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Data Article

Dataset for analyzing and modelling the eutrophication processes in groundwater-coastal lagoon systems: The La Pletera lagoons case study (NE Spain)

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A R T I C L E I N F O

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Dataset link: Piezometric data of the La Pletera salt marsh area (Original data)
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A B S T R A C T

A comprehensive hydrogeological report was conducted to determine the origin, occurrence and processes affecting nitrogen in a Mediterranean coastal aquifer-lagoon system. Water levels, hydrochemical and isotopic data was gathered during a 4-year period in the La Pletera salt marsh area (NE Spain). They were collected from the alluvial aquifer, two natural lagoons and four other permanent lagoons excavated during a restoration process (in 2002 and 2016), two watercourses (the Ter River and the Ter Vell artificial channel), 21 wells (considering six of them for groundwater sampling) and the Mediterranean Sea. Potentiometric surveys were carried out seasonally, however twelve-monthly campaigns (from November 2014 to October 2015), and nine seasonal campaigns (from January 2016 to January 2018) were conducted for hydrochemical and environmental isotopes analyses. The evolution of the water table was analysed for each well, and potentiometric maps were plotted to determine the relationship between the aquifer and the lagoons, sea, water-

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courses, and groundwater flow. Hydrochemical data included physicochemical data measured *in situ* (temperature, pH, Eh, dissolved oxygen, and electrical conductivity), major and minor ions (HCO_3^-, CO_3^{2-}, Cl^-, SO_4^{2-}, F^-, Br^-, Ca^{2+}, Mg^{2+}, Na^+, and K^+), and nutrients (NO_2^-, NO_3^-, NH_4^+, Total Nitrogen (TN), PO_4^{3-}, and Total Phosphorus (TP)). Environmental isotopes included stable water isotopes ($\delta^{18}O$ and δD), nitrate ($\delta^{15}N_{NO3}$ and $\delta^{18}O_{NO3}$) and sulphate isotopes ($\delta^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$). Water isotopes were analysed for all campaigns, however, nitrate and sulphate isotopes water samples were only analysed in some particular surveys (November and December 2014; January, April, June, July and August 2015). Additionally, two more surveys for sulphate isotopes were conducted in April and October of 2016. The data generated through this research may be used as a starting point to analyse the evolution of these recently restored lagoons, and their future responses to global change. In addition, this dataset may be used to model the hydrological and hydrochemical behaviour of the aquifer.

Specifications Table

Subject	Environmental Science
Specific subject area	*The specific subject area for this dataset can be "Hydrology" and "Water quality", as well as, "Pollution", since there is not a specific subject area for hydrogeological studies data.*
Type of data	*Table and Figure*
How the data were acquired	Data were obtained through 21 sampling campaigns (2014-2019). Surveys included hydrochemical and isotopic sampling, and the measurement of potentiometric data (using Schlumberger water data loggers, and a potentiometric prober). Physicochemical parameters were determined *in situ*, using a flow cell for wells. Samples for major ions, nutrients and environmental isotopes were taken, filtered when necessary, stored in a fridge at 4^0 C in a dark environment, and frozen at -20 ^{0}C in the lab for nitrate and sulfate isotopes. Analyses conducted and their precision were described in [1] and [2].
Data format	Raw, Analyzed
Description of data collection	Data were obtained in the La Pletera salt marsh area from two natural lagoons, four excavated lagoons (in 2002 and 2016), 21 wells and piezometers (only six of them for hydrochemical and isotopic surveys), two water courses, and the Mediterranean Sea. Monthly surveys were conducted during the first year, and seasonal surveys during the rest of the studied period, which included hydrochemical and isotopic sampling. Potentiometric data were determined seasonally.
Data source location	• Institution: Universitat de Girona • City/Town/Region: L'Estartit, Girona, Catalunya • Country: Spain • Latitude and longitude: 42.0513° N,3.1905° E
Data accessibility	Repository name: Figshare Data identification number: 21820764 and 21809409 Direct URL to data: https://doi.org/10.6084/m9.figshare.21820764 and https://doi.org/10.6084/m9.figshare.21809409
Related research article	*Menció, A., Madaula, E., Meredith, W., Casamitjana, X, Quintana, X.D. (2023) Nitrogen in surface aquifer - coastal lagoons systems: Analyzing the origin of eutrophication processes. Science of the Total Environment, 871, 161947.* DOI:10.1016/j.scitotenv.2023.161947

Value of the Data

- This dataset provides comprehensive information of the hydrochemical, isotopic and potentiometric data of a Mediterranean aquifer-coastal lagoon system (for a period of 4 years).
- This dataset includes data from natural and recently excavated lagoons, which can be used as a starting point to analyse and compare the evolution of both, and their future responses to global change.
- Water table data, as well as water levels of the lagoons, river and sea may be used to model the hydrogeological behaviour of the aquifer, and its relationship with the lagoons (i.e. modflow, feflow, etc.). In addition, hydrochemical and isotopic data can be useful in testing reactive-transport modelling.

1. Objective

This dataset was generated to study the behavior of a Mediterranean coastal lagoons-aquifer system. In particular, the processes affecting nitrogen as a source of their possible eutrophication from the aquifer to the lagoons were analyzed. Also, piezometric data, together with hydrochemical and isotopic data, were combined to determine the aquifer behavior and its role in maintaining the La Pletera salt marsh area lagoons (NE Spain). Nitrate and sulfate stable isotopes were used to determine the origin of nitrate pollution in this area, and the natural nitrate attenuation processes occurring within the aquifer.

The dataset provides comprehensive and necessary information for analyzing the eutrophication processes in groundwater- coastal lagoon systems. Although a summary of these 21 sampling campaigns, their analysis and interpretation have been provided here, the presentation of the whole dataset may be useful for better interpretation, and can be a starting point for new research in similar coastal areas.

2. Data Description

2.1. Piezometric Data

Raw piezometric data of this study area are available in the repository https://doi.org/10.6084/m9.figshare.21809409. Provided in this file are water table values (m a.s.l.) that were obtained in wells located in the Ter River alluvial aquifer (NE Spain) and are associated with the La Pletera salt marsh lagoons, for a total of 19 seasonal surveys (conducted between 2014 and 2019). Also, water levels of the studied lagoons for the same period are also provided. An example of potentiometric map of the studied unconfined alluvial aquifer with the location of the monitoring wells, and lagoons is shown in Fig. 1. In addition, Table 1 provides a summary of the water table mean, standard deviation (S.D.), minimum, maximum and differences between the minimum and maximum levels measured in the monitoring wells, according to their situation in the study area. They are distinguished by those located in the North, which are more distant to the Ter River, the wells located in the center of the study area, and those located in the south, which are the closest to the Ter river.

