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Some data about plankton of 4 reservoirs of river Douro

BY
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(Faculty of Sciences — University of Porto)

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SOME DATA ABOUT PLANKTON OF 4 RESERVOIRS OF RIVER DOURO (1)

BY

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In our program concerning the study of the north of Portugal reservoirs productivity and the study of water quality, reservoirs of Miranda do Douro, Picote, Bemposta and Saucelle, situated in the international river Douro, were prospected (Fig. 1).

In each of these reservoirs a sample was made monthly, from June 1979 till May 1980.

From the study of these samples, data of the planktonic community where obtained — amount of phytoplankton pigments (chlorophylls *a* and *c*, and plant carotenoids), pigment diversity index, density of zooplankton.

On zooplanktonic organisms, identification of Copepoda and Rotífera was made, and the species diversity index was also made for the former.

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(1) This study is included in a program of research of the «Centre of Ecology» of the INIC (Instituto Nacional de Investigação Científica).

For extraction of pigments, samples of water were obtained at 5 m depth.

500 ml of water was filtered immediatly through a membrane filter 0,45 μ pore size.

Zooplankton was collected using a net for plankton having its entrance 26 cm diameter.

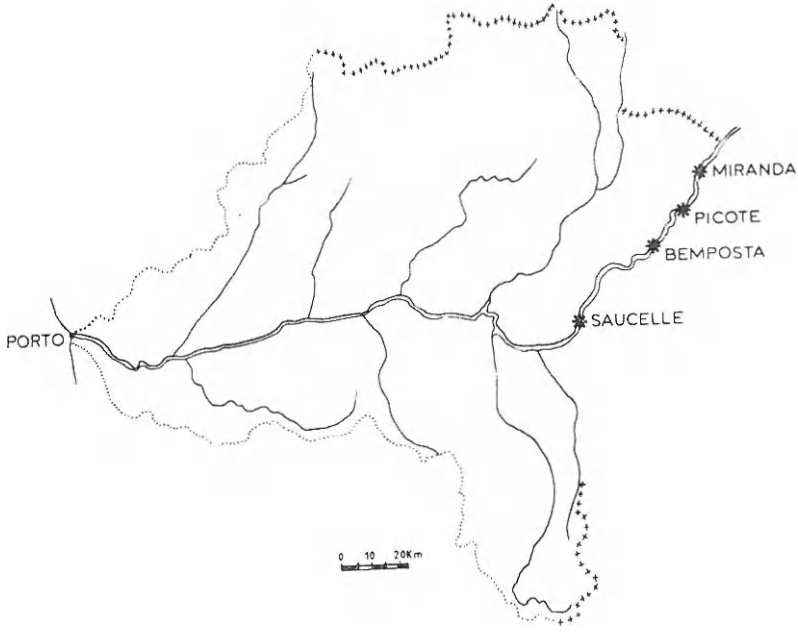

Fig. 1 — Hydroelectric power dams of international river Douro.

A verical haul was made from 15 m deep to surface. This haul corresponds therefore to a water column with 0.8 m^3.

The thecnics used in laboratory for the treatment of samples, were those ones refered in other paper (Galhano, Branco, Q. Machado, 1976).

RESULTS

As nothing was known about the abundance of plankton in the impoundments of the international river Douro, our objective was to obtain some date about that, that is, to have average values in each of the refered reservoirs.

Phytoplankton: pigments and pigment diversity index

Abundance of pigments, specially chlorophyll *a* and *c* is very scarce in Saucelle.

It is at Picot and Bemposta, but specially at the second, that values of pigments are the highest.

Pigment diversity index is similar at all the reservoirs, being quite low its value (Table 1, Fig. 2).

Table 1 — Mean values of pigments (mg/l) and pigment diversity index.

	cl a	cl c	Plant carotenoids	I. D.
Miranda	3.0745	1.3209	1.4438	2.8320
Picote	3.3270	4.1616	1.2424	2.5050
Bemposta	4.2275	4.2647	2.2905	2.3371
Saucelle	2.2108	0.9807	1.0082	2.4309

Low values of pigments at Saucelle may be due to a low density of phytoplankton.

