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Study about the Degradation of the Lentic Ecosystems in Pantelimon Lakes (Bucharest, Romania)

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Background and Significance

- Complex of artificial lakes for local tourism and sportive fishing
- Environmental deterioration in the last tens of years is due to chemical pollution, and loss of diversity
- Study of data obtained from sportive fishermen

Purpose

- Determine the evolution of environmental quality during 1994-1998 based on sportive fishing data

Methodology

- Data from an only person cover 11 species during 1994-1998 were analyzed using SAS
- Compare diversities, and species frequency distributions using the chi-square test

Informational entropy

$$h = - \sum_{i=1}^s p_i \ln p_i$$

where

- h is the informational entropy in *nits*
- p_i is the relative frequency of species i
- s is the total number of species

Test for comparing two empirical entropies

$$t = \frac{h_1 - h_2}{\sqrt{\text{var}(h_1) + \text{var}(h_2)}} \quad \text{with df} = \frac{[\text{var}(h_1) + \text{var}(h_2)]^2}{\frac{[\text{var}(h_1)]^2}{n_1} + \frac{[\text{var}(h_2)]^2}{n_2}}$$

where

$$\text{var}(h) = \frac{\sum_{i=1}^s p_i (\ln p_i)^2 - \left(\sum_{i=1}^s p_i \ln p_i \right)^2}{n} - \frac{s-1}{4n^2}$$

χ^2 Test

$$\chi_{n-1}^2 = \sum_{i=1}^s \frac{(O_i - R_i)^2}{R_i}$$

where

- R_i is the reference frequency of species i
- O_i is the observed frequency of species i

Table 1. Fishing data for the period 1994-1998

Name	1994-1995	1995-1996	1996-1997	1997-1998
<i>Carassius auratus</i>	254	37	5	0
<i>Alburnus sp.</i>	171	8	25	18
<i>Pelecus cultratus</i>	151	71	24	6
<i>Perca fluviatilis</i>	77	368	145	171
<i>Rutilus rutilus</i>	70	151	174	92
<i>Scardinius erythrophthalmus</i>	68	15	26	1
<i>Rhodeus sericeus amarus</i>	66	5	67	1
<i>Lepomis gibossus</i>	9	4	2	0
<i>Carassius carassius</i>	1	0	0	0
<i>Gobius kesleri</i>	6	5	1	1
<i>Alburnus alburnoides</i>	2	0	7	1

Table 2. Evolution of entropy during 1994-1998

Period	Entropy (<i>nits</i>)
1994-1995	1.89
1995-1996	1.31
1996-1997	1.62
1997-1998	1.01

Table 3. Comparison between species diversities during 1994-1998

Period	1995-1996	1996-1997	1997-1998
1994-1995	t ₁₅₂₇ = 6.66* $\chi^2_{11} = 1677.26^*$	t ₁₀₅₆ = 2.73* $\chi^2_{11} = 738.20^*$	t ₇₆₁ = 9.16* $\chi^2_{11} = 532.50^*$
1995-1996		t ₉₆₄ = -3.10* $\chi^2_{10} = 1014.62^*$	t ₆₉₀ = 3.17* $\chi^2_{10} = 219.99^*$
1996-1997			t ₇₄₇ = 5.67* $\chi^2_{10} = 969.92^*$

* significant ($p \leq 0,05$)

Results and Discussion

- Entropy values did not indicate loss of diversity
- t-tests indicated loss of diversity
- Frequency distributions comparison indicated significant changes in the structure of the community
- Limitations are due to the use of data from only one sportive fisherman

Conclusions and Recommendations

- Significant changes in the structure of Pantelimon lakes community confirm the hypothesis of the degradation by loss of species diversity
- Further research is recommended
- Promote environmental protection and reconstruction measures at the local level