



A clade-level morphospace for the Eocene fishes of Bolca: Patterns and relationships with modern tropical shallow marine assemblages

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SUPPLEMENTARY ONLINE MATERIAL

ab. S1 - Dataset list of all Recent taxa in each ecosystem. GBR, Great Barrier Reef; RS, Red Sea; EBS, East Brazil Shelf; CS, Caribbean Sea. For each ecosystem '1' indicates the presence of the taxon, '0' indicates its absence in the assemblage.

Clade	Family	Taxon	Ecosystem			
			GBR	RS	EBS	CS
Albuliformes	Albulidae	<i>Albula</i>	1	1	1	1
Anguilliformes	Anguillidae	<i>Anguilla</i>	0	1	1	1
	Chlopsidae	<i>Chilorhinus</i>	0	0	1	1
		<i>Chlopsis</i>	0	0	1	1
		<i>Kaupichthys</i>	1	0	0	1
	Congridae	<i>Ariosoma</i>	1	1	1	1
		<i>Bathyrcongus</i>	0	0	1	0
		<i>Conger</i>	1	1	1	1
		<i>Diploconger</i>	0	1	0	0
		<i>Gorgasia</i>	1	1	0	0
		<i>Heteroconger</i>	1	1	1	1
		<i>Paraconger</i>	0	0	1	1
		<i>Rhynchoconger</i>	0	0	1	1
		<i>Uroconger</i>	0	1	1	0
	Heterenchelyidae	<i>Pythonichthys</i>	0	0	0	1
	Moringuidae	<i>Moringua</i>	1	0	1	1
		<i>Neoconger</i>	0	0	1	1
	Muraenesocidae	<i>Congresox</i>	0	1	0	0
		<i>Cynoponticus</i>	0	0	1	1
		<i>Muraenesox</i>	0	1	0	0
	Muraenidae	<i>Anarchias</i>	1	0	1	1
		<i>Channomuraena</i>	0	0	0	1
		<i>Echidna</i>	1	1	1	1
		<i>Enchelycore</i>	1	1	1	1
		<i>Enchelynassa</i>	1	0	0	0
		<i>Gymnomuraena</i>	1	1	0	0
		<i>Gymnothorax</i>	1	1	1	1
		<i>Monopenchelys</i>	0	0	0	1

		<i>Muraena</i>	0	1	0	1
		<i>Strophidon</i>	0	1	0	0
		<i>Uropterygius</i>	1	1	1	1
	Nettastomatidae	<i>Hoplunnis</i>	0	0	1	0
		<i>Saurenychelys</i>	0	1	0	0
	Ophichthidae	<i>Ahlia</i>	0	0	1	1
		<i>Aplatophis</i>	0	0	1	1
		<i>Aprognathodon</i>	0	0	0	1
		<i>Apterichtus</i>	1	0	0	1
		<i>Bascanichthys</i>	1	0	0	0
		<i>Brachysomophis</i>	1	1	0	0
		<i>Callechelys</i>	1	1	1	1
		<i>Caralophia</i>	0	0	0	1
		<i>Echiophis</i>	0	0	1	1
		<i>Gordiichthys</i>	0	0	0	1
		<i>Hyphalophis</i>	0	0	0	1
		<i>Ichthyapus</i>	0	0	0	1
		<i>Lamnostoma</i>	0	1	0	0
		<i>Leiuranus</i>	1	0	0	0
		<i>Letharchus</i>	0	0	0	1
		<i>Muraenichthys</i>	0	1	0	0
		<i>Myrichthys</i>	1	1	0	1
		<i>Myrophis</i>	1	1	1	1
		<i>Neechelys</i>	0	1	0	0
		<i>Ophichthus</i>	1	1	1	1
		<i>Phyllophichthus</i>	1	1	0	0
		<i>Pisodonophis</i>	1	1	0	0
		<i>Quassiremus</i>	0	0	1	1
		<i>Schismorhynchus</i>	1	0	0	0
		<i>Schultzidia</i>	1	0	0	0
		<i>Scolecenchelys</i>	1	1	0	0
		<i>Skythrenchelys</i>	0	1	0	0
		<i>Xestochilus</i>	0	1	0	0
		<i>Yirkala</i>	0	1	0	0
	Synphobranchidae	<i>Dysomma</i>	0	0	0	1
Atheriniformes	Atherinidae	<i>Atherinomor</i>	1	1	1	1
		<i>Atherion</i>	1	0	0	0
		<i>Dentatherina</i>	1	0	0	0
		<i>Hypoatherina</i>	1	1	0	1
	Atherinopsidae	<i>Atherinella</i>	0	0	1	1
		<i>Melanorhinus</i>	0	0	0	1
		<i>Membras</i>	0	0	0	1
		<i>Odontesthes</i>	0	0	1	0
Aulopiformes	Chlorophthalmidae	<i>Parasudis</i>	0	0	0	1
	Synodontidae	<i>Saurida</i>	1	1	1	0
		<i>Synodus</i>	1	1	1	1
Batrachoidiformes	Batrachoididae	<i>Amphichthys</i>	0	0	1	1
		<i>Barchatus</i>	0	1	0	0

