

Diversity and structure of sparids external microbiota (Teleostei) and its link with monogenean ectoparasites

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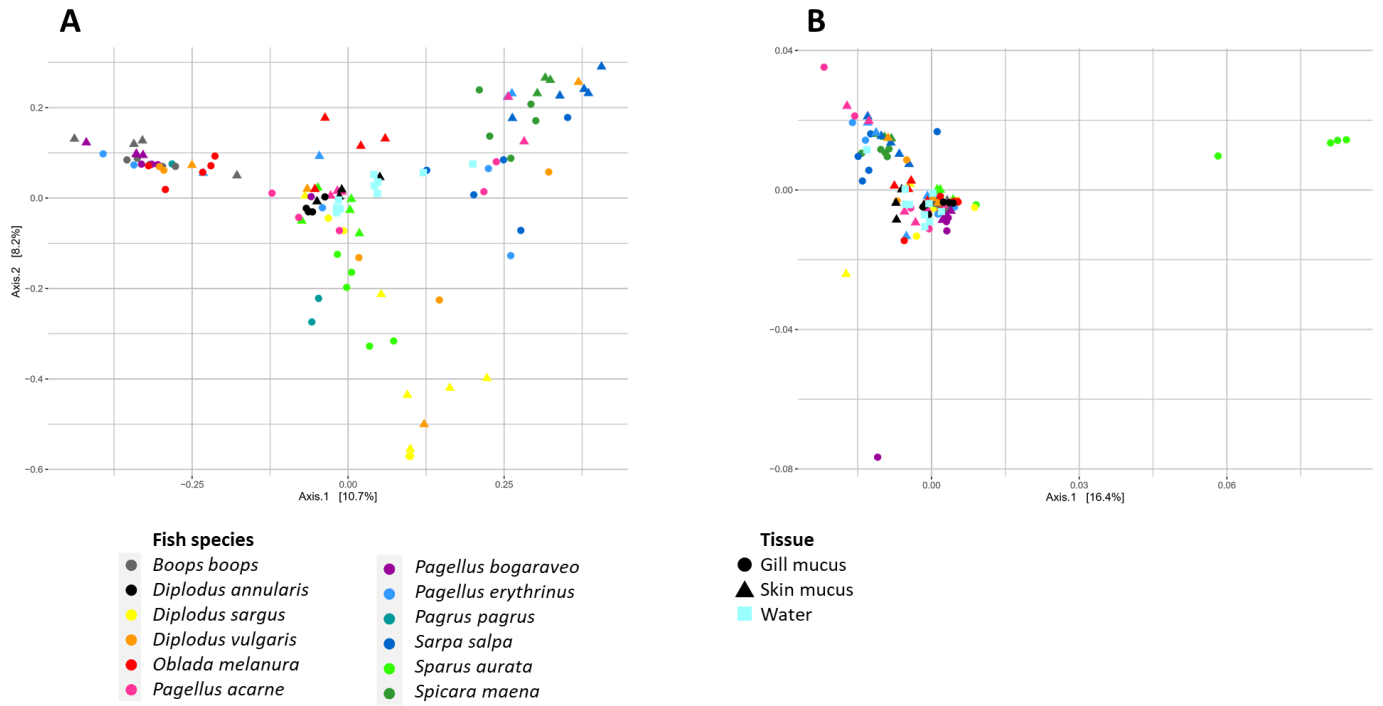


Fig S1. Dissimilarities between bacterial communities of all samples included in this study.

PCoA plot representing all fish skin mucus, gill mucus and water bacterial communities based on Bray-Curtis (A) and weighted Unifrac (B) dissimilarity values. Each dot represents one community (water sample or fish individual). Color and shape of dots indicate fish species and community type

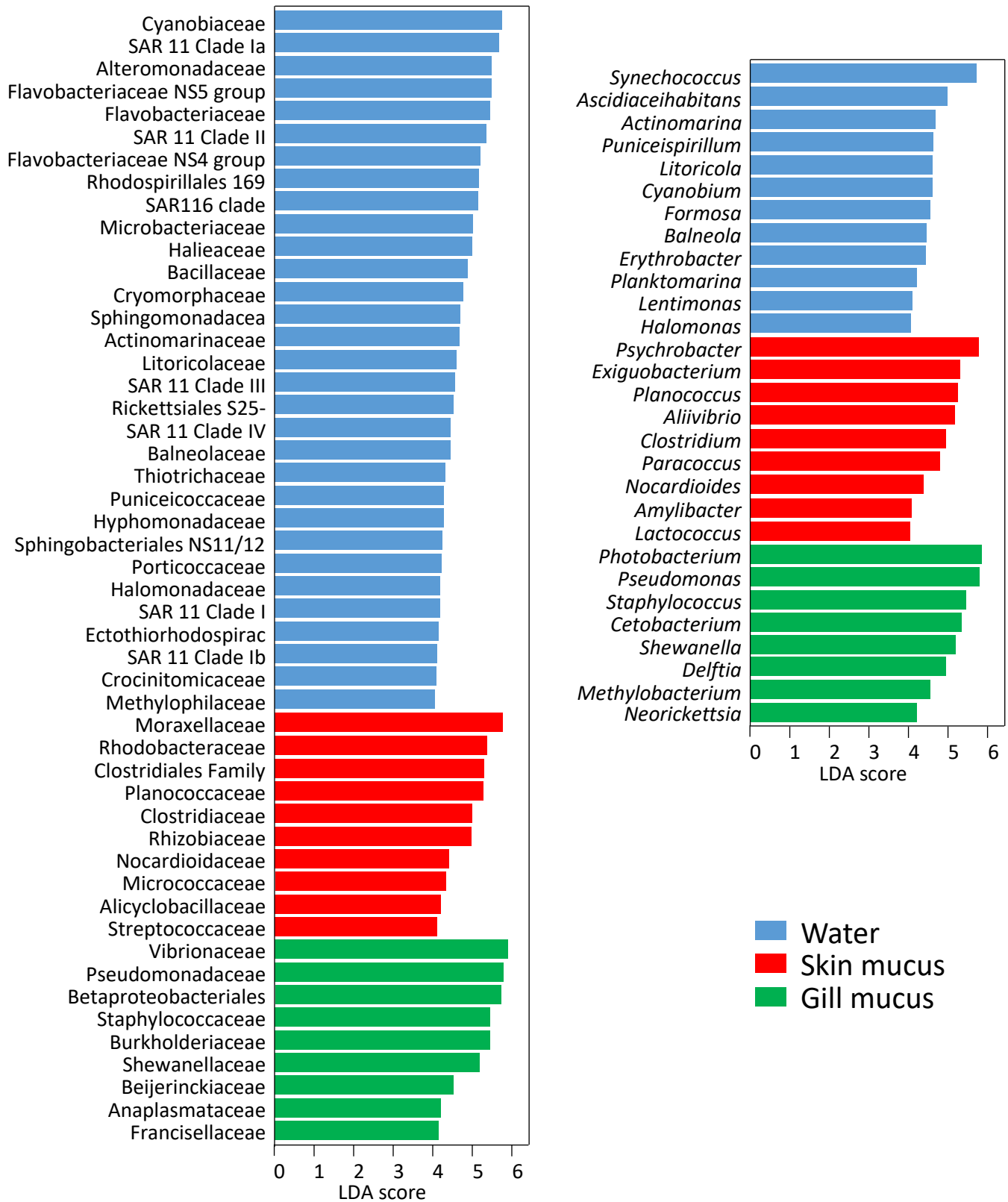


Fig S2. Most contributing taxa to differences between water (blue), skin (red) and gill (green) bacterial communities. (A) Family and (B) genus level. LDA scores were calculated using Linear discriminant analysis Effect Size (LEfSe), only bacterial taxa that raised an LDA score > 4 are shown

