Contrasted impacts of yellow flag iris (*Iris pseudacorus*) on plant diversity in tidal wetlands within its native and invaded distribution ranges

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Table S1. Geographical coordinates and number of study patches for locations colonized by native and invasive *Iris pseudacorus* populations. Locations are numbered from the most inland location to the closest to the sea.

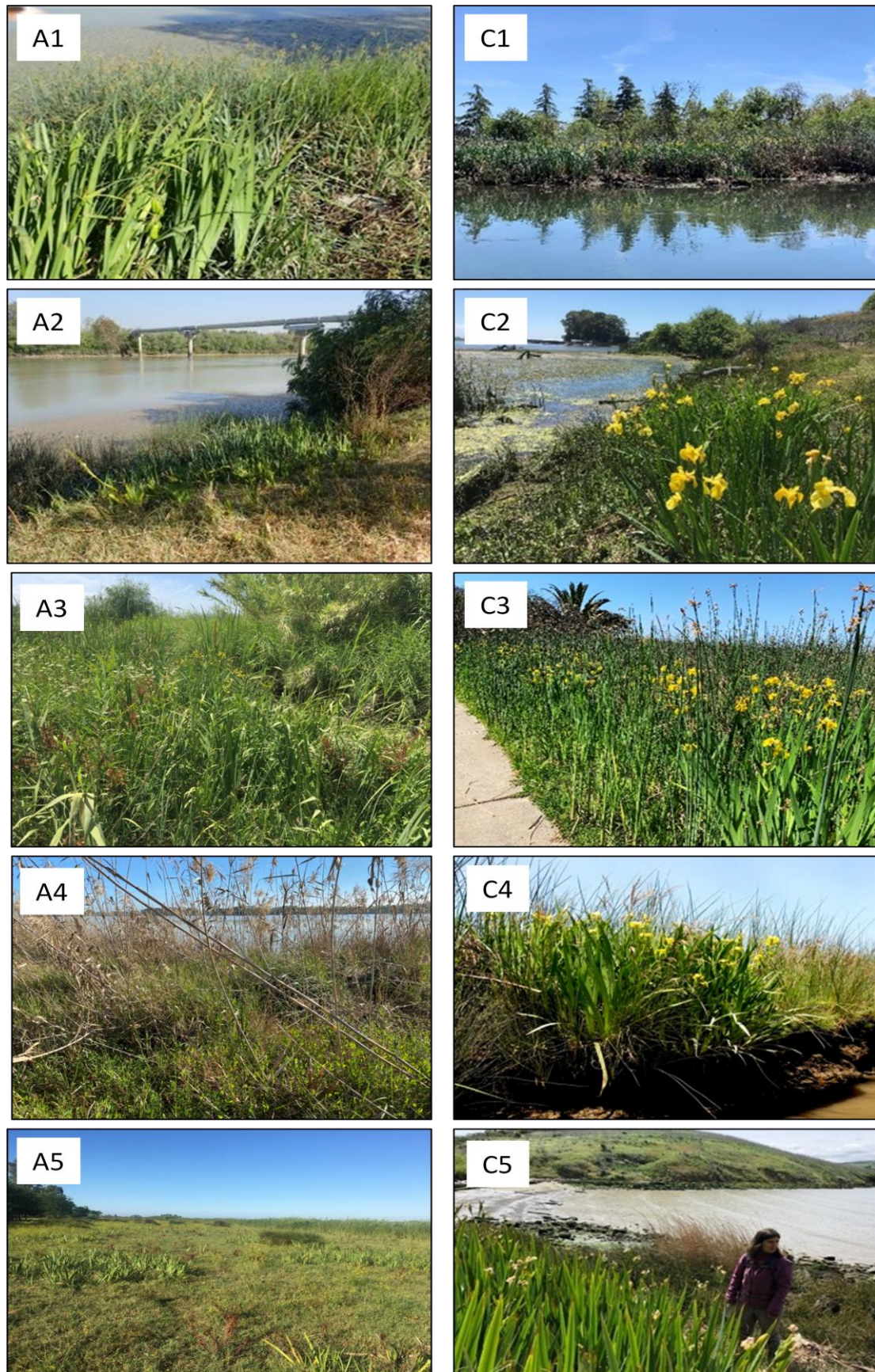| *Iris pseudacorus* locations	Geographical coordinates	Number of patches
Native range (Guadalquivir River Estuary, Andalusia)		
A1	37º25'7.8" N, 6º0'32.8" E	7
A2	37º22'36.4" N, 6º1'16.1" E	8
A3	37º4'30.0" N, 6º5'22.5" E	8
A4	37º1'55.8" N, 6º8'26.9" E	7
A5	37º1'34.0" N, 6º9'25.1" E	8
Invaded range (Sacramento-San Joaquin Delta, California)		
C1	37º58'37.4" N, 121º22'15.5" W	8
C2	38º7'1.4" N, 121º41'1.1" W	8
C3	38º1'15.5" N, 121º49'19.6" W	8
C4	38º5'47.7" N, 121º53'38.5" W	8
C5	38º4'14.2" N, 122º11'16.5" W 38º3'52.6" N, 122º12'6.2" W	7

