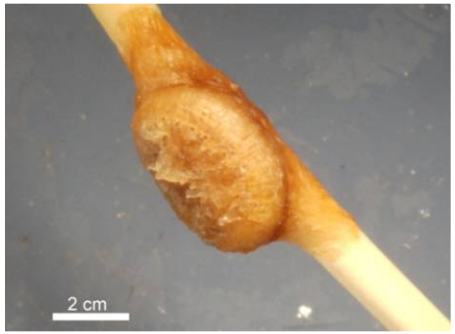
Halipteris finmarchica

Stephanauge nexilis

- Sea anemone
- Absent in the North (Labrador)
- Sea pen tissue absent under sea anemone
- Feeds on zooplankton

Commensal species?



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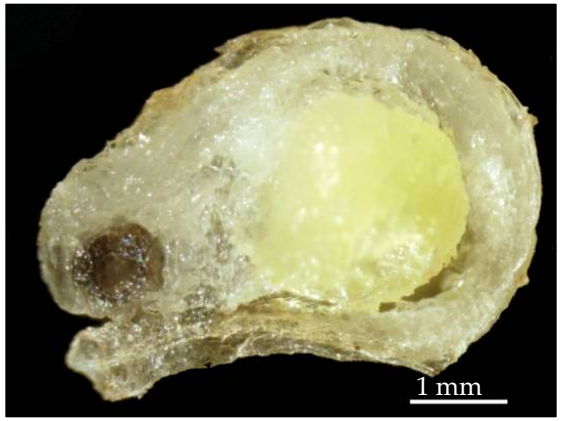
Sebastes spp.

- Larvae
- April and May in the Laurentian Channel

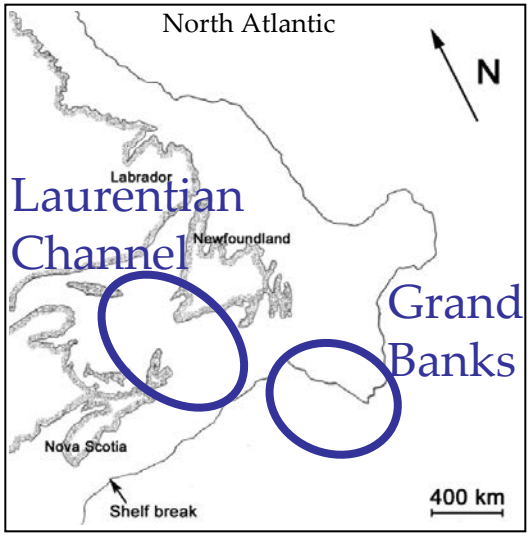
→ Sea pens = nursery

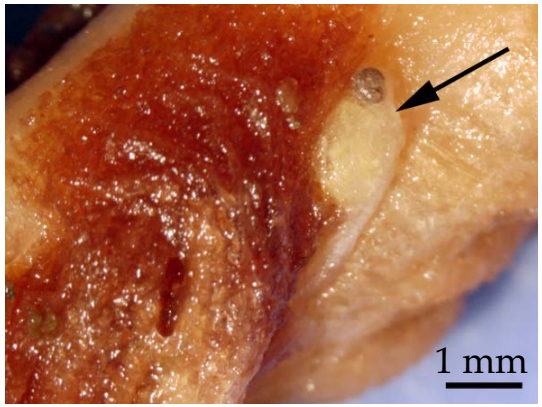


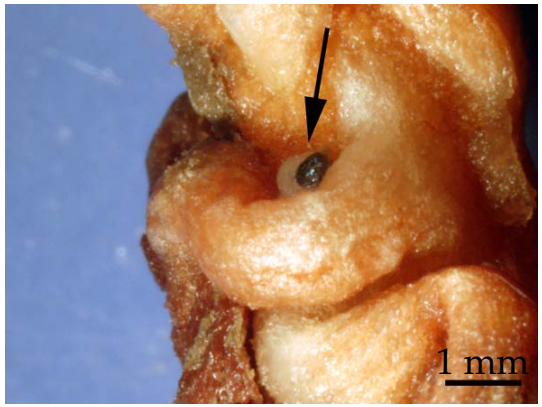
Anthoptilum grandiflorum and fish larvae

