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Aspects of hydrochemical balance of «Las Tablas de Daimiel» (C. Real, Spain)

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RESUMEN

«Las Tablas de Daimiel» es una zona húmeda del interior de España, importante por su avifauna.

En la presente investigación se ha realizado un estudio de las características hidroquímicas de «Las Tablas», con el fin de obtener una información objetiva para interpretar el equilibrio del sistema.

Se ha puesto de manifiesto el distinto comportamiento de los ríos Gigüela y Guadiana que confluyen y dan origen a «Las Tablas», tanto en lo referente a caudales a lo largo del año como a contenidos minerales.

El río Gigüela tiene un efecto mineralizante en las aguas de «Las Tablas», mientras que el río Guadiana tiene un efecto diluyente.

Los datos obtenidos permiten afirmar que el encauzamiento del río Guadiana recientemente llevado a cabo impide el mecanismo descrito, con el consiguiente desequilibrio en el sistema estudiado, a menos que se adopten medidas correctoras para restablecer el equilibrio hidroquímico inicial.

ABSTRACT

«Las Tablas de Daimiel» is a humid zone in South Central inland Spain, important for its rich bird wildlife.

A working scheme was set up to study the hydrochemical characteristics of «Las Tablas». The objective was to provide interpreting data of the balance of the system.

The confluence of the rivers Gigüela and Guadiana gives rise to «Las Tablas». The different behaviour of these rivers has been shown.

The river Gigüela has a mineralising effect on the waters of «Las Tablas», while the Guadiana has a diluting effect.

Results obtained show that the recent channelling of the Guadiana prevents the diluting of the waters, with a resulting imbalance in the system, unless corrective measures are adopted to reestablish the original hydrochemical balance.

INTRODUCTION

«Las Tablas de Daimiel» is located in the province of Ciudad Real (Spain), about 150 km south of Madrid (fig. 1). They constitute an important humid area in inland Spain, housing such valuable and interesting bird wildlife that the zone has been recently declared a National Park and Aquatic Wild Bird Reserve (1973). Project MAR classifies this area under category A, i.e., a zone of exceptional interest (Coronado et al., 1974).

«Las Tablas» is a lacustrine zone formed by the widening beds of the Gigüela river at its confluence with the Guadiana river (fig. 1). The slope of the stream at the confluence is very slight, with little if any excavation effect by the river. This results in poor hierarchical differentiation of the hydrographic network. Discharge is impeded and a secondary river bed is formed, and often flooded areas where the river bed totally disappears.

The alluvial plain of the Gigüela river constitutes a formation in erosive discordance with the Miocene limestones and marls of the bottom and sides. These are formed by impermeable materials which make flooding possible.

The study of flow rates in the Gigüela and Guadiana rivers reveals striking differences in their behaviour (Table I).

At the gauging station of Zoacorta the Guadiana river presents a highly regular flow rate throughout the year, with little or no incidence of the dry season. Such regularity arises from the fact that its waters originate from a karstic source known by the name of «Los Ojos del Guadiana».

On the contrary, the Gigüela river shows marked seasonal variations i.e., it presents an irregular annual flow, with flow rates that are at their maximum in March-April, and their minimum in August-September. At Villarrubia de los Ojos, values of 0.00 are recorded for the summer flow rate with a relative frequency of 65,4 %. It is therefore evident that the existence of permanently flooded areas as is found at «Las Tablas» cannot be explained as originating from the water of the Gigüela river.

A possible explanation for the existence of «Las Tablas» may be found, however, in the interrelation of the system Gigüela - Las Tablas - Guadiana. The course of the Guadiana river entering the «Las Tablas» area from S.E. to N.W. provides a water supply to the zone even during the summer season, avoiding drying up.

A working scheme was set up to study the hydrochemical characteristics of «Las Tablas», to provide interpreting data of the balance of the system.

MATERIALS AND METHODS

Testing points were fixed in locations as indicated in Table 2 and fig. 1. Sampling was carried out at monthly intervals during a complete annual cycle (1972-73). The results corresponding to this cycle were checked against those from samples taken during the two subsequent cycles (1973-1975) at longer time intervals.

