SUPPLEMENTARY INFORMATION

Otolith shape analysis as a tool for species identification and management of cryptic congeners in the northern Benguela ocean-warming hotspot

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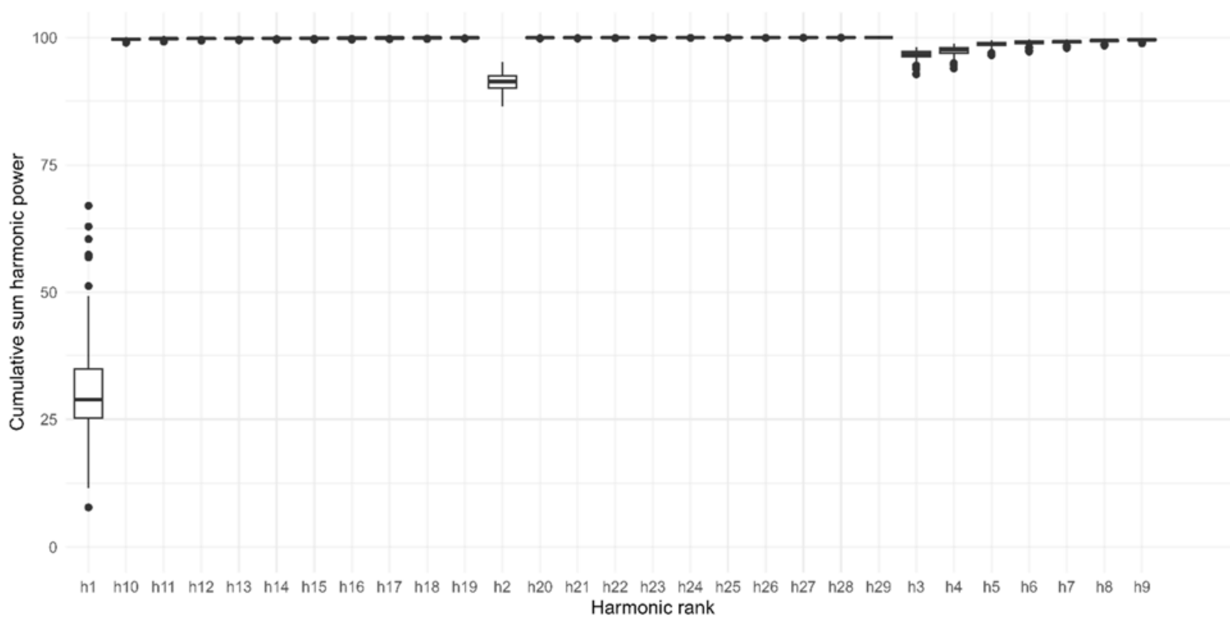


Figure S1. Cumulative Harmonic Fourier power calculated for *Argyrosumus* spp. otolith shapes against the harmonic rank. The boxes show the median and the interquartile range (IQR), the whiskers show the gates (1.5 × IQR), and the black dots represent the outliers.

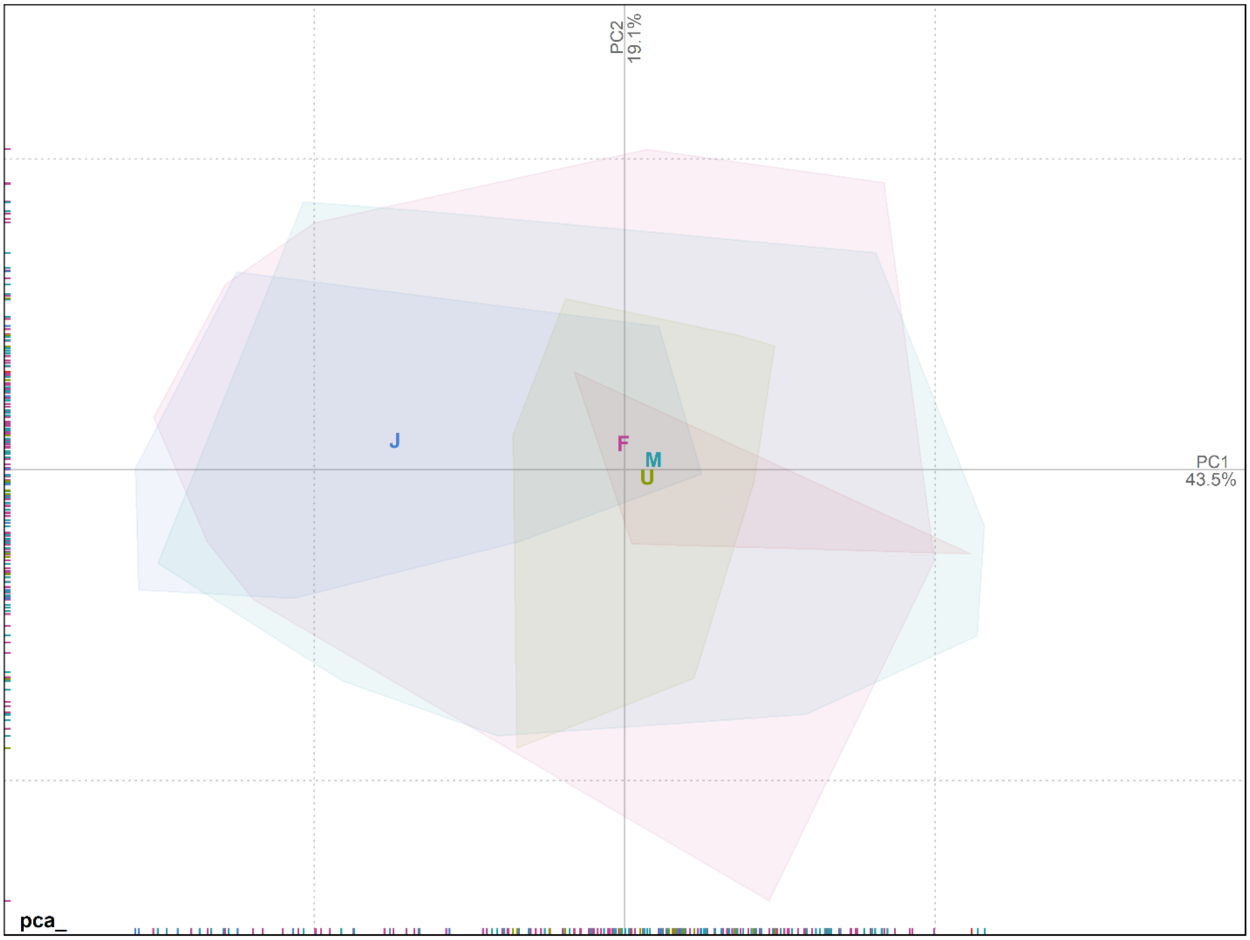


Figure S2. Principal component analysis (PCA) conducted on the 65 Fourier coefficients of otolith shape for *Argyrosomus coronus* (n = 29), *A. inodorus* (n = 180) and their putative hybrids (n = 8). The sexes male (M), female (F), juvenile (J) or unsexed (U), are indicated as shaded areas. The levels of variance explained by the first two PCA axes are shown on the axes.

Table S1. Means, standard deviations (SD) and Shapiro-Wilk test results to test for normality of each of a. 65 otolith shape Fourier descriptors and b. 12 shape indices of 217 *Argyrosomus* spp. otoliths. The 12 shape indices are: aspect ratio (AR), ellipticity (ellip), form-factor (FF), rectangularity (rect), roundness (round), circularity (circ), otolith length (OL), otolith height (OH), otolith perimeter (OP), otolith area (OA) and log-transformed otolith area (logOA), circularity (circ), ostium-caudal distance (OCD) and OCD – otolith height ratio (OCD.OH). Bolded p-values are those < 0.05 and indicate significant deviation from a normality