Figure S1. Field pictures of sampled locations colonized by *Iris pseudacorus* in its native (Guadalquivir River Estuary, Andalusia, Spain, A1-A5) and the invaded range (Sacramento-San Joaquin Delta Estuary, California, USA, C1-C5).
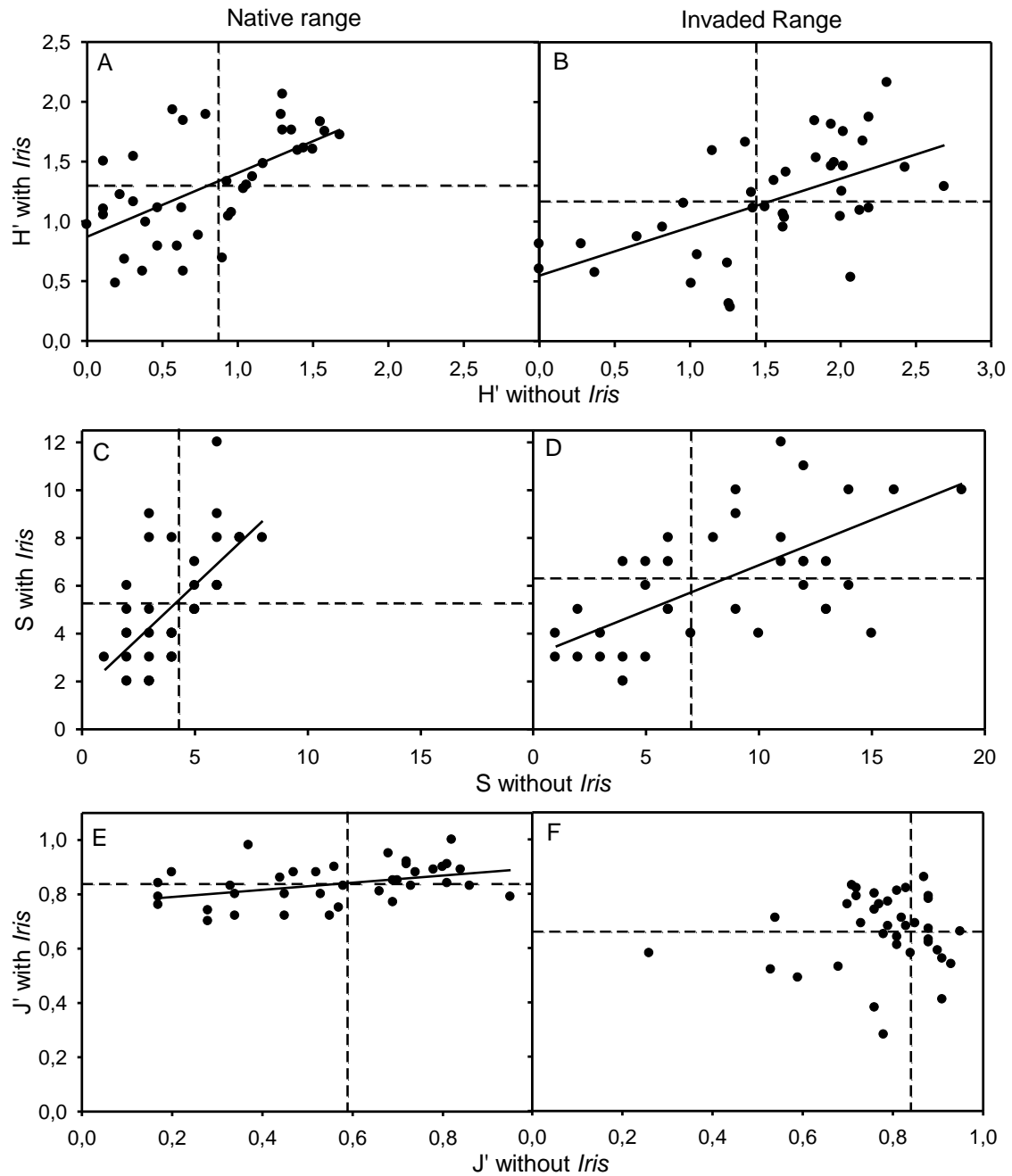
Figure S2. Relationship between the α-diversity (H'), plant species richness (S) and evenness (J') with and without *Iris pseudacorus* in native (Guadalquivir Estuary) and invaded (San Francisco Bay-Delta Estuary) distribution ranges. Dashed lines indicate means values. Regression equations: A, y = 0.871 + 0.533 x (R = 0.598, P < 