Main sampling points were G-3 (Guadiana) and GI-8 (Gigüela). Samples were temporarily stored in polyethylene bottles. After filtering the following laboratory determinations were carried out: pH by potentiometry (accuracy of $\pm$ 0.05 pH units), electric conductivity E.C. by conductimetry (acc. $\pm$ 0.1 mmho/cm at 25 °C), calcium and magne-

TABLE 1.- Discharge: The study of flow rates in the Guadiana and Cigüela rivers reveals striking differences in their behaviour.

river	Cigüela	Guadiana
Sampling points	Villarrubia de los Ojos	Zoacorta
Code No.	2-4	7.1
No. years	26	21
MEAN OF MONTHLY FLOW (m^3/sec)		
January	4.027	2.448
February	5.967	2.541
March	6.121	2.477
April	6.166	2.426
May	4.793	2.517
June	3.368	2.539
July	1.293	2.389
August	0.347	2.138
September	0.162	1.967
October	0.596	2.018
November	2.247	2.183
December	3.096	2.410

sium by complexometry (acc. ± 0.01 meq/1), sodium by emission spectrometry (acc. ± 0.01 meq/1), sulphates by gravimetry (acc. ± 0.01 meq/1), chlorides by volumetry (acc. ± 0.01 meq/1), and carbonates and bicarbonates by acidimetry (acc. ± 0.01 meq/1). All determinations were performed at Level II of Golterman (1971). Criteria for evaluation and classification were those of the United States Salinity Laboratory (Richards, 1954, 1969), and Schoeller (1962).

Data related to flow rates was computed from that recorded at the gauging stations of the Public Works Department (M.O.P. 1966, 1970).

RESULTS

Selected analytical data are reported in Table 3 (Guadiana river) and Table 4 (Gigüela river). The variation of the hydrochemical characteristics of Guadiana river upstream (G-1) and downstream (G-2 and G-3) from «Las tablas de Daimiel» is illustrated in figs. 2 and 3, where as fig-4 shows characteristics of the Giguela River (GI-8).

DISCUSSION

According to the results, two subzones may be distin-

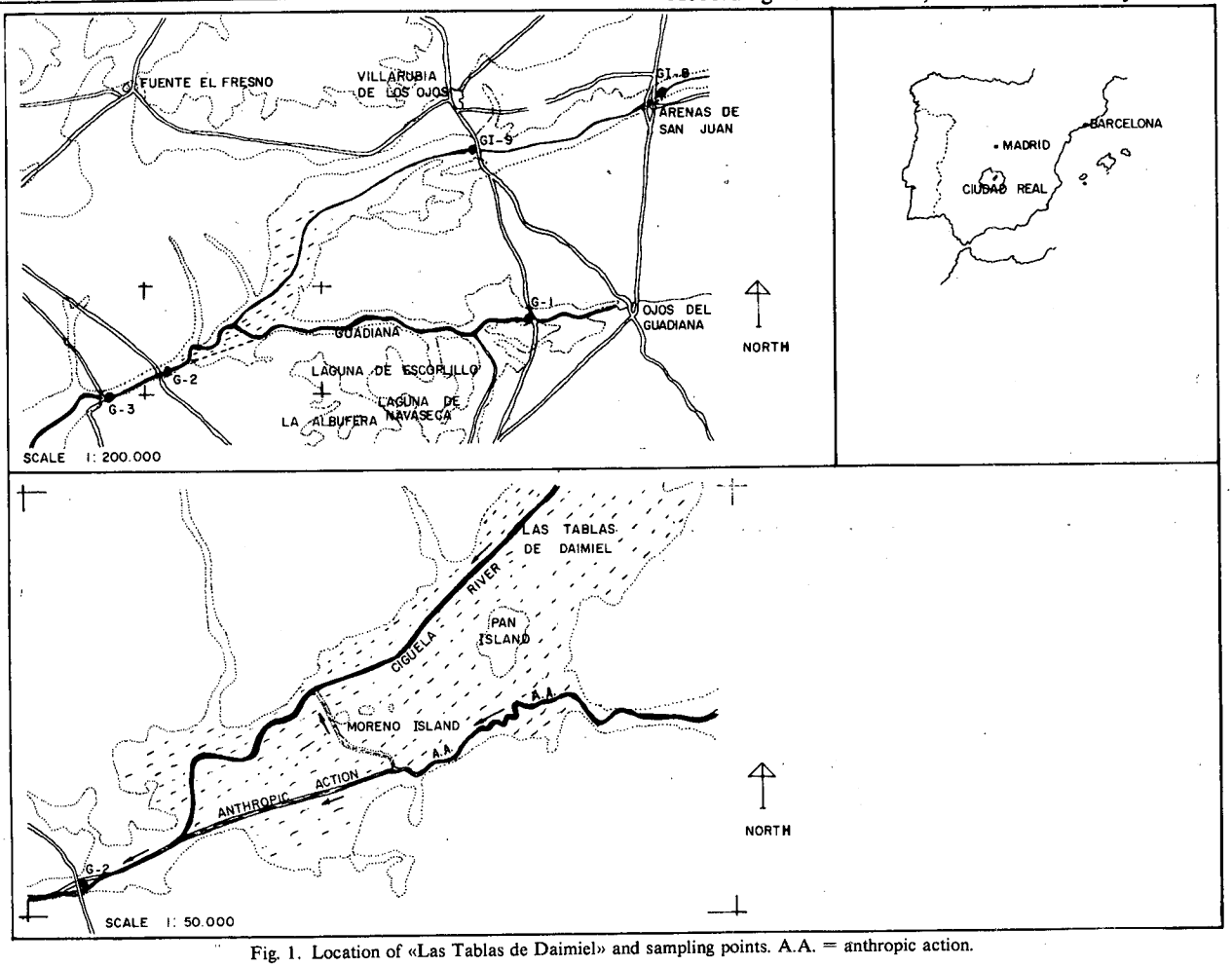

Fig. 1. Location of «Las Tablas de Daimiel» and sampling points. A.A. = anthropic action.