	A. inodorus				*A. coronus*			
a. Descriptor	**Mean**	**SD**	**W-statistic**	**p-value**	**Mean**	**SD**	**W-statistic**	**p-value**
A2			0.9884	0.1476			0.9626	0.3799
A3			0.9206	**<0.0001**			0.8571	**0.0011**
A4			0.9454	**<0.0001**			0.9742	0.6776
A5			0.9728	**0.0014**			0.9602	0.3326
A6			0.9921	0.4349			0.9745	0.6863
A7			0.9672	**0.0003**			0.9547	0.2422
A8			0.9912	0.3428			0.9342	0.0706
A9			0.9727	**0.0013**			0.9896	0.9902
A10			0.9783	**0.0066**			0.9769	0.7549
A11			0.9463	**<0.0001**			0.8555	**0.0010**
A12			0.9946	0.7532			0.9567	0.2711
A13			0.9967	0.9662			0.9586	0.3038
A14			0.9706	**0.0007**			0.9327	0.0648
A15			0.9939	0.6674			0.9784	0.7949
A16			0.9944	0.7381			0.9623	0.3735
A17			0.9623	**0.0001**			0.9444	0.1305
B2			0.8303	**<0.0001**			0.8648	**0.0016**
B3			0.9411	**<0.0001**			0.9534	0.2246
B4			0.9904	0.2669			0.8244	**0.0002**
B5			0.9549	**<0.0001**			0.9200	**0.0304**
B6			0.9918	0.4000			0.9591	0.3129
B7			0.9944	0.7381			0.9763	0.7372
B8			0.9779	**0.0058**			0.9628	0.3839
B9			0.9951	0.8202			0.9867	0.9667
B10			0.9891	0.1843			0.9358	0.0779
B11			0.9844	**0.0423**			0.9104	**0.0175**
B12			0.9938	0.6472			0.9521	0.2072
B13			0.9953	0.8508			0.8203	**0.0002**
B14			0.9941	0.6901			0.8298	**0.0003**
B15			0.9923	0.4594			0.9107	**0.0179**
B16			0.9964	0.9477			0.9918	0.9976
B17			0.9908	0.3026			0.9151	**0.0230**
C2			0.9826	**0.0244**			0.8468	**0.0007**
C3			0.9960	0.9160			0.9315	0.0601
C4			0.9789	**0.0078**			0.9346	0.0723
C5			0.9858	0.0651			0.9809	0.8603

C6			0.9857	0.0628			0.9757	0.7218
C7			0.9950	0.8128			0.9351	0.0747
C8			0.9910	0.3189			0.9651	0.4358
C9			0.9927	0.5087			0.9461	0.1446
C10			0.9929	0.5289			0.9698	0.5540
C11			0.9966	0.9634			0.9596	0.3218
C12			0.9927	0.5018			0.9719	0.6120
C13			0.9911	0.3327			0.9634	0.3981
C14			0.9910	0.3216			0.9474	0.1562
C15			0.9941	0.6963			0.9500	0.1835
C16			0.9885	0.1543			0.9038	**0.0121**
C17			0.9914	0.3542			0.9695	0.5468
D1			0.9914	0.3553			0.9556	0.2552
D2			0.9942	0.7056			0.9929	0.9991
D3			0.9951	0.8269			0.8637	**0.0015**
D4			0.9942	0.7120			0.9869	0.9690
D5			0.9895	0.2060			0.9700	0.5594
D6			0.9912	0.3440			0.9541	0.2331
D7			0.9969	0.9777			0.9776	0.7750
D8			0.9641	**0.0001**			0.9578	0.2894
D9			0.9920	0.4250			0.9108	**0.0179**
D10			0.9911	0.3274			0.9717	0.6069
D11			0.9896	0.2143			0.9643	0.4181
D12			0.9917	0.3906			0.9792	0.8179
D13			0.9909	0.3120			0.9849	0.9407
D14			0.9908	0.3056			0.9296	0.0538
D15			0.9946	0.7572			0.9644	0.4190
D16			0.9915	0.3687			0.9863	0.9611
D17			0.9896	0.2122			0.9552	0.2493
b. Shape Index	**Mean**	**SD**	**W-statistic**	**p-value**	**Mean**	**SD**	**W-statistic**	**p-value**
AR	1.804	0.0940	0.99561	0.8810	1.789	0.0823	0.96698	0.4810
ellip	0.286	0.0240	0.99385	0.6572	0.282	0.0212	0.96663	0.4722
FF	0.787	0.0234	0.99345	0.6039	0.828	0.0176	0.98910	0.9875
rect	0.756	0.0256	0.98760	0.1154	0.814	0.0225	0.84743	**0.0007**
round	0.534	0.0242	0.98875	0.1646	0.580	0.0233	0.96980	0.5543
circ	15.987	0.4759	0.99248	0.4784	15.177	0.3232	0.98884	0.9857
OL	17.666	2.0475	0.97751	**0.0052**	17.875	1.8319	0.95745	0.2840
OH	9.813	1.2205	0.98447	**0.0433**	10.014	1.1365	0.93899	0.0943
OP	45.743	5.4757	0.97446	**0.0022**	47.006	4.9649	0.95303	0.2192
OA	132.300	30.1466	0.94275	**<0.0001**	147.038	30.6970	0.93725	0.0850
logOA	4.861	0.2201	0.99036	0.2669	4.970	0.2037	0.95939	0.3175
OCD	3.836	0.5246	0.98147	**0.0171**	2.566	0.3125	0.97800	0.7853
OCD.OH	0.393	0.0481	0.98848	0.1515	0.258	0.0334	0.94830	0.1653

Table S2. ANCOVA results to test for fish total length (length), species (pop) and interaction effects on
a. 40 otolith shape descriptors and
b. 7 shape indices for 217 *Argyrosomus* spp. otoliths. P-values at < 0.05 for length are bolded and in red for pop (with no significant pop-length interaction)

a.

Descriptor	Term	df	Sumsq	Meansq	F-statistic	p-value
A2	length	1	0.00217	0.00217	47.8156	**<0.0001**
A2	pop	2	0.00112	0.00056	12.3437	<0.0001
A2	length:pop	2	0.00009	0.00004	0.9513	0.3879
A2	Residuals	211	0.00959	0.00005	NA	NA
A6	length	1	0.00032	0.00032	62.6439	**<0.0001**
A6	pop	2	0.00010	0.00005	9.2107	0.0002
A6	length:pop	2	0.00000	0.00000	0.3025	0.7393
A6	Residuals	211	0.00109	0.00001	NA	NA
A8	length	1	0.00001	0.00001	4.3987	**0.0372**
A8	pop	2	0.00023	0.00011	37.3855	<0.0001
A8	length:pop	2	0.00002	0.00001	2.8764	0.0586
A8	Residuals	211	0.00064	0.00000	NA	NA
A12	length	1	0.00000	0.00000	2.1938	0.1401
A12	pop	2	0.00000	0.00000	0.4797	0.6196
A12	length:pop	2	0.00001	0.00000	4.0563	0.0187
A12	Residuals	211	0.00023	0.00000	NA	NA
A13	length	1	0.00000	0.00000	0.1682	0.6821
A13	pop	2	0.00000	0.00000	2.7415	0.0668
A13	length:pop	2	0.00000	0.00000	0.8813	0.4158
A13	Residuals	211	0.00018	0.00000	NA	NA
A15	length	1	0.00000	0.00000	1.8532	0.1749
A15	pop	2	0.00000	0.00000	0.5943	0.5529
A15	length:pop	2	0.00000	0.00000	0.3171	0.7286
A15	Residuals	211	0.00012	0.00000	NA	NA
A16	length	1	0.00000	0.00000	0.0056	0.9406
A16	pop	2	0.00000	0.00000	4.1794	0.0166
A16	length:pop	2	0.00000	0.00000	0.1233	0.8840
A16	Residuals	211	0.00012	0.00000	NA	NA
B6	length	1	0.00013	0.00013	19.5780	<0.0001
B6	pop	2	0.00003	0.00001	2.1084	0.1240
B6	length:pop	2	0.00001	0.00000	0.6124	0.5430
B6	Residuals	211	0.00137	0.00001	NA	NA
B7	length	1	0.00003	0.00003	6.3560	0.0124
B7	pop	2	0.00000	0.00000	0.2470	0.7814
B7	length:pop	2	0.00001	0.00000	0.6728	0.5114
B7	Residuals	211	0.00088	0.00000	NA	NA
B9	length	1	0.00002	0.00002	7.1496	0.0081
B9	pop	2	0.00002	0.00001	3.3592	0.0366

