



Bulgarian Academy of Sciences
Institute of Biodiversity and Ecosystem Research
Department of Water Ecosystems

BACTERIAL DIVERSITY IN *ZOSTERA* SP. BEDS ANALYZED BY MOLECULAR FINGERPRINT METHOD ARDRA

Nadezhda Todorova and Ventzislav Karamfilov





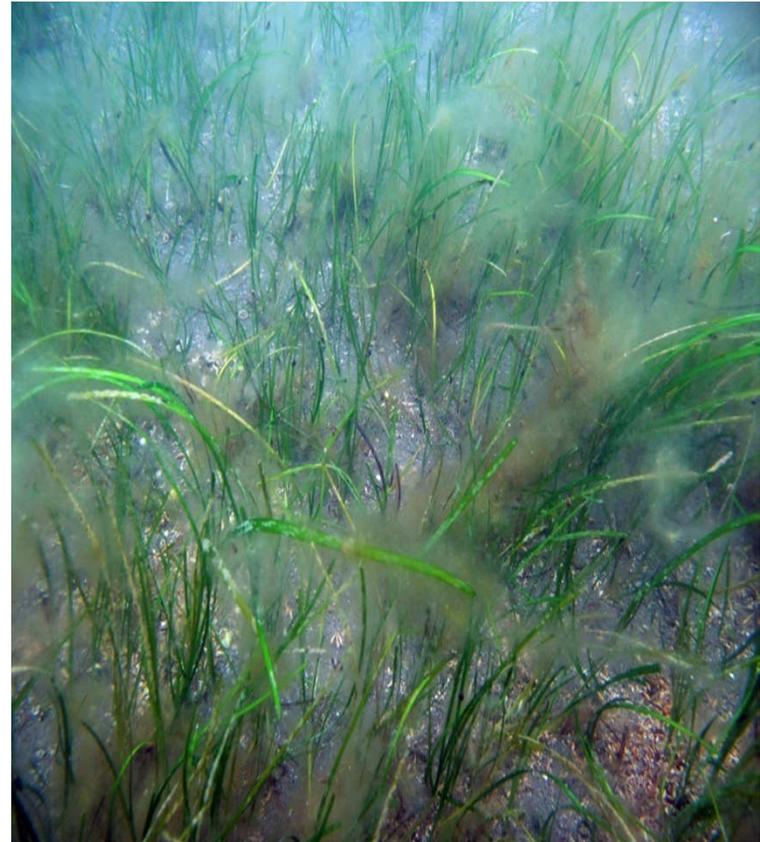
MSFD - Marine Strategy Framework Directive

Qualitative descriptors for determining good environmental status

- Biological diversity is maintained
- Human-induced eutrophication is minimised
- Sea-floor integrity ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems are not adversely affected
- Concentrations of contaminants are at levels not giving rise to pollution effects

Seagrasses – indicators of the status of coastal water bodies

- Seagrass communities – great abundance and richness of resident fauna. Habitat forming.
- *Zostera* sp. meadows – endangered, Red Data Book of Habitats of Bulgaria.
- Overdevelopment in the coastal areas – significantly affects seagrass communities.
- Increased organic matter load: elevated H_2S in sediments or even near bottom anoxia

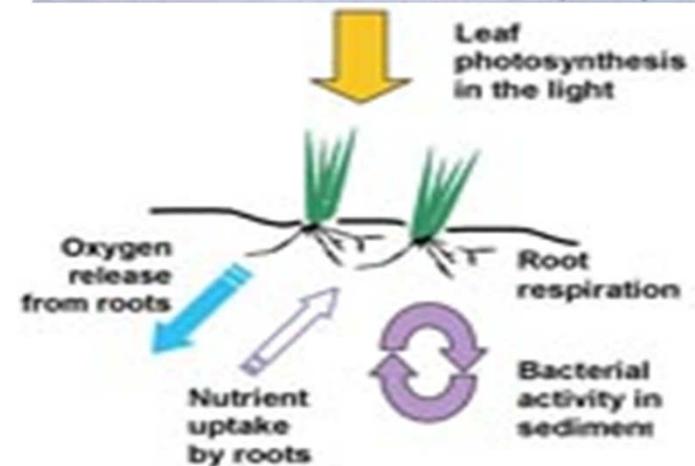


Photograph: Dimitar Berov, PhD

Phenomena in *Zostera* sp. beds - integrated interdisciplinary investigation

- Current ecological status: Water Framework Directive
- Highly diverse Bacteria inhabit seagrass rhizosphere – synergistic relationships
- Possible reasons for the seagrass decline