guished in the middle course of the Guadiana river: one (SZ-1) extending from the place named «Los Ojos del Guadiana» to «Las Tablas de Daimiel», and another (SZ-2) extending downstream from Las Tablas.

Waters SZ-1 originated from a calcareous Miocene are scarcely mineralized: their chloride and sulphate contents are low, and so are the contents of sodium, magnesium and calcium (stated in increasing order). The water sampled at Zoacorta shows values for the electric conductivity oscillating along the annual cycle, between 680 and 760 micromhos/cm at 25 °C.

No increase of the salt content is observed in these waters during the dry season, a fact that is consistent with the highly regular flow rate of the river all through the year.

The annual variation of the salt content of the Guadiana river at the points G-2 and G-3, both lying within the subzone SZ-2, indicates that the quality of its waters improves with the arrival of the dry season, and is maintained from July to November. During these months the values of electrical conductivity are about 50 % of those attained during the rest of the year.

In November, the sulphate content increases abruptly, from 5 meq/1 to 20 meq/1 or more, a value that corresponds to near saturation in gypsum. Also the contents of calcium, magnesium and sodium increasse accordingly.

For the whole period, pH values were above neutrality, i.e., the waters were alcaline. This would indicate that bivalent cations, especially calcium, predominate over monovalent cations.

The curves for the variation of Ca^{2+} and Mg^{2+} contents throughout the annual cycle show oscillations identical to those of E.C.

The behaviour of the hydrochemical characteristics of the Guadiana river may be explained in therms of the flow of the Gigüela river. There is no water intake from this river into the Guadiana during the dry season.

As long as the Gigüela river is not functional, the Guadiana is hydrochemically uniform, i.e., its Ca^{2+} and Mg^{2+} contents are slightly lower at the heading: 4.40 meq/1 of Ca^{2+} (G-1) against 6.90 meq/1 of Ca^{2+} (G-3), or 2.90 meq/1 of Mg^{2+} (G-1) against 3.00 meq/1 of Mg^{2+} (G-3). After November, these values are doubled or even tripled in the subzone which is under the influence of Gigüela river (SZ-2); 22 meq/1 of Ca^{2+} and 7.60 meq/1 of Mg^{2+} in G-3 (20-11-72). At this time of the year, just after the first and more intense autumn rainfall, there is once again water intake from the Gigüela into the Guadiana.

Salts which rise to the soil surface after the end of the wet season are washed away again by the first rainfalls. As autumn advances the salt content decreases, but the influence of the water intake from the Gigüela river into the Guadiana still persists, and so does the influence on the hydrochemical balance of Las Tablas.

The ratio between EC and total cation content oscillates between 73 and 95, the mean value for the annual cycle being 82.75. Those values indicate that the waters are rich in sulphates and bicarbonates, with high levels of Ca and Mg (Tames, 1969). This agrees with the remaining results.

In relation to the anion contents, it might be stated that the waters from the Guadiana river are «normally chlorinated», «normally sulphated», and «normally carbonated», during the summer season, according to the classification of Schroeller (1962). After water intake from the Gigüela river, these become «oligosulphated» (G-2 and G-3).