B9	length:pop	2	0.00000	0.00000	0.7441	0.4764
B9	Residuals	211	0.00047	0.00000	NA	NA
B10	length	1	0.00002	0.00002	11.2798	**0.0009**
B10	pop	2	0.00005	0.00002	10.7977	<0.0001
B10	length:pop	2	0.00003	0.00001	6.5281	**0.00177**
B10	Residuals	211	0.00047	0.00000	NA	NA
B12	length	1	0.00000	0.00000	0.6323	0.4274
B12	pop	2	0.00007	0.00003	20.9087	<0.0001
B12	length:pop	2	0.00000	0.00000	0.8834	0.4149
B12	Residuals	211	0.00035	0.00000	NA	NA
B16	length	1	0.00000	0.00000	1.0569	0.3051
B16	pop	2	0.00000	0.00000	0.2165	0.8055
B16	length:pop	2	0.00000	0.00000	4.3360	**0.0143**
B16	Residuals	211	0.00009	0.00000	NA	NA
C3	length	1	0.00026	0.00026	4.4724	**0.0356**
C3	pop	2	0.00526	0.00263	44.8479	<0.0001
C3	length:pop	2	0.00008	0.00004	0.7074	0.4941
C3	Residuals	211	0.01237	0.00006	NA	NA
C5	length	1	0.00012	0.00012	5.4447	**0.0206**
C5	pop	2	0.00004	0.00002	0.9694	0.3810
C5	length:pop	2	0.00000	0.00000	0.1095	0.8964
C5	Residuals	211	0.00459	0.00002	NA	NA
C6	length	1	0.00002	0.00002	1.6148	0.2052
C6	pop	2	0.00013	0.00007	5.5952	0.0043
C6	length:pop	2	0.00002	0.00001	0.9131	0.4028
C6	Residuals	211	0.00250	0.00001	NA	NA
C7	length	1	0.00001	0.00001	1.1532	0.2841
C7	pop	2	0.00040	0.00020	20.8034	<0.0001
C7	length:pop	2	0.00001	0.00001	0.5589	0.5727
C7	Residuals	211	0.00205	0.00001	NA	NA
C8	length	1	0.00001	0.00001	0.5658	0.4528
C8	pop	2	0.00006	0.00003	3.2067	0.0425
C8	length:pop	2	0.00001	0.00001	0.6228	0.5374
C8	Residuals	211	0.00195	0.00001	NA	NA
C9	length	1	0.00001	0.00001	2.1297	0.1460
C9	pop	2	0.00008	0.00004	7.1399	0.0010
C9	length:pop	2	0.00002	0.00001	1.7173	0.1821
C9	Residuals	211	0.00114	0.00001	NA	NA
C10	length	1	0.00000	0.00000	0.0791	0.7788
C10	pop	2	0.00002	0.00001	1.8014	0.1676
C10	length:pop	2	0.00000	0.00000	0.3111	0.7330
C10	Residuals	211	0.00105	0.00000	NA	NA
C11	length	1	0.00001	0.00001	1.8030	0.1808
C11	pop	2	0.00003	0.00002	4.0799	0.0183

C11	length:pop	2	0.00001	0.00000	0.6703	0.5126
C11	Residuals	211	0.00087	0.00000	NA	NA
C12	length	1	0.00000	0.00000	0.5289	0.4679
C12	pop	2	0.00009	0.00004	15.5817	<0.0001
C12	length:pop	2	0.00000	0.00000	0.0207	0.9795
C12	Residuals	211	0.00060	0.00000	NA	NA
C13	length	1	0.00001	0.00001	3.5253	0.0618
C13	pop	2	0.00001	0.00000	1.7485	0.1765
C13	length:pop	2	0.00001	0.00000	1.3298	0.2667
C13	Residuals	211	0.00050	0.00000	NA	NA
C14	length	1	0.00000	0.00000	2.7217	0.1005
C14	pop	2	0.00000	0.00000	0.5512	0.5771
C14	length:pop	2	0.00000	0.00000	0.6980	0.4987
C14	Residuals	211	0.00028	0.00000	NA	NA
C15	length	1	0.00001	0.00001	6.3393	**0.0126**
C15	pop	2	0.00000	0.00000	1.4389	0.2395
C15	length:pop	2	0.00000	0.00000	1.3430	0.2633
C15	Residuals	211	0.00028	0.00000	NA	NA
C17	length	1	0.00000	0.00000	4.0373	**0.0458**
C17	pop	2	0.00000	0.00000	0.2699	0.7637
C17	length:pop	2	0.00000	0.00000	2.9883	0.0525
C17	Residuals	211	0.00018	0.00000	NA	NA
D1	length	1	0.00460	0.00460	9.8776	**0.0019**
D1	pop	2	0.02402	0.01201	25.7994	<0.0001
D1	length:pop	2	0.00083	0.00041	0.8881	0.4129
D1	Residuals	211	0.09822	0.00047	NA	NA
D2	length	1	0.00047	0.00047	7.5775	**0.0064**
D2	pop	2	0.00575	0.00288	45.9224	<0.0001
D2	length:pop	2	0.00004	0.00002	0.2950	0.7448
D2	Residuals	211	0.01321	0.00006	NA	NA
D4	length	1	0.00013	0.00013	3.3392	0.0691
D4	pop	2	0.00131	0.00066	16.8769	<0.0001
D4	length:pop	2	0.00001	0.00001	0.1436	0.8663
D4	Residuals	211	0.00821	0.00004	NA	NA
D5	length	1	0.00019	0.00019	10.6445	**0.0013**
D5	pop	2	0.00001	0.00001	0.2953	0.7446
D5	length:pop	2	0.00002	0.00001	0.6721	0.5117
D5	Residuals	211	0.00379	0.00002	NA	NA
D6	length	1	0.00008	0.00008	4.6872	**0.0315**
D6	pop	2	0.00095	0.00048	27.9745	<0.0001
D6	length:pop	2	0.00001	0.00000	0.1519	0.8592
D6	Residuals	211	0.00359	0.00002	NA	NA
D7	length	1	0.00012	0.00012	11.6054	**0.0008**
D7	pop	2	0.00023	0.00012	11.4268	<0.0001

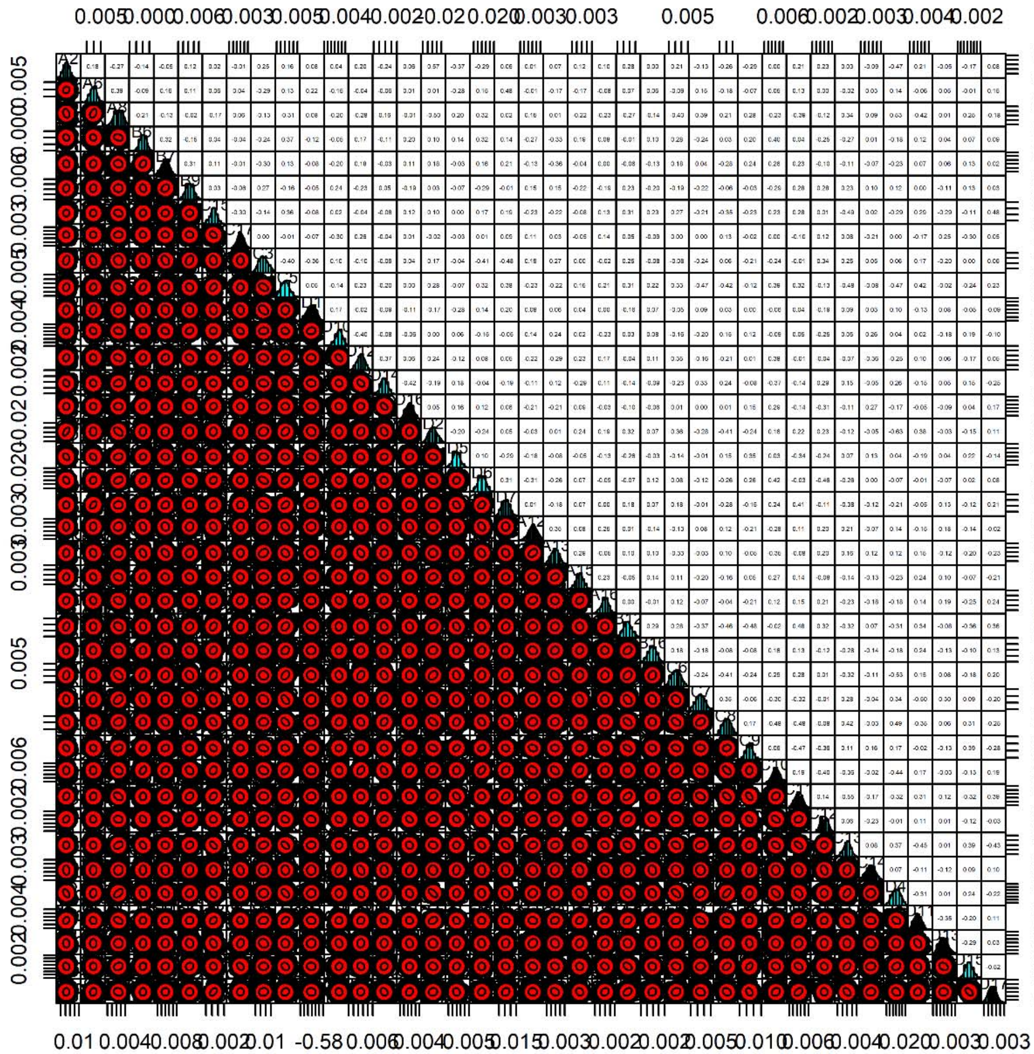
D7	length:pop	2	0.00002	0.00001	0.8662	0.4220
D7	Residuals	211	0.00214	0.00001	NA	NA
D10	length	1	0.00002	0.00002	4.1134	**0.0438**
D10	pop	2	0.00001	0.00000	1.0611	0.3479
D10	length:pop	2	0.00001	0.00000	0.6561	0.5199
D10	Residuals	211	0.00083	0.00000	NA	NA
D11	length	1	0.00001	0.00001	3.2659	0.0722
D11	pop	2	0.00013	0.00007	20.8039	<0.0001
D11	length:pop	2	0.00001	0.00001	1.8252	0.1637
D11	Residuals	211	0.00068	0.00000	NA	NA
D12	length	1	0.00003	0.00003	14.8553	**0.0002**
D12	pop	2	0.00001	0.00000	1.2004	0.3031
D12	length:pop	2	0.00000	0.00000	0.1005	0.9045
D12	Residuals	211	0.00049	0.00000	NA	NA
D13	length	1	0.00000	0.00000	0.3308	0.5658
D13	pop	2	0.00001	0.00000	2.3617	0.0966
D13	length:pop	2	0.00001	0.00000	1.8169	0.1651
D13	Residuals	211	0.00030	0.00000	NA	NA
D14	length	1	0.00003	0.00003	17.8924	**<0.0001**
D14	pop	2	0.00000	0.00000	0.6314	0.5328
D14	length:pop	2	0.00000	0.00000	0.6297	0.5338
D14	Residuals	211	0.00032	0.00000	NA	NA
D15	length	1	0.00000	0.00000	0.0066	0.9355
D15	pop	2	0.00000	0.00000	1.1056	0.3329
D15	length:pop	2	0.00001	0.00000	2.9783	0.0530
D15	Residuals	211	0.00028	0.00000	NA	NA
D16	length	1	0.00001	0.00001	9.3531	**0.0025**
D16	pop	2	0.00000	0.00000	0.3063	0.7365
D16	length:pop	2	0.00000	0.00000	0.0031	0.9969
D16	Residuals	211	0.00019	0.00000	NA	NA
D17	length	1	0.00000	0.00000	1.4371	0.2320
D17	pop	2	0.00000	0.00000	1.4796	0.2301
D17	length:pop	2	0.00000	0.00000	1.8876	0.1540
D17	Residuals	211	0.00020	0.00000	NA	NA