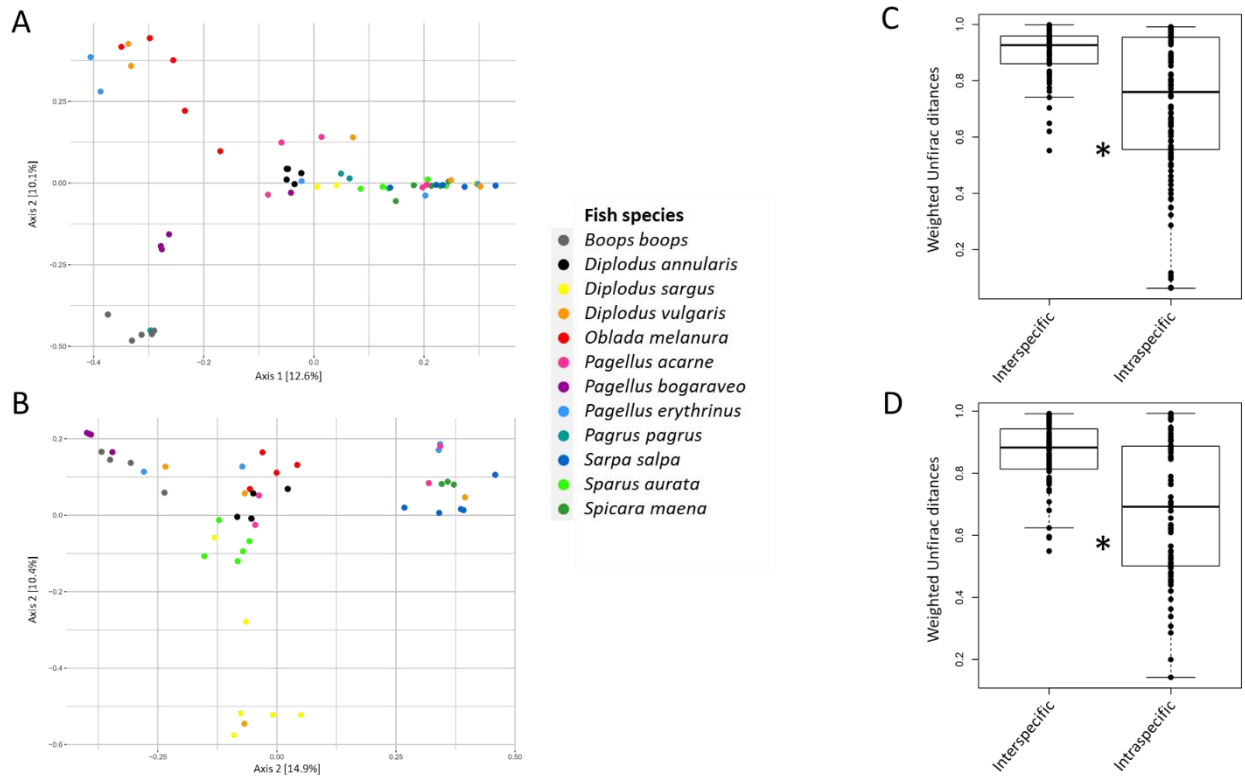


Fig S3. Dissimilarities between bacterial communities based on Bray-Curtis dissimilarity values. PCoA plot representing all fish gill mucus (A) and skin mucus (B) microbiota included in this study. Color indicates fish species. Intraspecific and interspecific values based on Bray-Curtis dissimilarity within gill mucus (C) and skin mucus (D) microbiota

*: Significant differences between intraspecific and interspecific values (Kruskal-Wallis test, $p < 0.05$)

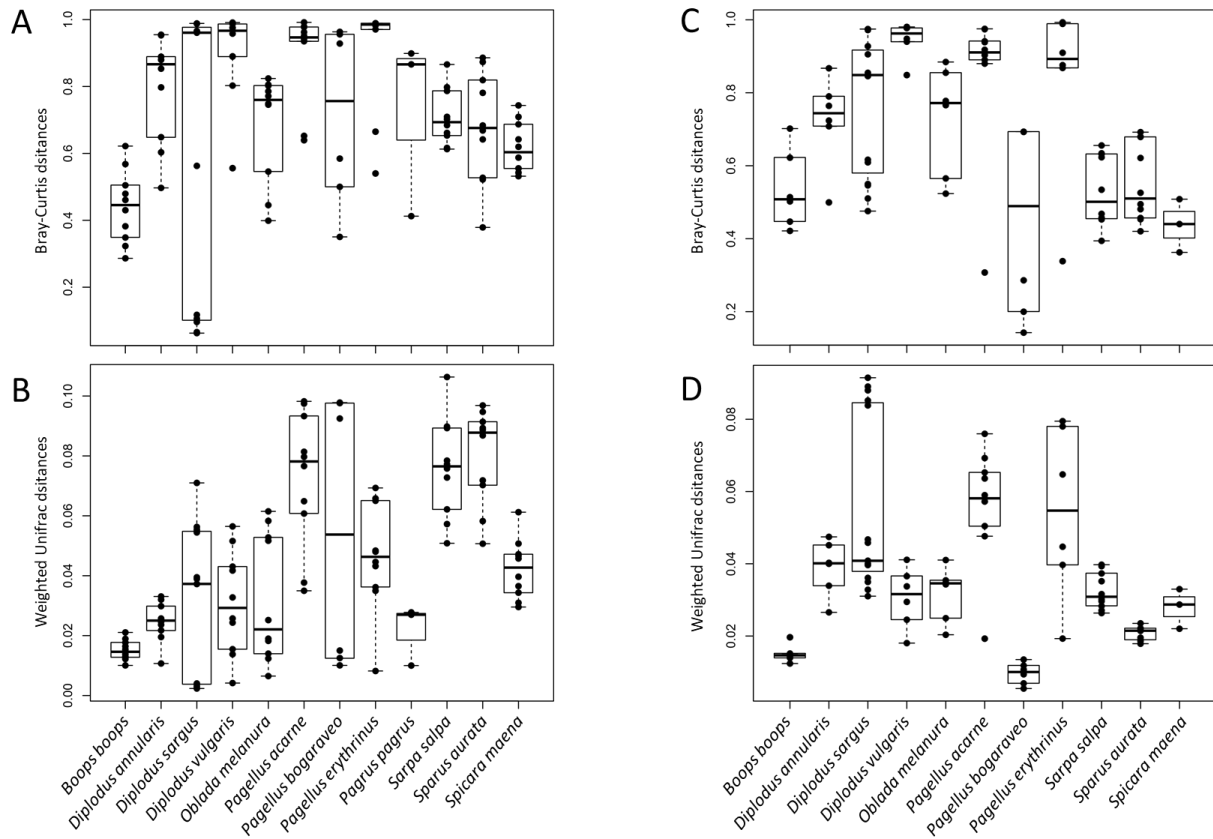


Fig S4. Intraspecific values within each fish species. Bray-Curtis and weighted Unifrac dissimilarities within gill mucus (A, B respectively) and skin mucus (C, D respectively) microbiota