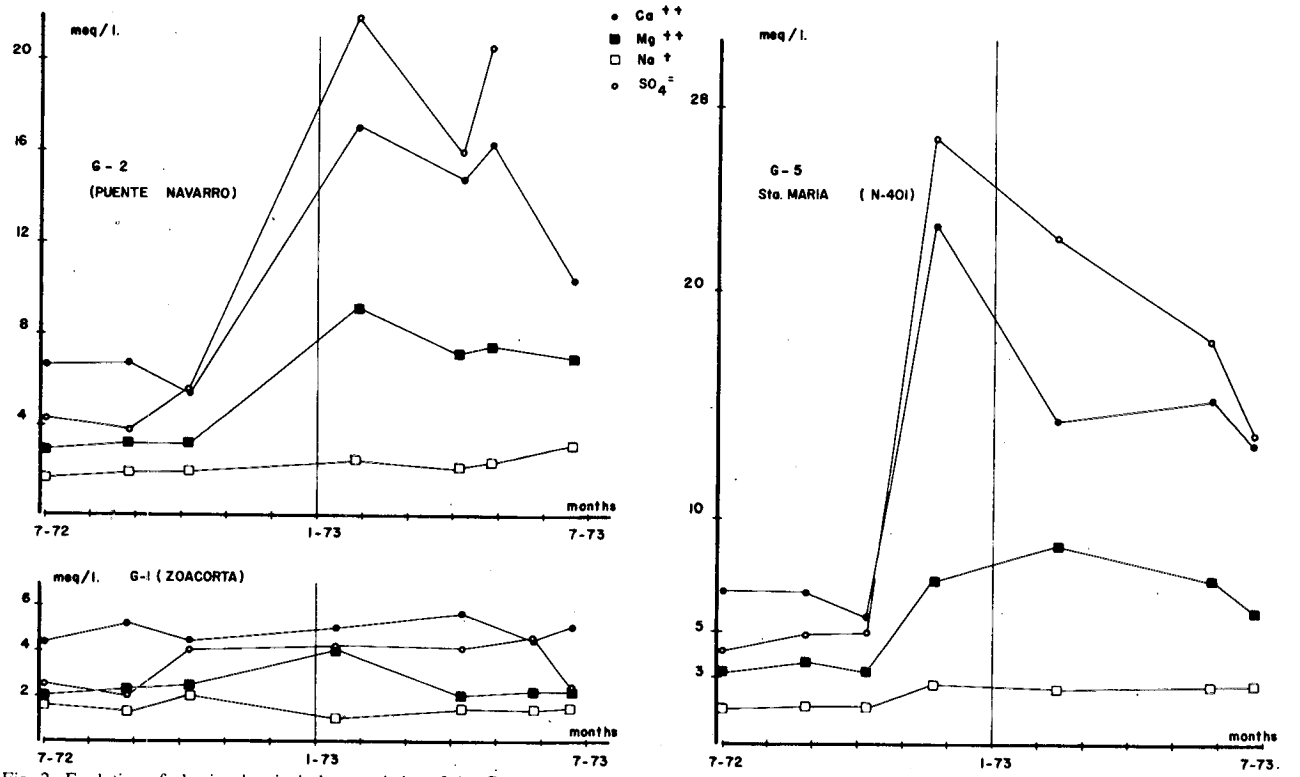

Fig. 2. Evolution of physicochemical characteristics of the Guadiana river: G-1 (Zoacorta) upstream and G-2 (Puente Navarro) and G-5 (Santa Maria Bridge) dowstream of «Las Tablas de Daimiel».

TABLE 2.- Location of sampling points in the water courses.

river	sampling point	waters	relative location to Las Tablas de Daimiel
Guadiana	Zoacorta (G-1)	Guadiana	upstream
	Puente Navarro (G-2)	Guadiana + + Cigüela	downstream
	Torralba to Malagon (G-3)	Guadiana + + Cigüela	downstream
	Puente Santa María (G-5)	Guadiana + + Cigüela	downstream
Cigüela	Arenas de San Juan (GI-8)	Cigüela	upstream
	Villarrubia de los Ojos(GI-9)	Cigüela	upstream

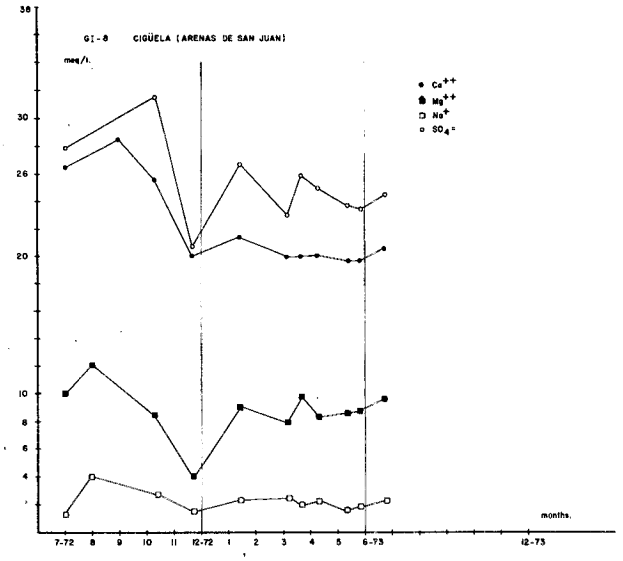

Fig. 4. Evolution of physicochemical characteristics of Gigüela river (Arenas de San Juan).