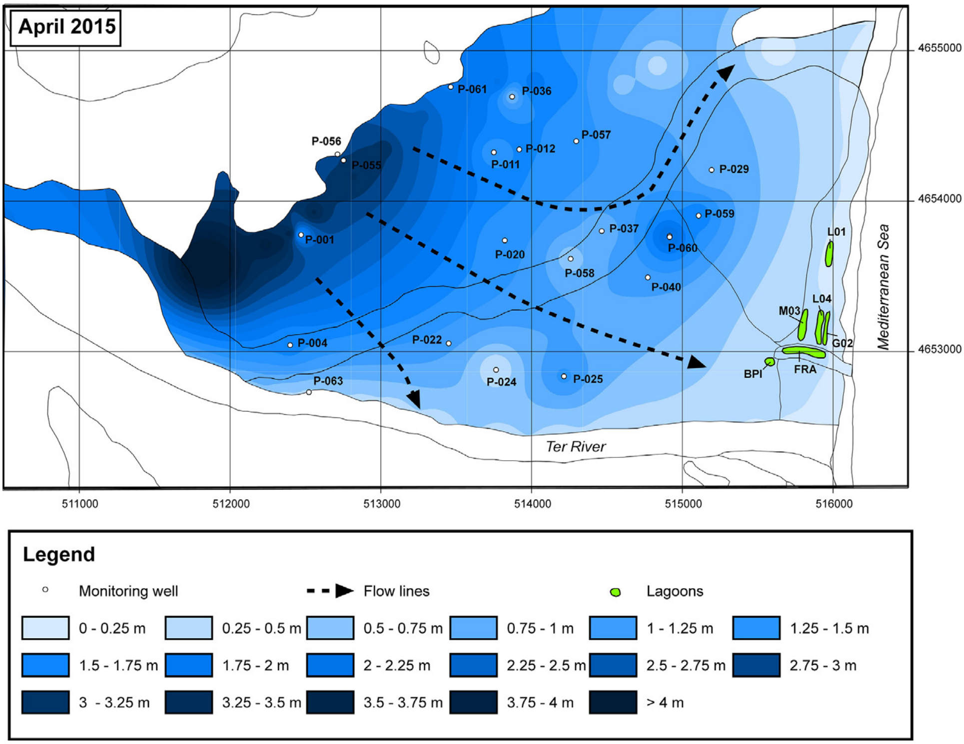

Fig. 1. Potentiometric map of April 2015 survey (adapted from [1]) and the locations of monitoring wells, and lagoons.

Table 1
Summary of the water table levels (in m. a.s.l.) measured in the monitoring wells of the study area (Fig. 1). Legend: S.D., standard deviation: min, minimum level; max., maximum level; Max-Min difference, difference between the maximum and minimum water table level.

Well Code	Mean (m. a.s.l.)	S.D. (m. a.s.l.)	Min (m. a.s.l.)	Max (m. a.s.l.)	Max-Min difference (m. a.s.l.)
Northern wells					
P-055	2.66	0.57	1.55	3.52	1.97
P-056	2.01	0.79	0.64	3.07	2.43
P-001	1.48	0.55	0.33	2.35	2.02
P-011	1.28	0.29	0.73	1.77	1.04
P-012	0.90	0.37	0.29	1.56	1.27
P-036	0.70	0.44	0.15	1.22	1.07
P-057	1.13	0.23	0.85	1.37	0.52
Center wells					
P-020	1.20	0.28	0.69	1.75	1.06
P-058	0.57	0.25	0.13	1.1	0.97
P-059	1.64	0.22	1.32	2.07	0.75
P-060					
P-028	0.14	0.17	-0.21	0.35	0.56
P-029	0.63	0.22	0.25	1.02	0.77
P-037	0.70	0.24	0.3	1.17	0.87
P-040	2.03	0.24	1.71	2.46	0.75
Southern wells					
P-004	1.51	0.17	1.18	1.78	0.6
P-024	0.27	0.28	-0.05	1.12	1.17
P-026	1.17	0.18	0.83	1.56	0.73
P-062	-0.02	0.14	-0.165	0.33	0.49
P-063	1.09	0.17	0.88	1.48	0.6

2.2. Hydrochemical and Isotopic Data

The main physicochemical data measured *in situ* during the sampling campaigns are summarized In Table 2. The total number of data, mean, standard deviation, minimum and maximum values of temperature (T^0), electrical conductivity (EC), pH, dissolved oxygen (O_2) and Eh are presented for the 21 sampling campaigns and studied points. Sampling points considered were: two natural lagoons (BPI, and FRA), four excavated lagoons (GO2 in 2002; and L04, L01, M03 in 2016), Mediterranean sea water samples collected in this area (MAR-01), six superficial dug or drilled wells (P-022, P-024, P-025, P-029, P-040 and P-058), six points in the Ter River (R1, R2, R3, R4, TER-01 and TER-03), and one point in the Ter Vell artificial channel (RT-01).

The raw data of these surveys are provided at https://doi.org/10.6084/m9.figshare.21820764, together with the coordinates (UTM 31N ETR89) and characteristics of the different sampling points.

Table 2
Number of data (Num.), mean, standard deviation (SD), minimum (Min), and maximum (Max) values of physicochemical parameters measured in situ for sampling point.

Sampling point	Statistic	EC(μS/cm)	pH	O_2 (mg/L)	T (^{0}C)	Eh (mV)
Lagoons						
BPI	Num.	17	17	17	17	17
	Mean	63400	8.69	4.02	16.1	112
	SD	29000	0.60	5.00	6.48	85.9
	Min	13400	7.71	0.00	5.72	36.3
	Max	127000	10.0	19.2	27.0	374
FRA-01P	Num.	13	7	7	7	6
	Mean	56800	7.32	0.22	16.9	179
	SD	9000	0.32	0.18	3.21	27.5
	Min	44700	6.87	0.00	12.6	161
	Max	80000	7.78	0.48	22.6	234
FRA-01S	Num.	21	21	21	21	21
	Mean	51200	8.77	4.90	16.3	109
	SD	17300	0.77	4.27	7.21	101
	Min	7680	7.63	0.00	5.60	-1.3
	Max	93000	11.0	17.6	30.9	435
FRA-02	Num.	18	16	16	16	16
	Mean	51200	8.90	6.67	17.9	111
	SD	16200	0.82	5.60	8.04	98.3
	Min	28600	7.47	0.00	3.20	19.8
	Max	92600	10.4	19.9	32.3	397
G02	Num.	21	21	21	21	21
	Mean	34900	8.74	6.59	17.4	127
	SD	10700	0.61	2.95	6.99	103
	Min	6550	7.61	0.00	6.11	38.2
	Max	53100	10.2	10.7	31.9	421
L04	Num.	8	8	8	8	8
	Mean	33700	8.74	11.9	15.9	209
	SD	18000	0.38	15.8	6.86	145
	Min	3160	8.09	3.88	6.39	58.6
	Max	55600	9.29	50.5	27.0	409
L01	Num.	8	8	8	8	8
	Mean	24900	8.88	6.87	16.5	155
	SD	13700	1.03	2.00	6.87	140
	Min	3530	7.76	4.35	6.23	3.1
	Max	51800	11.0	10.8	26.6	392

(*continued on next page*)

Table 2 (*continued*)