We can suppose that, because it is at this impoundment that values of phosphates are the lowest. We must point out,

neverthless, that values of nutrients were not obtained during the same period, but between June 1978 and May 1979.

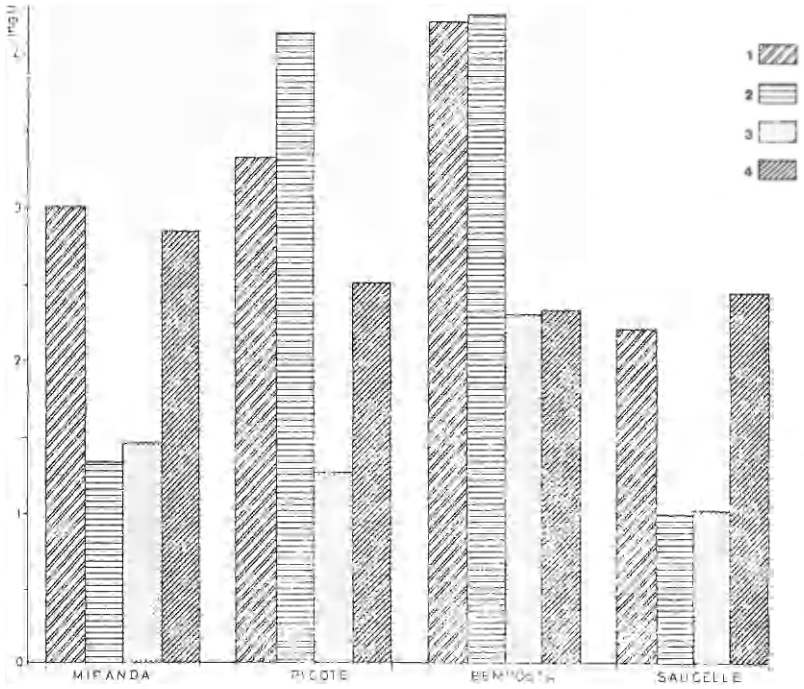

Fig. 2 — Mean values of pigments and pigment diversity index. 1 — chlorophyll *a*; 2 — chlorophyll *c*; 3 — plant carotenoids; 4 — pigment diversity index.

Zooplankton density

Mean density has a variation between 1681 and 2844 animals/m^3.

The highest values were registered at those reservoirs where highest values of pigments were also registered — Picote and Bemposta.

Table 2 — Mean density of zooplankton (n/m³).

	Ciclopoida	Calanoida	Cladocera	Rotifera	Total
Miranda	413	169	639	460	1681
Picote	530	236	573	1505	2844
Bemposta	1191	431	541	266	2429
Saucelle	1020	370	496	145	2031

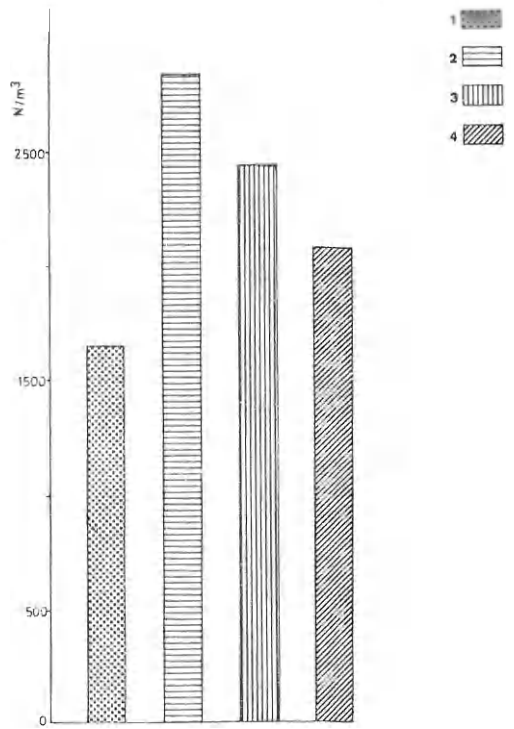

Fig. 3 — Mean values of zooplankton density. 1 — Miranda; 2 — Picote; 3 — Bemposta; 4 — Saucelle.