Associated species analyses on *Anthoptilum grandiflorum*

- Presence of fish larvae only in April/May on sea pens
- Presence in Laurentian Channel and Grand Banks
- Larvae tucked among polyps

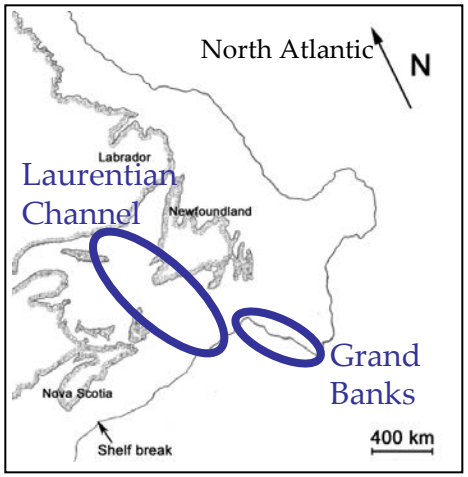




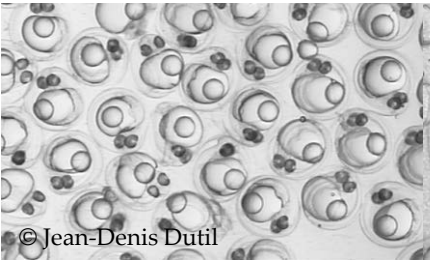


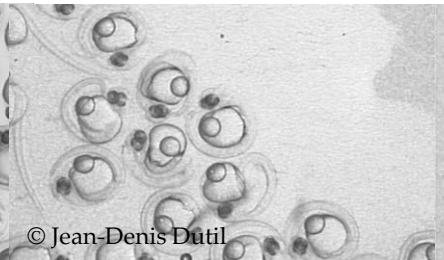
Pennatulaceans and fish larvae

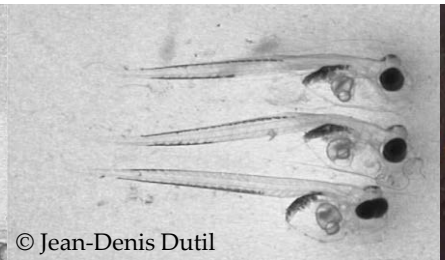
- Analysis in April/May between 2005 and 2010



- Analysis on 5 species – 288 colonies
- 58 sites – 23 sites with larvae on sea pens
- DNA results (BOLD): *Sebastes* spp.







Pennatulaceans and fish larvae

	A. grandiflorum	*P. aculeata*	*F. quadranlugaris*	*H. finmarchica*	*P. grandis*
Number of colonies	109	96	43	35	5
Prevalence of association (% colonies)	35.8	11.5	27.9	17.1	100
Total number of fish larvae	148	58	98	69	20
Mean yield (fish larvae colony^{-1})	1.4	0.6	2.3	1.9	4
Mean exact yield (fish larvae colony^{-1})	3.8	5.3	8.2	11.5	4
Maximum yield (fish larvae colony^{-1})	36	16	22	26	4

