A descriptive study of physico-chemical characteristics of *Posidonia* litter accumulation

Gilles Lepoint, Alberto V. Borges1, François Darchambeau2, Patrick Dauby3, Thibaud Mascart1, François Remy1, Willy Champenois2

1MARE center, Laboratory of Oceanology, University of Liège, Belgium,
2MARE Centre, Chemical Oceanography Unit, University of Liège, Belgium
3MARE Centre, Animal Systemsatics and Diversity Laboratory, University of Liège, Belgium

**Introduction:**

*The natural life cycle of the seagrass *Posidonia oceanica* involves senescing of leaf biomass and seasonal massive leaf fall,*

*Such phytodetritus exported outside the seagrass meadow may constitute big submarine accumulations (fig. 1),

*This particular habitat is colonized by various organisms which participate to the degradation and to the seagrass carbon transfer trough detritus foodweb,*

*These accumulations are subject of intense remineralisation and degradation processes.

**Aim:** By repetitive sampling in different litter accumulations occurring in the Revellata Bay (Calvi, Corsica) (2009-now), this preliminary study aimed to describe the cycle of litter accumulation occurrence, to determine their composition, to describe oxygen and nutrient concentrations inside the litter.

**Results I: Litter accumulation occurrence and composition**

Big accumulation of dead leaves were only found in fall (average thickness: 30-50 cm), but persisted till winter (average thickness: 5 - 10 cm),

Litter accumulation may be found in all seasons, but in spring and early summer, macroalgae wrack and uprooted *P. oceanica* shoots contributed significantly to accumulation biomass,

Photosynthetic active material was found in litter accumulations (macroalgae as wrack or epiphytes and diatoms as epiphytes).

**Results II: Oxygen and nutrient concentrations**

*Oxygen:* Water inside the litter showed high variability in oxygen concentrations (from saturation to anomy) (fig. 2); oxygen depletion was not measured in the water just above the litter (fig. 2); anoxia appeared rapidly during the night and period of low water movement (fig. 3).

*Nutrients:* Litter was generally enriched in NH4+ and PO4 and depleted in nitrates when compared to oligotrophic water column (fig. 2); nutrient enrichment was not measured in the water just above the litter (fig. 2).

**Results III: Conceptual model**

- When and where water movements are low, litter accumulations act as a permeable barrier between sediment and water column (fig. 4) and:
  - Nutrient (and DOC) coming from sediment or produces by remineralisation inside the litter are temporarily trapped inside (and consumed by associated heterotrophic and autotrophic organism),
  - Nitrification, oxidation of reduced compound (e.g. H2S) and respiration by decomposing organisms and litter fauna consume oxygen, driving sometimes to anoxia,
  - Photosynthesis occurs due to the presence of macro and micro epiphytes and of active *P. oceanica* and macroalgae wrack, but it is not enough to compensate respiration due to decomposition,
  - Passage tooxic and low nutrient condition inside the litter are due to physical disturbance of litter accumulation linked to water movement

**Take home message:**

- *P. oceanica* phytodetritus form large ephemeral accumulations outside the seagrass meadow,
- These accumulations, heterogeneous in their composition, are present in all season, but are important in autumn,
- Water inside the litter encompassed a large range of O2 and nutrient concentrations, but may be depleted in O2 and enriched in nutrient compared to water column,
- This particular environment could be an interesting natural model to study hypoxic effect on biodiversity.

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**Figure 1:** Position of the study area and localization of sampling points

**Figure 2:** Oxygen saturation percentage and nutrient concentrations measurement in the water column, just above and inside the litter accumulation and in the interstitial water under *Posidonia oceanica* litter.

Oxygen have been measured using a Winkler methods adapted for small volumes (10 ml) and nutrient have been measured by spectrophotometry using SKALAR analytic chain with method and tubing adapted for oligotrophic seawater (R. Biondo) (n = 12 per point, except Interstitial water, n = 6).

**Figure 3:** Oxygen saturation percentage measured inside and just above a litter accumulation (40 cm thick) using 2 Optodes during 3 consecutive very calm days in August 2011. For Optode methodology applied in this seagrass meadow, see Champenois & Borges, Limnology & Oceanography (2012), 57(1), 347-361.

**Figure 4:** Conceptual model

- Sediment on the left side of the diagram,
- Litter accumulation on the right side of the diagram,