b. Shape Index	Term	df	Sumsq	Meansq	F-statistic	p-value
AR	length	1	0.00087	0.00087	0.1005	0.7515
AR	pop	2	0.00650	0.00325	0.3743	0.6882
AR	length:pop	2	0.02632	0.01316	1.5157	0.2220
AR	Residuals	211	1.83214	0.00868	NA	NA
FF	length	1	0.02648	0.02648	76.2068	**<0.0001**
FF	pop	2	0.05443	0.02721	78.3107	<0.0001
FF	length:pop	2	0.00111	0.00056	1.6033	0.2037
FF	Residuals	211	0.07333	0.00035	NA	NA
OCD.OH	length	1	0.05707	0.05707	26.5523	**<0.0001**
OCD.OH	pop	2	0.42068	0.21034	97.8673	<0.0001
OCD.OH	length:pop	2	0.00212	0.00106	0.4942	0.6108
OCD.OH	Residuals	211	0.45349	0.00215	NA	NA
circ	length	1	11.00879	11.00879	77.9978	**<0.0001**
circ	pop	2	20.81111	10.40556	73.7239	<0.0001
circ	length:pop	2	0.57706	0.28853	2.0443	0.1320
circ	Residuals	211	29.78103	0.14114	NA	NA
ellip	length	1	0.00009	0.00009	0.1577	0.6916
ellip	pop	2	0.00039	0.00019	0.3423	0.7105
ellip	length:pop	2	0.00190	0.00095	1.6709	0.1906
ellip	Residuals	211	0.11987	0.00057	NA	NA
logOA	length	1	7.48252	7.48252	487.8613	**<0.0001**
logOA	pop	2	0.06782	0.03391	2.2111	0.1121
logOA	length:pop	2	0.14201	0.07101	4.6295	**0.0108**
logOA	Residuals	211	3.23619	0.01534	NA	NA
round	length	1	0.00099	0.00099	1.7552	0.1867
round	pop	2	0.05613	0.02806	49.5931	<0.0001
round	length:pop	2	0.00129	0.00065	1.1398	0.3219
round	Residuals	211	0.11940	0.00057	NA	NA

Table S3. Significant fish length a. -descriptor and b. -shape index effects slopes used for fish length corrections of 19 Fourier Descriptors and 4 shape indices for 217 *Argyrosomus* spp. otoliths

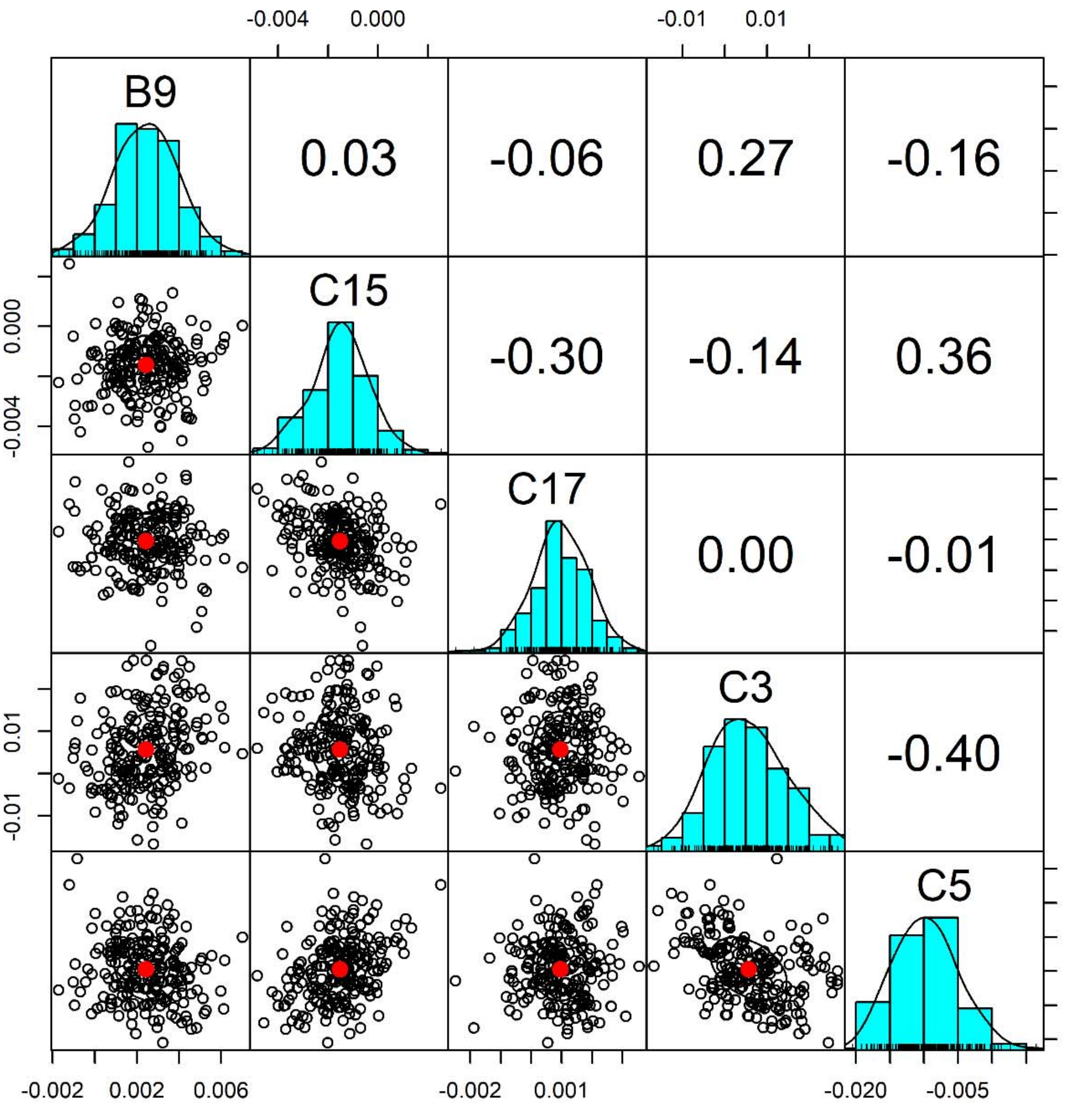
	a. Fourier Descriptor	**Slope**
1	A2	-0.00035
2	A6	-0.00013
3	A8	-0.00003
4	B6	0.00008
5	B7	-0.00004
6	B9	-0.00003
7	C3	-0.00012
8	C5	0.00008
9	C15	0.00002
10	C17	-0.00001
11	D1	0.00050
12	D2	-0.00016
13	D5	0.00010
14	D6	0.00007
15	D7	-0.00008
16	D10	0.00003
17	D12	-0.00004
18	D14	0.00004
19	D16	-0.00002