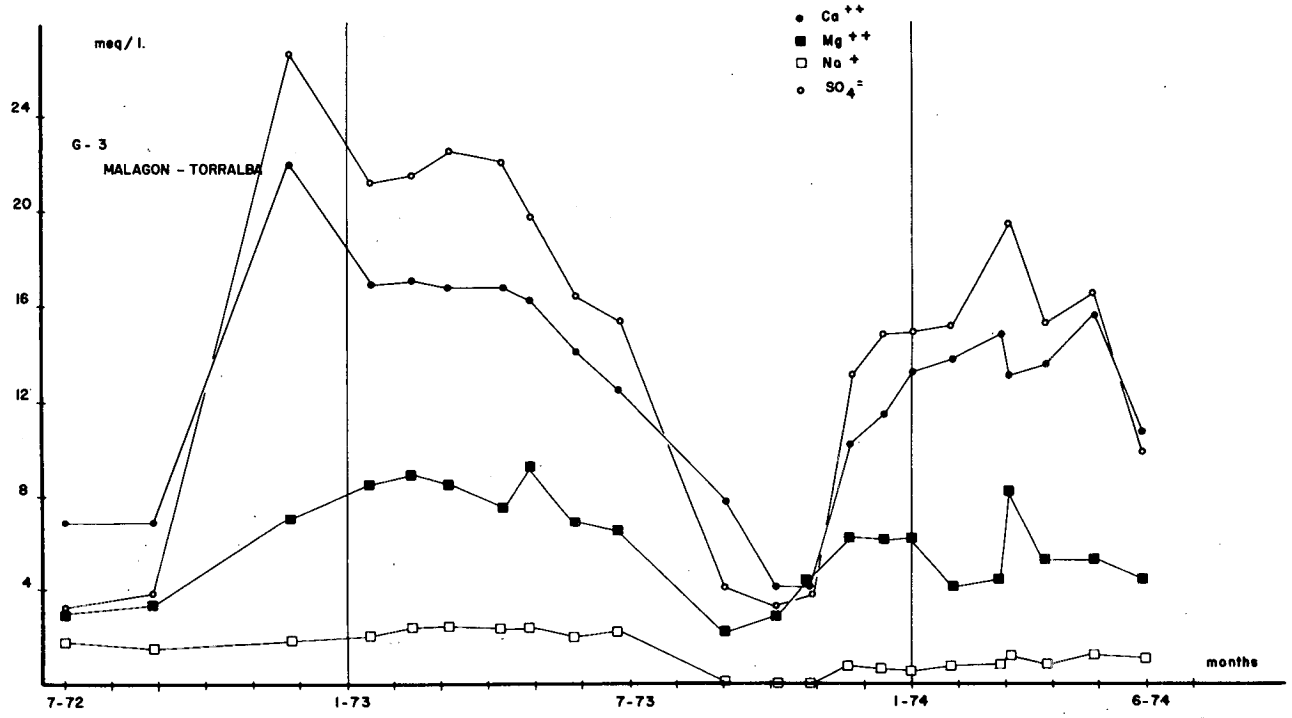

Fig. 3. Evolution of physicochemical characteristics of Guadiana river: during the dry season theres no water intake from Cigüela river into the Guadiana.

Values of SAR are low at any time during the year; therefore they belong to class S-1 of the U.S.S.L. classification (1954, 1969). Since the subzone SZ-1 has a lower salt contents it is classified as C-2, while SZ-2 becomes C-3.

For the waters of the Gigüela river values for the E.C. are above 2.000 micromhos/cm at 25 °C and below 2.800 micromhos/cm at 25 °C. Maximum values are reached during the period July-October. In November a relative minimum is reached, due to the increase resulting from the floeds over the whole zone. The direct mean value for the annual cycle is 2,443 micromhos/cm at 25 °C. pH values oscillate between 7.20 and 8.40, i.e., waters are alcaline, with a predominance of Ca^{2+} and Mg^{2+} over monovalent cations.

The Ca^{2+} contents are above 20 meq/1, but they never go above 29 meq/1; Mg^{2+} contents oscillate between 6.00 and 12 meq/1. The ratio Ca^{2+}/Mg^{2+} stays within 2.25 to 5.00; the annual mean value being 2.75.

Sodium is a minor cationic component. Its percentage with respect to the total oscillates between 5 and 9 %.

Accordingly, SAR values are lower than those for the

TABLE 3.- Selected analytical data: evolution of physicochemical characteristics of the Guadiana river.