<http://www.niwa.co.nz/news-and-publications/publications/all/wa/12-4/seagrass>





BSIMAP - Black Sea Integrated Monitoring and Assessment Program, 2012 meeting

Monitoring requirements

- Problem: response of biodiversity on pollution and destruction of habitats. Sampling media: Biota

Bacteria are not included, but they react first - research study to fill existing knowledge gap



Main objectives

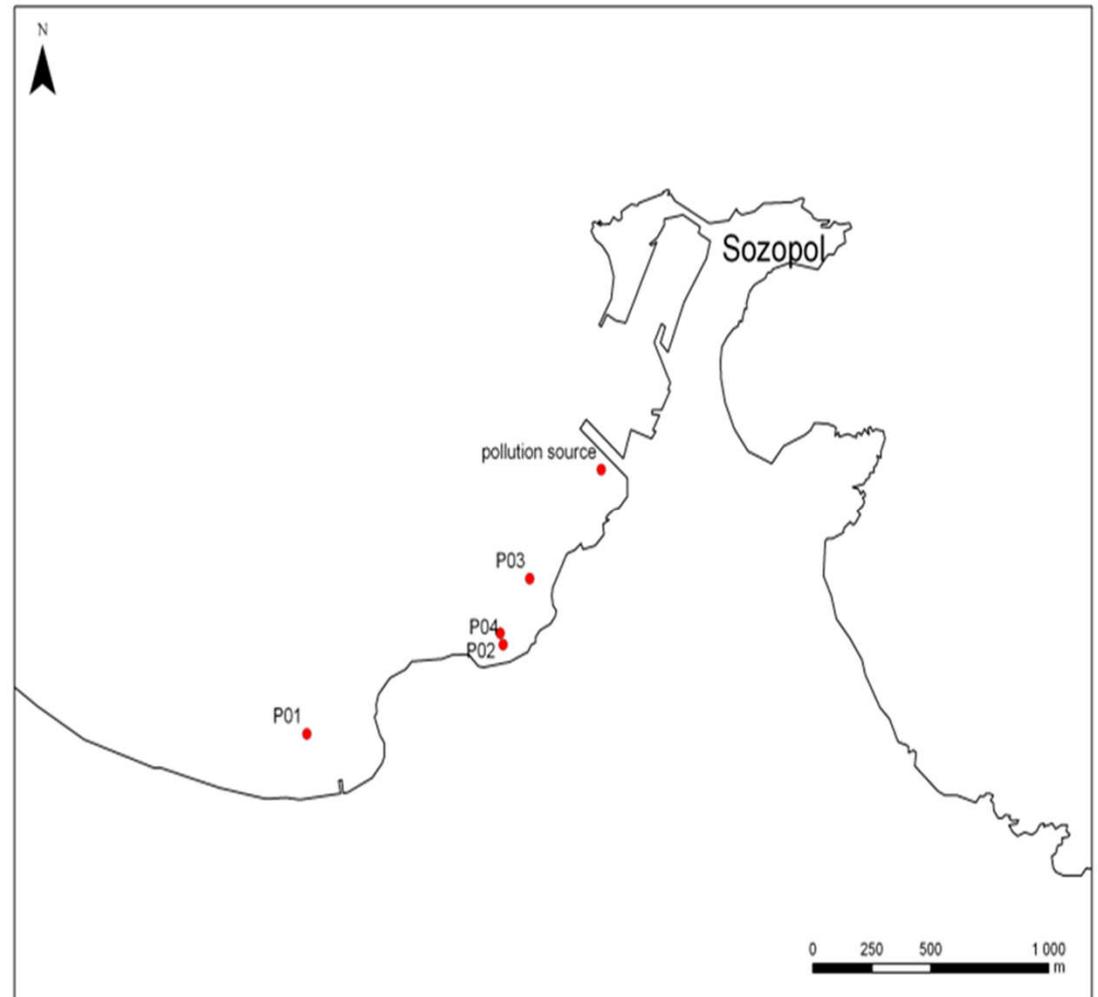
To study the microbial community structure in relation to:

- a gradient of anthropogenic impact
- presence/absence of vegetation
(effect of the *Zostera* sp. rhizosphere)
- depth into the sediment
- sulfate reduction and vegetation