0.0001, n = 38); B, y = 0.548 + 0.405 x (R = 0.581, P < 0.0001, n = 39); C, y = 1.581 + 0.891 x (R = 0.445, P < 0.005, n = 38); D, y = 3.074 + 0.379 x (R = 0.624, P < 0.0001, n = 39); E, y = 0.764 + 0.132 x (R = 0.397, P = 0.015, n = 37).
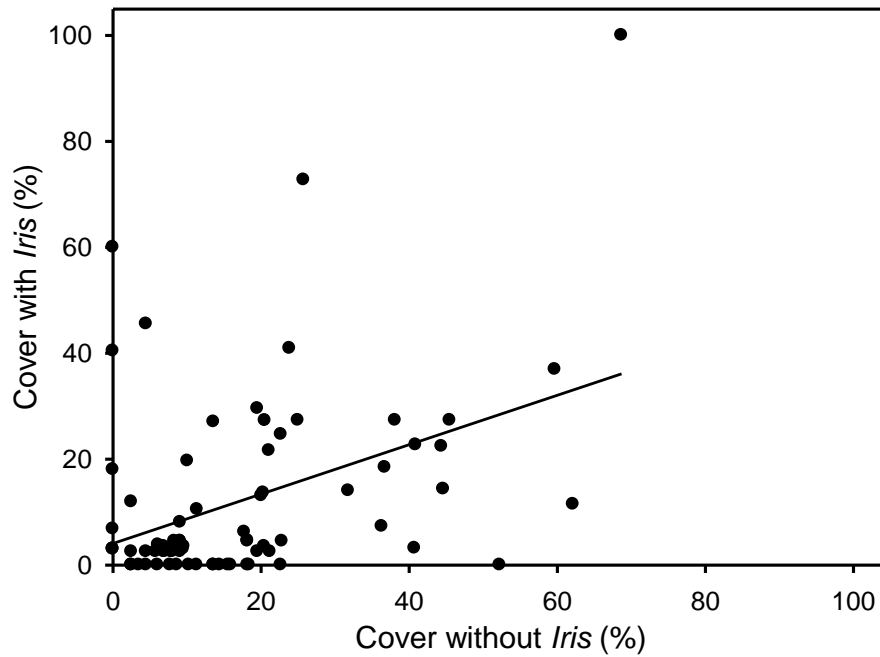
Figure S3. Relationship between cover (%) of plant taxa in paired plots with and without invasive *Iris pseudacorus* in *Iris*-invaded study locations in tidal wetlands along an estuarine gradient in the San Francisco Bay-Delta Estuary (California, USA). Regression equation: y = 4.076 + 0.467 x (R = 0.408, P < 0.0001, n = 75).