Sampling point	Statistic	EC(μS/cm)	pH	O_2 (mg/L)	T (^{0}C)	Eh (mV)
M03	Num.	8	8	8	8	8
	Mean	47100	8.74	7.04	17.1	170
	SD	23800	0.93	2.61	7.15	147
	Min	7910	7.79	3.66	6.72	25.5
	Max	82100	10.7	10.9	27.7	391
Sea						
MAR-01	Num.	18	18	18	18	18
	Mean	54200	6.39	6.84	15.0	164
	SD	15800	3.53	4.27	8.07	89.9
	Min	19100	0.00	0.00	0.00	83.6
	Max	77600	8.70	18.8	28.2	339
Groundwater						
P-022	Num.	13	13	13	13	13
	Mean	1300	7.11	0.61	17.7	342
	SD	231	0.25	0.79	0.19	81.3
	Min	717	6.83	0.00	17.3	212
	Max	1560	7.87	2.87	18.0	526
P-024	Num.	18	18	18	18	18
	Mean	1430	7.16	1.76	17.1	323
	SD	259	0.23	1.80	4.67	81.6
	Min	771	6.81	0.06	7.80	146
	Max	2090	7.93	6.96	24.3	443
P-025	Num.	17	17	17	17	17
	Mean	1320	7.24	1.61	17.6	200
	SD	190	0.27	2.38	1.29	81.0
	Min	853	6.97	0.12	15.5	69.3
	Max	1770	8.17	9.02	20.0	365
P-029	Num.	18	18	18	18	18
	Mean	1610	7.23	0.41	16.9	342
	SD	285	0.15	0.53	2.41	145
	Min	932	7.01	0.00	10.5	201
	Max	2030	7.63	2.32	20.5	772
P-040	Num.	17	17	17	17	16
	Mean	1060	7.36	3.68	16.6	381
	SD	159	0.23	2.09	2.96	98.0
	Min	706	7.00	0.09	13.1	215
	Max	1290	7.99	8.82	22.2	670
P-058	Num.	18	18	18	18	18
	Mean	880	7.15	1.55	18.3	355
	SD	174	0.12	0.62	1.93	101
	Min	569	7.00	0.06	15.3	146
	Max	1100	7.50	2.57	21.9	583
Water courses and artificial channels						
R1	Num.	5	5	5	5	5
	Mean	608	7.90	10.3	15.2	352
	SD	299	0.22	5.98	5.59	87.6
	Min	237	7.58	7.24	6.90	212
	Max	919	8.12	21.0	22.2	452
R2	Num.	5	5	5	5	5
	Mean	548	7.89	9.50	15.9	353
	SD	246	0.12	5.78	5.25	83.6
	Min	216	7.71	6.16	8.50	212
	Max	805	8.04	19.8	23.0	431

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Table 2 (*continued*)

Sampling point	Statistic	EC(μS/cm)	pH	O_2 (mg/L)	T (⁰C)	Eh (mV)
R3	Num.	3	3	3	3	3
	Mean	522	7.84	11.5	16.1	374
	SD	259	0.21	8.14	7.30	10.0
	Min	225	7.60	6.09	9.30	367
	Max	698	7.98	20.9	23.8	386
R4	Num.	5	5	5	5	5
	Mean	598	7.97	9.94	17.1	358
	SD	232	0.06	5.98	5.10	87.8
	Min	227	7.90	6.05	9.70	212
	Max	854	8.06	20.5	24.1	439
TER-01	Num.	21	21	21	21	21
	Mean	726	7.64	5.86	15.4	173
	SD	319	1.81	4.20	6.47	119
	Min	299	0.00	0.00	0.00	65.4
	Max	1890	9.63	19.4	26.7	478
TER-03	Num.	21	21	21	21	21
	Mean	1100	7.77	6.51	16.1	139
	SD	1650	1.83	4.46	7.10	115
	Min	324	0.00	0.00	0.00	-137
	Max	8240	9.22	20.0	28.3	399
RT-01	Num.	13	13	13	13	13
	Mean	1180	7.91	3.91	15.1	176
	SD	494	0.55	2.14	6.02	94.1
	Min	404	7.32	0.29	6.24	77.5
	Max	1760	8.89	6.72	24.9	370

A summary of the major and minor ions determined for each sampling campaign is shown in Table 3. The total number of data, mean, standard deviation, minimum and maximum values of bicarbonates (HCO_3^-), carbonates (CO_3^{2-}), chlorides (Cl^-), sulfates (as S-SO_4^{2-}), bromides (Br^-), fluorides (F^-), sodium (Na^+), potassium (K^+), magnesium (Mg^{2+}) and calcium (Ca^{2+}) concentrations are shown.

Sampling points considered are the same as in Table 2, and the raw data of these surveys are provided at https://doi.org/10.6084/m9.figshare.21820764.

Table 3
Number of data (Num.), mean, standard deviation (SD), minimum (Min), and maximum (Max) values of major ions analyzed for sampling point. Legend: bdl, below the detection level.

Sampling point	Statistic	HCO_3^- (mg/L)	CO_3^{2-} (mg/L)	Cl^- (mg/L)	S-SO_4^{2-} (mg/L)	Br^- (mg/L)	F^- (mg/L)	Na^+ (mg/L)	K^+ (mg/L)	Mg^{2+} (mg/L)	Ca^{2+} (mg/L)
Lagoons											
BPI	Num.	17	17	17	17	17	17	17	17	17	17
	Mean	410	12.3	30100	1040	102	0.580	16900	600	1880	392
	SD	91.4	17.2	20200	637	68.8	0.243	11200	396	1270	147
	Min	242	*bdl*	5670	243	19.2	0.000	3220	137	380	180
	Max	561	66.0	66200	2180	234	0.964	36830	1340	4220	642
FRA-01P	Num.	17	17	17	17	17	17	17	17	17	17
	Mean	962	14.3	23300	749	89.1	1.06	13100	496	1520	354
	SD	923	30.1	4530	327	23.9	0.175	2640	105	316	84,6
	Min	220	*bdl*	15200	239	52.4	0.756	8790	322	1020	168
	Max	2900	96.0	34300	1440	138	1.39	19800	752	2390	577

(*continued on next page*)

Table 3 (*continued*)

Sampling point	Statistic	HCO_3^- (mg/L)	CO_3^{2-} (mg/L)	Cl^- (mg/L)	S-SO_4^{2-} (mg/L)	Br^- (mg/L)	F^- (mg/L)	Na^+ (mg/L)	K^+ (mg/L)	Mg^{2+} (mg/L)	Ca^{2+} (mg/L)
FRA-01S	Num.	21	21	21	21	21	21	21	21	21	21
	Mean	267	11.3	19500	784	68.8	0.861	11000	412	1270	332
	SD	52.9	11.6	6970	283	25.4	0.230	3890	149	452	97.6
	Min	154	*bdl*	8840	396	30.1	0.585	4990	190	583	197
	Max	381	37.2	35700	1430	129	1.56	20100	745	2390	609
FRA-02	Num.	18	18	18	18	18	18	18	18	18	18
	Mean	255	18.6	18400	731	65.1	0.863	10300	389	1200	325
	SD	51.3	15.3	7290	280	26.6	0.209	4100	158	479	97.4
	Min	171	*bdl*	5970	247	21.0	0.443	3350	137	391	168
	Max	383	48.0	34100	1270	122	1.25	19200	712	2260	543
G02	Num.	21	20	21	21	21	21	21	21	21	21
	Mean	335	7.33	17700	621	63.0	0.804	9920	354	1130	337
	SD	75.5	6.62	20900	716	80.8	0.243	11800	394	1320	399
	Min	194	*bdl*	6080	172	18.6	0.244	3430	117	397	102
	Max	478	19.7	107000	3620	410	1.39	60300	2030	6780	2049
L04	Num.	8	8	8	8	8	8	8	8	8	8
	Mean	299	6.81	11900	476	41.8	0.789	6710	235	762	274
	SD	56.1	4.84	4870	252	17.2	0.279	2740	97.1	319	89.1
	Min	210	*bdl*	5810	215	17.4	0.279	3230	102	374	172
	Max	381	13.2	18700	1010	62.1	1.28	10500	362	1210	397
L01	Num.	8	6	8	8	8	8	8	8	8	8
	Mean	323	23.8	10600	457	35.1	0.724	5920	211	700	280
	SD	64.7	45.4	6640	321	20.7	0.357	3640	127	424	150
	Min	209	*bdl*	5410	208	16.0	0.286	2980	96.0	353	141
	Max	408	116	24400	995	71.9	1.30	13300	458	1540	595
M03	Num.	8	7	8	8	8	8	8	8	8	8
	Mean	306	10.8	18800	674	65.0	0.580	10600	345	1210	321
	SD	93.7	11.5	7940	259	27.4	0.308	4460	134	499	77.2
	Min	116	*bdl*	8990	326	28.6	0.201	5020	150	578	211
	Max	432	33.1	30500	993	108	1.09	17200	533	1960	401
Sea											
MAR-01	Num.	18	18	18	18	18	18	18	18	18	18
	Mean	177	0.167	19100	913	68.1	1.09	10800	398	1300	413
	SD	72.0	0.707	3870	197	14.6	0.210	2200	82.4	269	76,4
	Min	142	*bdl*	8310	379	29.1	0.672	4590	163	555	211
	Max	454	3.00	21900	1230	81.8	1.33	12600	461	1510	514
Groundwater											
P-022	Num.	13	13	13	13	13	13	13	13	13	13
	Mean	384	*bdl*	109	53.9	0.205	0.208	109	9.06	22.4	142
	SD	56.9	*bdl*	14.9	8.59	0.036	0.023	25.8	1.01	2.37	21.3
	Min	249	*bdl*	71.2	33.3	0.127	0.157	57.1	6.54	15.6	103
	Max	464	*bdl*	126	66.9	0.264	0.235	153	10.5	24.8	169
P-024	Num.	18	18	18	18	18	18	18	18	18	18
	Mean	433	*bdl*	130	64.5	0.232	0.096	98.6	6.26	28.4	172
	SD	40.1	*bdl*	24.0	7.21	0.053	0.018	15.7	1.37	2.75	24.3
	Min	286	*bdl*	67.9	43.3	0.111	0.044	60.8	4.61	19.1	108
	Max	473	*bdl*	192	73.7	0.377	0.127	128	8.96	32.0	200
P-025	Num.	17	17	17	17	17	17	17	17	17	17
	Mean	437	*bdl*	128	66.1	0.209	0.125	87.8	5.84	32.1	160
	SD	37.3	*bdl*	20.9	6.41	0.045	0.018	8.02	0.49	3.50	25.0
	Min	302	*bdl*	99.7	58.6	0.144	0.091	75.5	5.14	28.0	119
	Max	468	*bdl*	175	84.4	0.273	0.158	110	6.59	39.7	202