	b. Shape index	**Slope**
1	FF	-0.0012
2	OCD.OH	-0.0018
3	circ	0.0246



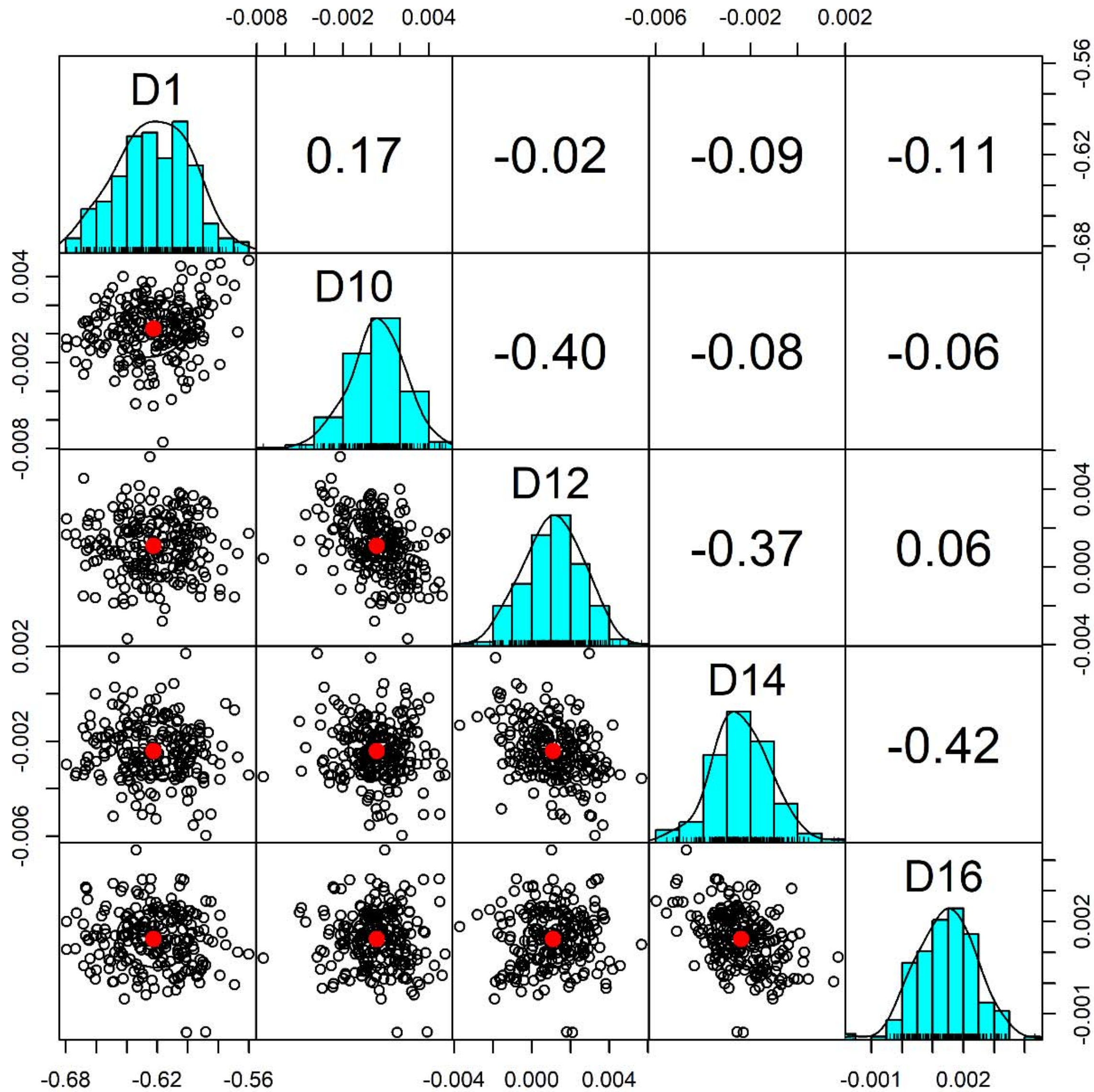
A.

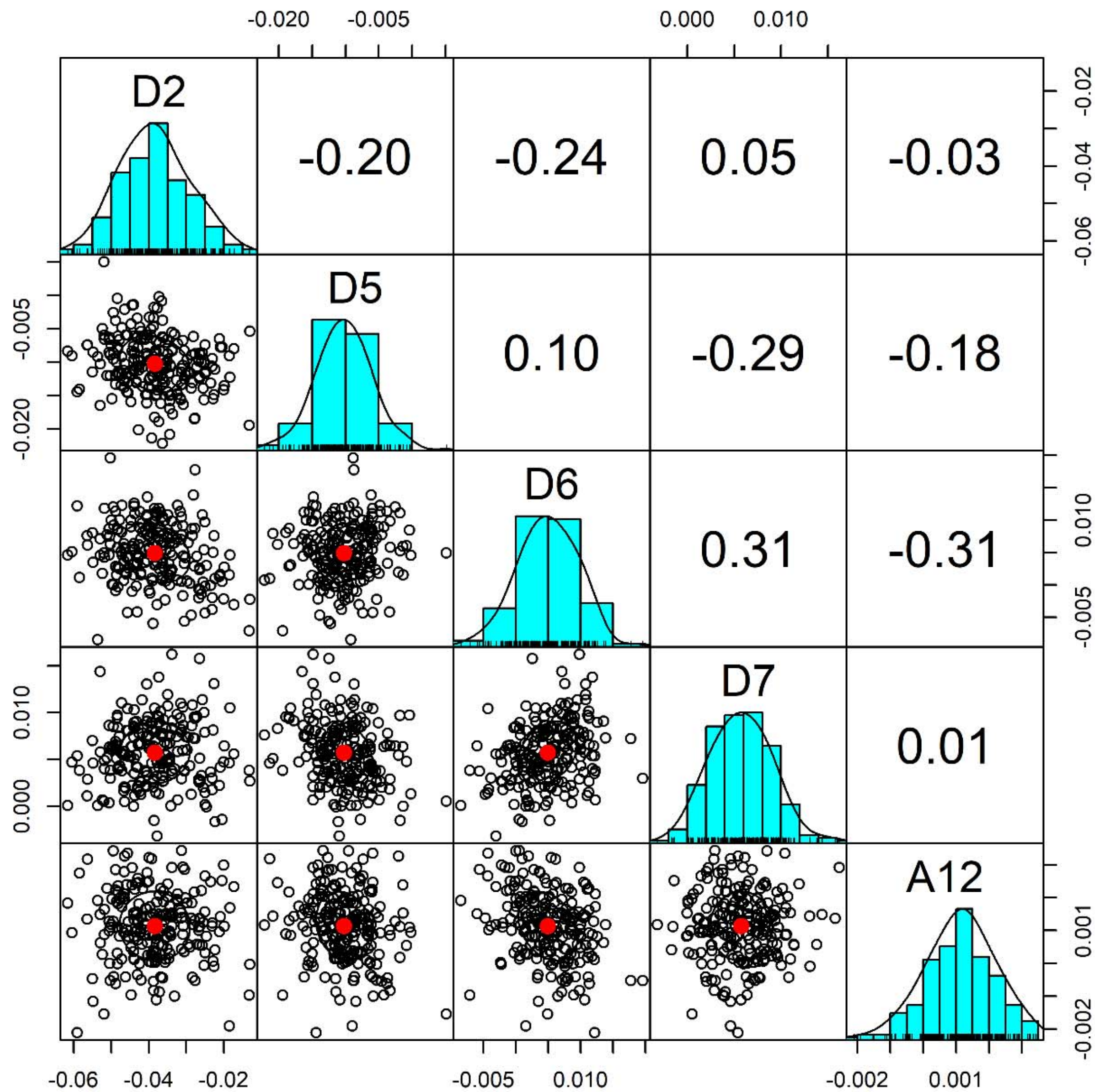
Figure S3. Correlation matrix, of 39 fish length-crrected Fourier descriptors used in the otolith shape analysis of N = 217 *Argyrosomus* spp. linked by individual fish (r, rounded and font size scaled according to p-value), histograms of frequency distributions and pairwise scatterplots with mean values indicated in red. Names of the Fourier coefficients are shown in the diagonal histograms. A. All coefficients, B. C., D., E., F., G., H.: Five coefficients at a time.