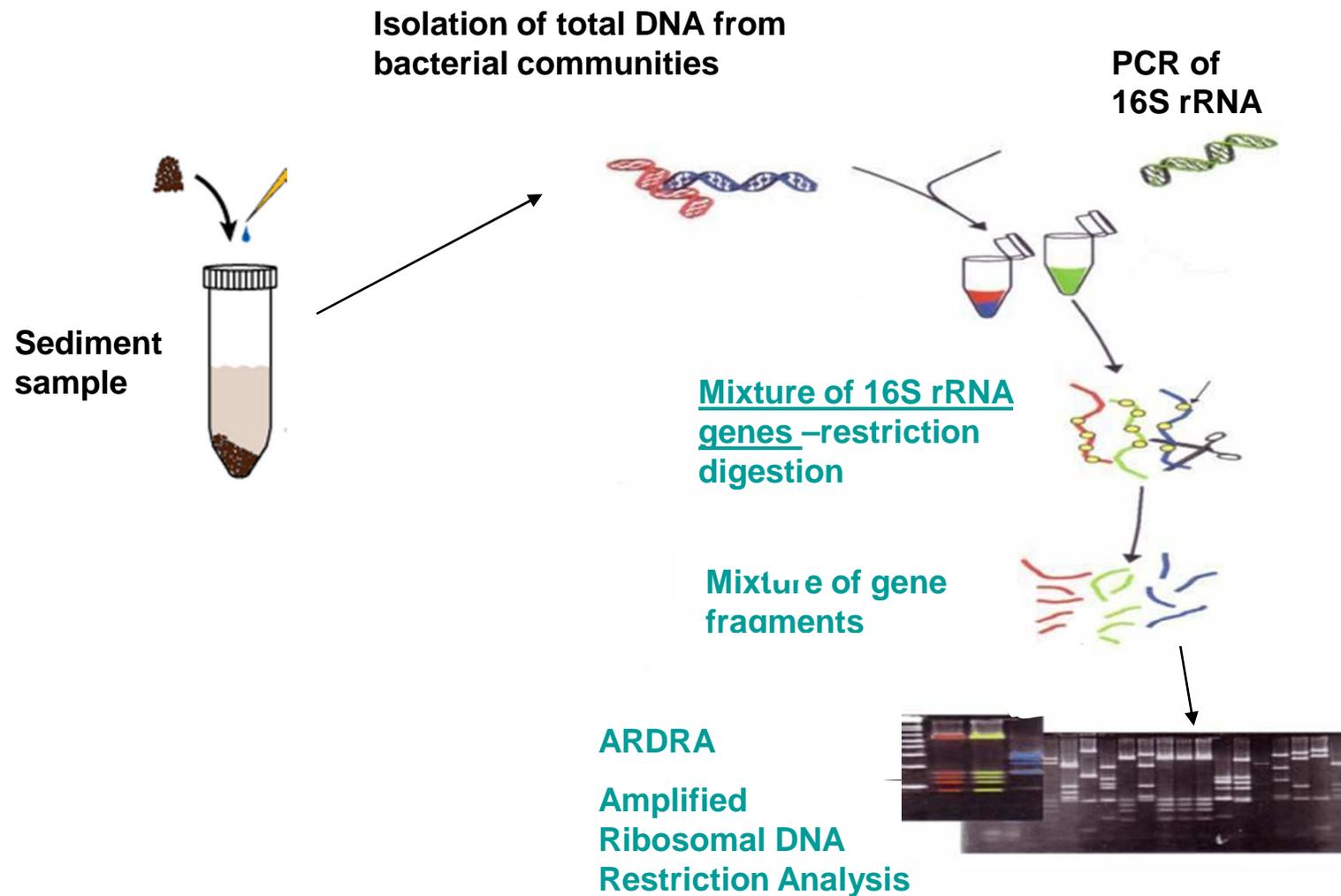
Sampling – Sozopol, *Zostera* sp. beds and bare sediments along a gradient of anthropogenic impact

Undisturbed sediment cores
Summer 2009 & 2010

- **p.1** - referent station
- **p.2** – offshore part of *Zostera* sp. meadow
- **p.3** – closest part to the point source of anthropogenic impact
- **p.4** – inshore part of *Zostera* sp. meadow