A. grandiflorum:

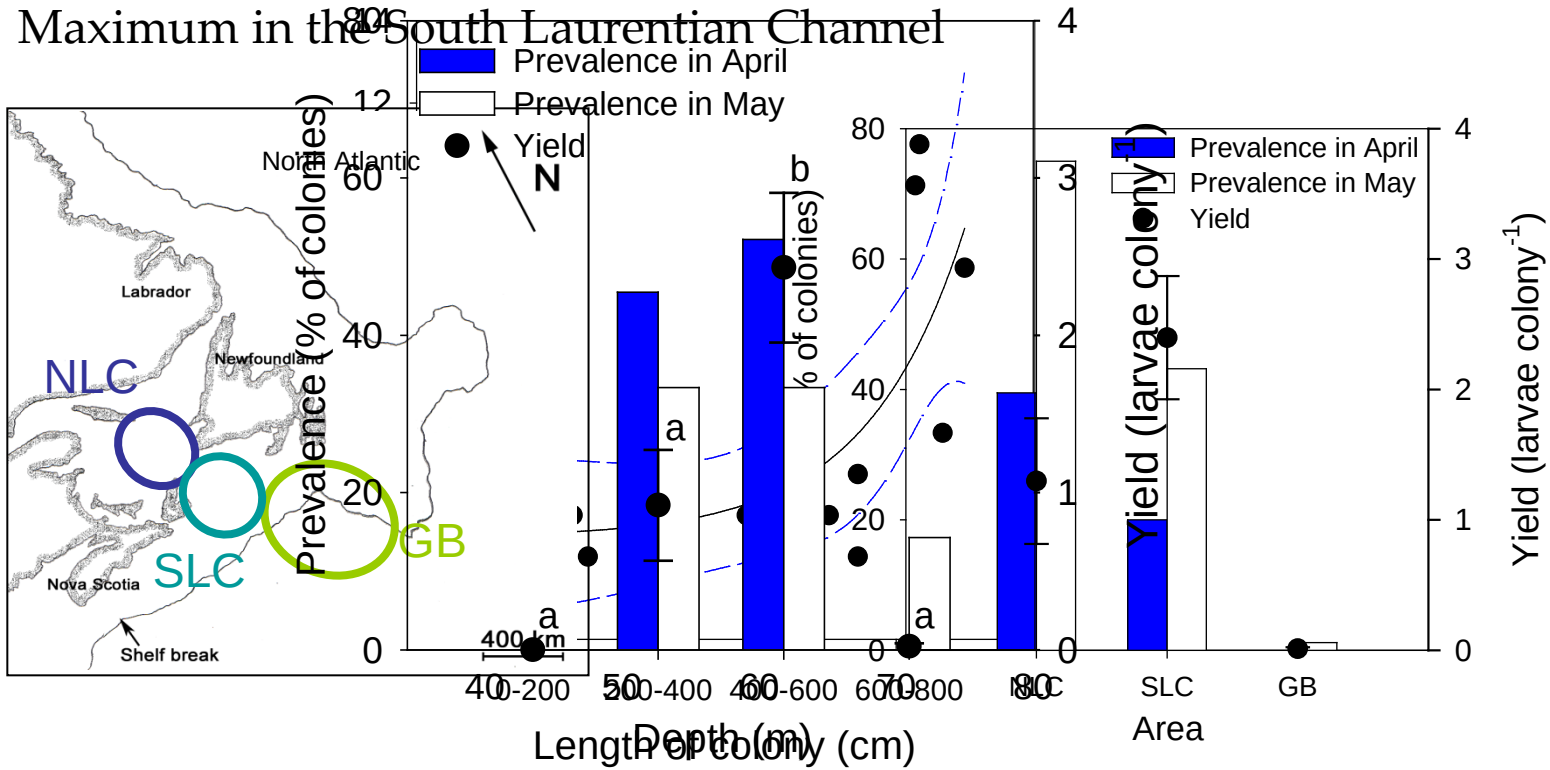
- Most abundant species (79% of the sites)
- 53% of site with larvae are mono-specific for *A. grandiflorum*

→ Importance of *A. grandiflorum* (cosmopolitan species)