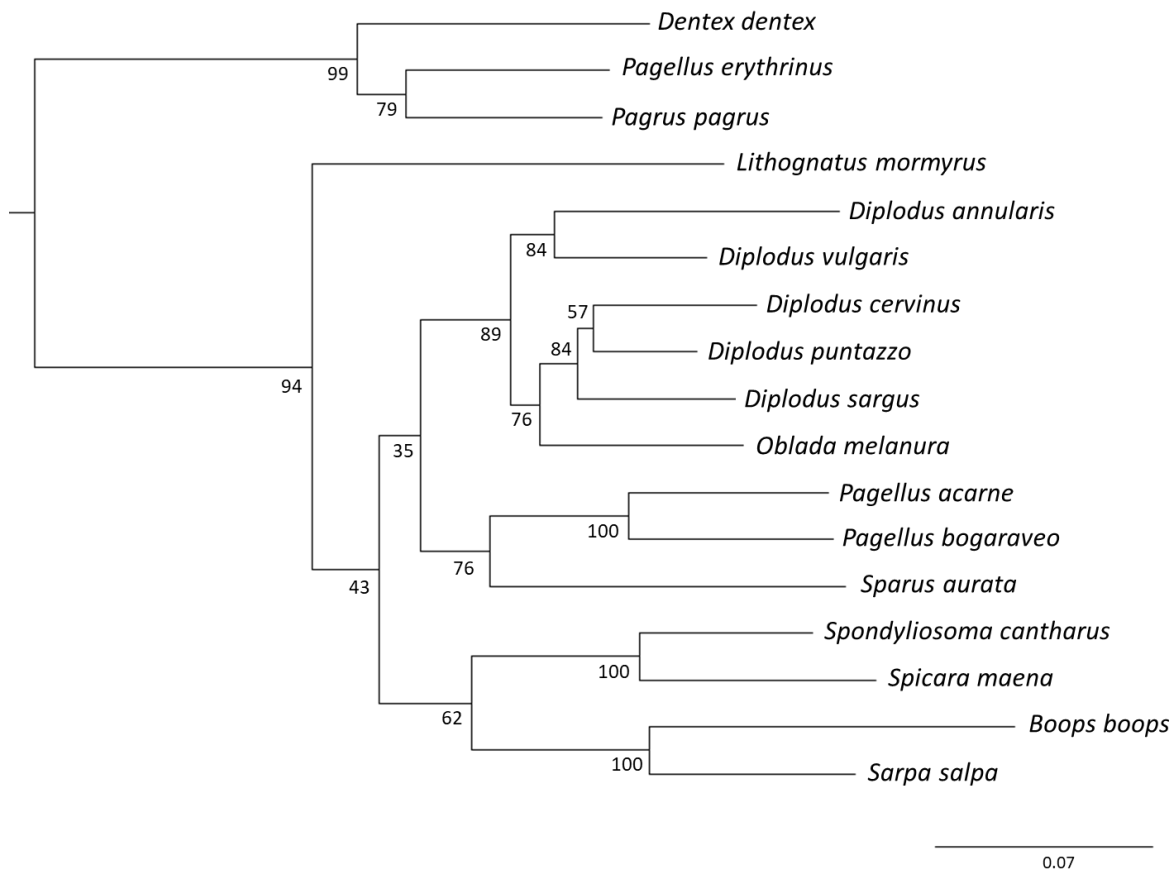


Fig S5. Phylogenetic tree of sparids included in this study. This tree is inferred by maximum likelihood using partitioned dataset (rhodopsin, cytochrome b, cytochrome c oxidase subunit 1 and 16S) conducted with IQ-Tree. Numbers at branches indicate support values, based on 10000 ultrafast bootstrap replicates. *Dicentrarchus labrax* is used as outgroup (Chiba et al. 2009)

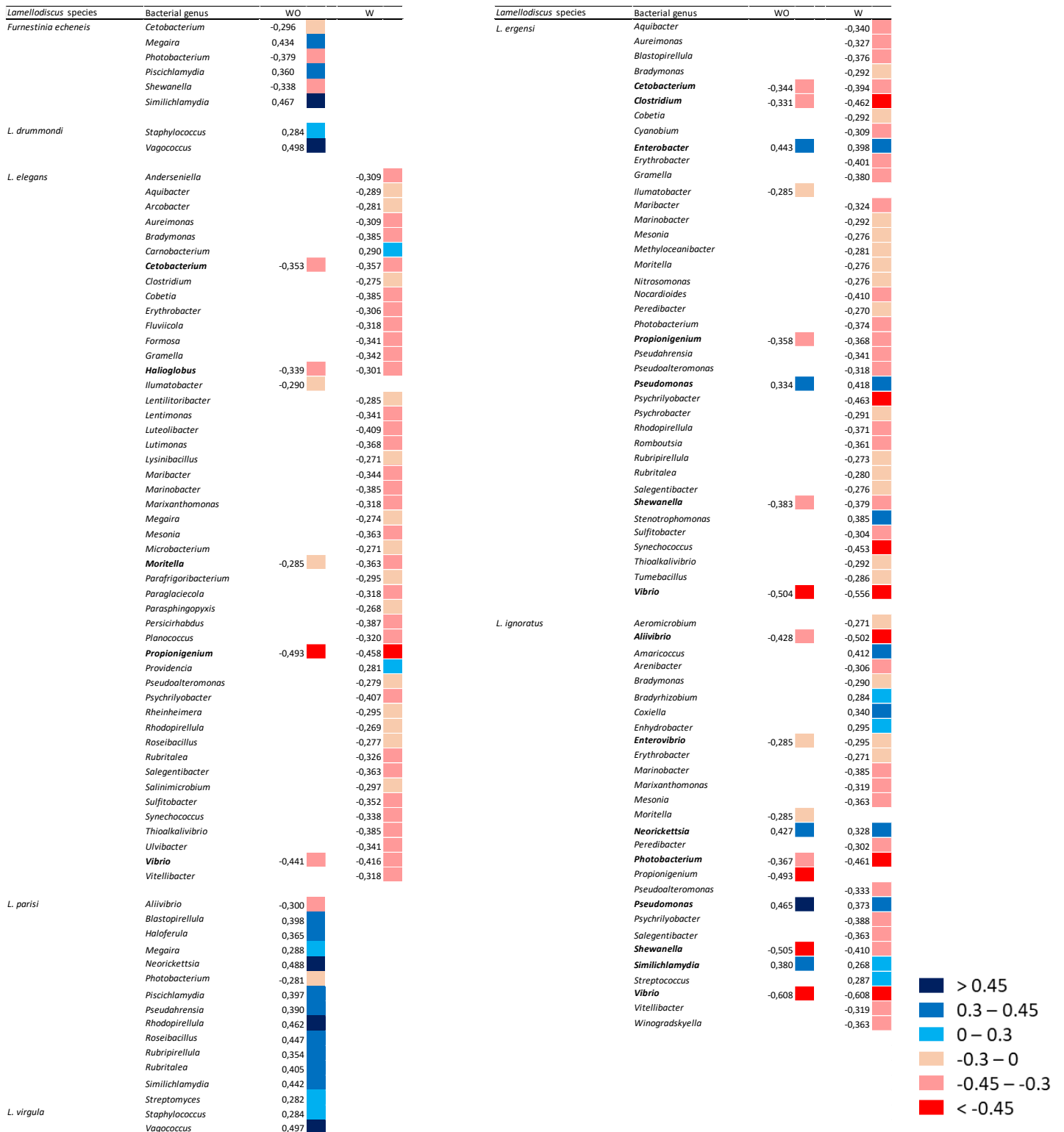


Fig S6. Significant Spearman correlation coefficients between the abundances of *Lamellodiscus* species and bacterial genus in fish gills. Comparison computed with (W) and without (WO) considering sequences in water samples. Bacterial genera present in the two categories are in bold. The color of each cell represents positive (blue) and negative (red) correlations coefficients