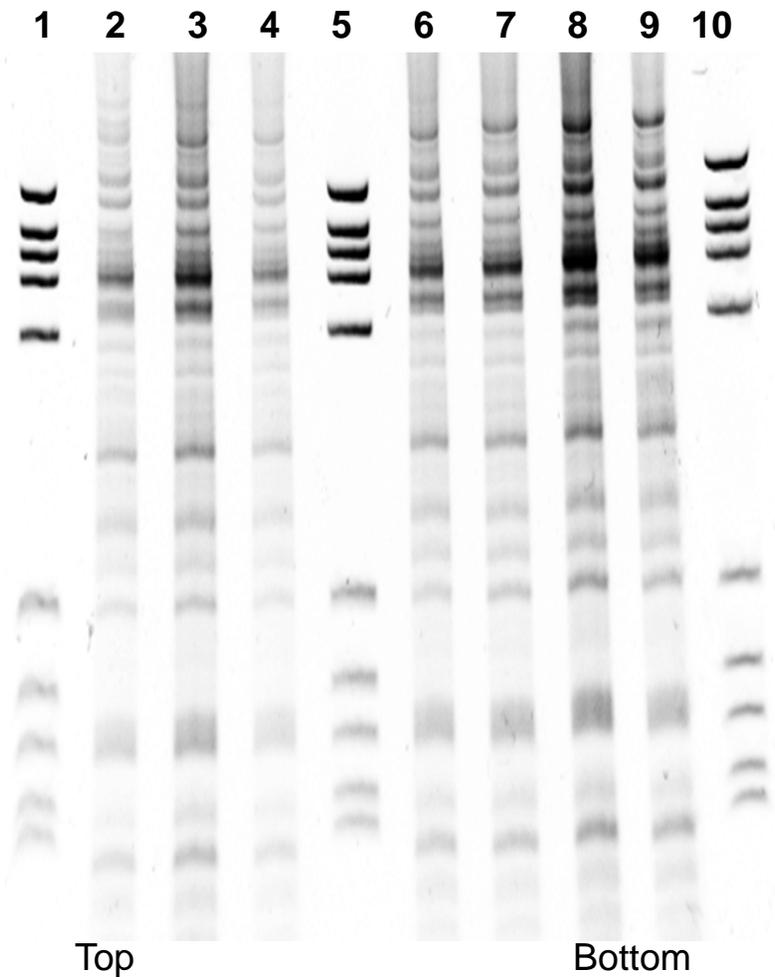


Main steps in analysis of bacterial communities, using molecular methods

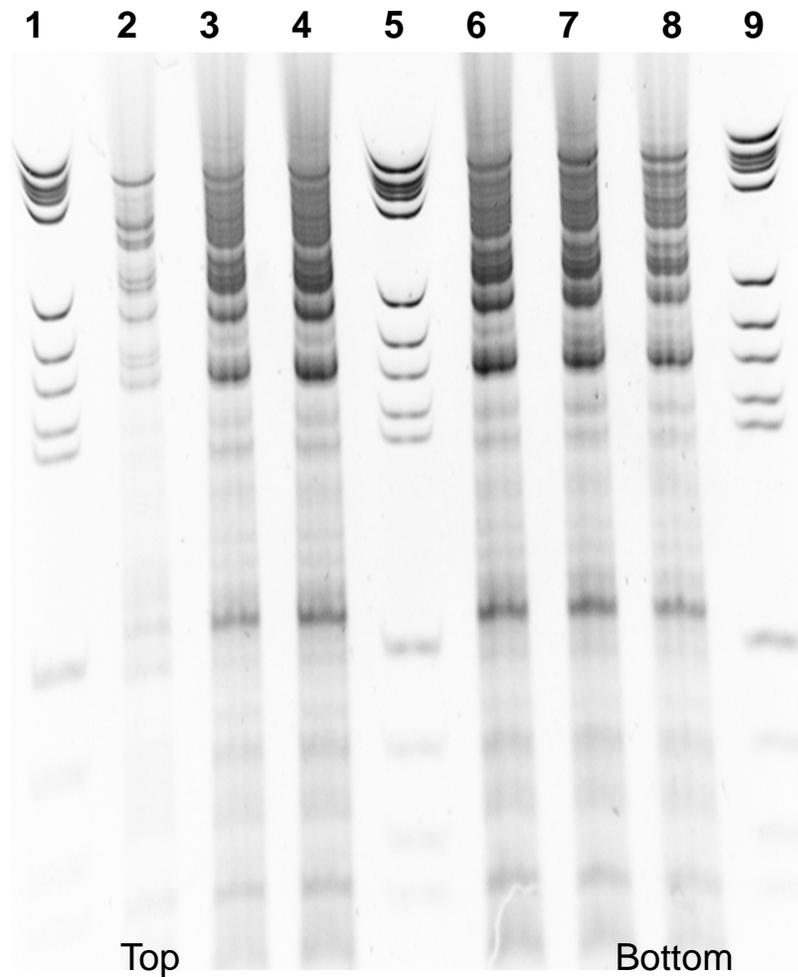


Results

I. Fingerprint (ARDRA) comparative analysis along the gradient of anthropogenic impact – **depth variation**



