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Metal Content in Seston from the San José Gulf, Patagonia, Argentina

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According to Margalef (1974), seston is formed by a living fraction (plankton) and a dead fraction (tripton).

Plankton are capable of concentrating large quantities of heavy metals from seawater, and this provides an entry into the marine food web. Tripton also accumulate metals by adsorption on its inorganic particles or by affinity with organic materials.

There is information about metal content in mollusks and sediments from the Patagonian coast, (Gil et al. 1988, Harvey and Gil, 1988), but not data are available for seston.

In this report we present baseline levels of Fe, Zn, Mn, Cu, Cd, Pb and Ni in seston from the San José Gulf, a semiarid area with no human-industrial settlement on its coast.

MATERIALS AND METHODS

The San José Gulf is a basin of 432 sq km surface, 45 m deep and presents a very low water residence time (nearly 44 hr) due to high tides (8.5 m). The sampling site was located at Punta Gales at the southern coast of this Gulf (Fig. 1).

Seston samples were collected seasonaly (two samples each time) with a net of 25 µm mesh at 2 knots for 10 min. An aliquot of each sample was fixed with formol (4%) and observed under a conventional microscope to determine its composition and characteristics. For metals analysis, samples were kept frozen in plastic jars until processed. Two fractions of each sample were filtered through preweighed 0.45 µm Millipore filters. The total retained material and filters were dried at 80°C for 2 days and digested with 4 ml of aqua regia at room temperature overnight and then at 90°C for 1 hr. The acid solutions obtained were made up to the final volume of 25 ml with deionized water and then measured with an IL 457 Atomic Absorption Spectrometer. The accuracy of the analysis was

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checked by the standard addition method. Variation coefficients obtained from three replicates were the following (the respective averaged concentrations in brackets): Fe 4% (2037 ppm), Zn 7% (145 ppm), Mn 11% (4479 ppm), Cu 14% (24 ppm), Cd 15% (27 ppm) and Pb 3% (43 ppm). Ni concentrations were below detection limits.

RESULTS AND DISCUSSION

Analysis of seston composition (Table 1) shows the succession of the phytoplanktonic community with high dynamics, probably due to the low water residence time. Diatoms were generally the major fraction of phytoplankton, with a wide variety of species. *Coscinodiscus sp.*, *Gyrosigma sp.*, *Pleurosigma strigosum*, *Striatetella unipunctata*, *Rhizosolenia setigera* and *Ditylum brightwellii* were present in every sample. Large quantities of *Odontella mobiliensis*, *Nitzchia seriata* and *Nitzchia closterium* were observed in September 1986. Two toxic species were found among dinoflagellates: *Alexandrium excavatum* (Braarud) Balech et Tangen = *Gonyaulax excavata* (Braarud) Balech (September-December 1986), which represents a human hazard, and *Dynophysis acuminata* Clap et Lach (December 1986), which produce diarrhetic toxins (Steindinger 1983). *Prorocentrum micans* was the most abundant dinoflagellate observed in December 1985. This organism is found all along the Argentine Sea and may produce water discolorations (Akselman et al. 1986). Zooplankton and detritus were generally scarce. No gross contaminant particles such us tar balls, paints or rust chips were found. Samples collected in july were poor in species and rich in suspended particles, probably introduced by resuspension of bottom sediments.

Metal levels were variable throughout the year and no regular seasonal variation was observed (Table 2). This may be caused by the important succession of the phytoplankton community mentioned above. Effect of discharge waters must be disregarded since the San José Gulf is not affected by water influx from rivers, rainwater or sewage outfalls. Zn, Cu, Cd and Pb concentrations were at the minimum in July, which is in good agreement with the scarce plankton. The very high levels of Fe and Mn found in these samples may be attributed to ferric oxide and manganese dioxide particles. The maximum values of Cu and Cd coincide with the presence of toxic dinoflagellates in December 1986. Further investigation is needed to determine the existence of any correlation between both observations.

Table 1. Seston composition. (Observations under conventional microscope).