(*continued on next page*)

Table 3 (*continued*)

Sampling point	Statistic	HCO_3^- (mg/L)	CO_3^{2-} (mg/L)	Cl^- (mg/L)	S-SO_4^{2-} (mg/L)	Br^- (mg/L)	F^- (mg/L)	Na^+ (mg/L)	K^+ (mg/L)	Mg^{2+} (mg/L)	Ca^{2+} (mg/L)
P-029	Num.	18	18	18	18	18	18	18	18	18	18
	Mean	453	*bdl*	217	73.6	0.442	0.158	156	9.11	40.8	152
	SD	27.1	*bdl*	37.8	8.75	0.098	0.024	16.9	1.16	3.95	25.5
	Min	378	*bdl*	165.7	53.5	0.314	0.115	120	6.03	34.7	91.4
	Max	493	*bdl*	268	85.8	0.619	0.195	180	11.2	47.9	198
P-040	Num.	17	17	17	17	17	17	17	17	17	17
	Mean	379	*bdl*	99.4	48.1	0.147	0.191	73.0	3.27	23.9	128
	SD	58.1	*bdl*	24.2	8.49	0.060	0.070	14.0	0.92	4.35	24.4
	Min	231	*bdl*	60.4	32.2	0.054	0.077	40.8	1.48	15.2	77.4
	Max	451	*bdl*	145	59.9	0.267	0.321	89.2	5.07	30.6	157
P-058	Num.	18	18	18	18	18	18	18	18	18	18
	Mean	368	*bdl*	60.1	33.7	9.12	0.198	43.4	3.74	18.8	131
	SD	79.1	*bdl*	16.4	4.28	38.4	0.043	6.86	0.50	3.50	31.4
	Min	182	*bdl*	27.5	22.1	*bdl*	0.119	26.2	2.39	11.5	67.3
	Max	449	*bdl*	97.2	41.3	163	0.291	52.3	4.43	22.9	176
Water courses and artificial channels											
R1	Num.	6	6	6	6	6	6	6	6	6	6
	Mean	175	0.68	52.9	26.5	0.064	0.159	39.4	5.71	11.4	73.7
	SD	34.8	1.08	14.8	7.77	0.017	0.033	9.68	0.52	2.80	16.5
	Min	107	*bdl*	39.1	13.1	0.037	0.116	29.9	5.14	6.6	45.4
	Max	207	2.40	81.5	34.9	0.088	0.207	57.0	6.67	14.3	92.3
R2	Num.	6	6	6	6	6	6	6	6	6	6
	Mean	183	1.40	48.4	26.7	0.058	0.159	36.7	5.64	11.4	72.5
	SD	30.5	2.45	9.83	6.69	0.031	0.034	6.88	1.01	2.72	16.9
	Min	122	*bdl*	32.0	15.4	*bdl*	0.101	25.3	4.74	6.65	47.0
	Max	207	6.00	59.7	35.0	0.086	0.200	44.3	7.54	14.5	92.4
R3	Num.	3	3	3	3	3	3	3	3	3	3
	Mean	193	0.88	54.0	26.3	0.037	0.158	38.4	9.58	11.8	74.4
	SD	19.4	1.52	2.75	3.29	0.035	0.021	4.06	7.06	1.36	11.1
	Min	177	*bdl*	50.8	23.9	*bdl*	0.134	33.8	5.46	10.6	64.4
	Max	215	2.64	56.8	30.1	0.070	0.173	41.6	17.7	13.3	86.3
R4	Num.	6	6	6	6	6	6	6	6	6	6
	Mean	188	1.08	46.8	28.2	0.048	0.156	35	6.72	11.3	76.4
	SD	14.3	2.65	7.24	4.89	0.028	0.020	6.8	3.06	1.89	10.7
	Min	166	*bdl*	37.9	20.3	*bdl*	0.124	24.3	4.98	8.55	59.6
	Max	210	6.48	55.8	33.8	0.072	0.173	42	12.9	13.7	89.6
TER-01	Num.	21	19	21	21	21	21	21	21	21	21
	Mean	215	0.19	60.8	30.3	0.070	0.162	44	5.29	14.0	84.7
	SD	32.5	0.60	19.3	6.96	0.054	0.024	12.8	0.76	2.49	15.5
	Min	134	*bdl*	19.9	17.0	*bdl*	0.116	16.3	3.51	8.35	55.1
	Max	288	2.40	105	44.2	0.153	0.224	71	6.4	17.8	111
TER-03	Num.	21	19	21	21	21	21	21	21	21	21
	Mean	204	1.09	199	35.0	0.533	0.164	122	8.78	22.7	82.0
	SD	24.0	2.05	495	23.90	1.689	0.040	274.5	11.05	32.1	18.4
	Min	132	*bdl*	28.5	16.0	*bdl*	0.117	21.1	3.77	8.63	54.5
	Max	234	6.00	2350	136	7.89	0.304	1320	56.6	162	139
RT-01	Num.	13	13	13	13	13	13	13	13	13	13
	Mean	370	*bdl*	218	57.5	0.520	0.257	147	10.8	37.8	126
	SD	119	*bdl*	204	24.1	0.576	0.061	121	4.38	20.9	36.3
	Min	176	*bdl*	49.7	26.8	0.046	0.158	40.2	6.43	14.3	81.0
	Max	500	*bdl*	815	95.1	2.20	0.356	477	24.3	81.0	211

A summary of the nutrients determined for each sampling campaign is shown in Table 4. The total number of data, mean, standard deviation, minimum and maximum values of ammonium (as $N\text{-}NH_4^+$), nitrites (as $N\text{-}NO_2^-$), nitrates (as $N\text{-}NO_3^-$), phosphates (as $P\text{-}PO_4^{3-}$), the Total Phosphorous (TP), Total Organic Mater (TOC) and Total Nitrogen (TN) concentrations are shown.