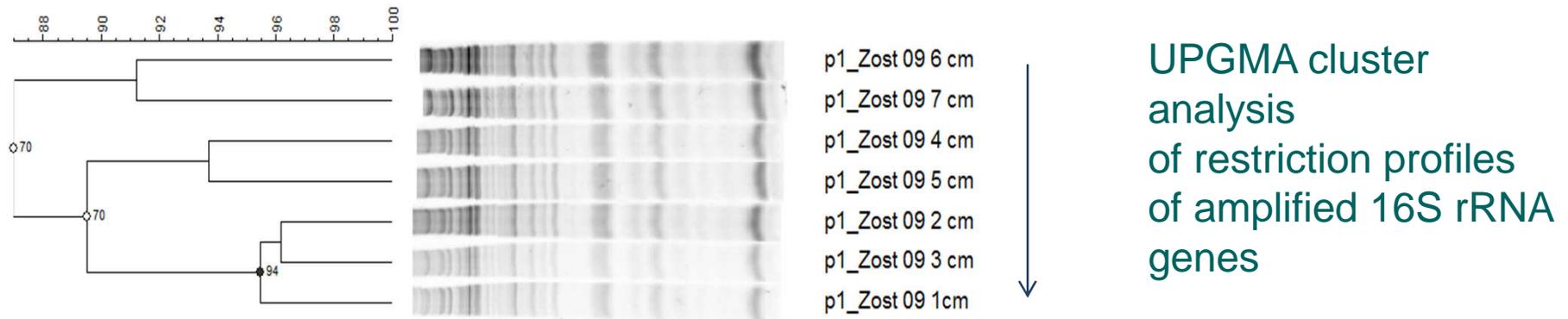
Zostera rhizosphere 1-7 cm, 2009



Bare sediment 1-6 cm, 2009

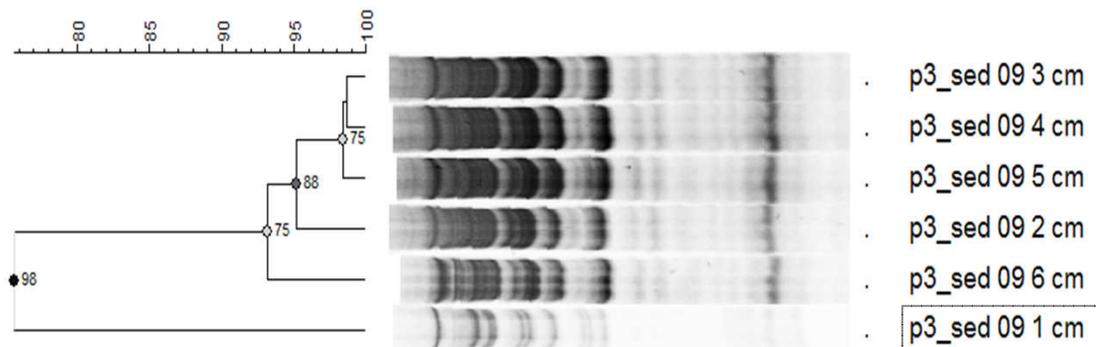
I. Fingerprint (ARDRA) comparative analysis along the gradient of anthropogenic impact – **depth variation**