Table S2. Native and exotic plant taxa growing without and with *Iris pseudacorus* in the Guadalquivir River Estuary.

Plant taxa	Family	Without *Iris*	With *Iris*	Native (N) / Exotic (E)
Agropogon lutosus (Poir.) P. Fourn.	Poaceae	X	-	N
Arundo donax L.	Poaceae	-	X	E
Atriplex chenopodioides Batt.	Amaranthaceae	X	X	N
Atriplex prostrata Boucher EX. DC.	Amaranthaceae	X	X	N
Bolboschoenus maritimus (L.) Palla	Cyperaceae	X	X	N
Carex divisa Huds.	Cyperaceae	X	X	N
Carex otrubae Podp.	Cyperaceae	X	-	N
Carex sp.	Cyperaceae	X	-	N
Cichorium intybus L.	Asteraceae	X	-	N
Convulvulus arvensis L.	Convolvulaceae	X	X	N
Cynodon dactylon (L) Pers.	Poaceae	X	X	N
Cyperus eragrostis Lam.	Cyperaceae	X	X	N
Cyperus laevigatus L.	Cyperaceae	X	-	N
Cyperus longus L.	Cyperaceae	X	X	N
Datura stramonium L.	Solanaceae	X	-	E
Equisetum ramosissimum Desf.	Equisetaceae	X	X	N
Euphorbia hirsute L.	Euphorbiaceae	X	X	N
Galium sp.	Rubiaceae	X	X	N
Juncus maritimus Lam.	Juncaceae	X	X	N
Lotus angustissimus L.	Fabaceae	X	X	N
Lycopus europaeus L.	Lamiaceae	X	X	N
Lythrum salicaria L.	Lithraceae	X	X	N
Oenanthe lachenalii C.C. Gmel.	Apiaceae	X	X	N
Phragmites australis (Cav.) Trin. EX. Steud	Poaceae	X	X	N
Plantago latifolia Salisb.	Plantaginaceae	X	-	N
Poligonum equisetiforme Sm.	Polygonaceae	X	X	N
Polygonum salicifolium Brouss.	Polygonaceae	X	X	N
Rumex conglomerates Murray	Polygonaceae	X	-	N
Senecio gallicus Vill.	Asteraceae	X	X	N
Trifolium repens L.	Fabaceae	X	X	N
Typha angustifolia L.	Typhaceae	-	X	N
Verbena officinalis L.	Lamiaceae	X	-	N

Table S3. Native and exotic plant taxa growing without and with *Iris pseudacorus* in the Sacramento-San Joaquin Delta Estuary.

