

Comparison of two methods for the ecological status assessment of benthic intertidal macroalgae, within the Basque coast, for the European Water Framework Directive

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Introduction

The European Water Framework Directive (WFD) uses macroalgae as one of the biological quality elements in assessing the ecological status of coastal waters. In front of the environmental and biogeographical conditions, macroalgal communities on the basque coast exhibit some specificities which must be taken into account when applying any method of assessment. Two protocols have been applied in June 2009 for the first time: a Breton protocol used on the French coasts (Channel and Atlantic Ocean) and the Spanish method used on the northern coast of Spain. The aim of this work is to compare methods and results of the two protocols in a specific biogeographical area with warm water macroalgal communities.

Keywords: macroalgae, Water Framework Directive, quality indicator, intertidal, Basque coast

Materials and Methods

Breton protocol

Breton protocol described
In Ar Gall & le Duff, (2007)

• Quadrat methodology

3 quadrats of 2,5 m² by belt divided in quadrats of 0,1 m²
3 quadrats of 0,1 m² for larger quadrat
What makes 9 quadrats and 0,3 m² by belt

Two belts defined



Belt for Upper Mid Tide Zone
Corallina spp. (A) *Caulacanthus ustulatus* (B)
Note as CorCau
Belt for lower Mid Tide Zone
Styocaulon scoparium (A) *Gelidium* spp. (B)
Note as StyGel

• Species lists

Characteristics species for each belt and Opportunist list are available in (de Casamajor *et al.*, 2010)

• Parameters taken into account

Note 1- Vegetation global cover [C] = 40 points

Note 2- Number of characteristic species [N] = 30 points

Note 3- Opportunist species cover [O] = 30 points

| Rank 1 | Rank 2 |
|----------|----------|
| 9 75-100 | 8 75-100 |
| 7 50-75 | 7 50-75 |
| 6 25-50 | 6 25-50 |
| 5 10-25 | 5 10-25 |
| 4 5-10 | 3 5-10 |
| 3 2,5-5 | 2 2,5-5 |
| 0 0-2,5 | 0 0-2,5 |

| Note | Nbre | Note | Nbre |
|------|------|------|-------|
| 30 | ≥ 4 | 30 | ≥ 7 |
| 20 | 3 | 20 | 5 - 6 |
| 10 | 2 | 10 | 3 - 4 |
| 5 | 1 | 5 | 1 - 2 |
| 0 | 0 | 0 | 0 |

| Note | % |
|------|----------|
| 6 | < 5 |
| 4 | 5 - 25 |
| 2 | 25 - 50 |
| 1 | 50 - 75 |
| 0 | 75 - 100 |

• Final notation for quality index

| Note | Statut |
|----------|----------|
| 83 - 100 | High |
| 62 - 82 | Good |
| 41 - 61 | Moderate |
| 20 - 40 | Poor |
| 0 - 19 | Bad |



Sampling site : The Twins



Spanish protocol

Spanish protocol described
in Juanes *et al.*, (2008)

• Transect methodology

Without taking into account belts
3 perpendicular transects in the coast line
5 m of wide on both sides of the transect

• Parameters taking into account

Note 1- Number of characteristic species [R] = 20 points

Note 2- Characteristic species cover [C] = 45 points

Note 3- Opportunist species cover [O] = 30 points

| Note | Number of species |
|------|-------------------|
| 20 | > 3 |
| 15 | 3 |
| 10 | 2 |
| 5 | 1 |
| 0 | 0 |

| Note | Cover (in %) |
|------|--------------|
| 45 | > 50 |
| 35 | 30-49 |
| 20 | 10-29 |
| 10 | 5-9 |
| 0 | < 5 |

| Note | Cover (in %) |
|------|--------------|
| 35 | < 10 |
| 25 | 10-19 |
| 15 | 20-29 |
| 5 | 30-69 |
| 0 | > 70 |

• Species lists

Characteristic and opportunist species list are available in Juanes *et al.*, 2008

Note 1- Vegetation global cover [C]

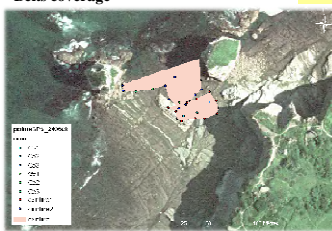
The cover for StyGel belt is 45 % of the total - rank 1 = 6 points

For CorCau the belt cover is 55 % of the total - rank 2 = 7 points

A total of 13 points over 17

[C] = 30,6/40

Belts coverage



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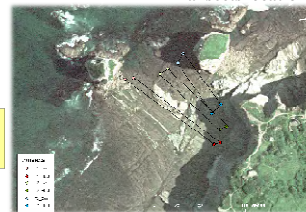
Results

Note 1- Number of characteristic species [R]

The number for each transect is 5, score is 20 points

[R] = 20/20

Transects location



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Note 2- Characteristic species cover [C]

The rate of characteristic species cover is between 78 and 95 %, score is 45 points

[C] = 45/45

Note 2- Number of characteristic species [N]

For CorCau belt, number of characteristic species which mean cover is upper than 2,5 % is 4, number of points is 30.

For StyGel belt number of characteristic species which mean cover is upper than 2,5 % is 9 number of points is 30.

[N] = 30/30

Note 3- Opportunist species cover [O]

For CorCau belt the mean cover is 28,5 % (2/6 points)
For StyGel belt the mean cover is 10 % (4/6 points)

[O] = 15/30

Note 3- Opportunist species cover [O]

The rate of opportunist species cover is between 13 and 16 %, score is 25 points

[O] = 25/35

Quality index = 75,6
Good

Quality index = 90
High

Discussion & Conclusion

Both protocols are accurate and macroalgal communities may be good indicators of ecological quality for coastal body waters in the WFD

• At the scale of the Basque coast

Basque coast is divided in 5 water bodies: 4 in Spain (8 stations for 300 km) and 1 in France (1 station for 35 km).

Results for the French coast have been compared with Spanish ones and they are very similar: High or Good (Borja, 2009; Guinda *et al.*, 2008).

Lists of characteristic and opportunist species taken into account to calculate the quality indicators allow consideration of biogeographical factor on Basque coast.

• Main differences in methodology

Sampling unit quadrat or transect: quadrats allow to increase the precision in term of covering rate in each belt. Transects integrate the two belts.

While belts remain little defined on this area (Gorostiaga *et al.*, 2004) their use offers possibility to apply the Breton protocol (Ar Gall & Le Duff, 2007).

Lists of characteristic species differ between the two methods but if we take Spanish list for both, results are quite similar (de Casamajor *et al.*, 2010).

The comparison is very relevant for intercalibration and validation of this quality index at a larger scale

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