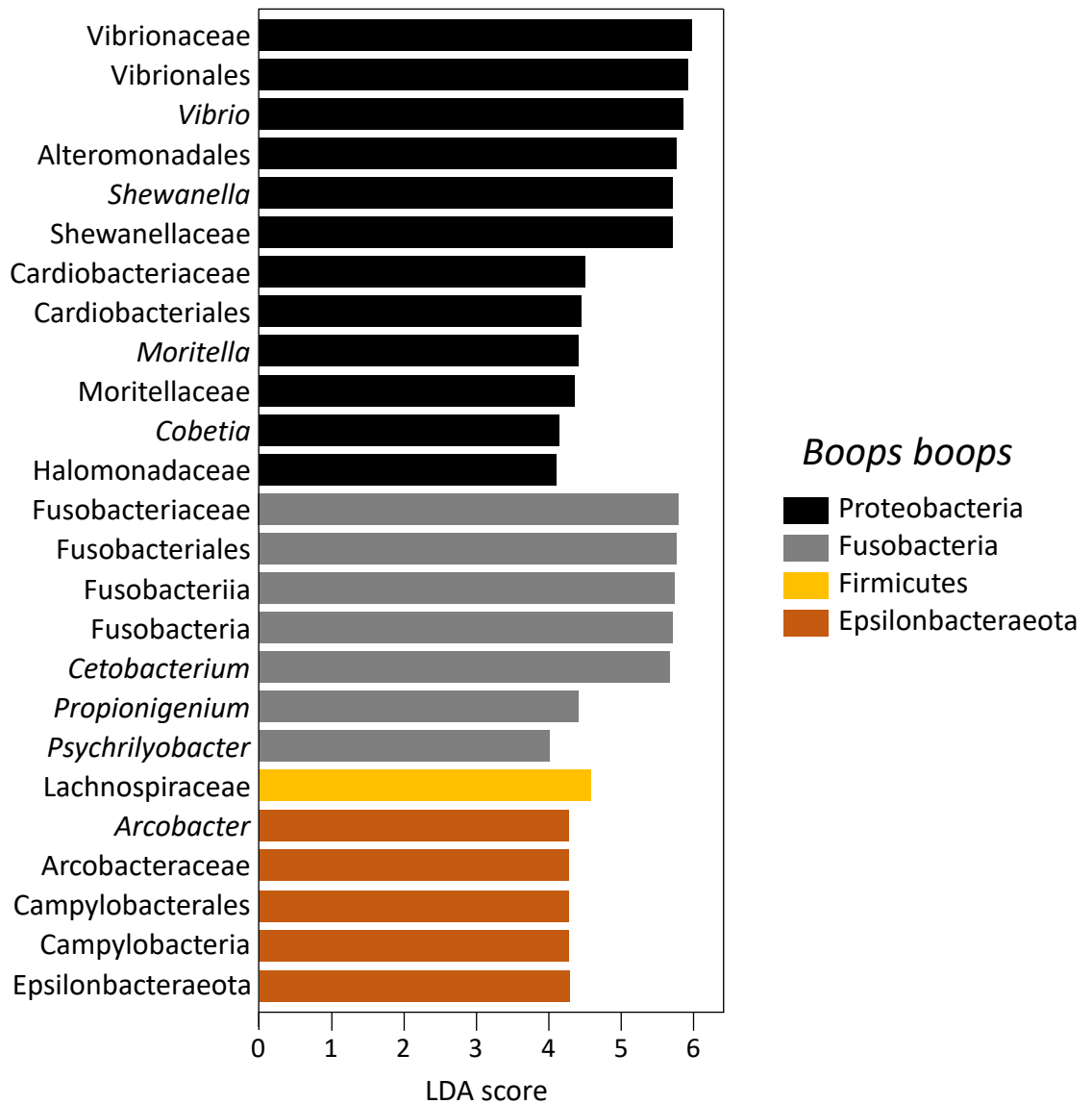


Fig S7. Taxa significantly more associated to *Boops boops*' gill mucus microbiota. LDA scores were calculated using Linear discriminant analysis Effect Size (LEfSe). Only bacterial taxa that raised an LDA score > 4 are shown

Table S1. Specificity of *Lamellodiscus* species within Sparids. *Furnestinia echeneis* was added to the *Lamellodiscus* genus [58]

<i>Lamellodiscus</i> spp.	Sparid hosts	Number of hosts
<i>L. abbreviatus</i>	<i>Diplodus sargus</i>	1
<i>L. baeri</i>	<i>Pagrus pagrus</i>	1
<i>L. bidens</i>	<i>Diplodus puntazzo</i>	1
<i>L. coronatus</i>	<i>Diplodus annularis, Diplodus cervinus, Diplodus sargus</i>	3
<i>L. drummondi</i>	<i>Pagellus acarne</i>	1
<i>L. diplodi</i>	<i>Diplodus sargus, Diplodus vulgaris</i>	2
<i>L. elegans</i>	<i>Diplodus annularis, Diplodus sargus, Diplodus vulgaris, Oblada melanura, Spondyliosoma cantharus</i>	5
<i>L. ergensi</i>	<i>Diplodus annularis, Diplodus puntazzo, Diplodus sargus, Diplodus vulgaris</i>	4
<i>L. erythrini</i>	<i>Pagellus erythrinus</i>	1
<i>L. falcus</i>	<i>Diplodus sargus, Diplodus vulgaris</i>	2
<i>L. fraternus</i>	<i>Diplodus annularis, Diplodus vulgaris</i>	2
<i>L. furcosus</i>	<i>Diplodus annularis, Diplodus sargus</i>	2
<i>L. gracilis</i>	<i>Diplodus annularis, Diplodus sargus, Oblada melanura</i>	3
<i>L. gussevi</i>	<i>Diplodus sargus</i>	1
<i>L. hили</i>	<i>Diplodus puntazzo</i>	1
<i>L. ignoratus</i>	<i>Diplodus annularis, Diplodus puntazzo, Diplodus sargus, Diplodus vulgaris, Lithognathus mormyrus, Sarpa salpa</i>	6
<i>L. impervius</i>	<i>Diplodus puntazzo</i>	1
<i>L. knoepffleri</i>	<i>Spondyliosoma cantharus, Spicara maena, Spicara smaris, Spicara flexuosa</i>	4
<i>L. mirandus</i>	<i>Diplodus sargus</i>	1
<i>L. mormyri</i>	<i>Lithognathus mormyrus</i>	1
<i>L. neifari</i>	<i>Diplodus sargus, Diplodus vulgaris</i>	2
<i>L. obeliae</i>	<i>Pagellus bogaraveo</i>	1
<i>L. oliveri</i>	<i>Diplodus vulgaris</i>	1
<i>L. parisi</i>	<i>Sarpa salpa</i>	1
<i>L. tomentosus</i>	<i>Diplodus sargus, Diplodus vulgaris</i>	2
<i>L. verberis</i>	<i>Lithognathus mormyrus</i>	1
<i>L. virgula</i>	<i>Pagellus acarne</i>	1

Table S2. Ecological traits of fish species tested in this study

Fish species	Position water column	Schooling behavior	Diet	Living in ... environment			
				Sandy	Muddy	Rocky	Grassy
<i>Boops boops</i>	Pelagic	Group	Omnivorous	Yes	Yes	Yes	Yes
<i>Dentex dentex</i>	Sea bottom	Solitary	Carnivorous	No	No	Yes	No
<i>Diplodus annularis</i>	Sea bottom	Group	Carnivorous	Yes	No	No	Yes
<i>Diplodus puntazzo</i>	Sea bottom	Group	Omnivorous	No	No	Yes	No
<i>Diplodus sargus</i>	Sea bottom	Group	Carnivorous	Yes	No	Yes	No
<i>Diplodus vulgaris</i>	Sea bottom	Group	Carnivorous	Yes	No	Yes	No
<i>Oblada melanura</i>	Pelagic	Group	Omnivorous	No	No	Yes	Yes
<i>Pagellus acarne</i>	Sea bottom	Group	Omnivorous	Yes	Yes	No	Yes
<i>Pagellus bogaraveo</i>	Sea bottom	Group	Omnivorous	Yes	Yes	Yes	No
<i>Pagellus erythrinus</i>	Sea bottom	Group	Omnivorous	Yes	Yes	Yes	No
<i>Pagrus pagrus</i>	Sea bottom	Solitary	Carnivorous	Yes	No	Yes	No
<i>Sarpa salpa</i>	Sea bottom	Group	Herbivorous	Yes	Yes	Yes	Yes
<i>Sparus aurata</i>	Sea bottom	Group	Carnivorous	Yes	No	Yes	Yes
<i>Spicara maena</i>	Pelagic	Group	Omnivorous	No	Yes	Yes	Yes
<i>Spondyliosoma cantharus</i>	Sea bottom	Group	Omnivorous	Yes	No	Yes	Yes

Table S3. Abiotic factors for each sampling date measured by the SOMLIT

(<https://www.somlit.fr/>)

		Temperature °C	Salinity (PSU)	Oxygen (ml/l)	NH ₄ (μmol/l)	NO ₃ (μmol/l)	NO ₂ (μmol/l)	PO ₄ (μmol/l)	SiOH ₄ (μmol/l)
2017	Jun. 21	20.92	37.896	5.29	8.14	0	0.08	0.01	0.01
2018	Apr. 18	13.476	35.498	6.1	7.95	0.291	4.84	0.32	0.09
	Jun. 26	20.402	37.418	5.27	8.02	0.022	1.26	0.16	0.03
	Jul. 13	22.097	38.155	5.17	7.99	0.036	0.02	0.01	0.01
	Sept. 4	20.929	38.096	5.11	-	0.01	0.06	0.01	0.02
	Oct. 5	18.761	38.167	5.25	8.17	0.067	0.02	0.01	0.01
2019	Mar. 22	13.102	38.017	5.84	8.17	0.036	1.2	0.18	0.02
	Mar. 28	12.556	38.149	5.95	7.91	0.087	0.7	0.27	0.05
	May 10	14.508	38.043	5.85	8.13	0.029	0.05	0.02	0.04
	Jun. 6	17.168	38.062	5.67	7.94	0.009	0.02	0.02	0.06
	Jun. 28	20.839	37.538	5.46	7.99	0.057	0.02	0.01	0.04
	Jul. 8	25.265	36.542	4.81	8.04	0.041	0.02	0.01	0.03
	Jul. 10	25.265	36.542	4.81	8.04	0.041	0.02	0.01	0.03