B9
C15
C17
C3
C5
0.03
-0.06
0.27
-0.16
-0.30
-0.14
0.36
0.00
-0.01
-0.40
-0.004
0.000
-0.01
0.01
-0.002
0.002
0.006
-0.002
0.001
-0.020
-0.005

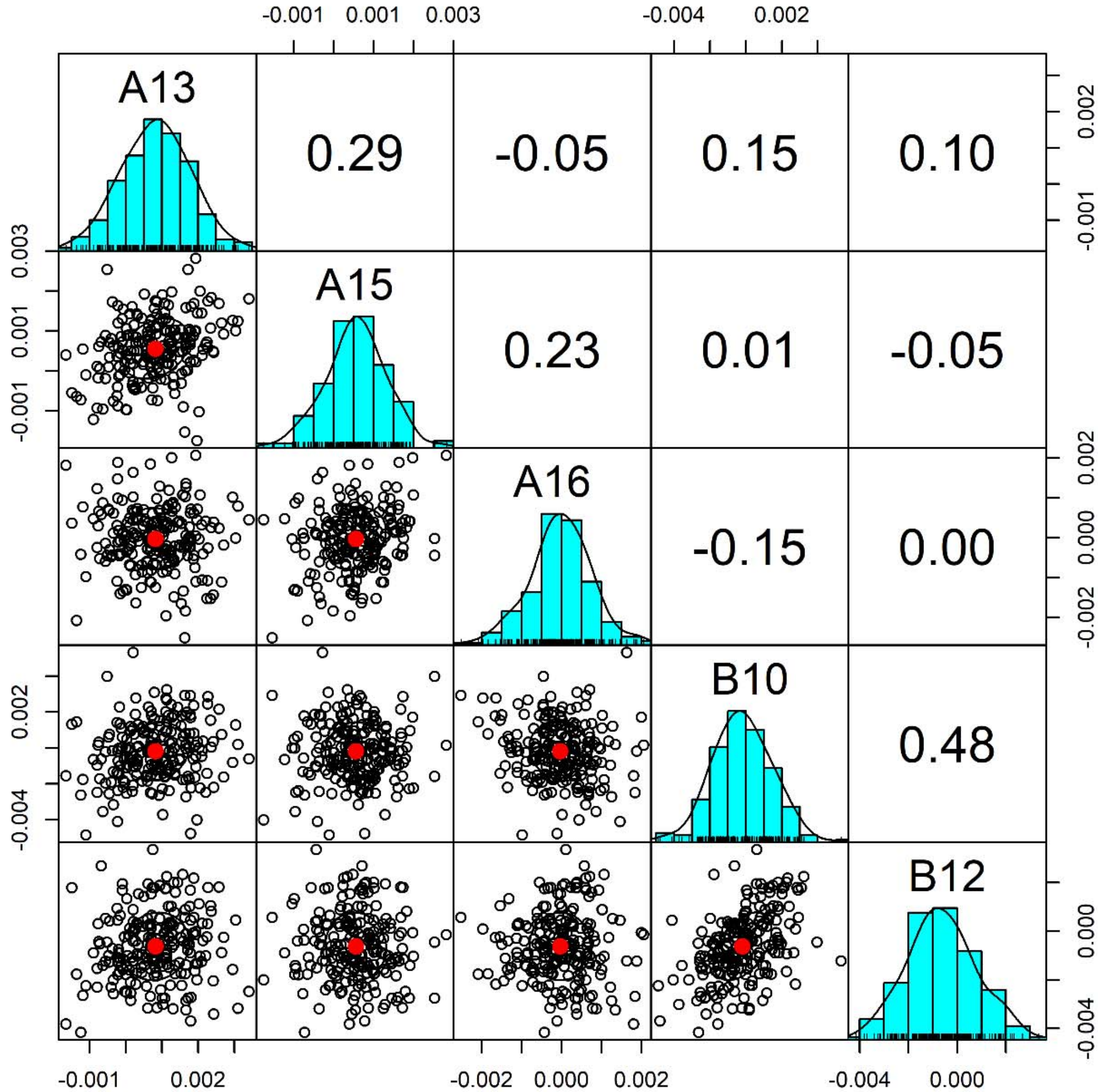
B.

C.

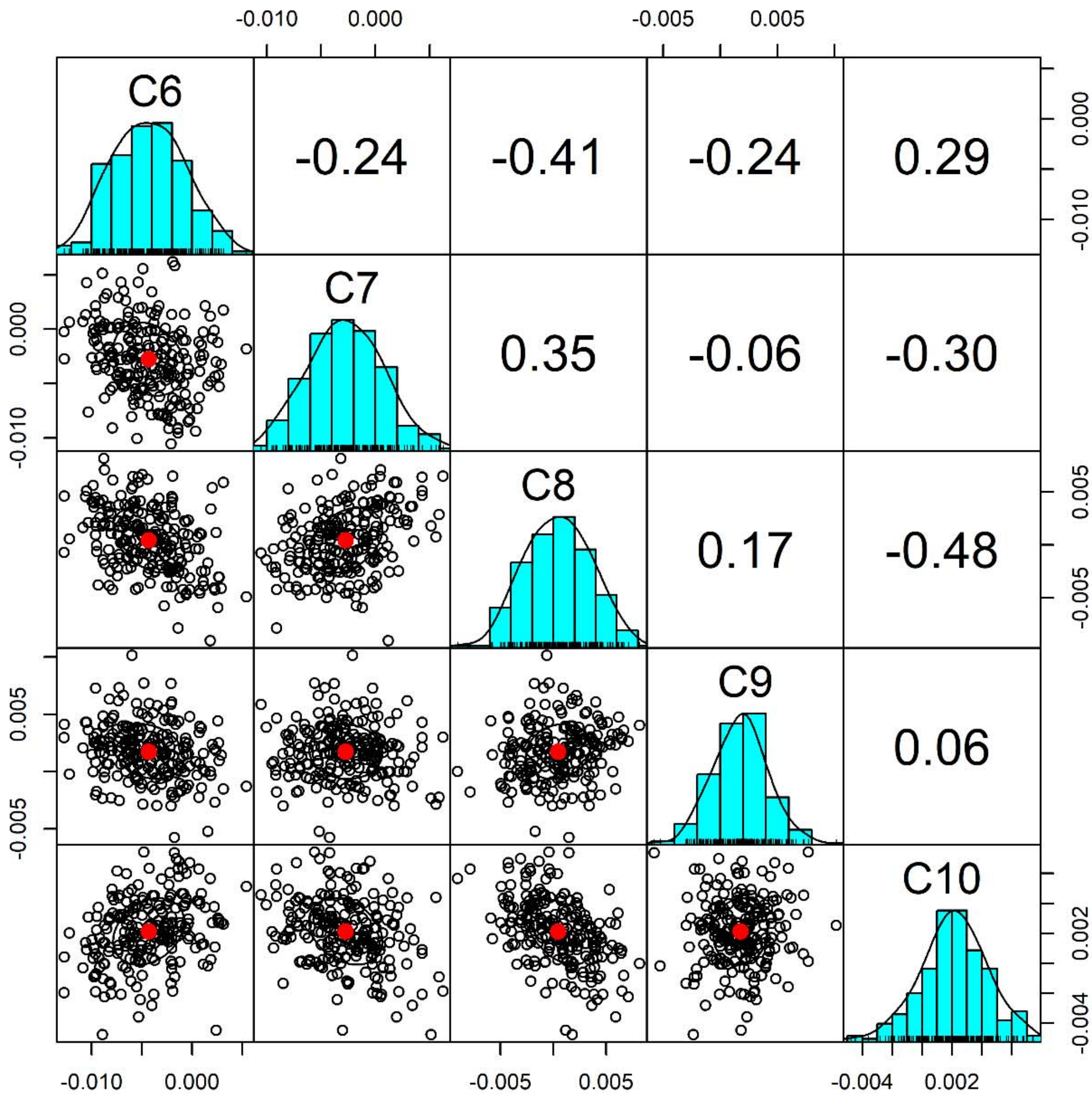

D1
D10
D12
D14
D16
0.17
-0.02
-0.09
-0.11
-0.40
-0.08
-0.06
-0.37
0.06
-0.42
-0.008
-0.002
0.004
-0.006
-0.002
0.002
-0.56
-0.62
-0.68
0.004
-0.002
-0.008
0.004
0.000
-0.004
0.002
-0.002
-0.006
0.002
-0.001
-0.68
-0.62
-0.56
-0.004
0.000
0.004
-0.001
0.002


D2
D5
D6
D7
A12
-0.20
-0.24
0.05
-0.03
0.10
-0.29
-0.18
0.31
-0.31
0.01
-0.020
-0.005
0.000
0.010
-0.02
-0.04
-0.06
-0.005
-0.020
0.010
-0.005
0.010
0.000
0.001
-0.002
-0.06
-0.04
-0.02
-0.005
0.010
-0.002
0.001