The lower value of zooplankton density at Miranda than at Saucelle may be due to the temperature, because its mean value is lower at the former (Fig. 4).

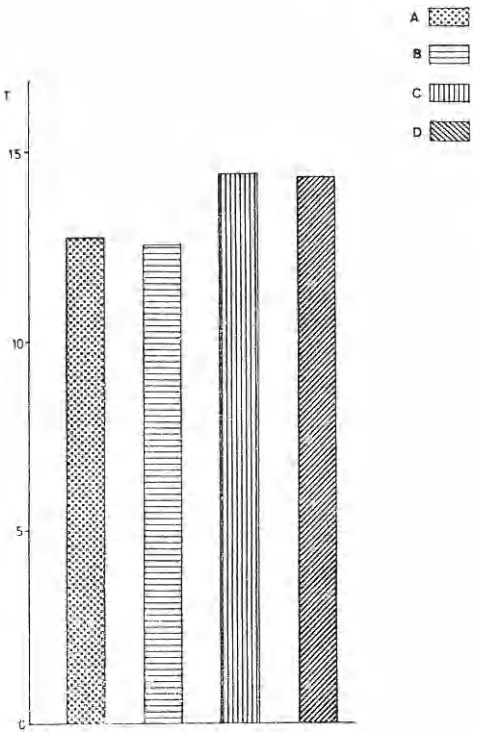

Fig. 4 — Mean values of temperature. A — Miranda; B — Picote; C — Bemposta; D — Saucelle.

The highest mean density, registered at Picote, is due to the great abundance of Rotifera (Fig. 5).

Though, biomass determination was not made, one can say, with the obtained data, that the highest values of biomass would not be registered at Picote, but, probably, at Bemposta, where Copepoda is the dominant group, with higher values of