Table S4. Non-significant and significant (in bold) pairwise comparisons between fish species skin or gill**mucus diversity.** Post hoc Conover-Iman test significant if $p < \alpha/2 = 0.025$

Comparison	Faith's phylogenetic index		Shannon index	
	Gills	Skin	Gills	Skin
<i>Boops boops</i> - <i>Diplodus annularis</i>	0.015	0.049	0.042	0.465
<i>Boops boops</i> - <i>Diplodus sargus</i>	0.241	0.195	0.003	0.465
<i>Boops boops</i> - <i>Diplodus vulgaris</i>	0.091	0.359	0.273	0.492
<i>Boops boops</i> - <i>Oblada melanura</i>	0.121	0.199	0.295	0.488
<i>Boops boops</i> - <i>Pagellus acarne</i>	0.135	0.354	0.371	0.500
<i>Boops boops</i> - <i>Pagellus bogaraveo</i>	0.184	0.013	0.214	0.494
<i>Boops boops</i> - <i>Pagellus erythrinus</i>	0.230	0.159	0.461	0.214
<i>Boops boops</i> - <i>Pagrus pagrus</i>	0.257	-	0.468	-
<i>Boops boops</i> - <i>Sarpa salpa</i>	0.000	0.000	0.055	0.004
<i>Boops boops</i> - <i>Sparus aurata</i>	0.032	0.055	0.209	0.070
<i>Boops boops</i> - <i>Spicara maena</i>	0.000	0.001	0.003	0.013
<i>Diplodus annularis</i> - <i>Diplodus sargus</i>	0.076	0.003	0.211	0.499
<i>Diplodus annularis</i> - <i>Diplodus vulgaris</i>	0.000	0.017	0.165	0.479
<i>Diplodus annularis</i> - <i>Oblada melanura</i>	0.000	0.004	0.155	0.487
<i>Diplodus annularis</i> - <i>Pagellus acarne</i>	0.001	0.013	0.118	0.465
<i>Diplodus annularis</i> - <i>Pagellus bogaraveo</i>	0.162	0.324	0.244	0.460
<i>Diplodus annularis</i> - <i>Pagellus erythrinus</i>	0.001	0.003	0.067	0.179
<i>Diplodus annularis</i> - <i>Pagrus pagrus</i>	0.004	-	0.048	-
<i>Diplodus annularis</i> - <i>Sarpa salpa</i>	0.000	0.000	0.000	0.003
<i>Diplodus annularis</i> - <i>Sparus aurata</i>	0.000	0.000	0.216	0.048
<i>Diplodus annularis</i> - <i>Spicara maena</i>	0.000	0.000	0.000	0.009
<i>Diplodus sargus</i> - <i>Diplodus vulgaris</i>	0.013	0.347	0.021	0.480
<i>Diplodus sargus</i> - <i>Oblada melanura</i>	0.018	0.476	0.019	0.485
<i>Diplodus sargus</i> - <i>Pagellus acarne</i>	0.021	0.336	0.012	0.465
<i>Diplodus sargus</i> - <i>Pagellus bogaraveo</i>	0.412	0.000	0.055	0.459
<i>Diplodus sargus</i> - <i>Pagellus erythrinus</i>	0.049	0.421	0.005	0.154
<i>Diplodus sargus</i> - <i>Pagrus pagrus</i>	0.079	-	0.005	-
<i>Diplodus sargus</i> - <i>Sarpa salpa</i>	0.000	0.001	0.000	0.001
<i>Diplodus sargus</i> - <i>Sparus aurata</i>	0.003	0.243	0.038	0.031
<i>Diplodus sargus</i> - <i>Spicara maena</i>	0.000	0.008	0.000	0.005
<i>Diplodus vulgaris</i> - <i>Oblada melanura</i>	0.446	0.340	0.496	0.495
<i>Diplodus vulgaris</i> - <i>Pagellus acarne</i>	0.423	0.497	0.456	0.495
<i>Diplodus vulgaris</i> - <i>Pagellus bogaraveo</i>	0.011	0.004	0.454	0.487
<i>Diplodus vulgaris</i> - <i>Pagellus erythrinus</i>	0.324	0.289	0.361	0.207
<i>Diplodus vulgaris</i> - <i>Pagrus pagrus</i>	0.354	-	0.243	-
<i>Diplodus vulgaris</i> - <i>Sarpa salpa</i>	0.001	0.001	0.010	0.004
<i>Diplodus vulgaris</i> - <i>Sparus aurata</i>	0.348	0.135	0.461	0.064
<i>Diplodus vulgaris</i> - <i>Spicara maena</i>	0.001	0.004	0.000	0.011
<i>Oblada melanura</i> - <i>Pagellus acarne</i>	0.480	0.328	0.466	0.490
<i>Oblada melanura</i> - <i>Pagellus bogaraveo</i>	0.016	0.001	0.440	0.484
<i>Oblada melanura</i> - <i>Pagellus erythrinus</i>	0.368	0.447	0.378	0.202
<i>Oblada melanura</i> - <i>Pagrus pagrus</i>	0.397	-	0.257	-
<i>Oblada melanura</i> - <i>Sarpa salpa</i>	0.001	0.004	0.011	0.004
<i>Oblada melanura</i> - <i>Sparus aurata</i>	0.294	0.288	0.444	0.060
<i>Oblada melanura</i> - <i>Spicara maena</i>	0.001	0.015	0.000	0.011

<i>Pagellus acarne - Pagellus bogaraveo</i>	0.018	0.003	0.372	0.497
<i>Pagellus acarne - Pagellus erythrinus</i>	0.391	0.275	0.449	0.206
<i>Pagellus acarne - Pagrus pagrus</i>	0.413	-	0.317	-
<i>Pagellus acarne - Sarpa salpa</i>	0.000	0.000	0.017	0.003
<i>Pagellus acarne - Sparus aurata</i>	0.275	0.118	0.373	0.057
<i>Pagellus acarne - Spicara maena</i>	0.001	0.003	0.001	0.010
<i>Pagellus bogaraveo - Pagellus erythrinus</i>	0.040	0.001	0.275	0.228
<i>Pagellus bogaraveo - Pagrus pagrus</i>	0.060	-	0.201	-
<i>Pagellus bogaraveo - Sarpa salpa</i>	0.000	0.000	0.007	0.005
<i>Pagellus bogaraveo - Sparus aurata</i>	0.003	0.000	0.494	0.077
<i>Pagellus bogaraveo - Spicara maena</i>	0.000	0.000	0.000	0.014
<i>Pagellus erythrinus - Pagrus pagrus</i>	0.494	-	0.405	-
<i>Pagellus erythrinus - Sarpa salpa</i>	0.000	0.006	0.033	0.048
<i>Pagellus erythrinus - Sparus aurata</i>	0.172	0.344	0.272	0.302
<i>Pagellus erythrinus - Spicara maena</i>	0.000	0.020	0.002	0.094
<i>Pagrus pagrus - Sarpa salpa</i>	0.001	-	0.131	-
<i>Pagrus pagrus - Sparus aurata</i>	0.218	-	0.199	-
<i>Pagrus pagrus - Spicara maena</i>	0.001	-	0.013	-
<i>Sarpa salpa - Sparus aurata</i>	0.004	0.016	0.005	0.150
<i>Sarpa salpa - Spicara maena</i>	0.470	0.439	0.154	0.485
<i>Sparus aurata - Spicara maena</i>	0.005	0.049	0.000	0.207