Sampling points considered are also the same in Table 1, and the raw data of these surveys can be found at (https://doi.org/10.6084/m9.figshare.21820764).

Table 4
Number of data (Num.), mean, standard deviation (SD), minimum (Min), and maximum (Max) values of nutrients determined for sampling point. Legend: bdl, below the detection level.

Sampling point	Statistic	$N\text{-}NH_4^+$ (mg/L)	$N\text{-}NO_2^-$ (mg/L)	$N\text{-}NO_3^-$ (mg/L)	$P\text{-}PO_4^{3-}$ (mg/L)	TP (mg P/L)	TOC (mg C/L)	TN (mg N/L)
Lagoons								
BPI	Num.	17	17	17	17	17	17	17
	Mean	0.411	0.009	0.118	0.054	0.363	99.7	10.6
	SD	0.894	0.036	0.302	0.093	0.310	64.7	7.46
	Min	bdl	bdl	bdl	bdl	0.065	31.1	3.29
	Max	3.53	0.147	1.15	0.304	1.19	256	28.7
FRA-01P	Num.	17	17	17	17	17	17	17
	Mean	15.8	0.006	0.135	1.55	2.22	70.1	26.7
	SD	20.9	0.025	0.396	2.03	2.49	30.1	26.5
	Min	bdl	bdl	bdl	0.015	0.148	29.3	4.45
	Max	56.7	0.102	1.44	7.95	9.32	140	86.6
FRA-01S	Num.	21	21	21	21	21	21	21
	Mean	0.045	bdl	0.148	0.028	0.278	47.9	5.24
	SD	0.118	bdl	0.452	0.033	0.235	22.2	2.94
	Min	bdl	bdl	bdl	bdl	0.047	11.0	bdl
	Max	0.486	bdl	1.91	0.140	0.726	99.6	10.6
FRA-02	Num.	18	18	18	18	18	18	18
	Mean	0.097	0.023	0.078	0.046	0.287	43.6	4.41
	SD	0.183	0.097	0.168	0.064	0.275	21.1	2.51
	Min	bdl	bdl	bdl	bdl	0,057	10,3	bdl
	Max	0.608	0.413	0.623	0.182	0.966	103	8.45
G02	Num.	21	21	21	21	21	21	21
	Mean	0.112	bdl	0.062	0.014	0.187	31.4	3.14
	SD	0.173	bdl	0.149	0.019	0.200	13.4	2.36
	Min	bdl	bdl	bdl	bdl	0.026	10.4	bdl
	Max	0.460	bdl	0.606	0.066	0.767	61.3	7.52
L04	Num.	8	8	8	8	8	8	8
	Mean	0.014	0.026	0.066	0.007	0.208	24.2	2.36
	SD	0.040	0.074	0.187	0.011	0.344	9.74	1.57
	Min	bdl	bdl	bdl	bdl	0,016	11,0	bdl
	Max	0.113	0.210	0.530	0.033	1.05	36.7	5.45
L01	Num.	8	8	8	8	8	8	8
	Mean	0.081	0.035	0.084	0.002	0.113	23.7	2.18
	SD	0.165	0.099	0.239	0.004	0.190	12.7	1.18
	Min	bdl	bdl	bdl	bdl	0.011	9.59	bdl
	Max	0.451	0.280	0.676	0.009	0.579	41.9	3.77
M03	Num.	8	8	8	8	8	8	8
	Mean	bdl	bdl	0.079	0.005	0.161	30.0	3.54
	SD	bdl	bdl	0.224	0.005	0.105	11.9	1.86
	Min	bdl	bdl	bdl	bdl	0.072	13.1	bdl
	Max	bdl	bdl	0.635	0.012	0.337	49.8	5.69

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Table 4 (*continued*)

Sampling point	Statistic	N-NH_4^+ (mg/L)	N-NO_2^- (mg/L)	N-NO_3^- (mg/L)	P-PO_4^{3-} (mg/L)	TP (mg P/L)	TOC (mg C/L)	TN (mg N/L)
Sea								
MAR	Num.	18	18	18	17	18	18	18
	Mean	0.176	bdl	0.155	0.011	0.043	13.8	1.48
	SD	0.377	bdl	0310	0.017	0.059	11.5	1.87
	Min	bdl	bdl	bdl	bdl	0.011	5.34	bdl
	Max	1.50	bdl	1.14	0.067	0.253	47.9	5.58
Groundwater								
P-022	Num.	13	13	13	13	13	13	13
	Mean	0.006	0.031	19.5	0.006	0.008	1.71	20.2
	SD	0.018	0.008	4.81	0.001	0.003	0.48	5.23
	Min	bdl	0.015	14.8	0.004	0.004	1.18	12.7
	Max	0.063	0.044	30.7	0.008	0.016	3.03	31.2
P-024	Num.	18	18	18	18	18	18	18
	Mean	0.013	0.043	10.1	0.030	0.037	1.32	10.3
	SD	0.031	0.058	3.09	0.031	0.025	0.37	2.65
	Min	bdl	bdl	4.53	0.004	0.010	0.96	5.25
	Max	0.120	0.235	15.7	0.115	0.098	2.56	14.1
P-025	Num.	17	17	17	17	17	17	17
	Mean	0.023	0.010	0.349	0.008	0.013	1.83	0.526
	SD	0.032	0.004	0.262	0.004	0.006	1.56	0.270
	Min	bdl	0.003	0.053	0.003	0.005	1.26	0.244
	Max	0.134	0.021	0.974	0.016	0.026	7.82	1.12
P-029	Num.	18	18	18	18	18	18	18
	Mean	0.264	0.001	0.967	0.008	0.013	2.44	1.49
	SD	0.134	0.002	1.36	0.003	0.006	0500	1.11
	Min	0.055	0.000	0.014	0.004	0.003	1.78	0.533
	Max	0.494	0.007	5.07	0.014	0.023	3.78	3.62
P-040	Num.	17	17	17	17	17	17	17
	Mean	0.018	0.004	0.520	0.007	0.015	1.72	0.752
	SD	0.030	0.003	0.464	0.002	0.013	0.360	0.476
	Min	bdl	bdl	0.069	0.004	0.007	1.22	0.289
	Max	0.089	0.011	1.74	0.012	0.063	2.67	1.96
P-058	Num.	18	18	18	18	18	18	18
	Mean	0.010	0.006	6.39	0.015	0.019	1.17	6.73
	SD	0.014	0.004	1.66	0.005	0.012	0.130	1.51
	Min	bdl	bdl	3.38	0.006	0.008	0.94	4.72
	Max	0.042	0.018	9.56	0.023	0.063	1.39	9.96
Water courses and artificial channels								
R1	Num.	6	6	6	6	6	6	6
	Mean	0.309	0.049	1.97	0.123	0.239	4.93	2.91
	SD	0.215	0.037	0.66	0.097	0.100	1.44	0.599
	Min	0.055	0.004	1.16	0.011	0.134	3.06	2.12
	Max	0.641	0.111	2.87	0.252	0.342	6.46	3.90
R2	Num.	6	6	6	6	6	6	6
	Mean	0.299	0.046	1.99	0.126	0.189	4.81	2.82
	SD	0.255	0.036	0.674	0.075	0.083	1.63	0.556
	Min	0.026	0.002	1.15	0.024	0.092	2.94	2.19
	Max	0.652	0.104	2.91	0.246	0.323	6.53	3.76
R3	Num.	3	3	3	3	3	3	3
	Mean	0.155	0.044	1.84	0.107	0.193	5.35	2.61
	SD	0.131	0.034	0.726	0.089	0.093	1.56	0.662
	Min	0.010	0.005	1.01	0.008	0.133	3.56	2.04
	Max	0.263	0.070	2.36	0.181	0.300	6.44	3.34

