

Supplementary material

I. Statistical tests

a) Shapiro Wilk test of D by season (N=60 in all cases)

	Summer 2020	Winter 2020	Summer 2021
S.W.	0.9168	0.8349	0.8828
p-value	0.0005704	1.12E-06	3.28E-05

b) Shapiro Wilk test of D by beach (N=9 in all cases). Los Delfines (D), Tres Picos (TP), Punta Roquitas (PR), La Pampilla 2 (PA2), La Pampilla (PA), Waikiki (W), Makaha (M), Redondo (R), La Estrella (E), Las Piedritas (PD), Las Cascadas (C), Barranquito (BT), Los Pavos (PV), Barranco (B), Los Yuyos (Y), Las Sombrilla (S), Agua Dulce (AD), Los Pescadores (PE), La Caplina (LC) and La Herradura (LH).

	LD	TP	PR	PM	PA	WK	MK	RD	LE	PD
S.W.	0.6689	0.7111	0.5134	0.7731	0.4435	0.6173	0.5671	0.6547	0.6209	-
p-value	0.0006146	0.001915	9.19E-06	0.01003	1.38E-06	0.0001526	3.93E-05	0.0004194	0.0001683	-

	LC	BT	PV	BR	LY	LS	AD	PE	LN	LH
S.W.	0.5999	0.527	0.6547	0.886	0.788	0.7821	0.7684	0.6313	0.8741	0.8999
p-value	9.56E-05	1.33E-05	0.0004194	0.1813	0.01489	0.01273	0.008854	0.000223	0.136	0.2517

c) Levene test of *D* by season (N=60 in all cases)

	Summer 2020	Winter 2020	Summer 2021
p-value	0.08173	0.00013	0.04454

d) Levene test of D by beach (N=9 in all cases). Los Delfines (D), Tres Picos (TP), Punta Roquitas (PR), La Pampilla 2 (PA2), La Pampilla (PA), Waikiki (W), Makaha (M), Redondo (R), La Estrella (E), Las Piedritas (PD), Las Cascadas (C), Barranquito (BT), Los Pavos (PV), Barranco (B), Los Yuyos (Y), Las Sombrilla (S), Agua Dulce (AD), Los Pescadores (PE), La Caplina (LC) and La Herradura (LH).

	LD	TP	PR	PM	PA	WK	MK	RD	LE	PD
p-value	-	-	0.00949	-	-	-	-	-	-	-
p-value	LC	BT	PV	BR	LY	LS	AD	PE	LN	LH

e) Mann-Whitney test of D by beach Los Delfines (LD), Tres Picos (TP), Punta Roquitas (PR), La Pampilla 2 (PM), La Pampilla (PA), Waikiki (WK), Makaha (MK), Redondo (RD), La Estrella (LE), Las Piedritas (PD), Las Cascadas (LC), Barranquito (BT), Los Pavos (PV), Barranco (BR), Los Yuyos (LY), Las Sombrilla (LS), Agua Dulce (AD), Los Pescadores (PE), La Caplina (LN) and La Herradura (LH).