		<i>Batrachoides</i>	0	0	1	1
		<i>Halophryne</i>	1	0	0	0
		<i>Opsanus</i>	0	0	0	1
		<i>Porichthys</i>	0	0	1	1
		<i>Sanopus</i>	0	0	0	1
		<i>Thalassophryne</i>	0	0	1	1
		<i>Vladichthys</i>	0	0	0	1
Beloniformes	Belonidae	<i>Ablennes</i>	1	1	1	1
		<i>Platybelone</i>	1	1	1	1
		<i>Strongylura</i>	1	0	1	1
		<i>Tylosurus</i>	1	1	1	1
	Exocoetidae	<i>Cheilopogon</i>	1	1	1	1
		<i>Cypselurus</i>	0	1	0	0
		<i>Exocoetus</i>	0	1	1	1
		<i>Hirundichthys</i>	1	1	1	1
		<i>Parexocoetus</i>	1	1	1	1
		<i>Prognichthys</i>	0	0	0	1
		<i>Chriodorus</i>	0	0	0	1
	Hemiramphidae	<i>Euleptorhamphus</i>	0	1	1	1
		<i>Hemiramphus</i>	1	1	1	1
		<i>Hyporhamphus</i>	1	1	1	1
		<i>Oxyporhamphus</i>	0	0	0	1
		<i>Scomberesox</i>	0	1	0	1
	Zenarchopteridae	<i>Zenarchopterus</i>	1	0	0	0
Beryciformes	Anomalopidae	<i>Anomalops</i>	1	0	0	0
		<i>Kryptophanaron</i>	0	0	0	1
		<i>Photoblepharon</i>	1	1	0	0
	Holocentridae	<i>Corniger</i>	0	0	1	1
		<i>Holocentrus</i>	0	0	1	1
		<i>Myripristis</i>	1	1	1	1
		<i>Neoniphon</i>	1	1	0	1
		<i>Ostiichthys</i>	0	1	1	1
		<i>Plectrypops</i>	1	0	1	1
		<i>Sargocentron</i>	1	0	1	1
	Monocentridae	<i>Cleidopus</i>	1	0	0	0
		<i>Monocentris</i>	0	1	0	0
		<i>Polymixia</i>	1	0	0	0
Clupeiformes	Chirocentridae	<i>Chirocentrus</i>	1	1	0	0
	Clupeidae	<i>Amblygaster</i>	1	1	0	0
		<i>Brevoortia</i>	0	0	1	0
		<i>Dorosoma</i>	0	0	0	1
		<i>Dussumieria</i>	1	1	0	0
		<i>Etrumeus</i>	0	1	0	1
		<i>Harengula</i>	1	1	0	0
		<i>Herklotsichthys</i>	0	1	0	0
		<i>Hilsa</i>	0	0	1	1
		<i>Jenkinsia</i>	0	0	0	1
		<i>Lile</i>	0	0	1	1