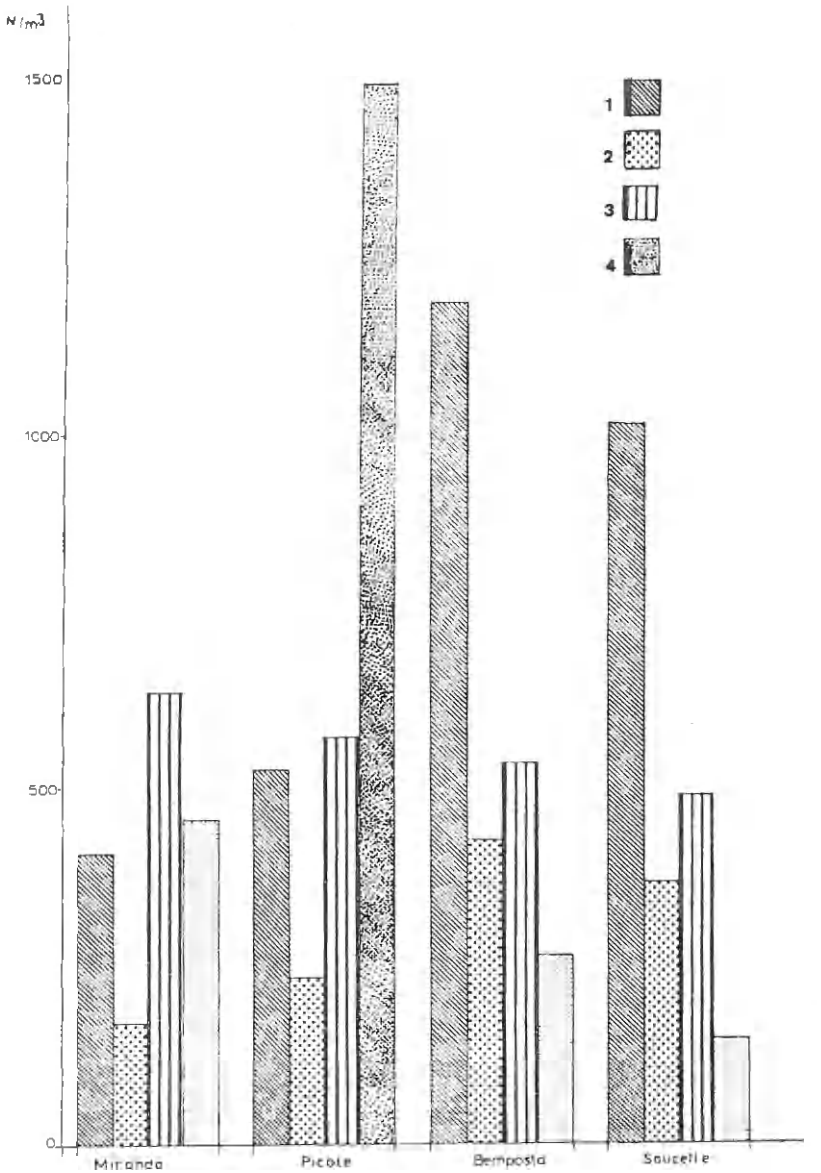

Fig. 5 — Mean density of the different groups of zooplankton. 1 — Cyclopoida; 2 — Calanoida; 3 — Cladocera; 4 — Rotifera.

density than in the other reservoirs. At Saucelle Copepoda is also the dominant group, being Cladocera at Miranda.

Copepoda species diversity index

The following species were identified:

	Miranda	Picote	Bemposta	Saucelle
Copidodiaptomus numidicus	+	+	+	+
Eucyclops serratulus	+	—	—	—
Tropocyclops prasinus	+	+	+	—
Acanthocyclops robustus	+	+	+	+
Thermocyclops sp.	+	—	—	—
Macrocyclops albidus	—	+	—	—
Paracyclops fimbriatus	—	—	+	—
Cyclops abyssorum	+	+	+	+

It can be seen that the highest number of species was registered at Miranda (6), followed by Bemposta and Picote (5) and Saucelle (3).

The species diversity index ($d = S/\sqrt{N}$) is the following:

Miranda	0.25
Picote	0.18
Bemposta	0,12
Saucelle	0.08

Only *C. numidicus*, *A. robustus* and *C. abyssorum* are present at the 4 impoundments, being *A. robustus* the most abundant in all of them.

Though *T. prasinus* is present in 3 reservoirs, its density was very low.

Rotifera identification

The identification of Rotifera was made to the genus level, being the highest number of genera registered at Picote (6), and the lowest at Saucelle (3).

The following genera were identified:

	Miranda	Picote	Bemposta	Saucelle
Polyarthra sp.	+	+	+	+
Kerattela sp.	+	+	+	+
Brachionus sp.	+	+	+	+
Lecane sp.	+	+	—	—
Asplanchna sp.	—	+	+	—
Notholca sp.	—	+	—	—

In all the studied reservoirs, the most abundant genus was *Brachionus*.

CONCLUSIONS

With base on data obtained at Miranda, Picote, Bemposta and Saucelle, concerning values of phytoplankton pigments and zooplankton density, some conclusions may be formulated:

- Saucelle reservoir is that one with lowest values of pigments. This suggests that phytoplankton density is probably the smallest in this reservoir.

- The highest values of pigments were registered at Bemposta. This fact suggests that probably this reservoir has the highest values of phytoplankton density.

- Concerning the zooplankton, Bemposta and Picote are the richest reservoirs — Picote with the highest values

of density, and Bemposta probably with the highest values of biomass.

- Basing on those data, it can be said that, concerning planktonic community, Bemposta reservoir is that one that has the best conditions to try a program of restocking or perhaps of fish culture in net cages.

Of course that if a restock program or establishment of a fish farm will be decided, it is necessary to procede to the evaluation of the ecological parameters in order to select the most suitable species.

BIBLIOGRAPHY

GALHANO, M. H., BRANCO, R. and Q. MACHADO, M., 1976 — *About the productivity in reservoirs. First results obtained at Carrapatelo impoundment (River Douro). Publ. Inst. Zool. «Dr. A. Nobre»* n.º 131.

GALHANO, M. H., GUIMARÃES, C. and GOUVEIA, A., 1979 — Contribuição para o estudo da qualidade das águas na bacia hidrográfica do Rio Ave: características do plancton e do bentos. *Relatório final da Com. Coord. Região Norte.*