SAMPLING POINTS	SAMPLE No	DATE	E.C. µmho/cm 25º	SAR	CLASS	pH	$\frac{Na}{S}$ %	$\frac{Ca^{++}}{Mg^{++}}$	CATIONS (meq/l)				ANIONS (meq/l)					E.C. / S
									Ca^{++}	Mg^{++}	Na^{+}	TOTAL S	Cl^{-}	$SO_4^{=}$	CO_3H^{-}	$CO_3^{=}$	TOTAL S'	
C-1	1	07-72	682	0.84	C2-S1	8.20	18.00	1.50	4.40	2.90	1.60	8.90	2.00	2.57	3.30	0.90	8.77	76.6
ZOACORTA	11	28-08-72	761	0.67	C3-S1	7.20	14.80	2.26	5.20	2.30	1.30	8.80	0.50	2.14	4.10	1.20	7.94	86.4
	23	09-10-72	721	1.08	C2-S1	7.85	22.73	1.83	4.40	2.40	2.00	8.80	0.25	4.05	3.40	0.80	8.50	81.9
	58	13-01-73	750	0.94	C2-S1	7.80	10.00	1.25	5.00	4.00	1.00	10.00	1.00	4.10	3.70	1.00	9.80	75.0
	119	08-04-73	756	0.76	C3-S1	8.05	16.40	2.74	5.60	2.04	1.50	9.14	0.75	4.11	4.20	0.00	9.06	90.0
	160	26-05-73	760	0.76	C3-S1	8.30	17.20	2.01	4.51	2.24	1.40	8.15	1.30	4.54	1.90	0.16	7.90	93.8
	184	20-06-73	758	0.78	C3-S1	8.25	16.90	2.28	5.10	2.24	1.50	8.84	1.65	2.42	3.69	1.34	9.10	85.7
DIRECT MEAN			741	0.83	C2-S1	7.95	16.60	1.91	4.88	2.64	1.50	8.94	1.06	3.42	3.47	0.77	8.72	83.9
	500	09-09-74	750	0.45	C2-S1	8.10	11.80	3.26	4.93	1.51	0.76	7.20	0.00	5.00	1.00	1.00	7.00	116.45
	560	03-10-74	730	0.57	C2-S1	8.05	13.00	2.10	4.72	2.24	1.04	8.00	1.29	2.34	4.38	0.00	8.01	91.2
C-3	3	07-72	1023	0.81	C3-S1	7.50	15.40	2.30	6.90	3.00	1.80	11.70	2.50	3.25	4.45	0.70	10.90	87.6
TORRALBA TO	13	28-08-72	1059	0.66	C3-S1	7.95	12.80	2.10	6.90	3.30	1.50	11.70	1.75	3.85	3.70	1.20	10.50	84.0
MALAGON	41	20-11-72	2442	0.46	C4-S1	7.50	5.70	2.90	22.00	7.60	1.80	31.40	1.50	26.73	4.10	0.00	32.30	77.7
	56	13-01-73	2199	0.56	C3-S1	7.65	7.30	1.97	16.90	8.75	2.00	27.47	1.00	21.25	3.20	0.70	26.10	80.0
	88	10-02-73	2168	0.66	C3-S1	8.00	8.40	1.90	17.13	8.97	2.40	28.50	2.25	21.50	3.38	1.00	28.13	76.0
	95	03-03-73	2057	0.65	C3-S1	8.00	8.36	2.00	16.80	8.40	2.30	27.50	2.00	22.56	3.16	0.84	28.56	74.8
	130	08-04-73	1967	0.66	C3-S1	7.80	8.60	2.25	16.95	7.55	2.30	26.81	2.00	22.10	3.44	0.60	28.14	73.4
	134	28-04-73	1868	0.67	C3-S1	7.90	8.60	1.70	16.20	9.29	2.40	27.89	2.75	19.94	3.38	0.68	26.75	66.9
	165	26-05-73	1848	0.62	C3-S1	8.20	8.70	2.03	14.07	6.93	2.00	23.00	3.00	16.45	2.35	0.60	22.40	80.3
	183	20-06-73	1710	0.71	C3-S1	7.90	10.39	1.90	12.44	6.53	2.20	21.17	3.15	15.44	2.94	0.81	22.34	80.7
DIRECT MEAN			1848	0.65	C3-S1	7.80	9.42	2.10	14.63	7.01	2.00	23.71	2.19	17.30	3.41	0.71	23.61	77.8
D. MEAN without Cigüela (dry season)			1041	0.73	C3-S1	7.70	14.10	2.20	6.90	3.15	1.65	11.70	2.13	3.55	4.07	0.95	10.70	85.7
		01-09-73	1210	0.07	C3-S1	7.70	1.64	3.59	7.98	2.22	0.17	10.37	2.00	4.10	3.70	1.00	10.80	116.7
		05-10-73	870	0.00	C3-S1	7.20	0.00	1.38	4.13	2.99	0.00	7.12	2.00	3.35	1.80	0.40	7.55	115.2
		25-10-73	990	0.00	C3-S1	7.30	0.00	0.97	4.13	4.24	0.00	8.37	1.50	3.90	2.90	0.80	9.10	108.8
		19-11-73	1650	0.24	C3-S1	7.90	4.05	1.67	10.22	6.11	0.69	17.02	2.00	13.10	1.30	0.20	16.60	96.9
		13-12-73	1680	0.20	C3-S1	7.80	3.35	1.89	11.52	6.07	0.61	18.20	2.00	14.85	1.60	0.40	18.85	92.3
		01-01-74	1860	0.17	C3-S1	7.95	2.60	2.13	13.26	6.21	0.52	19.99	1.50	14.95	3.20	1.00	20.65	93.0
		26-01-74	1800	0.26	C3-S1	8.20	4.15	3.32	13.86	4.17	0.78	18.81	1.00	15.20	2.50	0.40	19.10	95.7
		28-02-74	1870	0.26	C3-S1	8.25	4.05	3.36	14.96	4.45	0.82	20.23	1.20	14.90	3.30	0.40	19.80	92.4
		02-03-74	1870	0.31	C3-S1	8.20	4.63	1.57	13.09	8.32	1.04	22.45	1.50	19.50	1.60	0.20	22.80	83.3
		28-03-74	1930	0.29	C3-S1	8.00	4.58	2.55	13.62	5.33	0.91	19.86	2.00	15.30	2.50	0.40	20.20	97.2
		29-04-74	2120	0.37	C3-S1	8.20	5.49	3.01	15.75	5.22	1.22	22.19	1.00	16.50	3.00	1.20	21.70	95.5
		30-05-74	1620	0.37	C3-S1	8.00	6.34	2.37	10.81	4.55	1.04	16.40	0.80	9.95	4.90	0.80	16.45	98.8