		<i>Opisthonema</i>	0	0	1	0
		<i>Sardinella</i>	1	1	0	0
		<i>Spratelloides</i>	0	0	1	1
	Engraulidae	<i>Anchoa</i>	0	0	1	1
		<i>Anchovia</i>	0	0	1	1
		<i>Anchoviella</i>	0	0	1	1
		<i>Cetengraulis</i>	0	0	1	1
		<i>Encrasicholina</i>	1	1	0	0
		<i>Engraulis</i>	0	1	1	0
		<i>Lycengraulis</i>	0	0	1	1
		<i>Stolephorus</i>	1	1	0	0
		<i>Thryssina</i>	1	1	0	0
	Pristigasteridae	<i>Chirocentron</i>	0	0	1	1
		<i>Neopisthopterus</i>	0	0	0	1
		<i>Odontognathus</i>	0	0	1	1
		<i>Pellona</i>	1	0	1	1
		<i>Pliosteostoma</i>	0	0	0	1
Elopiiformes	Elopidae	<i>Elops</i>	0	1	1	1
	Megalopidae	<i>Megalops</i>	0	1	1	1
Gonorynchiformes	Chanidae	<i>Chanos</i>	1	1	0	0
Lophiiformes	Antennariidae	<i>Antennarius</i>	1	1	1	1
		<i>Antennatus</i>	1	1	0	1
		<i>Fowlerichthys</i>	0	0	0	1
		<i>Histrio</i>	1	1	1	1
		<i>Lophiocharon</i>	1	0	0	0
		<i>Tathicarpus</i>	1	0	0	0
	Lophiidae	<i>Lophiomus</i>	0	1	0	0
	Ogcocephalidae	<i>Halieutichthys</i>	0	0	1	1
		<i>Ogcocephalus</i>	0	0	1	1
		<i>Zalieutes</i>	0	0	1	1
Ophidiiformes	Bythitidae	<i>Alionematichthys</i>	1	0	0	0
		<i>Brosmophyciops</i>	1	1	0	0
		<i>Calamopterix</i>	0	0	0	1
		<i>Diancistrus</i>	1	0	0	0
		<i>Dinematichthys</i>	0	1	0	0
		<i>Grammonus</i>	0	0	0	1
		<i>Lucifuga</i>	0	0	0	1
		<i>Microbrotula</i>	1	1	0	0
		<i>Ogilbia</i>	0	0	0	1
		<i>Ogilblichthys</i>	0	0	0	1
		<i>Pseudogilbia</i>	0	0	0	1
		<i>Saccogaster</i>	0	0	0	1
		<i>Stygnobrotula</i>	0	0	0	1
	Carapidae	<i>Carapus</i>	1	1	0	1
		<i>Encheliophis</i>	1	1	0	0
		<i>Onuxodon</i>	1	0	0	0
	Ophidiidae	<i>Brotula</i>	1	1	1	1
		<i>Genypterus</i>	0	0	1	0