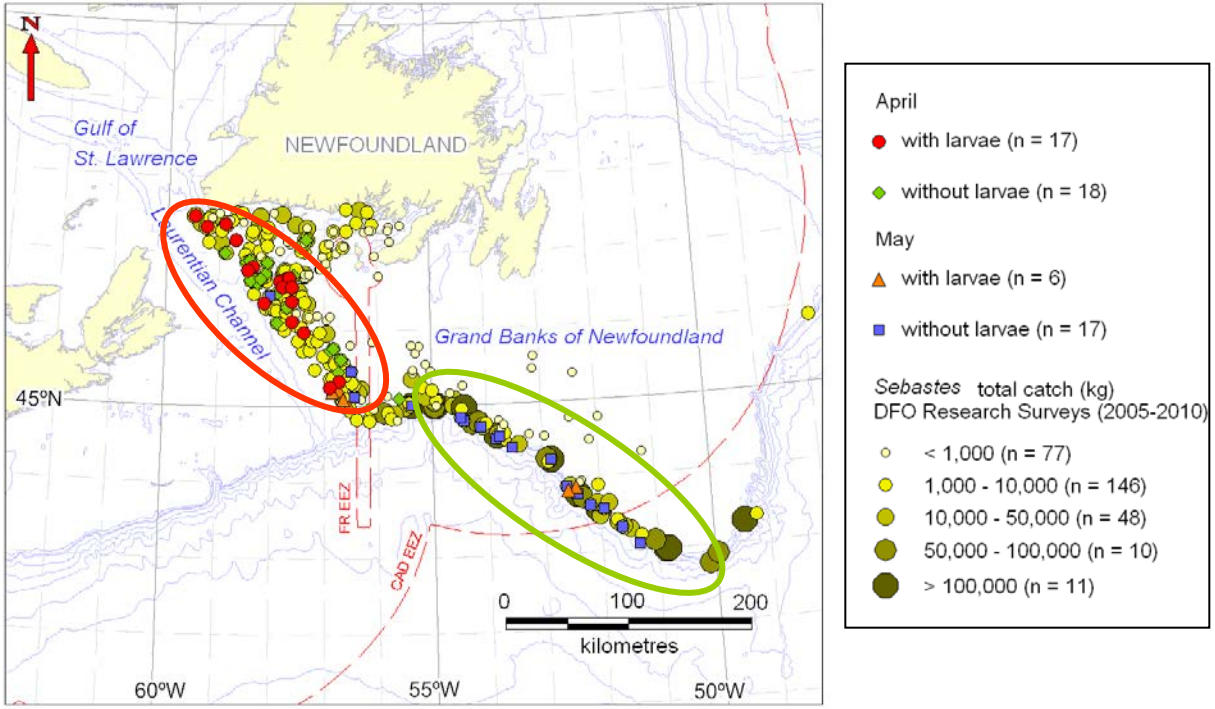
Pennatulaceans and fish larvae

Yield (larvae.colony^{-1}) and prevalence (% of colonies)

- Increase with colony length of *A. grandiflorum*
- Maximum at mid depth (400-600 m)
- Maximum in the South Laurentian Channel



Catches of adults *Sebastes* sp.



Grand Banks:

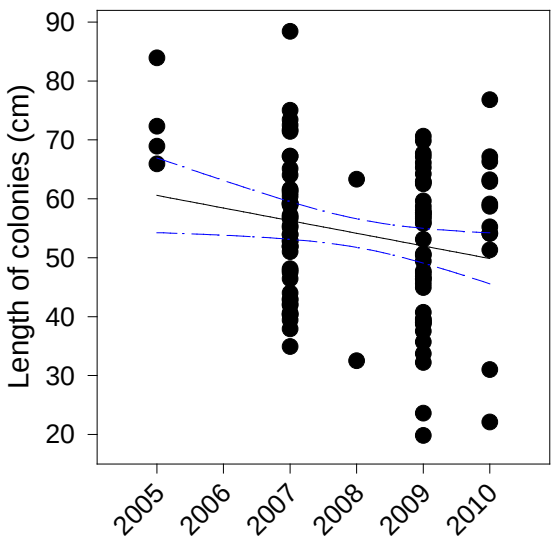
- Largest catches for April/May
- Few fish larvae on sea pen