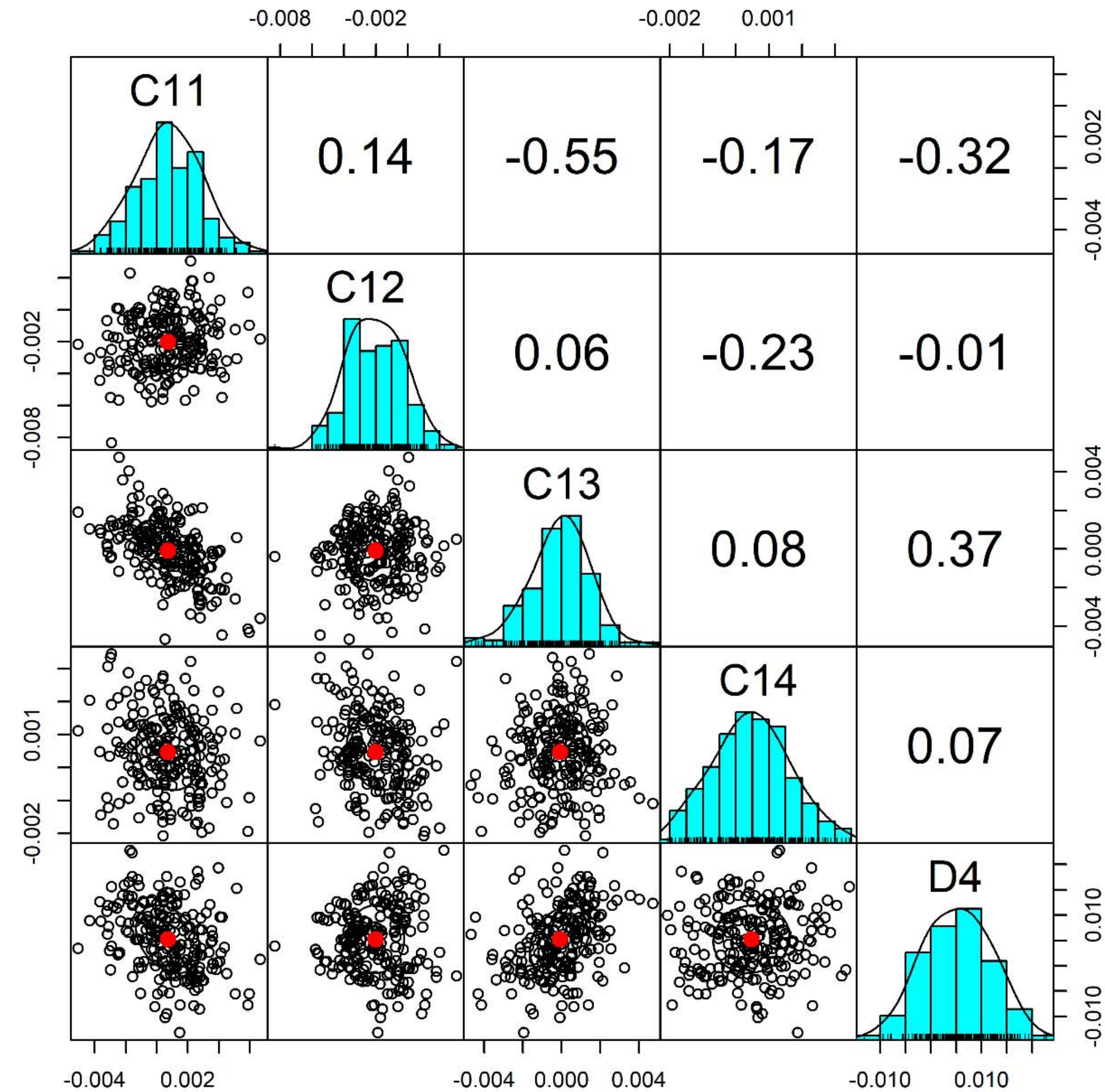
D.



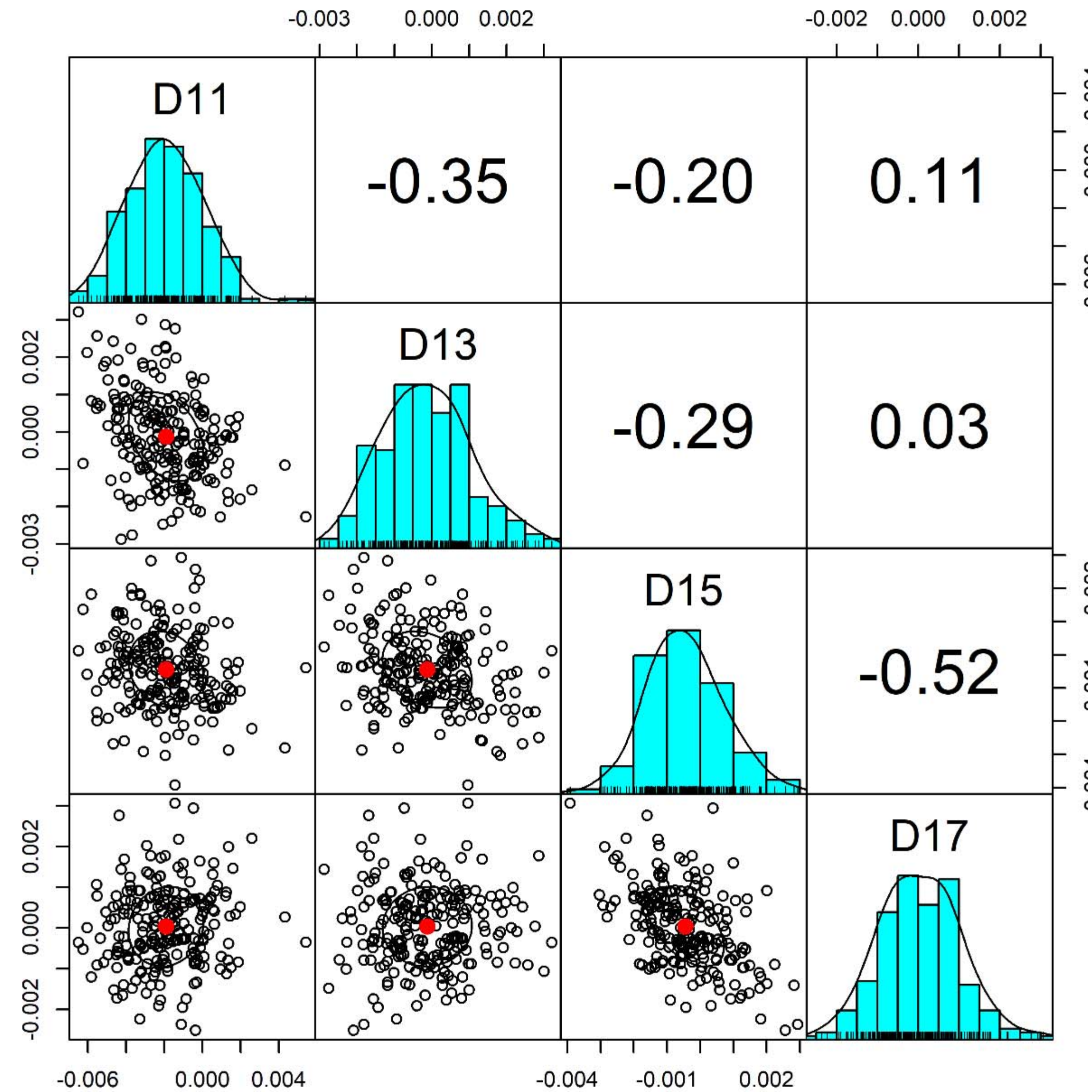
E.


C6
C7
C8
C9
C10
-0.24
-0.41
-0.24
0.29
0.35
-0.06
-0.30
0.17
-0.48
0.06
-0.010
0.000
-0.005
0.005
-0.004
0.002

F.


C11
C12
C13
C14
D4
0.14
-0.55
-0.17
-0.32
0.06
-0.23
-0.01
0.08
0.37
0.07
-0.008
-0.002
-0.002
0.001
-0.004
0.002
-0.004
0.000
0.004
-0.010
0.010

G.


D11
D13
D15
D17
-0.35
-0.20
0.11
-0.29
0.03
-0.52
-0.003
0.000
0.002
-0.002
0.000
0.002
0.004
0.000
-0.006
0.002
0.000
-0.003
0.002
-0.001
-0.004
0.002
0.000
-0.002
-0.006
0.000
0.004
-0.004
-0.001
0.002

H.