		<i>Lepophidium</i>	0	0	1	1
		<i>Monomitopus</i>	0	0	1	0
		<i>Neobythites</i>	0	0	0	1
		<i>Ophidion</i>	0	1	1	1
		<i>Otophidium</i>	0	0	1	1
		<i>Parophiodon</i>	0	0	1	1
		<i>Petrotyx</i>	0	0	0	1
		<i>Raneya</i>	0	0	1	0
		<i>Sirembo</i>	1	1	0	0
"perciforms"	Acanthuridae	<i>Acanthurus</i>	1	1	1	1
		<i>Ctenochaetus</i>	1	1	0	0
		<i>Naso</i>	1	1	0	0
		<i>Paracanthurus</i>	1	0	0	0
		<i>Prionurus</i>	1	0	0	0
		<i>Zebrasoma</i>	1	1	0	0
	Ambassidae	<i>Ambassis</i>	1	1	0	0
	Ammodytidae	<i>Brachaluteres</i>	0	1	0	0
	Apistidae	<i>Apistops</i>	1	0	0	0
		<i>Apistus</i>	0	1	0	0
	Aploactinidae	<i>Acathosphex</i>	1	0	0	0
		<i>Adventor</i>	1	0	0	0
		<i>Aploactis</i>	1	0	0	0
		<i>Matsubarichthys</i>	1	0	0	0
		<i>Neoaploactis</i>	1	0	0	0
		<i>Paraploactis</i>	1	0	0	0
		<i>Pseudopataecus</i>	1	0	0	0
		<i>Ptarmus</i>	0	1	0	0
	Apogonidae	<i>Apogon</i>	1	1	1	1
		<i>Apogonichthyoides</i>	1	1	0	0
		<i>Apogonichthys</i>	1	1	0	0
		<i>Archamia</i>	1	1	0	0
		<i>Astrapogon</i>	0	0	0	1
		<i>Cercamia</i>	1	1	0	0
		<i>Cheilodipterus</i>	1	1	0	0
		<i>Foa</i>	1	1	0	0
		<i>Fowleria</i>	1	1	0	0
		<i>Gymnapogon</i>	1	1	0	0
		<i>Neamia</i>	1	1	0	0
		<i>Nectamia</i>	1	1	0	0
		<i>Ostorhinchus</i>	1	1	0	0
		<i>Phaeoptyx</i>	0	0	1	1
		<i>Pristiapogon</i>	1	1	0	0
		<i>Pristicon</i>	1	0	0	0
		<i>Pseudamia</i>	1	1	0	0
		<i>Pseudamiops</i>	1	1	0	0
		<i>Rhabdamia</i>	1	1	0	0
		<i>Siphamia</i>	1	1	0	0
		<i>Sphaeramia</i>	1	1	0	0

	<i>Taeniamia</i>	0	1	0	0
	<i>Zapogon</i>	0	0	0	1
	<i>Zoramia</i>	1	1	0	0
Blenniidae	<i>Alloblennius</i>	0	1	0	0
	<i>Alticus</i>	0	1	0	0
	<i>Antennablennius</i>	0	1	0	0
	<i>Aspidontus</i>	1	1	0	0
	<i>Atrosalarias</i>	0	1	0	0
	<i>Blenniella</i>	1	1	0	0
	<i>Cirripectes</i>	1	1	0	0
	<i>Crossosalarias</i>	1	0	0	0
	<i>Ecsenius</i>	1	1	0	0
	<i>Enchelyurus</i>	1	1	0	0
	<i>Entomacrodus</i>	1	1	0	1
	<i>Exallias</i>	1	1	0	0
	<i>Glyptoparus</i>	1	0	0	0
	<i>Hirculops</i>	0	1	0	0
	<i>Hypleurochilus</i>	0	0	1	1
	<i>Hypsoblennius</i>	0	0	0	1
	<i>Istiblennius</i>	1	1	0	0
	<i>Lupinoblennius</i>	0	0	0	1
	<i>Meiacanthus</i>	1	1	0	0
	<i>Mimoblennius</i>	0	1	0	0
	<i>Nannosalarias</i>	1	0	0	0
	<i>Omobranchus</i>	1	1	0	0
	<i>Ophioblennius</i>	0	0	1	1
	<i>Parablennius</i>	0	1	1	1
	<i>Parenchelyurus</i>	1	0	0	0
	<i>Petroscirtes</i>	1	1	0	0
	<i>Plagiotremus</i>	1	1	0	0
	<i>Rhabdoblennius</i>	1	0	0	0
	<i>Salarias</i>	1	1	0	0
	<i>Scartella</i>	0	0	1	1
	<i>Stanulus</i>	1	0	0	0
	<i>Xiphasia</i>	1	1	0	0
Caesionidae	<i>Caesio</i>	1	1	0	0
	<i>Dipterygonotus</i>	1	0	0	0
	<i>Gymnoaesio</i>	0	1	0	0
	<i>Pterocaesio</i>	1	1	0	0
Callionymidae	<i>Callionymus</i>	1	1	0	1
	<i>Diplogrammus</i>	1	1	0	1
	<i>Synchiropus</i>	1	1	0	0
Caproidae	<i>Antigonia</i>	0	1	1	1
Carangidae	<i>Alectis</i>	1	1	1	1
	<i>Alepes</i>	1	1	0	0
	<i>Atule</i>	1	0	0	0
	<i>Carangoides</i>	1	1	1	1
	<i>Caranx</i>	1	1	1	1