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Table 4 (*continued*)

Sampling point	Statistic	$N\text{-}NH_4^+$ (mg/L)	$N\text{-}NO_2^-$ (mg/L)	$N\text{-}NO_3^-$ (mg/L)	$P\text{-}PO_4^{3-}$ (mg/L)	TP (mg P/L)	TOC (mg C/L)	TN (mg N/L)
R4	Num.	6	6	6	6	6	6	6
	Mean	0.191	0.039	1.90	0.102	0.184	5.13	2.67
	SD	0.171	0.026	0.782	0.063	0.064	2.01	0.884
	Min	bdl	bdl	0.670	0.019	0.107	2.63	1.09
	Max	0.480	0.071	2.89	0.178	0.278	7.73	3.63
TER-01	Num.	21	21	21	21	21	21	21
	Mean	0.039	0.029	2.14	0.096	0.156	5.08	2.70
	SD	0.041	0.017	1.06	0.039	0.079	1.76	0.648
	Min	bdl	bdl	0.704	0.026	0.079	2.46	1.25
	Max	0.134	0.056	6.00	0.209	0.474	8.86	3.98
TER-03	Num.	21	21	21	21	21	21	21
	Mean	0.049	0.030	1.82	0.106	0.166	7.26	2.67
	SD	0.059	0.027	0.682	0.088	0.117	4.11	0.630
	Min	bdl	bdl	0.379	0.004	0.008	2.30	1.20
	Max	0.204	0.120	2.97	0.440	0.640	16.2	3.84
RT-01	Num.	13	13	13	13	13	13	13
	Mean	0.114	0.030	0.813	0.123	0.241	9.13	1.81
	SD	0.300	0.046	1.70	0.254	0.307	4.84	1.78
	Min	bdl	bdl	bdl	0.004	0.030	3.30	0.419
	Max	1.09	0.160	6.10	0.950	1.16	18.1	6.87

Finally, the isotopic data obtained for the same sampling points are summarized in Table 5. In particular, mean values and standard errors of mean are reported for water stable isotopes ($\delta^{18}O$ and δD), nitrate ($\delta^{15}N_{NO3}$, $\delta^{18}O_{NO3}$) and sulphate ($\delta^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$) isotopes. Sampling points considered are also the same than in Table 1, and the raw data of these surveys are shared through a Figshare document https://doi.org/10.6084/m9.figshare.21820764.

Table 5
Number of data (Num.), mean, standard deviation (SD), minimum (Min), and maximum (Max) values of stable isotopes of water, nitrates and sulfates for sampling point. Legend: bdl, below the detection level; nd, non-determined.

Sampling point	Statistic	$\delta^{18}O_{H2O}$ (‰)	$\delta^{2}H_{H2O}$ (‰)	$\delta^{15}N_{NO3}$ (‰)	$\delta^{18}O_{NO3}$ (‰)	$\delta^{34}S_{SO4}$ (‰)	$\delta^{18}O_{SO4}$ (‰)
Lagoons							
BPI	Num.	17	17	4	4	9	9
	Mean	2.9	2.5	23,5	15.5	26.3	16.5
	SD	4.3	16.1	bdl	bdl	2.6	4.3
	Min	-3.8	-24.8	bdl	bdl	22.3	10.8
	Max	12.2	35.4	23.5	15.5	29.7	23.4
FRA-01P	Num.	17	17	4	4	7	7
	Mean	4.0	9.4	bdl	bdl	32.2	19.8
	SD	1.9	7.7	bdl	bdl	6.3	4.3
	Min	0.2	-7.4	bdl	bdl	25.9	14.2
	Max	7.3	21.5	bdl	bdl	43.9	25.6
FRA-01S	Num.	21	21	4	4	9	9
	Mean	2.3	2.8	bdl	bdl	26.6	16.5
	SD	2.7	10.9	bdl	bdl	2.3	3.0
	Min	-2.3	-17.7	bdl	bdl	22.8	12.2
	Max	7.1	20.6	bdl	bdl	29.4	20.4

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Table 5 (*continued*)

Sampling point	Statistic	$\delta^{18}O_{H2O}$ (‰)	$\delta^{2}H_{H2O}$ (‰)	$\delta^{15}N_{NO3}$ (‰)	$\delta^{18}O_{NO3}$ (‰)	$\delta^{34}S_{SO4}$ (‰)	$\delta^{18}O_{SO4}$ (‰)
FRA-02	Num.	18	18	3	3	7	7
	Mean	1.6	1.0	bdl	bdl	26.6	16.9
	SD	2.2	9.9	bdl	bdl	2.8	4.1
	Min	-2.8	-19.6	bdl	bdl	22.8	11.7
	Max	4.7	15.3	bdl	bdl	30.4	22.3
G02	Num.	21	21	4	4	9	9
	Mean	0.9	-2.8	bdl	bdl	27.7	15.7
	SD	2.4	10.4	bdl	bdl	4.8	2.9
	Min	-2.6	-19.4	bdl	bdl	20.8	10.5
	Max	6.7	20.1	bdl	bdl	36.0	18.5
L04	Num.	8	8	0	0	2	2
	Mean	1.9	2.4	nd	nd	27.2	14.6
	SD	2.8	12.1	nd	nd	0.4	0.8
	Min	-2.0	-15.6	nd	nd	26.9	14.0
	Max	7.4	23.6	nd	nd	27.5	15.2
L01	Num.	8	8	0	0	2	2
	Mean	0.7	-3.2	nd	nd	28.5	15.3
	SD	2.2	9.6	nd	nd	1.8	0.2
	Min	-2.7	-18.9	nd	nd	27.2	15.1
	Max	4.5	10.9	nd	nd	29.8	15.4
M03	Num.	8	8	0	0	2	2
	Mean	2.0	1.7	nd	nd	33.7	18.8
	SD	3.4	13.9	nd	nd	0.8	0.6
	Min	-1.6	-17.0	nd	nd	33.2	18.4
	Max	8.5	27.7	nd	nd	34.3	19.2
Sea							
MAR	Num.	12	12	3	3	4	4
	Mean	0.3	0.9	bdl	bdl	20.6	7.7
	SD	1.6	9.6	bdl	bdl	0.3	4.0
	Min	-4.0	-25.7	bdl	bdl	20.3	1.7
	Max	1.8	8.2	bdl	bdl	21.1	9.8
Groundwater							
P-022	Num.	7	7	5	5	4	4
	Mean	-6.2	-40.7	11.2	7.1	9.0	7.4
	SD	0.2	0.9	1.1	2.0	0.2	0.2
	Min	-6.5	-41.9	10.2	3.8	8.7	7.1
	Max	-5.9	-39.8	12.7	9.2	9.2	7.7
P-024	Num.	12	12	7	7	4	4
	Mean	-6.2	-41.1	16.5	14.6	6.2	7.4
	SD	0.3	1.1	2.7	3.1	0.5	0.1
	Min	-6.7	-42.6	14.4	10.7	5.5	7.3
	Max	-5.9	-39.5	21.9	18.5	6.7	7.5
P-025	Num.	11	11	4	4	3	3
	Mean	-6.5	-41.9	27.8	18.0	7.4	9.6
	SD	0.2	0.8	5.9	2.6	0.3	0.4
	Min	-6.8	-43.2	bdl	bdl	7.2	9.2
	Max	-6.2	-40.2	32.0	19.8	7.7	9.9