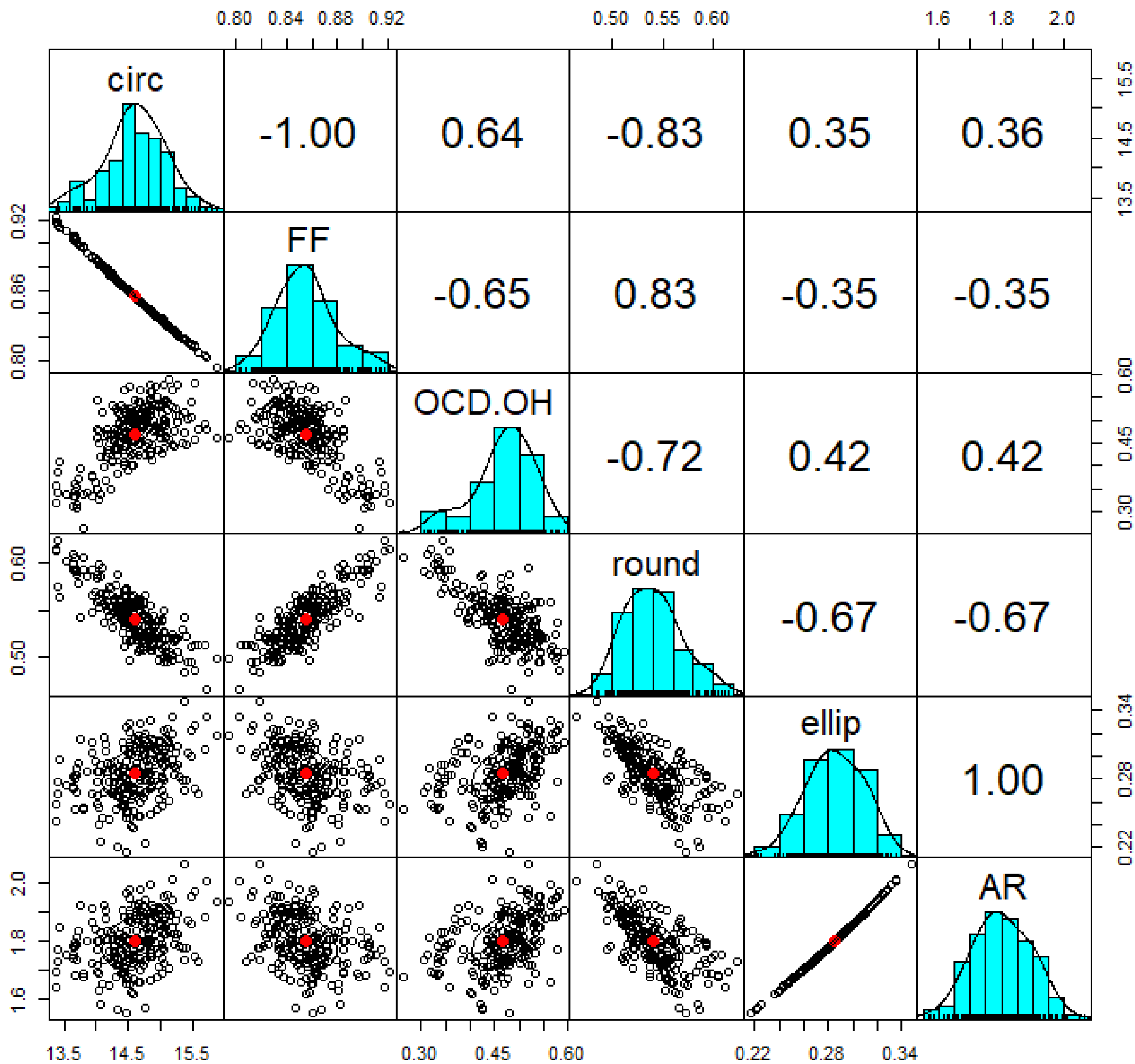


Figure S4. Correlation matrix, of 6 fish length-crrected otolith shape indices used in the otolith shape analysis of 217 otoliths of *Argyrosomus* spp. linked by individual fish (r, rounded and font size scaled according to p-value), histograms of frequency distributions and pairwise scatterplots with mean values indicated in red. Names of the descriptors are shown in the diagonal histograms: circularity (circ), form-factor (FF), ostium-cauda distance to otolith height ratio (OCD.OH), roundness (round), ellipticity (ellip) and aspect ratio (AR).

Table S4. ANOVA results to test for species (pop) effects of four fish length-standardized shape indices, ostium-cauda distance to otolith height ratio (OCD.OH), circularity (circ), ellipticity (ellip) and roundness (round) of 217 *Argyrosomus* spp. otoliths. P-values at < 0.05 are bolded and have Tukey-HSD test results displayed below

Shape Index	Term	Df	Sumsq	Meansq	Statistic	p-value
OCD.OH	pop	2	0.413055	0.206528	95.408	**<0.0001**
OCD.OH	Residuals	214	0.463243	0.002165	NA	NA
circ	pop	2	20.44441	10.22221	71.198	**<0.0001**
circ	Residuals	214	30.72479	0.143574	NA	NA
ellip	pop	2	0.000435	0.000217	0.382	0.683
ellip	Residuals	214	0.121812	0.000569	NA	NA
round	pop	2	0.0531	0.02655	45.556	**<0.0001**
round	Residuals	214	0.124717	0.000583	NA	NA

Tukey multiple comparisons of means OCD.OH
95% family-wise confidence level of OCD.OH

	Diff	**Lwr**	**Upr**	**p adj**
A.inodorus-A.coronus	0.12841	0.10644	0.15038	**<0.000001**
Hybrid-A.coronus	0.12323	0.07938	0.16708	**<0.000001**
Hybrid-A.inodorus	-0.00518	-0.04486	0.03450	0.94901

Tukey multiple comparisons of means circ
95% family-wise confidence level of circ

	Diff	**Lwr**	**Upr**	**p adj**
A.inodorus-A.coronus	0.90053	0.72159	1.07947	**<0.000001**
Hybrid-A.coronus	0.93264	0.57550	1.28977	**<0.000001**
Hybrid-A.inodorus	0.03211	-0.29102	0.35524	0.97014

Tukey multiple comparisons of means round
95% family-wise confidence level of round

	Diff	**Lwr**	**Upr**	**p adj**
A.inodorus-A.coronus	0.90053	0.72159	1.07947	**<0.000001**
Hybrid-A.coronus	0.93264	0.57550	1.28977	**<0.000001**
Hybrid-A.inodorus	0.03211	-0.29102	0.35524	0.97014

Table S5. Coefficients of the first two linear discriminants (LD1 and LD2) for 39 standardized Fourier coefficients and 4 otolith shape indices. The order is sorted from largest to smallest absolute value of LD1. Shape indices are: ostium-cauda distance to otolith height ratio (OCD.OH), circularity (circ), ellipticity (ellip) and roundness (round).

	LD1	**LD2**
C13	294.2249971	52.0649636
D15	-268.151622	-182.0451257
C11	228.7626736	477.7568603
C7	218.5788893	-110.2132389
C10	204.8156555	-115.8448432
A16	-193.2776881	-121.5786362
B7	-181.9000321	-78.2408089
B9	176.570746	-351.0824533
C9	176.4541527	-33.8296573
C14	-167.0114527	64.1148824
D13	-160.3030939	-18.6397473
D12	-139.4243089	286.5643369
D14	-135.5017469	-77.827928
A15	127.488473	-385.3182134
C17	-126.8320311	193.4835476
D11	-113.9631929	99.7408213
D6	112.3864969	-152.2638317
D10	-105.3923119	354.5545169
C12	78.208788	18.9191482
D7	75.7443683	-59.6881225
D16	-69.2927992	-108.6586292
C6	68.8853183	41.6829627
D4	60.4677796	-91.9473934
C8	56.2239503	-77.0561978
B12	-55.1452419	-642.6335435
C3	-50.6869944	-20.8794809
B6	49.4568433	265.9711749
A12	-45.9003796	-332.8851928
C15	29.2275037	136.6862115
B16	-27.7393235	52.8144204
A2	23.1342191	-79.1686656
D2	-20.83396	15.8389967
ellip	-18.906893	1.7936769
A6	-17.2982009	83.3057862
A8	-16.7290386	563.5654091
A13	-12.3897861	11.842061
D1	10.8391943	-8.5566749
D5	10.7677195	-117.0499646
OCD.OH	8.7016906	-0.5724837

C5	-7.3679024	-100.4548459
D17	4.3990548	-378.9588798
circ	0.8343846	-0.3710749
C13	294.2249971	52.0649636