Zostera rhizosphere 1-7 cm, 2009

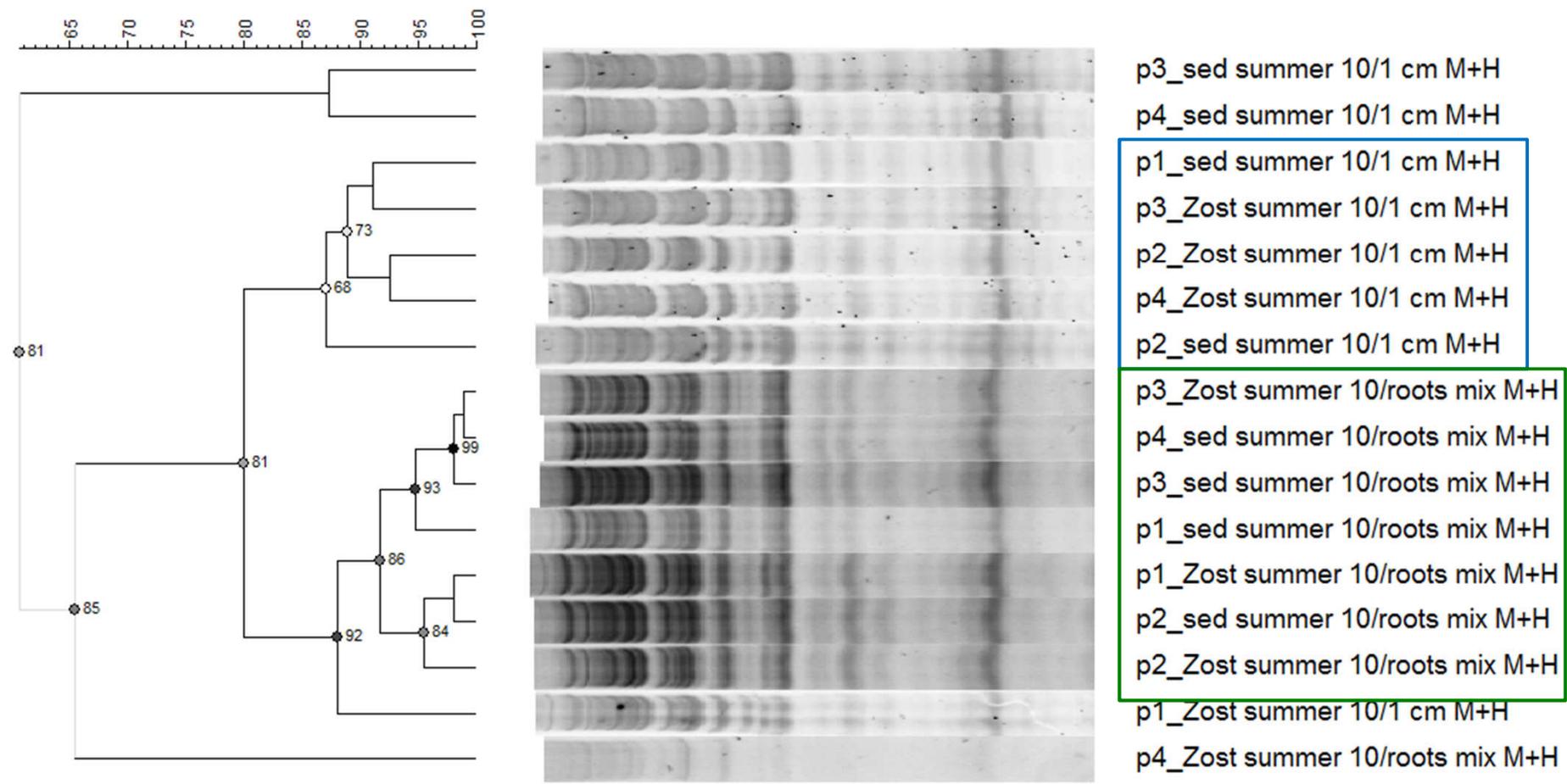


Gradient depth variation – within the upper 6-7 cm, no disruption or abrupt change in the bacterial community profile