Table S5. Non-significant (in bold) and significant pairwise comparisons between fish species within skin

or gill mucus. Based on Pairwise PERMANOVAs, non-significant if $p > 0.05$

Skin mucus Bray-Curtis		Gill mucus Bray-Curtis	
Associations	P-value	Associations	P-value
<i>Boops boops</i> vs <i>Diplodus annularis</i>	0.030	<i>Boops boops</i> vs <i>Diplodus annularis</i>	0.008
<i>Boops boops</i> vs <i>Diplodus vulgaris</i>	0.029	<i>Boops boops</i> vs <i>Diplodus vulgaris</i>	0.009
<i>Boops boops</i> vs <i>Oblada melanura</i>	0.028	<i>Boops boops</i> vs <i>Oblada melanura</i>	0.01
<i>Boops boops</i> vs <i>Pagellus acarne</i>	0.008	<i>Boops boops</i> vs <i>Pagellus acarne</i>	0.008
<i>Boops boops</i> vs <i>Pagellus bogaraveo</i>	0.027	<i>Boops boops</i> vs <i>Pagellus bogaraveo</i>	0.008
<i>Boops boops</i> vs <i>Pagellus erythrinus</i>	0.029	<i>Boops boops</i> vs <i>Pagellus erythrinus</i>	0.008
<i>Boops boops</i> vs <i>Sarpa salpa</i>	0.007	<i>Boops boops</i> vs <i>Sarpa salpa</i>	0.008
<i>Diplodus sargus</i> vs <i>Boops boops</i>	0.005	<i>Diplodus sargus</i> vs <i>Boops boops</i>	0.002
<i>Diplodus sargus</i> vs <i>Diplodus annularis</i>	0.004	<i>Diplodus sargus</i> vs <i>Diplodus annularis</i>	0.002
<i>Diplodus sargus</i> vs <i>Diplodus vulgaris</i>	0.077	<i>Diplodus sargus</i> vs <i>Diplodus vulgaris</i>	0.024
<i>Diplodus sargus</i> vs <i>Oblada melanura</i>	0.005	<i>Diplodus sargus</i> vs <i>Oblada melanura</i>	0.002
<i>Diplodus sargus</i> vs <i>Pagellus acarne</i>	0.005	<i>Diplodus sargus</i> vs <i>Pagellus acarne</i>	0.019
<i>Diplodus sargus</i> vs <i>Pagellus bogaraveo</i>	0.005	<i>Diplodus sargus</i> vs <i>Pagellus bogaraveo</i>	0.008
<i>Diplodus sargus</i> vs <i>Pagellus erythrinus</i>	0.009	<i>Diplodus sargus</i> vs <i>Pagellus erythrinus</i>	0.02
<i>Diplodus sargus</i> vs <i>Sarpa salpa</i>	0.002	<i>Diplodus sargus</i> vs <i>Pagrus pagrus</i>	0.023
<i>Diplodus sargus</i> vs <i>Spicara maena</i>	0.011	<i>Diplodus sargus</i> vs <i>Sarpa salpa</i>	0.003
<i>Diplodus vulgaris</i> vs <i>Diplodus annularis</i>	0.030	<i>Diplodus sargus</i> vs <i>Spicara maena</i>	0.002
<i>Diplodus vulgaris</i> vs <i>Oblada melanura</i>	0.088	<i>Diplodus vulgaris</i> vs <i>Diplodus annularis</i>	0.008
<i>Oblada melanura</i> vs <i>Diplodus annularis</i>	0.029	<i>Diplodus vulgaris</i> vs <i>Oblada melanura</i>	0.283
<i>Pagellus acarne</i> vs <i>Diplodus annularis</i>	0.017	<i>Oblada melanura</i> vs <i>Diplodus annularis</i>	0.007
<i>Pagellus acarne</i> vs <i>Diplodus vulgaris</i>	0.259	<i>Pagellus acarne</i> vs <i>Diplodus annularis</i>	0.009
<i>Pagellus acarne</i> vs <i>Oblada melanura</i>	0.115	<i>Pagellus acarne</i> vs <i>Diplodus vulgaris</i>	0.252
<i>Pagellus acarne</i> vs <i>Pagellus bogaraveo</i>	0.008	<i>Pagellus acarne</i> vs <i>Oblada melanura</i>	0.009
<i>Pagellus bogaraveo</i> vs <i>Diplodus annularis</i>	0.030	<i>Pagellus acarne</i> vs <i>Pagellus bogaraveo</i>	0.023
<i>Pagellus bogaraveo</i> vs <i>Diplodus vulgaris</i>	0.028	<i>Pagellus bogaraveo</i> vs <i>Diplodus annularis</i>	0.008
<i>Pagellus bogaraveo</i> vs <i>Oblada melanura</i>	0.029	<i>Pagellus bogaraveo</i> vs <i>Diplodus vulgaris</i>	0.01
<i>Pagellus erythrinus</i> vs <i>Diplodus annularis</i>	0.030	<i>Pagellus bogaraveo</i> vs <i>Oblada melanura</i>	0.018
<i>Pagellus erythrinus</i> vs <i>Diplodus vulgaris</i>	0.162	<i>Pagellus erythrinus</i> vs <i>Diplodus annularis</i>	0.009
<i>Pagellus erythrinus</i> vs <i>Oblada melanura</i>	0.263	<i>Pagellus erythrinus</i> vs <i>Diplodus vulgaris</i>	0.844
<i>Pagellus erythrinus</i> vs <i>Pagellus acarne</i>	0.621	<i>Pagellus erythrinus</i> vs <i>Oblada melanura</i>	0.188
<i>Pagellus erythrinus</i> vs <i>Pagellus bogaraveo</i>	0.025	<i>Pagellus erythrinus</i> vs <i>Pagellus acarne</i>	0.408
<i>Sarpa salpa</i> vs <i>Diplodus annularis</i>	0.008	<i>Pagellus erythrinus</i> vs <i>Pagellus bogaraveo</i>	0.023
<i>Sarpa salpa</i> vs <i>Diplodus vulgaris</i>	0.040	<i>Pagrus pagrus</i> vs <i>Boops boops</i>	0.037
<i>Sarpa salpa</i> vs <i>Oblada melanura</i>	0.009	<i>Pagrus pagrus</i> vs <i>Diplodus annularis</i>	0.019
<i>Sarpa salpa</i> vs <i>Pagellus acarne</i>	0.009	<i>Pagrus pagrus</i> vs <i>Diplodus vulgaris</i>	0.106
<i>Sarpa salpa</i> vs <i>Pagellus bogaraveo</i>	0.009	<i>Pagrus pagrus</i> vs <i>Oblada melanura</i>	0.019
<i>Sarpa salpa</i> vs <i>Pagellus erythrinus</i>	0.009	<i>Pagrus pagrus</i> vs <i>Pagellus acarne</i>	0.07
<i>Sparus aurata</i> vs <i>Boops boops</i>	0.007	<i>Pagrus pagrus</i> vs <i>Pagellus bogaraveo</i>	0.086
<i>Sparus aurata</i> vs <i>Diplodus annularis</i>	0.010	<i>Pagrus pagrus</i> vs <i>Pagellus erythrinus</i>	0.16
<i>Sparus aurata</i> vs <i>Diplodus sargus</i>	0.002	<i>Pagrus pagrus</i> vs <i>Sarpa salpa</i>	0.02
<i>Sparus aurata</i> vs <i>Diplodus vulgaris</i>	0.009	<i>Sarpa salpa</i> vs <i>Diplodus annularis</i>	0.007
<i>Sparus aurata</i> vs <i>Oblada melanura</i>	0.008	<i>Sarpa salpa</i> vs <i>Diplodus vulgaris</i>	0.008
<i>Sparus aurata</i> vs <i>Pagellus acarne</i>	0.008	<i>Sarpa salpa</i> vs <i>Oblada melanura</i>	0.008
<i>Sparus aurata</i> vs <i>Pagellus bogaraveo</i>	0.009	<i>Sarpa salpa</i> vs <i>Pagellus acarne</i>	0.007
<i>Sparus aurata</i> vs <i>Pagellus erythrinus</i>	0.007	<i>Sarpa salpa</i> vs <i>Pagellus bogaraveo</i>	0.009