	<i>Chloroscombrus</i>	0	0	1	1
	<i>Decapterus</i>	1	1	1	1
	<i>Elagatis</i>	1	1	1	1
	<i>Gnathanodon</i>	1	1	0	0
	<i>Hemicaranx</i>	0	0	1	1
	<i>Megalaspis</i>	1	1	0	0
	<i>Naucrates</i>	1	1	1	1
	<i>Oligoplites</i>	0	0	1	1
	<i>Pantolabus</i>	1	0	0	0
	<i>Parastromateus</i>	1	1	0	0
	<i>Parona</i>	0	0	1	0
	<i>Pseudocaranx</i>	1	0	0	0
	<i>Scomberoides</i>	1	1	0	0
	<i>Selar</i>	1	1	1	1
	<i>Selaroides</i>	1	0	0	0
	<i>Selene</i>	0	0	1	1
	<i>Seriola</i>	1	1	1	1
	<i>Seriolina</i>	1	1	0	0
	<i>Trachinotus</i>	1	1	1	1
	<i>Trachurus</i>	0	0	1	1
	<i>Ulua</i>	1	1	0	0
	<i>Uraspis</i>	0	1	1	1
Centropomidae	<i>Centropomus</i>	0	0	1	1
Cepolidae	<i>Acanthocephala</i>	1	0	0	0
Chaenopsidae	<i>Acanthemblemaria</i>	0	0	0	1
	<i>Chaenopsis</i>	0	0	0	1
	<i>Coralliozetus</i>	0	0	0	1
	<i>Ekemblemaria</i>	0	0	0	1
	<i>Emblemaria</i>	0	0	1	1
	<i>Emblemariopsis</i>	0	0	1	1
	<i>Hemimblemaria</i>	0	0	0	1
	<i>Lucayablennius</i>	0	0	0	1
	<i>Protemblemaria</i>	0	0	0	1
	<i>Stathmonotus</i>	0	0	0	1
Chaetodontidae	<i>Chaetodon</i>	1	1	1	1
	<i>Chelmon</i>	1	0	0	0
	<i>Coradion</i>	1	0	0	0
	<i>Forcipiger</i>	1	1	0	0
	<i>Hemitaurichthys</i>	1	0	0	0
	<i>Heniochus</i>	1	1	0	0
	<i>Parachaetodon</i>	1	0	0	0
	<i>Prognathodes</i>	0	0	1	1
	<i>Roa</i>	0	1	0	0
Cheilodactylidae	<i>Cheilodactylus</i>	1	0	0	0
	<i>Nemadactylus</i>	0	0	1	0
Cirrhitidae	<i>Amblycirrhitus</i>	1	0	1	1
	<i>Cirrhitus</i>	1	1	0	0
	<i>Cirrhitichthys</i>	1	1	0	0