Bare sediment 1-6 cm, 2009

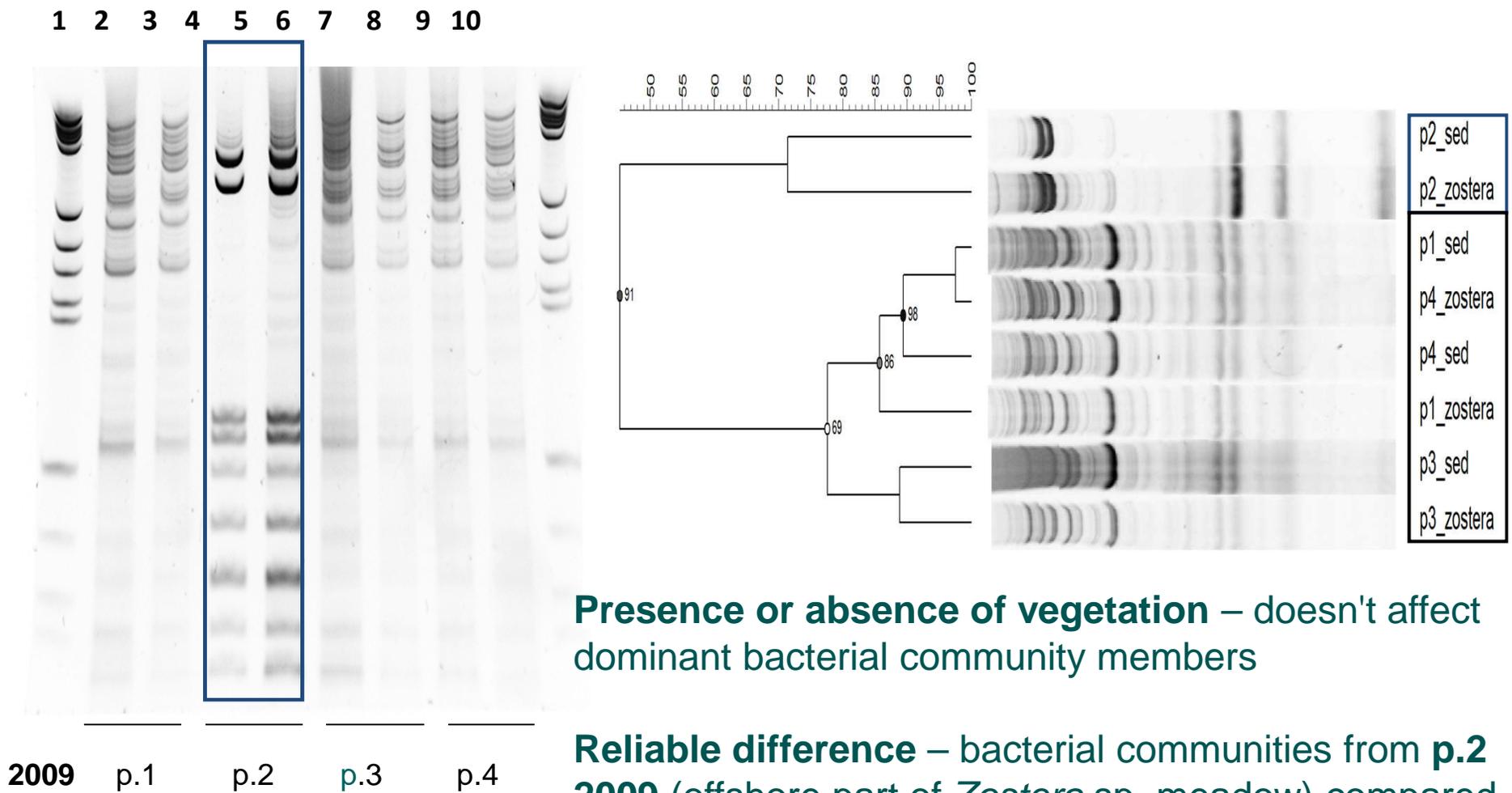


II. Fingerprint (ARDRA) comparative analysis along the gradient of anthropogenic impact – **top /rhizosphere layer**



Top/ rhizosphere layer – 2 clusters, 80% similarity bacterial community profiles

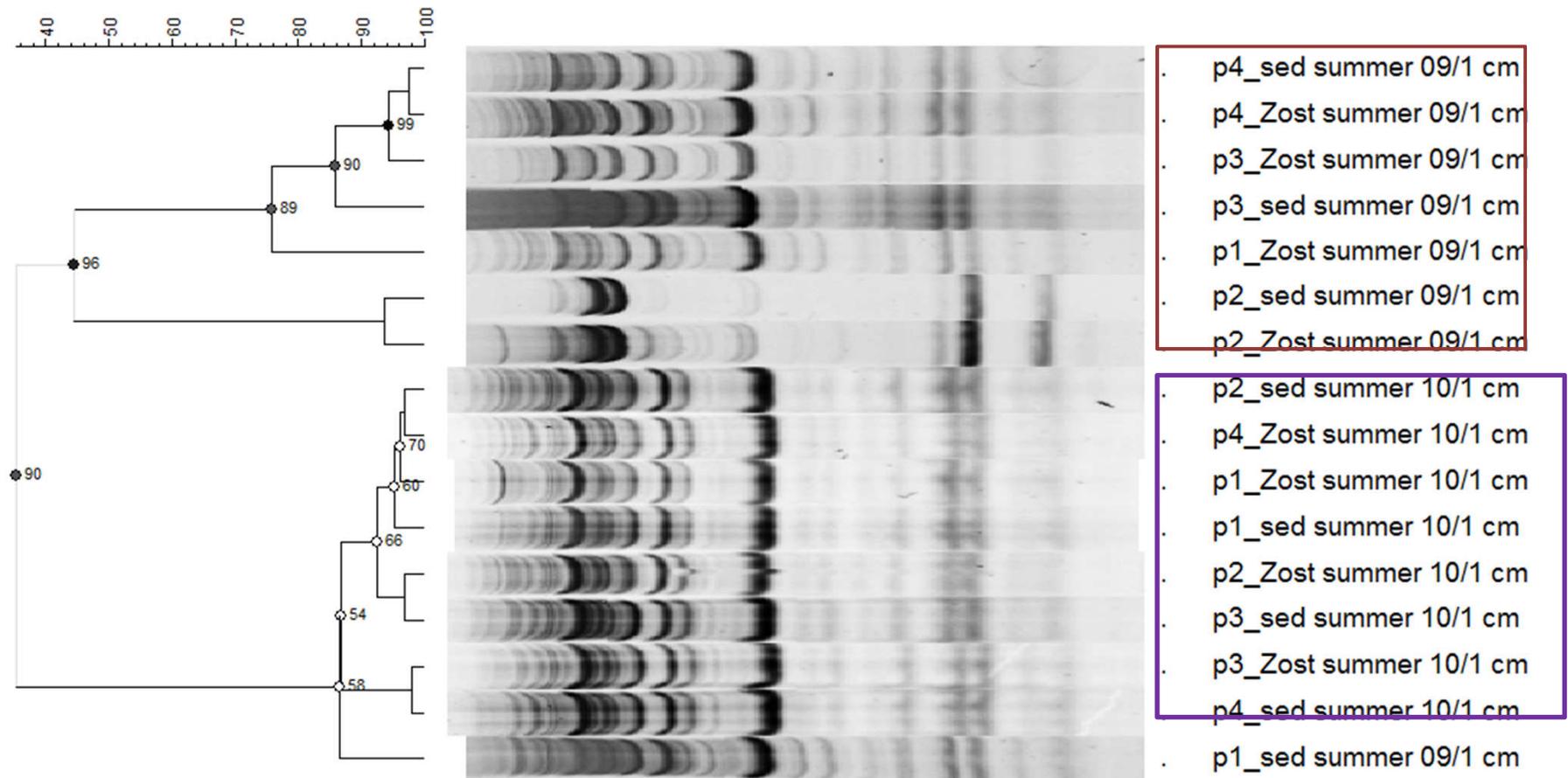
III. Fingerprint (ARDRA) comparative analysis along the gradient of anthropogenic impact – **present or absent *Zostera* sp.**



Presence or absence of vegetation – doesn't affect dominant bacterial community members

Reliable difference – bacterial communities from **p.2 2009** (offshore part of *Zostera* sp. meadow) compared to all others

IV. Fingerprint (ARDRA) comparative analysis along the gradient of anthropogenic impact – **annual difference**



Annual difference (summer`09/ summer`10) - very similar profiles similar environmental conditions

ARTICLE

BIODIVERSITY AND ECOSYSTEMS

DOI: 10.5504/50YRTIMB.2011.0002

MICROBIAL DIVERSITY IN *ZOSTERA SP.* BEDS IN SOUTH-WESTERN BLACK SEA REGION ANALYZED BY AMPLIFIED RIBOSOMAL DNA RESTRICTION ENZYME ANALYSIS (ARDRA)

N.H. Todorova¹, G.Radeva² and V.K. Karamfilov¹

¹Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia, Bulgaria

²Institute of Molecular Biology, Bulgarian Academy of Sciences, Sofia, Bulgaria

Correspondence to: Nadezhda H. Todorova

E-mail: nadeshda@abv.bg

ABSTRACT

Recent declines in sea grass distribution in south-western Black sea coast arise the need of understanding microbial community relationships in sea grass beds that might affect the viability of these plants. Several factors and their impact on bacterial community were investigated, including the presence or absence of vegetation, depth into sediment, and a gradient of eutrophication formed from pollution point-source. Amplified Ribosomal DNA Restriction enzyme Analysis (ARDRA) showed similar community profiles, thus demonstrating no difference in dominant bacterial members in connection with vegetation. Although highly diverse, sediment community showed also stable annual tendency. This suggested no effect of anthropogenic impact on the main characteristics of bottom sediments in the Zostera endangered meadows.



MSFD challenges: Need for scientific support

Science must provide the knowledge upon which integrated management can build the tools for assessing progress towards good environmental status.



wetlanet



ФОНД
НАУЧНИ
ИЗСЛЕДВАНИЯ

Министерство на образованието, младежта и науката



POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

Thanks to the colleagues from University of Vienna

Thank you for the attention!