	LD	TP	PR	PM	PA	WK	MK	RD	LE	PD	LC	BT	PV	BR	LY	LS	AD	PE	LN	LH	
LD		0.69	0.00	0.08	0.49	0.00	0.46	0.00	0.56	0.95	0.01	0.02	0.02	0.01	0.65	0.37	0.37	0.37	0.65	0.05	
TP	0.69		0.00	0.02	0.18	0.00	0.18	0.00	0.27	0.59	0.00	0.00	0.00	0.00	0.72	0.24	0.24	0.24	0.72	0.04	
PR	0.00	0.00		1.00	0.00	0.96	0.03	0.00	0.00	0.00	0.03	0.78	0.00	0.47	0.15	0.15	0.15	0.53	0.32	0.00	
PM	0.08	0.02	1.00		0.14	0.36	0.21	0.00	0.17	0.01	0.65	0.78	0.72	0.66	0.06	0.03	0.03	0.37	0.03	0.00	
PA	0.49	0.18	0.00	0.14		0.00	1.00	0.00	1.00	0.17	0.01	0.02	0.02	0.01	0.41	0.14	0.14	0.52	0.46	0.02	
WK	0.00	0.00	0.96	0.36	0.00		0.01	0.00	0.00	0.00	0.01	0.35	0.00	0.93	0.05	0.05	0.05	0.71	0.15	0.00	
MK	0.46	0.18	0.03	0.21	1.00	0.01		0.00	1.00	0.17	0.02	0.11	0.04	0.02	0.27	0.08	0.08	0.93	0.27	0.02	
RD	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.79	0.47	0.24	0.72	0.28	
LE	0.56	0.27	0.00	0.17	1.00	0.00	1.00		0.00	0.30	0.04	0.02	0.06	0.02	0.37	0.21	0.21	0.53	0.47	0.04	
PD	0.95	0.59	0.00	0.01	0.17	0.00	0.17		0.00	0.30	0.00	0.00	0.00	0.00	0.71	0.22	0.22	0.21	0.70	0.04	
LC	0.01	0.00	0.03	0.65	0.01	0.01	0.02		0.00	0.04	0.00	0.12	0.73	0.11	0.21	0.09	0.09	0.93	0.28	0.01	
BT	0.02	0.00	0.78	0.78	0.02	0.35	0.11		0.00	0.02	0.00	0.12		0.00	0.36	0.17	0.14	0.14	0.52	0.00	
PV	0.02	0.00	0.00	0.72	0.02	0.00	0.04		0.00	0.06	0.00	0.73	0.00		0.01	0.47	0.24	0.24	0.72	0.01	
BR	0.01	0.00	0.47	0.66	0.01	0.93	0.02		0.00	0.02	0.00	0.11	0.36	0.01		0.09	0.05	0.05	0.72	0.00	
LY	0.65	0.72	0.15	0.06	0.41	0.05	0.27	0.72		0.37	0.71	0.21	0.17	0.47	0.09		0.37	0.37	0.38	0.72	0.21
LS	0.37	0.24	0.15	0.03	0.14	0.05	0.08	0.79		0.21	0.22	0.09	0.14	0.24	0.05	0.37		0.69	0.86	0.25	0.16
AD	0.37	0.24	0.15	0.03	0.14	0.05	0.08	0.47		0.21	0.22	0.09	0.14	0.24	0.05	0.37	0.69		0.86	0.53	0.21
PE	0.37	0.24	0.53	0.37	0.52	0.71	0.93	0.24		0.53	0.21	0.93	0.52	0.24	0.72	0.38	0.86	0.86		0.09	0.03
LN	0.65	0.72	0.32	0.03	0.46	0.15	0.27	0.72		0.47	0.70	0.28	0.17	0.72	0.05	0.72	0.25	0.53	0.09		0.51
LH	0.05	0.04	0.00	0.00	0.02	0.00	0.02	0.28		0.04	0.04	0.01	0.00	0.01	0.00	0.21	0.16	0.21	0.03		0.51

II. Detailed review of urban beaches assessed by CSES around the world.

Reference	Beach	D index	Class
[11]	Nueva Andalucia	0.75	II
Spain	Conil	0.64	III
	Nagueles	0.57	III
	La Cortadura	0.51	III
	La Rada	0.48	III
	Santa Barbara	0.3	IV
	Fontanilla	0.24	IV
	Torre del Mar	0.21	IV
	La Barrosa (Urb.)	0.03	IV
	La Caleta	-0.05	V
	Las Acacias	-0.14	V
	Fuentebavia	-0.21	V
	El Rompidillo	-0.21	V
	El Rinconcillo	-0.24	V
	La Victoria	-0.36	V

	La Puntilla	-0.36	V
	Santa Amalia	-0.44	V
	Santa María del Mar	-0.47	V
	El Rompidillo	-0.48	V
[12]	Pozos Colourados	0.13	IV
Colombia	El Rodadero	0.04	IV
	Palmarito	-0.05	V
	Puerto Colombia	-0.17	V
	Aeropuerto	-0.33	V
	Castillo Grande	-0.33	V
	Riohacha (EAST)	-0.34	V
	Riohacha (WEST)	-0.34	V
	Playa el Bony e Hotel Caribe	-0.42	V
	Bocagrande	-0.42	V
	El laguito	-0.42	V
	Los Cocos	-0.46	V
	Bahía de Santa Marta	-0.48	V

	Marbella - Chiringuito	-0.6	V
[15]	Calle 46	0.8	II
Cuba	Calle 55	0.8	II
	Calle 57 Museo	0.79	II
	Calle 48-50	0.54	III
	Barlovento	0.38	IV
	Siboney	0.29	IV
	Canal Este	0.12	IV
	Allende	-0.22	V
	Tenis	-0.87	V
	El Judío	-0.9	V
[17]	Avenida Perú	0.2	IV
Chile	Caleta Abarca	0.03	IV
	Miramar	0.01	IV
	Punta Angeles	-0.04	V
	Los Marineros	-0.22	V
	Playa Chica Quintay	-0.24	V
	Caleta Pichicuy	-0.26	V

Cementerio	-0.27	V
Muelle Vergara	-0.5	V
Caleta Quintay	-0.5	V
Las Torpederas	-0.55	V
Reñaca	-0.57	V
Las Salinas	-0.65	V
Muelle Barón	-0.69	V
La Boca. Desembocadura Río Aconcagua	-0.75	V
Playa San Mateo	-0.76	V
Ventana	-0.85	V
Caleta Horcón	-0.85	V
Caleta Portales	-0.85	V
Balneario Algarrobo Norte	-0.35	V
Playa Las Cadenas	-0.26	V
Playa Los Tubos	-0.76	V
El Quisco Norte	-0.29	V
Playa Grande Cartagena	-0.48	V