<i>Sparus aurata</i> vs <i>Sarpa salpa</i>	0.008	<i>Sarpa salpa</i> vs <i>Pagellus erythrinus</i>	0.008
<i>Sparus aurata</i> vs <i>Spicara maena</i>	0.017	<i>Sparus aurata</i> vs <i>Boops boops</i>	0.007
<i>Spicara maena</i> vs <i>Boops boops</i>	0.029	<i>Sparus aurata</i> vs <i>Diplodus annularis</i>	0.007
<i>Spicara maena</i> vs <i>Diplodus annularis</i>	0.029	<i>Sparus aurata</i> vs <i>Diplodus sargus</i>	0.004
<i>Spicara maena</i> vs <i>Diplodus vulgaris</i>	0.057	<i>Sparus aurata</i> vs <i>Diplodus vulgaris</i>	0.007
<i>Spicara maena</i> vs <i>Oblada melanura</i>	0.029	<i>Sparus aurata</i> vs <i>Oblada melanura</i>	0.008
<i>Spicara maena</i> vs <i>Pagellus acarne</i>	0.035	<i>Sparus aurata</i> vs <i>Pagellus acarne</i>	0.008
<i>Spicara maena</i> vs <i>Pagellus bogaraveo</i>	0.029	<i>Sparus aurata</i> vs <i>Pagellus bogaraveo</i>	0.009
<i>Spicara maena</i> vs <i>Pagellus erythrinus</i>	0.029	<i>Sparus aurata</i> vs <i>Pagellus erythrinus</i>	0.008
<i>Spicara maena</i> vs <i>Sarpa salpa</i>	0.017	<i>Sparus aurata</i> vs <i>Pagrus pagrus</i>	0.018
		<i>Sparus aurata</i> vs <i>Sarpa salpa</i>	0.009
		<i>Sparus aurata</i> vs <i>Spicara maena</i>	0.008
		<i>Spicara maena</i> vs <i>Boops boops</i>	0.007
		<i>Spicara maena</i> vs <i>Diplodus annularis</i>	0.007
		<i>Spicara maena</i> vs <i>Diplodus vulgaris</i>	0.008
		<i>Spicara maena</i> vs <i>Oblada melanura</i>	0.01
		<i>Spicara maena</i> vs <i>Pagellus acarne</i>	0.008
		<i>Spicara maena</i> vs <i>Pagellus bogaraveo</i>	0.008
		<i>Spicara maena</i> vs <i>Pagellus erythrinus</i>	0.009
		<i>Spicara maena</i> vs <i>Pagrus pagrus</i>	0.018
		<i>Spicara maena</i> vs <i>Sarpa salpa</i>	0.007

Skin mucus Weighted Unifrac	
Associations	P-value
<i>Boops boops</i> vs <i>Diplodus annularis</i>	0.028
<i>Boops boops</i> vs <i>Diplodus vulgaris</i>	0.028
<i>Boops boops</i> vs <i>Oblada melanura</i>	0.029
<i>Boops boops</i> vs <i>Pagellus acarne</i>	0.337
<i>Boops boops</i> vs <i>Pagellus bogaraveo</i>	0.027
<i>Boops boops</i> vs <i>Pagellus erythrinus</i>	0.233
<i>Boops boops</i> vs <i>Sarpa salpa</i>	0.008
<i>Diplodus sargus</i> vs <i>Boops boops</i>	0.179
<i>Diplodus sargus</i> vs <i>Diplodus annularis</i>	0.005
<i>Diplodus sargus</i> vs <i>Diplodus vulgaris</i>	0.787
<i>Diplodus sargus</i> vs <i>Oblada melanura</i>	0.009
<i>Diplodus sargus</i> vs <i>Pagellus acarne</i>	0.002
<i>Diplodus sargus</i> vs <i>Pagellus bogaraveo</i>	0.073
<i>Diplodus sargus</i> vs <i>Pagellus erythrinus</i>	0.005
<i>Diplodus sargus</i> vs <i>Sarpa salpa</i>	0.003
<i>Diplodus sargus</i> vs <i>Spicara maena</i>	0.014
<i>Diplodus vulgaris</i> vs <i>Diplodus annularis</i>	0.027
<i>Diplodus vulgaris</i> vs <i>Oblada melanura</i>	0.089
<i>Oblada melanura</i> vs <i>Diplodus annularis</i>	0.029
<i>Pagellus acarne</i> vs <i>Diplodus annularis</i>	0.032
<i>Pagellus acarne</i> vs <i>Diplodus vulgaris</i>	0.778
<i>Pagellus acarne</i> vs <i>Oblada melanura</i>	0.47
<i>Pagellus acarne</i> vs <i>Pagellus bogaraveo</i>	0.056
<i>Pagellus bogaraveo</i> vs <i>Diplodus annularis</i>	0.027
<i>Pagellus bogaraveo</i> vs <i>Diplodus vulgaris</i>	0.029
<i>Pagellus bogaraveo</i> vs <i>Oblada melanura</i>	0.029

Gill mucus Bray-Curtis Weighted Unifrac	
Associations	P-value
<i>Boops boops</i> vs <i>Diplodus annularis</i>	0.008
<i>Boops boops</i> vs <i>Diplodus vulgaris</i>	0.009
<i>Boops boops</i> vs <i>Oblada melanura</i>	0.009
<i>Boops boops</i> vs <i>Pagellus acarne</i>	0.644
<i>Boops boops</i> vs <i>Pagellus bogaraveo</i>	0.009
<i>Boops boops</i> vs <i>Pagellus erythrinus</i>	0.008
<i>Boops boops</i> vs <i>Sarpa salpa</i>	0.015
<i>Diplodus sargus</i> vs <i>Boops boops</i>	0.002
<i>Diplodus sargus</i> vs <i>Diplodus annularis</i>	0.002
<i>Diplodus sargus</i> vs <i>Diplodus vulgaris</i>	0.063
<i>Diplodus sargus</i> vs <i>Oblada melanura</i>	0.002
<i>Diplodus sargus</i> vs <i>Pagellus acarne</i>	0.138
<i>Diplodus sargus</i> vs <i>Pagellus bogaraveo</i>	0.005
<i>Diplodus sargus</i> vs <i>Pagellus erythrinus</i>	0.004
<i>Diplodus sargus</i> vs <i>Pagrus pagrus</i>	0.365
<i>Diplodus sargus</i> vs <i>Sarpa salpa</i>	0.003
<i>Diplodus sargus</i> vs <i>Spicara maena</i>	0.002
<i>Diplodus vulgaris</i> vs <i>Diplodus annularis</i>	0.009
<i>Diplodus vulgaris</i> vs <i>Oblada melanura</i>	0.116
<i>Oblada melanura</i> vs <i>Diplodus annularis</i>	0.008
<i>Pagellus acarne</i> vs <i>Diplodus annularis</i>	0.762
<i>Pagellus acarne</i> vs <i>Diplodus vulgaris</i>	0.858
<i>Pagellus acarne</i> vs <i>Oblada melanura</i>	0.498
<i>Pagellus acarne</i> vs <i>Pagellus bogaraveo</i>	0.017
<i>Pagellus bogaraveo</i> vs <i>Diplodus annularis</i>	0.007
<i>Pagellus bogaraveo</i> vs <i>Diplodus vulgaris</i>	0.008

