TD 02: Biological Analyses of the Environment

1-Exercises:

1-1-Exercise 01:

The following table shows the abundance values, pollution sensitivity values, and indicator values of some diatom species. Calculate the Specific Pollution Sensitivity Index (IPS) and indicate the quality of the environment.

Table 01. Abundance (ni), pollution sensitivity (s), and indicator values (v) of some diatom species recorded in a river.

Genus	Species	ni	si	vi
Achnanthes	A.hungarica Grünow	13	2	3
Amphora	A. pediculus Kützing	6	4	2
Cratícula	C.accomoda (Hustedt) D.G. Mann	8	1	3
Cyclotella	C.atomus Hustedt	23	2	1
Navícula	N.lanceolata Agardh (Ehr.)	43	3	1
Neidium	N.Iridis (her.) cleve	21	5	2
Melosira	M.nummuloides (Dillwyn) Agardh	17	2	3
Sellaphora	S. pupula(Kützing) Mereschkowski D.G. Mann	11	2	2

1-2-Exercise 02:

The data in the following table show the values of several biological indices of bioindicators from various water stations. Classify the stations according to the different indices.

Table 02. Values of some biological indices from several stations.

Stations / Indices	Station 01	Station 02	Station 03	Station 04	Station 05
IPS	9,02	15,03	12,09	17,20	5,50
IBD	17,9	17,8	15	19,2	14,1
IOBS	3,02	3,59	1,30	15,35	2,08
IPR	7,30	6,6	123	6,9	36,6

1-3-Exercise 03:

The following are the biological index values of bioindicators from several agricultural areas. Interpret the table by indicating the quality of each terrestrial environment.

Table 03. Values of some biological indices from several agricultural areas.

Stations / Indices	Site 01	Site 02	Site 03	Site 04	Site 05
CMT-Végétaux	36	6,9	22,1	3,4	7,2
SET- Escargots	17	5,3	2,5	0,9	1,6

2-Solutions :

2-1-Solution Exercice 01 :

$$IPS1 = \frac{\sum(Ai \times Si \times Vi)}{\sum(Ai \times Vi)}$$

Genre	Espèce	Ni	A	si	vi		Axsixvi	Axvi
Achnanthes	A. hungaricaGrünow	13	9,15	2	3		54,93	27,46
Amphora	A. pediculusKützing	6	4,23	4	2		33,80	8,45
Cratícula	C. accomoda (Hustedt) D.G. Mann	8	5,63	1	3		16,90	16,90
Cyclotella	C. atomusHustedt	23	16,20	2	1		32,39	16,20
Navícula	N. lanceolataAgardh (Ehr.)	43	30,28	3	1		90,85	30,28
Neidium	N. Iridis (her.) cleve	21	14,79	5	2		147,89	29,58
Melosira	M. nummuloides (Dillwyn) Agardh	17	11,97	2	3		71,83	35,92
Sellaphora	S. pupula (Kützing) Mereschkowski D. G. Mann	11	7,75	2	2		30,99	15,49
N		**142**					**479,58**	**180,28**

IPS1	2,66

IPS = 4.75 x IPS1 - 3.75

The IPS index is equal to 8.89, therefore the river shows poor water quality with strong pollution.

2-2- Solution exorcise 02 :

1. **IPS: Specific Pollution-Sensitivity Index.**

IPS values range from 5.50 (S05) to 17.20 (S04). The quality of water is poor (S05), medium (S01 and S03), good (S02), and very good (S04).

2. **IBD: Diatomic Biological Index.**

IBD values range from 14.10 (S05) to 19.2 (S04). The quality of water is good (S03 and S05) and very good (S01, S02, and S04).

3. **IOBS: Oligochaete Sediment Bioindication Index.**

IOBS values range from 1.30 (S03) to 15.35 (S04). The quality of water is poor (S03), medium (S05), good (S01 and S02), and very good (S04).

4. **IPR: River Fish Index.**

IPR values range from 6.6 (S02) to 123 (S03). The quality of water is very poor (S03 and S05), good (S01), and excellent (S02 and S04).

Station ranking:

From the least polluted to the most polluted: **S04 – S02 – S01 – S03 – S05.**

2-3- Solution exercise 03:

1. **CMT–Plants:**
   Values range from 7.2 (S05) to 36 (S01). Soil quality is polluted (S01 and S03), moderately polluted (S02 and S05), and good (unpolluted) (S04).
2. **SET–Snails:**
   Values range from 0.9 (S04) to 17 (S01). Soil quality is polluted (S01 and S02), moderately polluted (S03 and S05), and good (unpolluted) (S04).

Station **S04** is the least polluted, and station **S01** is the most polluted.