	Caleta San Antonio	-0.94	V
[13]	Guarita Park	0.52	III
Brasil	Prainha beach	0.06	IV
	Praia Da Cal Beach	0.05	IV
	Praia dos Molhes beach	0.04	IV
	Itapeva Park - south	-0.02	V
	Itapeva beach - south	-0.03	V
	Itapeva Park - center	-0.14	V
	Center south beaches	-0.22	V
	Extreme south beaches	-0.25	V
	Praia Grande beach	-0.25	V
	Itapeva Park - north	-0.42	V
	Praia Grande beach - South	-0.46	V
[18]	Racó de L'Albir	0.3	IV
Spain	Morelló	0.27	IV
	Les Marines	0.21	IV
	Balbilónia	0.18	IV
	Almadraba	0.16	IV

Mil Palmeras	0.09	IV
Torrelamata	0.06	IV
Cala de la Fossa	0.06	IV
L'Arenal	0	IV
Playa de Cura	-0.025	V
La Estaca	-0.06	V
Playa San Juna	-0.07	V
LLlevant	-0.09	V
Cala Finestrat	-0.11	V
Arenales del Sol	-0.15	V
Saladar	-0.19	V
Albufereta	-0.21	V
Cabo Roig	-0.24	V
Serragrossa	-0.3	V
Postiguet	-0.36	V
Gran Playa	-0.45	V
San Gabriel	-0.61	V
[14]	La Concha	0.27
		IV

Spain	Ondarreta	0.22	IV
	Arrigunaga	0.15	IV
	Zurriola	0	IV
	Pla de l'os	-0.5	V
	Mar Bella	-0.52	V
	Bogatell	-0.57	V
	Nova Icária	-0.58	V
	Ocata	-0.6	V
	Somorrostro	-0.61	V
	San Sebastiá	-0.62	V
	Sant Miquel	-0.62	V
	La Barceloneta	-0.62	V
	Las Arenas	-0.73	V
[4]	Jurerê	0.26	IV
Brasil	Ingleses	-0.41	V
	Canasvieiras	-0.5	V
[16]	Cienaga	0.72	II
Colombia	Dibulla	0.65	II

Gaira	0.25	IV
Manaure Viejo	0.19	IV
Pozos Colourados	0.13	IV
Termoelectrica	0.07	IV
San Andres	0.07	IV
Puerto Escondido	0.04	IV
Rodadero	0.04	IV
Manaure Nuevo	-0.2	V
Catillogrande	-0.33	V
Aeropuerto	-0.33	V
Riohacha - East	-0.34	V
Riohacha - West	-0.34	V
Playa Blanca	-0.35	V
Berrugas	-0.35	V
Moñitos	-0.38	V
Playa el bony – Hotel Caribe	-0.42	V
El Laguito	-0.42	V

	Bocagrande	-0.42	V
	Los Cocos	-0.46	V
	Santa Marta	-0.48	V
	Tierra Bomba	-0.58	V
	Marbella	-0.6	V
	El Rincón	-0.66	V
	Tolu	-0.79	V
	Santa Verónica	-0.93	V
	Arboletes	-0.95	V
	Puerto Colombia - Malecón	-1.22	V
	Pradomar - Urbana	-1.23	V
	Puerto Colombia - Norte	-1.25	V
[19]	Magna Grecia	0.5	III
Italy	Le Dune	0.39	IV
	Blumen Bad	0.3	IV
	Mondial	0.19	IV
	Lido Scacchi	0.11	IV

	Ermitage	0.11	IV
	Sagano–Lido degli Scacchi	-0.19	V
	Nettuno–Porto Garibaldi	-0.24	V
	Aloha–Lido di Nazioni	-0.36	V
	Pic Nic–Lido Pomposa	-0.48	V
	Cristallo –Lido di Nazioni	-0.61	V
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Lizarbe-Palacios, Aponte & Botero (2022) [present article] Peru	La Herradura	-0.23	V
	La Caplina	-0.26	V
	Redondo 2	-0.27	V
	Los Yuyos	-0.29	V
	Tres Picos	-0.30	V
	La Estrella	-0.30	V
	Agua Dulce	-0.30	V
	Las Sombrillas	-0.31	V
	Los Pavos	-0.31	V
	Los Delfines	-0.31	V
	Redondo 1	-0.32	V
	Pampilla	-0.32	V

Makaha	-0.34	V
Los Pescadores	-0.34	V
Las Cascadas	-0.35	V
Barranquito	-0.35	V
Punta Roquitas	-0.35	V
Barranco	-0.38	V
Pampilla 2	-0.39	V
Waikiki	-0.39	V