<i>Pagellus erythrinus</i> vs <i>Diplodus annularis</i>	0.03	<i>Pagellus bogaraveo</i> vs <i>Oblada melanura</i>	0.01
<i>Pagellus erythrinus</i> vs <i>Diplodus vulgaris</i>	0.367	<i>Pagellus erythrinus</i> vs <i>Diplodus annularis</i>	0.082
<i>Pagellus erythrinus</i> vs <i>Oblada melanura</i>	0.345	<i>Pagellus erythrinus</i> vs <i>Diplodus vulgaris</i>	0.334
<i>Pagellus erythrinus</i> vs <i>Pagellus acarne</i>	0.607	<i>Pagellus erythrinus</i> vs <i>Oblada melanura</i>	0.216
<i>Pagellus erythrinus</i> vs <i>Pagellus bogaraveo</i>	0.318	<i>Pagellus erythrinus</i> vs <i>Pagellus acarne</i>	0.895
<i>Sarpa salpa</i> vs <i>Diplodus annularis</i>	0.008	<i>Pagellus erythrinus</i> vs <i>Pagellus bogaraveo</i>	0.009
<i>Sarpa salpa</i> vs <i>Diplodus vulgaris</i>	0.065	<i>Pagrus pagrus</i> vs <i>Boops boops</i>	0.0368
<i>Sarpa salpa</i> vs <i>Oblada melanura</i>	0.007	<i>Pagrus pagrus</i> vs <i>Diplodus annularis</i>	0.017
<i>Sarpa salpa</i> vs <i>Pagellus acarne</i>	0.009	<i>Pagrus pagrus</i> vs <i>Diplodus vulgaris</i>	0.352
<i>Sarpa salpa</i> vs <i>Pagellus bogaraveo</i>	0.01	<i>Pagrus pagrus</i> vs <i>Oblada melanura</i>	0.321
<i>Sarpa salpa</i> vs <i>Pagellus erythrinus</i>	0.009	<i>Pagrus pagrus</i> vs <i>Pagellus acarne</i>	0.946
<i>Sparus aurata</i> vs <i>Boops boops</i>	0.009	<i>Pagrus pagrus</i> vs <i>Pagellus bogaraveo</i>	0.371
<i>Sparus aurata</i> vs <i>Diplodus annularis</i>	0.008	<i>Pagrus pagrus</i> vs <i>Pagellus erythrinus</i>	0.84
<i>Sparus aurata</i> vs <i>Diplodus sargus</i>	0.014	<i>Pagrus pagrus</i> vs <i>Sarpa salpa</i>	0.22
<i>Sparus aurata</i> vs <i>Diplodus vulgaris</i>	0.009	<i>Sarpa salpa</i> vs <i>Diplodus annularis</i>	0.005
<i>Sparus aurata</i> vs <i>Oblada melanura</i>	0.008	<i>Sarpa salpa</i> vs <i>Diplodus vulgaris</i>	0.042
<i>Sparus aurata</i> vs <i>Pagellus acarne</i>	0.211	<i>Sarpa salpa</i> vs <i>Oblada melanura</i>	0.008
<i>Sparus aurata</i> vs <i>Pagellus bogaraveo</i>	0.01	<i>Sarpa salpa</i> vs <i>Pagellus acarne</i>	0.008
<i>Sparus aurata</i> vs <i>Pagellus erythrinus</i>	0.048	<i>Sarpa salpa</i> vs <i>Pagellus bogaraveo</i>	0.008
<i>Sparus aurata</i> vs <i>Sarpa salpa</i>	0.007	<i>Sarpa salpa</i> vs <i>Pagellus erythrinus</i>	0.006
<i>Sparus aurata</i> vs <i>Spicara maena</i>	0.019	<i>Sparus aurata</i> vs <i>Boops boops</i>	0.008
<i>Spicara maena</i> vs <i>Boops boops</i>	0.029	<i>Sparus aurata</i> vs <i>Diplodus annularis</i>	0.015
<i>Spicara maena</i> vs <i>Diplodus annularis</i>	0.029	<i>Sparus aurata</i> vs <i>Diplodus sargus</i>	0.002
<i>Spicara maena</i> vs <i>Diplodus vulgaris</i>	0.057	<i>Sparus aurata</i> vs <i>Diplodus vulgaris</i>	0.024
<i>Spicara maena</i> vs <i>Oblada melanura</i>	0.029	<i>Sparus aurata</i> vs <i>Oblada melanura</i>	0.022
<i>Spicara maena</i> vs <i>Pagellus acarne</i>	0.054	<i>Sparus aurata</i> vs <i>Pagellus acarne</i>	0.007
<i>Spicara maena</i> vs <i>Pagellus bogaraveo</i>	0.029	<i>Sparus aurata</i> vs <i>Pagellus bogaraveo</i>	0.014
<i>Spicara maena</i> vs <i>Pagellus erythrinus</i>	0.143	<i>Sparus aurata</i> vs <i>Pagellus erythrinus</i>	0.007
<i>Spicara maena</i> vs <i>Sarpa salpa</i>	0.02	<i>Sparus aurata</i> vs <i>Pagrus pagrus</i>	0.073
		<i>Sparus aurata</i> vs <i>Sarpa salpa</i>	0.008
		<i>Sparus aurata</i> vs <i>Spicara maena</i>	0.007
		<i>Spicara maena</i> vs <i>Boops boops</i>	0.009
		<i>Spicara maena</i> vs <i>Diplodus annularis</i>	0.008
		<i>Spicara maena</i> vs <i>Diplodus vulgaris</i>	0.009
		<i>Spicara maena</i> vs <i>Oblada melanura</i>	0.008
		<i>Spicara maena</i> vs <i>Pagellus acarne</i>	0.01
		<i>Spicara maena</i> vs <i>Pagellus bogaraveo</i>	0.008
		<i>Spicara maena</i> vs <i>Pagellus erythrinus</i>	0.01
		<i>Spicara maena</i> vs <i>Pagrus pagrus</i>	0.019
		<i>Spicara maena</i> vs <i>Sarpa salpa</i>	0.007

Table S6. Correlations between interspecific dissimilarities in skin mucus or gill mucus microbiota and host sparid phylogeny. Two methods were used to generate the dissimilarity matrix: random selection of one individual per fish species (A) and averaging the microbial taxa among individuals of each fish species (B). Based on Bray-Curtis (BC) or Weighted Unifrac (WU) dissimilarities

(A) Random selection of one individual per fish species - % of significant p-values (1000 permutations)											
With water sequences				Without water sequences				Core microbiota			
Gill mucus		Skin mucus		Gill mucus		Skin mucus		Gill mucus		Skin mucus	
BC	WU	BC	WU	BC	WU	BC	WU	BC	WU	BC	WU
2%	0%	17.4%	0%	0%	0%	0%	0.6%	15.4%	4.9%	1.4%	1.6%

(B) Average of microbial taxa among individuals of each fish species												
	With water sequences				Without water sequences				Core microbiota			
	Gill mucus		Skin mucus		Gill mucus		Skin mucus		Gill mucus		Skin mucus	
	BC	WU	BC	WU	BC	WU	BC	WU	BC	WU	BC	WU
P-value	0.88	0.79	0.68	0.51	0.93	0.71	0.79	0.29	0.42	0.75	0.39	0.99

Table S7. Total abundance (i.e. total number of *Lamellodiscus* individuals found on each fish individual). Abundance of each *Lamellodiscus* species and species richness (i.e. number of different *Lamellodiscus* species found on each fish individual) within gills of each fish individual

Fish species	Individual	Total abundance	<i>L. abbreviatus</i>	<i>L. baeri</i>	<i>L. coronatus</i>	<i>L. diplodi</i>	<i>L. drummondi</i>	<i>L. elegans</i>	<i>L. ergensi</i>	<i>L. erythrini</i>	<i>L. falcus</i>	<i>L. fraternus</i>	<i>L. furcosus</i>	<i>L. gracilis</i>	<i>L. ignoratus</i>	<i>L. knoeppfleri</i>	<i>L. mirandus</i>	<i>L. neifari</i>	<i>L. parisi</i>	<i>L. oliveri</i>	<i>L. tomentosus</i>	<i>L. virgula</i>	<i>Furnestinia echeneis</i>	Species richness	
<i>Boops boops</i>	1	0																						0	
	2	0																							0
	3	0																							0
	4	0																							0
	5	0																							0
<i>Diplodus annularis</i>	1	35						22	5						8										3
	2	21						12	4						5										3
	3	39						21	3				4	11											4
	4	29						24	3						2										3
	5	43						17	7				11	8											4
<i>Diplodus sargus</i>	1	101	3					31	12						38			11			6				6
	2	74			9			18	9				14	8	16										6
	3	127				7		22	5				21		44		11	17							7
	4	92			8	4		13	4		5		9	4	23		7				15				10
	5	111						25	6		2		11	19	32		16								7
	6	78			14			12	19				4	11	8		10								7
<i>Diplodus vulgaris</i>	1	82						41	4		10	11		14							2				6

Table S8. *Lamellodiscus* species with no significant influence on the composition of gill mucus microbiota. Performed with Mantel test, $p > 0.05$

<i>Lamellodiscus</i> species	P-value
<i>L. abbreviatus</i>	0.82
<i>L. baeri</i>	0.67
<i>L. coronatus</i>	0.17
<i>L. diplodi</i>	0.57
<i>L. erythrini</i>	0.66
<i>L. falcus</i>	0.36
<i>L. fraternus</i>	0.76
<i>L. furcosus</i>	0.19
<i>L. gracilis</i>	0.53
<i>L. knoepffleri</i>	0.19
<i>L. neifari</i>	0.71
<i>L. oliveri</i>	0.92
<i>L. tomentosus</i>	0.25