Guadiana river. Under the criteria of U.S.S.L., these waters are classified as S-1, and as C-3 and C-4, with a dominance of C-4.

According to the criteria of Schoeller the waters of the Gigüela river are classified as «normally chlorinated»; the «sulphated» ones are predominant, even when some waters are just «oligosulphated»; they are «far from saturation», and are «normally carbonated».

CONCLUSIONS

The Guadiana and Gigüela rivers which meet at «Las Tablas de Daimiel» have both dissimilar hydrochemical and flow characteristics.

The Guadiana has a flow rate which is uniform throughout the year, and its salt content is low. Conversely, the Gigüela river shows the effects of a pronounced dry season, and its salt content becomes high.

The interaction of both water courses within the Gigüela-Las Tablas-Guadiana system maintains a hydrochemical balance at Las Tablas de Daimiel.

The results obtained show that the balance has been endangered recently by the anthropic action introduced when the course of the Guadiana river was rectified, since from that moment the Guadiana river no longer forms part of the system.

TABLE 4.- Selected analytical data: evolution of physicochemical characteristics of the Cigüela river.

SAMPLIG POINTS	SAMPLE No	DATE	E.C. µmho/cm 25°C	SAR	CLASS	pH	Na % S	$\frac{Ca^{++}}{Mg^{++}}$	CATIONS (meq/l)				ANIONS (meq/l)					E.C. S
									Ca^{++}	Mg^{++}	Na^{+}	TOTAL S	Cl^{-}	$SO_4^{=}$	CO_3H^{-}	$CO_3^{=}$	TOTAL S	
GI - 8	7	07-72	2789	0.30	C4-S1	7.25	3.40	2.65	26.50	10.00	1.30	37.80	2.00	27.90	6.70	0.00	36.60	73.8
ARENAS DE SAN JUAN	17	31-08-72	3154	0.89	C4-S1	7.65	8.90	2.35	28.50	12.10	4.00	44.60	5.00	37.81	4.00	1.90	43.71	70.7
	29	08-10-72	2663	0.65	C4-S1	7.95	7.30	3.04	25.60	8.40	2.70	36.70	1.25	31.50	2.45	0.60	35.80	72.5
	37	17-11-72	2093	0.43	C3-S1	7.70	5.80	5.00	20.00	4.00	1.50	25.50	0.75	20.75	3.00	0.40	24.90	82.0
	54	13-01-73	2496	0.59	C4-S1	7.70	7.00	2.38	21.42	9.00	2.30	32.72	0.50	26.73	3.15	1.00	31.38	72.7
	86	03-03-73	2224	0.64	C3-S1	7.90	7.90	2.53	20.00	7.94	2.40	30.34	2.50	23.03	3.28	1.04	29.89	66.6
	124	18-03-73	2417	0.52	C4-S1	8.00	6.30	2.04	20.00	9.80	2.00	31.80	1.50	25.96	2.92	0.48	30.86	76.0
	129	08-04-73	2307	0.58	C4-S1	7.90	7.10	2.41	20.19	8.37	2.20	30.76	1.50	25.10	3.04	0.80	30.44	75.0
	151	13-05-73	2446	0.42	C4-S1	8.10	5.30	2.31	19.78	8.56	1.60	29.94	1.00	23.75	3.36	1.04	29.15	81.7
	161	26-05-73	2228	0.50	C3-S1	8.00	6.20	2.25	19.78	8.77	1.90	30.45	2.70	23.47	2.60	0.63	29.40	64.6
	185	20-06-73	2350	0.56	C4-S1	7.95	6.80	2.15	20.60	9.59	2.20	32.39	2.25	24.35	3.60	1.44	31.64	72.5
DIRECT MEAN			2469	0.55	C4-S1	7.80	6.54	2.65	22.23	8.86	2.20	33.00	1.90	26.40	3.46	0.85	32.16	73.6