Plant taxa	Family	Without *Iris*	With *Iris*	Native (N) / Exotic (E)
Alisma plantago-aquatica L.	Alismataceae	X	-	N
Ambrosia psilostachya DC.	Asteraceae	X	X	N
Ammania coccinea Rottb.	Lythraceae	X	-	N
Arundo donax L.	Poaceae	X	X	E
Symphyotrichum lentum (Greene) G.L. Nesom	Asteraceae	X	X	N
Atriplex prostrata Boucher ex DC	Chenopodiaceae	X	X	E
Azolla filiculoides Lam.	Azolliaceae	X	X	N
Bidens frondosa L.	Asteraceae	X	X	N
Calystegia sepium (L.) R.Br. ssp. *limnophila* (Greene) Brummitt	Convolvulaceae	X	X	N
Cephalanthus occidentalis L.	Rubiaceae	X	X	N
Crassula aquatica (L.) Schönl	Crassulaceae	X	-	N
Cyperus eragrostis Lam.	Cyperaceae	X	X	N
Deschampsia cespitosa (L.) P. Beauv. subsp. *holciformis* (J. Presl) W.E. Lawr.	Poaceae	X	X	N
Distichlis spicata (L.) Greene	Poaceae	X	X	N
Echinochloa crus-galli (L.) P. Beauv.	Poaceae	X	X	E
Eichhornia crassipes (Mart.) Solms	Pontederiaceae	X	X	E
Eleocharis parvula (Roem. & Schult.) Link ex Bluff, Nees, & Schauer	Cyperaceae	X	-	N
Epilobium ciliatum Raf. subsp. *ciliatum*	Onagraceae	X	X	N
Elymus triticoides Buckle	Poaceae	-	X	N
Eryngium articulatum Hook.	Apiaceae	X	-	N
Erythranthe guttata (DC.) G.L. Nesom	Phrymaceae	X	X	N
Euthamia occidentalis Nutt.	Asteraceae	X	-	N
Festuca rubra L.	Poaceae	X	X	N
Foeniculum vulgare Mill.	Apiaceae	X	X	E
Galium aparine L.	Rubiaceae	-	X	N
Galium trifudum L.	Rubiaceae	X	-	N
Grindelia stricta DC.	Asteraceae	X	-	N
Helenium bigelovii A. Gray	Asteraceae	X	X	N
Helianthus californicus Fisch. & C.A. Mey	Asteraceae	X	-	N
Hydrocotyle umbellate L.	Araliaceae	X	X	N
Hydrocotyle verticillate Thunb.	Araliaceae	X	X	N
Jaumea carnosa (Less.) A. Gray	Asteraceae	X	X	N
Juncus balticus Willd.	Juncaceae	X	X	N
Juncus effusus L.	Juncaceae	X	X	N
Juncus xiphiodes E. Mey.	Juncaceae	X	X	N
Lathyrus jepsonii Greene var. *jepsonii*	Fabaceae	X	-	N
Leersia oryzoides (L.) Sw.	Poaceae	X	X	N
Lepidium latifolium L.	Brassicaceae	X	X	E
Lemna minor L.	Araceae	X	-	N
Lotus corniculatus L.	Fabaceae	X	X	E
Ludwigia hexapetala Hook. & Arn.) Zardini, H. Gu, P.H. Raven	Onagraceae	X	X	E
Ludwigia peploides (Kunth) P.H.	Onagraceae	X	X	E

Lythrum californicum Torr. & A. Gray	Lythraceae	**X**	**X**	N
Mentha arvense L.	Lamiaceae	**X**	-	E
Mentha aquatica L.	Lamiaceae	**X**	**X**	E
Oenanthe sarmentosa C. Presl ex CD.	Apiaceae	**X**	**X**	N
Paspalum distichum L.	Poaceae	**X**	**X**	N
Passiflora caerulea L.	Passifloraceae	-	**X**	E
Persicaria amphibia (L.) Delarbe	Polygonaceae	-	**X**	N
Persicaria hydropiperoides (Michx.) Small	Polygonaceae	**X**	**X**	N
Persicaria lapathifolia (L.) Delarbe	Polygonaceae	-	**X**	N
Persicaria punctata (Elliott) Small	Polygonaceae	**X**	**X**	N
Phalaris aquatica L.	Poaceae	**X**	**X**	E
Phragmites australis (Cav.) Steud.	Poaceae	**X**	-	N?
Pluchea oderata (L.) Cass.	Asteraceae	**X**	**X**	N
Plantago subnuda Pilg.	Plantaginaceae	**X**	**X**	N
Potentilla anserina L. sbsp. *pacifica* (Howell) Rousi	Rosaceae	**X**	**X**	N
Polypogon monspeliensis (L.) Desf.	Poaceae	**X**	**X**	E
Rubus armeniacus Focke	Rosaceae	**X**	**X**	E
Rubus ursinus Cham. & Schltdl.	Rosaceae	**X**	**X**	N
Rumex crispus L.	Polygonaceae	**X**	**X**	E
Sarcocornia pacifica (Standl.) A.J. Scott	Chenopodiaceae	**X**	-	N
Salsola soda L.	Chenopodiaceae	**X**	-	E
Schoenoplectus acutus (Muhl. ex Bigelow) Á. Löve & D. Löve var. *occidentalis* (Watson) S.G. G. Sm.	Cyperaceae	**X**	**X**	N
Schoenoplectus americanus (Pers.) Volkart ex Schinz & R. Keller	Cyperaceae	**X**	**X**	N
Schoenoplectus californicus (C.A. Mey.) Soják	Cyperaceae	**X**	**X**	N
Setaria parviflora (Poir.) Kerguélen	Poaceae	**X**	**X**	N
Saggitaria latifolia Willd.	Alismataceae	**X**	**X**	N
Solanum physalifolium Rusby	Solanaceae	**X**	**X**	E
Triglochin concinna Burtt Davy	Juncaginaceae	**X**	**X**	N
Triglochin striata Ruiz & Pav.	Juncaginaceae	-	**X**	N
Typha angustifolia L.	Typhaceae	**X**	**X**	E
Typha latifolia L.	Typhaceae	**X**	**X**	N
Verbena bonariensis L.	Verbenaceae	**X**	**X**	E
Zeltnera venusta (A. Gray) G. Mans.	Gentianaceae	X	X	N