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Table 5 (*continued*)

Sampling point	Statistic	$\delta^{18}O_{H2O}$ (‰)	$\delta^{2}H_{H2O}$ (‰)	$\delta^{15}N_{NO3}$ (‰)	$\delta^{18}O_{NO3}$ (‰)	$\delta^{34}S_{SO4}$ (‰)	$\delta^{18}O_{SO4}$ (‰)
P-029	Num.	12	12	5	5	4	4
	Mean	-6.0	-40.0	17.5	14.3	7.9	9.0
	SD	0.4	1.2	1.5	2.3	0.1	0.1
	Min	-6.6	-42.1	bdl	bdl	7.7	8.9
	Max	-5.1	-38.1	18.6	15.9	8.0	9.2
P-040	Num.	11	11	5	5	4	4
	Mean	-6.3	-40.2	13.0	5.6	6.6	7.9
	SD	0.5	2.9	2.7	1.3	2.5	0.4
	Min	-6.9	-44.7	bdl	bdl	5.2	7.4
	Max	-5.8	-37.3	14.9	6.5	10.2	8.3
P-058	Num.	12	12	6	6	4	4
	Mean	-6.6	-43.3	9.4	6.3	9.3	7.8
	SD	0.3	1.0	1.7	2.4	0.2	0.7
	Min	-7.0	-45.1	7.0	4.3	9.1	7.1
	Max	-6.1	-41.8	11.6	10.8	9.5	8.8
Water courses and artificial channels							
R1	Num.	5	5	0	0	2	2
	Mean	-6.0	-40.4	nd	nd	11.2	9.9
	SD	1.5	4.9	nd	nd	1.6	1.8
	Min	-7.0	-46.6	nd	nd	10.0	8.6
	Max	-3.4	-34.0	nd	nd	12.3	11.1
R2	Num.	6	6	0	0	0	0
	Mean	-6.5	-40.8	nd	nd	nd	nd
	SD	0.3	4.5	nd	nd	nd	nd
	Min	-7.0	-46.7	nd	nd	nd	nd
	Max	-6.1	-33.3	nd	nd	nd	nd
R3	Num.	3	3	0	0	0	0
	Mean	-6.1	-41.7	nd	nd	nd	nd
	SD	0.4	2.0	nd	nd	nd	nd
	Min	-6.6	-44.0	nd	nd	nd	nd
	Max	-5.8	-40.1	nd	nd	nd	nd
R4	Num.	6	6	0	0	0	0
	Mean	-5.8	-38.7	nd	nd	nd	nd
	SD	0.7	4.2	nd	nd	nd	nd
	Min	-6.7	-42.0	nd	nd	nd	nd
	Max	-4.5	-30.4	nd	nd	nd	nd
TER-01	Num.	21	21	7	7	7	7
	Mean	-6.0	-40.8	14.7	7.8	10.8	10.3
	SD	1.4	5.1	3.4	2.4	1.2	1.1
	Min	-7.0	-46.1	8.3	4.3	9.6	8.9
	Max	-0.8	-26.1	17.8	12.2	12.2	11.8
TER-03	Num.	21	21	7	7	9	9
	Mean	-6.4	-42.2	13.4	6.6	11.9	9.6
	SD	0.5	2.8	1.7	1.5	1.3	0.9
	Min	-7.2	-46.0	11.2	3.8	9.5	8.3
	Max	-4.8	-34.9	16.0	8.3	13.8	10.8
RT-01	Num.	12	12	4	4	6	6
	Mean	-5.3	-35.9	21.5	12.3	13.3	11.8
	SD	0.7	4.0	bdl	bdl	4.8	3.5
	Min	-6.8	-44.0	bdl	bdl	8.9	7.5
	Max	-3.9	-27.6	21.5	12.3	22.3	15.9

3. Experimental Design, Materials and Methods

The study of the hydrogeological behaviour of the La Pletera groundwater-coastal lagoon system consisted of 12 monthly campaigns (from November 2014 to October 2015) and 9 seasonal campaigns (from January 2016 to January 2018), which included hydrochemical and environmental isotopes analyses of water samples. In all these surveys, a distinct number of sampling points and analyses were conducted. During the monthly campaigns of the first year, and until January of 2016, a total of 3 lagoons, two natural (BPI, FRA) and one excavated in 2002 (G02), in a first restauration Life$^+$ program; 6 drilled or dug wells (P-022, P-024, P-025, P-029, P-040 and P-058); two points in the Ter River (TER-01 and TER-03); one point in the Ter Vell artificial channel (RT-01), and one point in the Mediterranean sea (MAR-01) were considered as sampling points. In the case of FRA lagoon, a total of three sampling points were considered. Two points in the western area of the lagoon (FRA-01s in superficial positions, and FRA-01p, in approximately 1.5 m depth), and one point in the eastern area (FRA-02). In April 2016 some new lagoons were excavated in the framework of a second restauration Life$^+$ program (LIFE 13 NAT/ES/001001 project), and three new lagoon sampling points were added (L04, L01, and M03), to determine their evolution. The morphologic characteristics of these lagoons were described by Meredith et al. [3,4]. From January 2016 to April 2017, four new sampling points were added in the Ter River (R1, R2, R3 and R4), to analyse the relationship between the river and its alluvial aquifer in upstream areas, as well as the possible recharge of the alluvial aquifer by the Ter River water. Finally, from July 2017 to January 2018, only the six lagoons and the main watercourses (TER-01, TER-03 and RT-01) were sampled.

During hydrochemical and isotopic campaigns, physicochemical data were measured *in situ*. Electrical conductivity (EC) and temperature were determined with a Crison CM35 portable conductivity meter with a temperature measurement capability (accuracy EC $\leq$ 0.5%; temperature $\leq$0.2 °C), pH and Eh were measured with a WTW-330i pH/mV meter (accuracy pH $\leq$ 0.003 pH; Eh $\leq$ 0.2 mV); and Dissolved Oxygen was measured with a Crison OXI45 P portable meter (accuracy DO $\leq$ 0.5%). In the case of wells, a flow cell was used to avoid the contact of groundwater with the atmosphere, and samples were collected after purging the well. Since most of the wells were daily used for domestic purposes, groundwater samples were collected when all the physicochemical parameters, and particularly Eh values, became stabilized.

Water samples for ions and nutrients, taken in all the sampling campaigns, were stored in a fridge at 4°C, until their subsequent analysis. In the case of samples for ion analyses, they were previously filtered using a Whatman disposable non-sterile syringe filters, with a diameter 25 mm, and 0.22 μm pore size. Alkalinity, considering both CO_3^{2-} and HCO_3^-, was determined through Gran titration (their inter-day average precision with percent relative standard deviation, RSD%, was <1%) in the Geocamb lab (Universitat de Girona), on the same day or the day after the sampling campaign. For the rest of the parameters, samples were frozen at -20 °C when the analyses could not be done the same week of the survey, and they were conducted in the Catalan Institute for Water Research (ICRA). Nitrogen as total Kjeldahl nitrogen (TKN) and total organic carbon (TOC) were analyzed using catalytic oxidation (RSD% <1%). In the case of Cl^-, SO_4^{2-}, F^-, Br^-, Ca^{2+}, Mg^{2+}, Na^+, K^+, and NH_4^+ were determined using ion chromatography (Thermo Scientific Dionex ICS-5000, RSD% of 2.88%, 2.23%, 1.61%, 1.86%, 7.00%, 1.09%, 3.56%, 8.08%, and 2.82%), Finally, NO_2^-, NO_3^-, PO_4^{3-}, and Total Phosphorus (TP) were determined by spectrophotometry (Smartchem 140, AMS Alliance, RSD% of 2.82%, 2.44%, and 3.42%). In order to check the quality of the chemical analysis, the ionic mass balance was performed, obtaining an error lower than 5% in all samples.