	Phytoplankton: Diatoms	Phytoplankton: Dinoflagellates	Zooplankton	Observations
December 1985	*Coscinodiscus* sp. *Pleurosigma strigosum*. *Gyrosigma* sp. *Thalassiosira* sp1. *Thalassiosira* sp2. *Striatella unipunctata*. *Navicula* sp. *Navicula* sp. *Campylodiscus* sp. *Diploneis* sp. *Triceratium antediluvianum*. *Paralia sulcata*. *Biddulphia alternans*. *Rhabdonema adriaticum*. *Amphiprora* sp. *Bacteriastrum furcatum*. *Actinoptychus* sp. *Stauroneis* sp. *Cocconeis placentula*. *Grammatophora marina*.	*Prorocentrum micans*. *Gonyaulax spnifera*. *Protoperidinium* sp.1 *Protoperidinium* sp.2. *Protoperidinium oceanicum*. *Ceratium lineatum*. *Ceratium furca*. *Ceratium horridum*. *Scripsiella* sp.	Foraminifers, zooplankton eggs and crustaceans larval stages in regular quantities.	Samples without detritus.
March 1986	*Stephanopyxis turris*. *Coscinodiscus* sp. *Gyrosigma* sp. *Pleurosigma strigosum*. *Striatella unipunctata*. *Rhizosolenia setigera*. *Ditylum brightwellii*. *Odontella sinensis*. *Biddulphia alternans*. *Amphiprora* sp.	Not observed	Tintinnids, scarce zooplankton.	Samples with abundant detritus
July 1986	*Thalassiosira* sp. *Gyrosigma* sp. *Campylodiscus* sp. *Coscinodiscus* sp. *Odontella sinensis*.	Not observed	Scarce zooplankton	Samples with abundant detritus, poor in species.
August 1986	*Odontella mobiliensis*. *Cylindrotheca closterium*. *Nitzschia seriata*. *Gyrosigma* sp. *Pleurosigma strigosum*. *Ditylum brightwellii*. *Chaetoceros* sp. *Rhizosolenia setigera*. *Lithodesmium undulatum*. *Thalassionema nitzschioides*. *Licmophora* sp. *Striatella unipunctata*. *Coscinodiscus* sp.	*Protoperidinium capurroi*. *Protoperidinium* sp. *Ceratium lineatum*.	Tintinnids, zooplankton eggs and crustaceans larval stages in regular quantities	Samples without detritus.
September 1986	*Odontella mobiliensis*. *Nitzschia seriata*. *Cylindrotheca closterium*. *Rhizosolenia setigera*. *Grammatophora marina*. *Licmophora* sp. *Ditylum brightwellii*. *Gyrosigma* sp. *Pleurosigma strigosum*. *Coscinodiscus* sp. *Striatella unipunctata*. *Thalassionema nitzschioides*. *Odontella aurita*. *Biddulphia alternans*. *Paralia sulcata*. *Triceratium antediluvianum*. *Amphiprora* sp.	*Protoperidinium* sp. *Ceratium lineatum*. *Alexandrium excavatum*.	Zooplankton eggs and crustaceans larval stages in regular quantities	Samples without detritus.
December 1986	*Asterionella japonica*. *Cylindrotheca closterium*. *Ditylum brightwellii*. *Licmophora* sp. *Rhizosolenia setigera*. *Odontella mobiliensis*. *Striatella unipunctata*. *Gyrosigma* sp. *Nitzschia seriata*. *Coscinodiscus* sp. *Thalassionema nitzschioides*. *Biddulphia alternans*.	*Protoperidinium capurroi*. *Protoperidinium* sp. *Prorocentrum micans*. *Zigabikodinum lenticulatum*. *Dinophysis acuminata*. *Scripsiella* sp. *Alexandrium excavatum*	Zooplankton eggs and crustaceans larval stages in regular quantities	Samples without detritus.

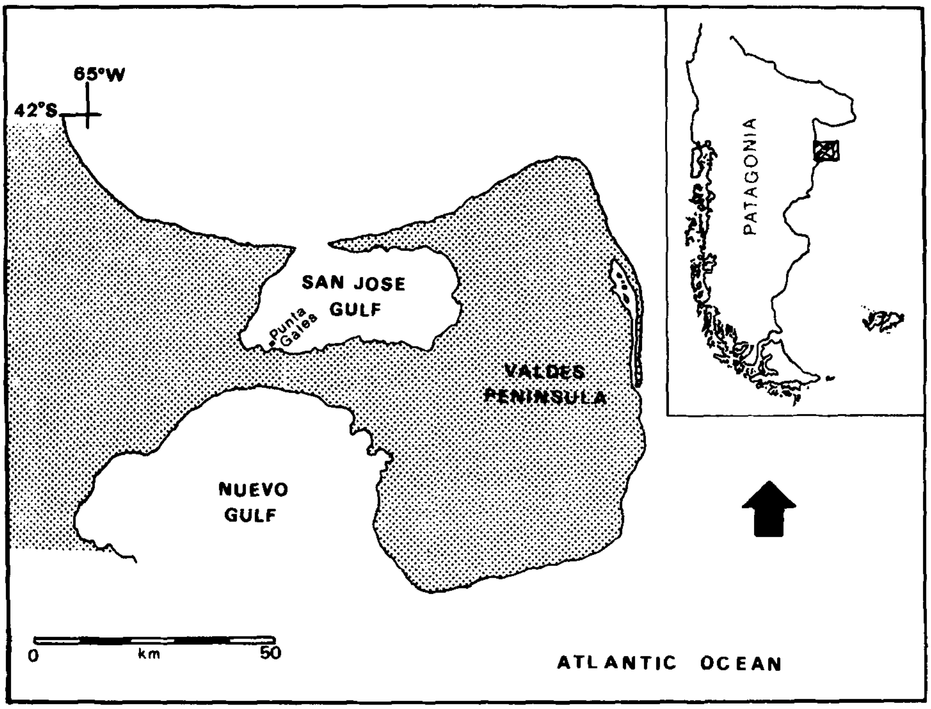

Figure 1. Sampling site.

Table 2. Trace Metal concentrations (ppm, dry wt.) in seston

Date	temp. (°C)	Fe	Zn	Mn	Cu	Cd	Pb	Ni
December 1985	16.0	721	600	948	30	15	111	ND
March 1986	15.2	1355	219	2934	45	24	134	ND
July 1986	11.0	2037	145	4479	24	15	43	ND
August 1986	9.8	1121	556	16116	34	12	144	ND
September 1986	13.0	1371	513	2715	55	-	222	ND
December 1986	10.0	1507	492	2839	93	54	116	ND

-: not analyzed.
ND: not detected (Detection limit for Ni = 0.5 ppm).

This preliminary research will be continued in order to better estimate the spatial and seasonal variations of metal concentrations in plankton from the San José Gulf.

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