Table S4. F-statistics and Pillai's trace from MANOVAs for diversity indices for the factors distribution range (native and invaded), *Iris pseudacorus* presence (with and without *Iris*), locations (grouped in each range sequentially according to their distance to the ocean) and their interactions, with sediment electrical conductivity as covariate, including main effect and model degrees of freedom (d.f.).

Factors	Pillai's Trace	F	d.f.	*P*
Range	0.360	23.997	3	< 0.0001
Iris presence	0.131	6.410	3	< 0.0001
Location	0.614	8.369	12	< 0.0001
Range * *Iris* presence	0.405	29.026	3	< 0.0001
Range * Location	0.334	4.075	12	< 0.0001
Iris presence * Location	0.146	1.667	12	0.072
Range * *Iris* presence* Location	0.331	4.033	12	< 0.0001

Table S5. General Linear Model or Generalized Linear Model for the Shannon–Wiener index (H′), species richness (S) and evenness (J′) comparing between distribution ranges (native and invaded), presence of *Iris pseudacorus* (with and without *Iris*) and locations (ordered in each range sequentially according to their distance to the ocean) and their corresponding interactions, with sediment electrical conductivity (EC) as covariate. Significant differences are marked in bold.

	EC		Range		*Iris* presence		Location		Range * *Iris* presence		Range * Location		*Iris* presence * Location		Range * *Iris* presence * Location	
	$F_{1,153}/\chi^2$	P	$F_{1,153}/\chi^2$	P	$F_{1,153}/\chi^2$	P	$F_{4,153}/\chi^2$	P	$F_{1,153}/\chi^2$	P	$F_{4,153}/\chi^2$	P	$F_{4,153}/\chi^2$	P	$F_{4,153}/\chi^2$	P
H′[1]	**4.539**	**0.033**	**28.210**	**<0.0001**	1.425	0.233	**138.071**	**<0.0001**	**55.134**	**<0.0001**	**15.308**	**0.004**	**10.774**	**0.029**	**12.173**	**0.016**
S[2]	2.837	0.094	**54.966**	**<0.0001**	0.398	0.529	**38.152**	**<0.0001**	**17.430**	**<0.0001**	**6.347**	**<0.0001**	**2.593**	**0.039**	**4.407**	**0.002**
J′[1]	1.167	0.280	0.717	0.397	**14.291**	**<0.0001**	**23.722**	**<0.0001**	**100.196**	**<0.0001**	**9.690**	**0.046**	5.116	0.276	**22.882**	**<0.0001**

[1] Data analyzed using the Gamma Generalized Linear Model and reporting Chi-square de Wald (χ^2). [2] Square root transformed

Table S6. Student t-test or Man-Whitney U-test comparing Shannon– Wiener index (H′) (A), number of plant species (S) (B), and evenness (J′) (C) without and with *Iris pseudacorus* in its native (Guadalquivir Estuary) and invaded (Sacramento-San Joaquin Delta Estuary) distribution range, including all recorded species in the analyses. Significant differences are marked in bold. d.f., degrees of freedom.