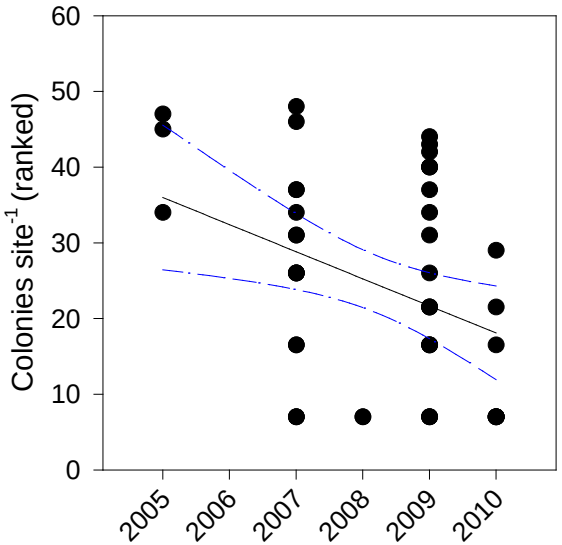
→ No strong correlation

A. grandiflorum situation

Since 2005:

- Decrease in length of colonies
- Decrease in number of colonies per site





Conclusions

- Consistent close relationship between fish larvae and sea pens
- Presence of fish larvae on other soft corals (results not shown)

→ Soft corals = fish nursery

→ Classification of deep-sea coral as Essential Fish Habitat

- No correlation between largest catches of redfish and presence of larvae on corals

→ Presence of adult ≠ nursery

Conclusions

- Presence of seasonal and year round trends in associated species
- Different levels of association:
    - Obligatory (parasitic copepods)
    - Facultative (sea anemone)
    - Functional (fish and shrimp larvae)
- Vulnerability of sea pens

→ Urgent need to define marine protected areas

Thanks to

Annie Mercier and Jean-François Hamel

Mercier lab (especially David, Katie G. , Matt and Christa)

Fisheries and Oceans Canada (Vonda Wareham, Kent Gilkinson, Teleost crew and scientists)