		28-05-73	2590	0.17	C4-S1	8.20	2.25	2.68	19.32	7.20	0.61	27.13	2.50	23.10	2.40	0.40	28.40	95.4
		17-06-73	2530	0.12	C4-S1	8.25	1.58	2.51	19.11	7.61	0.43	27.15	2.50	22.90	1.40	0.20	27.00	93.2
		03-07-73	2440	0.16	C4-S1	8.10	1.98	2.10	20.43	9.72	0.61	30.76	1.00	27.50	1.90	0.80	31.20	79.3
		17-07-73	2920	0.24	C4-S1	8.30	3.14	2.79	22.68	8.12	1.00	31.80	2.50	28.10	2.60	0.40	33.60	91.8
		15-08-73	3190	0.36	C4-S1	8.35	4.09	2.43	24.57	10.11	1.48	36.16	2.50	32.10	3.00	0.20	37.80	88.2
		20-10-73	3080	0.47	C4-S1	8.30	5.59	2.30	22.47	9.76	1.91	34.14	3.50	26.55	3.80	1.00	34.85	90.2
		20-11-73	2700	0.24	C4-S1	8.30	3.66	2.49	19.95	8.00	0.91	24.86	2.50	19.20	1.40	0.40	23.50	108.6
		09-12-73	2640	0.23	C4-S1	8.20	2.95	2.85	19.95	6.98	0.82	27.75	2.00	23.70	2.20	0.60	28.50	95.1
		17-11-74	3064	0.73	C4-S1	8.30	7.67	1.68	24.44	14.56	3.24	42.24	4.50	34.90	2.80	1.40	43.60	72.5
		21-12-74	2370	0.60	C4-S1	8.00	7.04	1.86	19.59	10.51	2.28	32.28	2.50	27.20	2.40	1.60	33.70	73.2
GI - 9	8	07-72	2557	0.88	C4-S1	7.30	9.80	3.02	24.80	8.20	3.60	36.60	5.00	20.90	9.40	0.00	35.30	68.8
VILLARRUBIA DE LOS OJOS	18	31-08-72	1693	1.23	C3-S1	7.80	16.90	1.98	12.10	6.10	3.70	21.90	1.75	14.30	3.00	1.20	20.25	77.30
	28	09-10-72	2674	0.61	C4-S1	7.70	6.90	2.45	24.00	9.80	2.50	36.30	1.75	29.75	3.10	0.80	35.40	73.6
	87	03-03-73	2335	0.59	C4-S1	8.00	7.10	1.86	19.38	10.40	2.30	32.08	1.00	27.33	3.04	0.76	32.13	78.8
	125	08-04-73	2307	0.58	C4-S1	8.10	6.70	2.25	23.20	10.30	2.40	35.90	4.25	28.79	3.06	0.80	36.90	66.0
	167	26-05-73	2337	0.51	C4-S1	8.10	6.20	2.24	21.00	9.38	2.00	32.38	3.00	26.13	2.00	0.77	31.90	72.1
	192	20-06-73	2424	0.60	C4-S1	8.15	7.10	2.85	23.26	8.16	2.40	33.82	2.00	25.21	4.17	0.72	32.10	71.7
DIRECT MEAN			2332	0.72	C4-S1	7.90	8.67	2.38	21.10	8.90	2.70	32.71	2.68	24.63	3.97	0.72	31.99	71.9

As a result, the Gigüela-Las Tablas-Guadiana system was split into two subsystems, (Gigüela-Las Tablas and Guadiana), endangering the natural balance of the former system.

This will result in progressive mineralization of the water of «Las Tablas» unless water from the Guadiana river is pumped in at regular time intervals. Simultaneously, water from «Las Tablas» should be drawn off or the initial balance should be restored.

Previous knowledge of the nature of the soils in the alluvial plain of the Gigüela river (Porta, 1975), allows one to anticipate that the mineralization will proceed predominantly by the accumulation of gypsum and magnesium sulphate. Gypsum will be formed by the evaporite phenomena that might be produced.

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