	Native vs invaded distribution range	
	Without *Iris pseudacorus*	With *Iris pseudacorus*
H′	**t = -5.473, d.f. = 75, P < 0.0001**	t = 1.276, d.f. = 75, P = 0.206
S	**U = 336.500, P < 0.0001**	t = -1.705, d.f. = 75, P = 0.092
J′	**U = 264.500, P < 0.0001**	**U = 144.500, P < 0.0001**
	Without vs with *Iris pseudacorus*	
	Native range	Invaded range
H′	**t = 4.641, d.f. = 74, P < 0.0001**	**t = -2.804, d.f. = 76, P = 0.006**
S	**t = 2.177, d.f. = 74, P = 0.033**[1]	**U = 560.000, P = 0.044**
J′	**U = 151.500, P < 0.0001**	**t = -4.068, d.f. = 74, P < 0.0001**

[1] Square root transformed

Table S7. Student t-test or Man-Whitney U-test comparing Shannon–Wiener index (H′) (A), number of plant species (S) (B), and evenness (J′) (C) without and with *Iris pseudacorus* in intertidal marshes within its native (Guadalquivir Estuary) and invaded (Sacramento-San Joaquin Delta Estuary) distribution range, including only native species in the analyses. Significant differences are marked in bold. d.f., degrees of freedom.

	Native vs invaded distribution range	
	Without *Iris pseudacorus*	With *Iris pseudacorus*
H′	**t = -3.765, d.f. = 75, P < 0.0001**	**t = 2.833, d.f. = 75, P = 0.006**
S	**U = 451.000, P = 0.003**	t = 0.186, d.f. = 75, P = 0.853
J′	**U = 319.000, P < 0.0001**	**U = 148.000, P < 0.0001**
	Without vs with *Iris pseudacorus*	
	Native range	Invaded range
H′	**t = 4.678, d.f. = 74, P < 0.0001**	**t = -2.280, d.f. = 76, P = 0.025**
S	**t = 2.385, d.f. = 74, P = 0.020**	U = 587.000, P = 0.081
J′	**U = 166.500, P < 0.0001**	**t = -2.616, d.f. = 71, P = 0.011**

Table S8. Generalized Linear Model for Morisita-Horn dissimilarity index comparing plant communities with and without *Iris pseudacorus* and between its distribution ranges (native and invaded).

	Chi-square of Wald	Degrees of freedom	P
Intersection	58146.685	1	< 0.0001
Range	21.296	1	< 0.0001
Iris presence	6431.517	2	< 0.0001
Range * *Iris* presence	360.949	2	< 0.0001

Table S9. Generalized Linear Model for Sørensen dissimilarity index comparing plant communities with and without *Iris pseudacorus* and between its distribution ranges (native and invaded).

	Chi-square of Wald	Degrees of freedom	P
Intersection	112559.446	1	< 0.0001
Range	411.958	1	< 0.0001
Iris presence	987.281	2	< 0.0001
Range * *Iris* presence	12.563	2	0.002

Table S10. Indicator values for the simultaneous occurrence of plant species with *Iris pseudacorus* (Irps) in intertidal marshes within its native and invaded ranges. A, Positive predictive power of species combinations; B, Sensitivity of species combinations; sqrtIV, Square root of indicator value of species combinations; P, P-value of the permutation test of statistical significance. We show results with sqrtIV > 0.05.

	A	B	sqrtIV	P
Native range				
Irps + *Polygonum salicifolium* (Posa)	1	0.553	0.743	0.005
Irps + *Cynodon dactylon*	1	0.553	0.743	0.005
Irps + *Oenanthe lachenalii* (Oela)	1	0.526	0.725	0.005
Irps + *Phragmites australis* (Phau)	1	0.526	0.725	0.005
Irps + *Scirpus maritimus* (Scma)	1	0.447	0.669	0.005
Irps + Oela + Phau	1	0.447	0.669	0.005
Irps + Oela + Posa	1	0.421	0.649	0.005
Irps + Oela + Scma	1	0.421	0.649	0.005
Irps + *Atriplex chenopodioides*	1	0.368	0.607	0.005
Irps + Phau + Scma	1	0.368	0.607	0.005
Invaded range				
Irps + *Juncus balticus* (Juba)	1	0.487	0.698	0.005
Irps + *Calystegia sepium* (Case)	1	0.385	0.620	0.005
Irps + *Schoenoplectus acutus*	1	0.385	0.620	0.005
Irps + Case + Juba	1	0.256	0.506	0.005
Irps + *Schoenoplectus californicus*	1	0.256	0.506	0.005