Funding: NSERC, CFI

Teleost, November 2011

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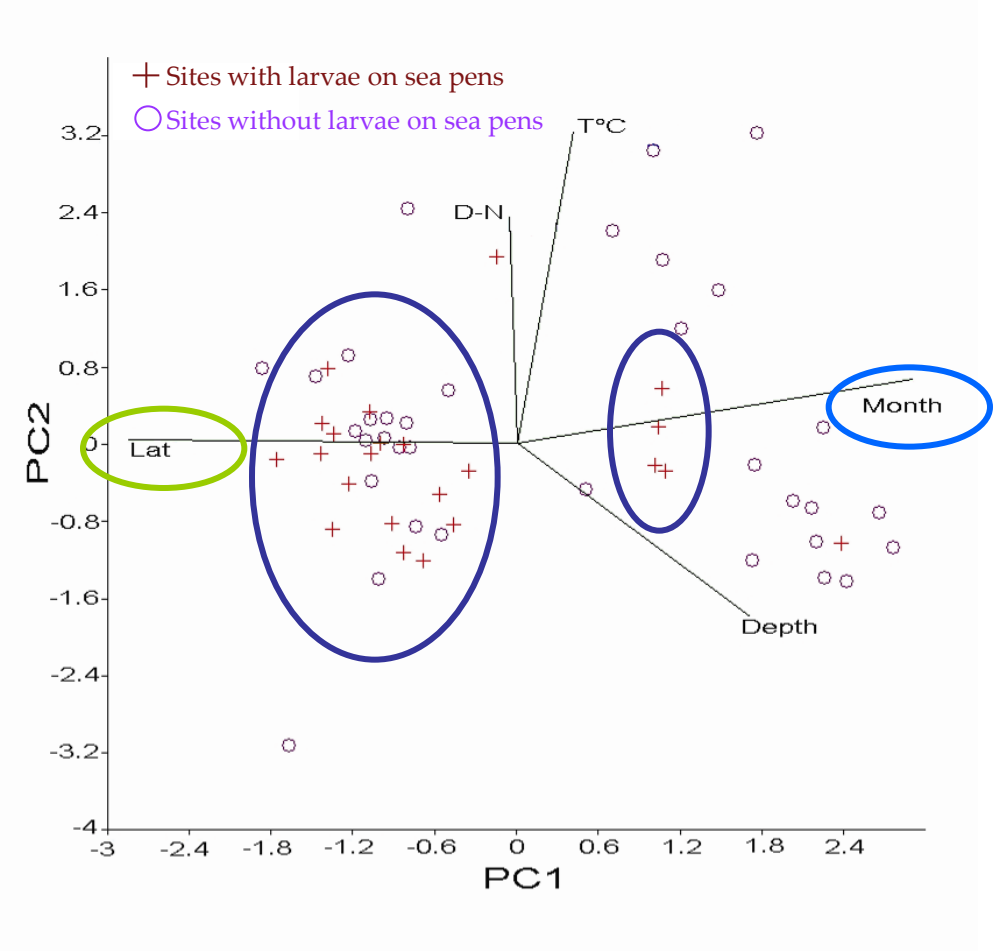
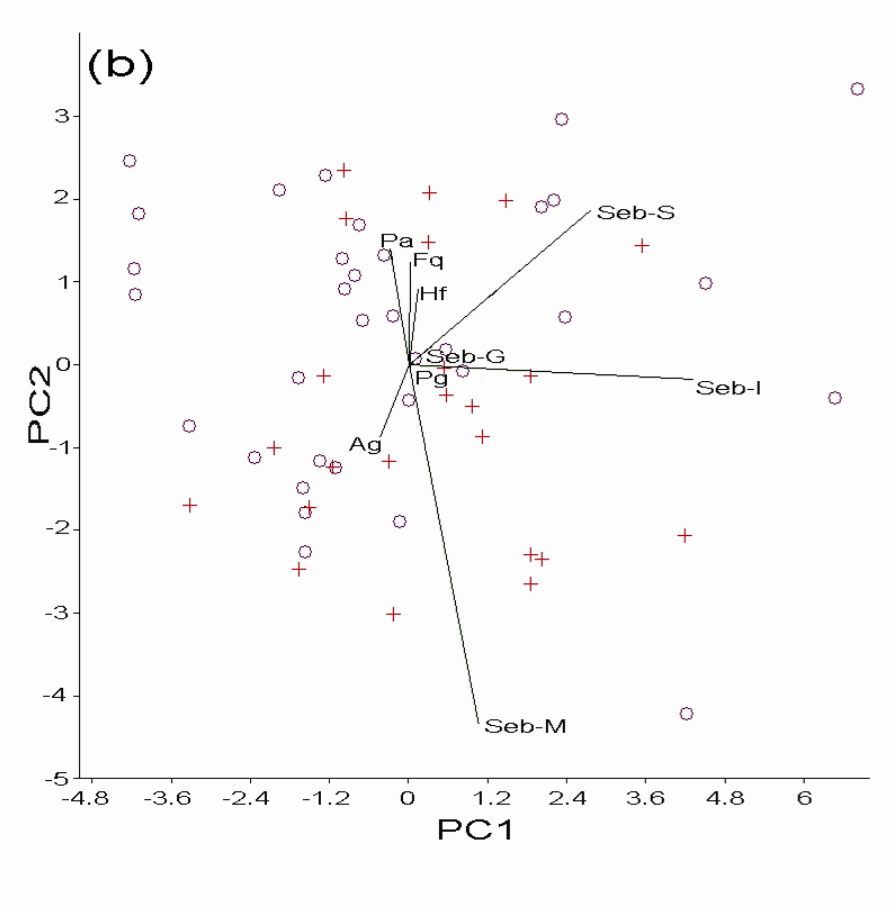
Abiotic factors



Influence of latitude and month

Biotic factors



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