Isotopic data ($\delta^{18}O$ and δD) of water samples were determined by the Interdepartmental Research Service (SIDI) of the Universidad Autónoma of Madrid. Water stable isotopes were analysed for lagoons and water courses for all the sampling campaigns. In the case of groundwater and seawater, these were only analysed during the first year of the study. $\delta^{18}O$ and δD are expressed in terms of the ‰ deviation of the isotope ratio of the sample relative to that of the V-SMOW standard, and reproducibility of the samples are ±0.06‰ for $\delta^{18}O$ and ±0.7‰ for δD;

and ±0.14‰ for $\delta^{18}O$ and ±0.92‰ for δD for high salinity samples. In the case of nitrate and sulphate isotopes samples ($\delta^{15}N_{NO3}$, $\delta^{18}O_{NO3}$, $\delta^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$) were analysed in the MAiMA laboratory of the Universitat de Barcelona and were only conducted in some particular sampling campaigns during the first year of sampling campaigns, taking into account all the seasons (November and December 2014; January, April, June, July and August 2015). Two more additional surveys for sulphate isotopes were conducted in April and October of 2016, in order to consider the lagoons excavated in 2016 and the new Ter River sampling points (L04, L01, M03, R1, R2, R3 and R4). Water samples for nitrate and sulphate isotopes were filtered during sample collection using a syringe and a 0.22µm and a 0.45µm pore-size disposable filter, respectively. Samples were stored in a fridge at 4°C during the sampling campaign, and immediately frozen in the laboratory at -20°C. $\delta^{15}N_{NO3}$ and $\delta^{18}O_{NO3}$ analysis of dissolved NO_3^- are expressed in terms of δ (‰) relative to that of AIR (atmospheric N_2) as the international standard for $\delta^{15}N$, and with respect to V-SMOW for $\delta^{18}O$. Precision ($\equiv 1\sigma$) are ±0.3‰ and ±0.4‰, for $\delta^{15}N_{NO3}$ and $\delta^{18}O_{NO3}$, respectively. Finally, for $\delta\ ^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$ analyses, the standards used were Vienna-Canyon Diablo Troilite (V-CDT) for $\delta\ ^{34}S_{SO4}$, and with respect to V-SMOW for $\delta^{18}O_{SO4}$. In this case, precision ($\equiv 1\sigma$) is ±0.2‰ for $\delta^{34}S_{SO4}$ and ±0.4‰ for $\delta^{18}O_{SO4}$.

Hydrochemical and isotopic data has been shared through the Figshare document: https://doi.org/10.6084/m9.figshare.21820764.

In the article by [1], the equilibrium chemical-speciation/mass transfer model PHREEQC 3.3.0 [5] was used to conduct mixing and evaporation models in the study area, using hydrochemical and isotopic data [2], and the IBM SPSS Statistics® v.28 (1989, 2021) was used to perform the statistical treatment. In order to analyse differences between sampling points or groups of samples, normality tests were performed, and one-way ANOVA or Kruskal-Wallis tests were used.

Complementarily, potentiometric data were recorded seasonally in 19 surveys. Water levels of the six studied lagoons were determined daily using Schlumberger water level data loggers (Schlumberger Cera-Diver, accuracy ±0.02m). In the case of the natural lagoons (BPI and FRA), and the lagoon excavated in the first restoration project (G02 in 2002), the records of water levels began in 2014, and in the case of the lagoons excavated in 2016 (L04, L01 and M03) the records started in April 2016 (see location in Fig. 1). These data were previously used by Casamitjana et al. [6] and Meredith et al. [3,4] to analyze the water level and salinity behavior of these lagoons. Additionally, a total of 21 wells and piezometers were used to determine the groundwater flow through the alluvial aquifer, as well as the water table level evolution through the studied campaigns, using a potentiometric probe (Geonica, KL010 model, precision 1 cm). Data from wells that were pumping during the survey were discarded to elaborate the different potentiometric maps. Most of these wells showed a maximum depth 8 m, exploiting the most superficial levels of the unconfined alluvial aquifer of this area. Finally, the stream water level variations, measured in Torroella de Montgrí [7], and the sea level records from l'Estartit station [8], were also used to obtain the seasonal maps generated with Miramon® v.8.2d (1994-2019) software.

Piezometric data is provided at: https://doi.org/10.6084/m9.figshare.21809409.

Ethics Statements

The authors declare there are no ethical issues with the data presented or methods used.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Piezometric data of the La Pletera salt marsh area (Original data) (figshare).
Hydrochemical and isotopic data of the La Pletera salt marsh area (Original data) (figshare).

CRediT Author Statement

A. Menció: Conceptualization, Data curation, Methodology, Formal analysis, Writing – original draft, Funding acquisition; **E. Madaula:** Conceptualization, Formal analysis, Methodology; **W. Meredith:** Conceptualization, Formal analysis, Writing – review & editing; **X. Casamitjana:** Conceptualization, Writing – review & editing; **X.D. Quintana:** Conceptualization, Data curation, Funding acquisition, Project administration, Writing – review & editing.

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References

[1] A. Menció, E. Madaula, W. Meredith, X Casamitjana, X.D. Quintana, Nitrogen in surface aquifer - coastal lagoons systems: analyzing the origin of eutrophication processes, Sci. Total Environ. 871 (2023) 161947, doi:10.1016/j.scitotenv.2023.161947.

[2] A. Menció, X. Casamitjana, J. Mas-Pla, N. Coll, J. Compte, M. Martinoy, J. Pascual, X.D. Quintana, Groundwater dependence of coastal lagoons: the case of La Pletera salt marshes (NE Catalonia), J. Hydrol. 552 (2017) 793–806, doi:10.1016/j.jhydrol.2017.07.034.

[3] W. Meredith, X. Casamitjana, X.D. Quintana, A. Menció, Effects of morphology and sediment permeability on coastal lagoons' hydrological patterns, J. Hydrol. 612 (2022) 128259, doi:10.1016/j.jhydrol.2022.128259.

[4] W. Meredith, X. Casamitjana, X.D. Quintana, A. Menció, Dataset for modeling the hydrological patterns and salinity fluctuations of a Mediterranean confined coastal lagoon system (La Pletera salt marsh area, NE Spain), Data Brief 45 (2022) 108593, doi:10.1016/j.dib.2022.108593.

[5] D.L. Parkhust, C.A.J. Appello, User's Guide to PHREEQC (Version 2)—A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and Inverse Geochemical Calculations. U.S. Geologial Survey, 1999 Water-Resources Investigations Report 99-4259, doi:10.3133/wri994259.

[6] X. Casamitjana, A. Menció, X. Quintana, D. Soler, J. Compte, M. Martinoy, J. Pascual, Modeling the salinity fluctuations in salt marsh lagoons, J. Hydrol. 575 (2019) 1178–1187, doi:10.1016/j.jhydrol.2019.06.018.

[7] ACAConsulta de Dades de Control de la Qualitat i la Quantitat de L'aigua al Medi, Departament de Territori i Sostenibilitat, 2021 http://aca.gencat.cat/.

[8] J. Pascual, Estacions meteorològiques de l'Estartit i Torroella de Montgrí, 2021 http://www.meteolestartit.cat.