	<i>Cyprinocirrhites</i>	1	0	0	0
	<i>Neocirrhites</i>	1	0	0	0
	<i>Oxycirrhites</i>	1	1	0	0
	<i>Paracirrhites</i>	1	1	0	0
Clinidae	<i>Ribeiroclinus</i>	0	0	1	0
Coryphaenidae	<i>Coryphaena</i>	1	1	1	1
Creediidae	<i>Limnichthys</i>	1	1	0	0
Dactylopteridae	<i>Dactyloptena</i>	1	1	0	0
	<i>Dactylopterus</i>	0	0	1	1
	<i>Dactylagnus</i>	0	0	0	1
	<i>Dactyloscopus</i>	0	0	1	1
	<i>Gillellus</i>	0	0	1	1
	<i>Leurochilus</i>	0	0	0	1
	<i>Myxodagnus</i>	0	0	0	1
	<i>Platygillellus</i>	0	0	0	1
Drepaneidae	<i>Drepane</i>	1	1	0	0
Echeneidae	<i>Echeneis</i>	1	1	1	1
	<i>Phtheichthys</i>	1	0	0	0
	<i>Remora</i>	1	1	1	1
Eleotridae	<i>Calumia</i>	1	0	0	0
	<i>Dormitator</i>	0	0	1	1
	<i>Eleotris</i>	0	0	1	1
	<i>Erotelis</i>	0	0	1	1
	<i>Gobiomorus</i>	0	0	1	0
	<i>Guavina</i>	0	0	1	1
Emmelichthyidae	<i>Emmelichthys</i>	0	0	0	1
	<i>Erythrocles</i>	0	0	0	1
Ephippidae	<i>Chaetodipterus</i>	0	0	1	1
	<i>Platax</i>	1	1	0	0
	<i>Tripteron</i>	0	1	0	0
	<i>Zabidius</i>	1	0	0	0
Epigonidae	<i>Epigonus</i>	0	1	0	0
Gempylidae	<i>Lepidocybium</i>	1	0	0	0
Gerreidae	<i>Diapterus</i>	0	0	1	1
	<i>Eucinostomus</i>	0	0	1	1
	<i>Eugerres</i>	0	0	1	1
	<i>Gerres</i>	1	1	1	1
	<i>Ulaema</i>	0	0	1	1
Gobiesocidae	<i>Acyrtops</i>	0	0	0	1
	<i>Acyrtus</i>	0	0	0	1
	<i>Arcos</i>	0	0	0	1
	<i>Chorisochismus</i>	0	1	0	0
	<i>Derilissus</i>	0	0	0	1
	<i>Diademichthys</i>	1	0	0	0
	<i>Gobiesox</i>	0	0	1	1
	<i>Lepadichthys</i>	0	1	0	0
	<i>Tomicodon</i>	0	0	1	1
Gobiidae	<i>Acentrogobius</i>	1	1	0	0

<i>Amblyeleotris</i>	1	1	0	0
<i>Amblygobius</i>	1	1	0	0
<i>Amoya</i>	0	1	0	0
<i>Ancistrogobius</i>	0	1	0	0
<i>Asterropteryx</i>	1	0	0	0
<i>Austrolethops</i>	1	0	0	0
<i>Barbulifer</i>	0	0	0	1
<i>Barbuligobius</i>	1	0	0	0
<i>Bathygobius</i>	1	1	1	1
<i>Bollmannia</i>	0	0	0	1
<i>Bryaninops</i>	1	1	0	0
<i>Cabillus</i>	1	0	0	0
<i>Callogobius</i>	1	1	0	0
<i>Chriolepis</i>	0	0	0	1
<i>Corygalops</i>	0	1	0	0
<i>Coryphopterus</i>	0	0	1	1
<i>Cryptocentroides</i>	0	1	0	0
<i>Cryptocentrus</i>	1	1	0	0
<i>Ctenogobiops</i>	1	1	0	0
<i>Ctenogobius</i>	0	0	1	1
<i>Discordipinna</i>	1	1	0	0
<i>Elactinus</i>	0	0	0	1
<i>Evermannichthys</i>	0	0	0	1
<i>Eviota</i>	1	1	0	0
<i>Evorthodus</i>	0	0	0	1
<i>Exyrias</i>	1	1	0	0
<i>Favonigobius</i>	1	1	0	0
<i>Feia</i>	0	1	0	0
<i>Fusigobius</i>	1	1	0	0
<i>Ginsburgellus</i>	0	0	0	1
<i>Gladiogobius</i>	0	1	0	0
<i>Glossogobius</i>	0	1	0	0
<i>Gnatholepis</i>	1	1	1	1
<i>Gobiodon</i>	1	1	0	0
<i>Gobioides</i>	0	0	1	1
<i>Gobionellus</i>	0	0	0	1
<i>Gobiosoma</i>	0	0	0	1
<i>Gobulus</i>	0	0	0	1
<i>Hazeus</i>	0	1	0	0
<i>Heteroleotris</i>	0	1	0	0
<i>Istigobius</i>	1	1	0	0
<i>Koumansetta</i>	1	1	0	0
<i>Lobulogobius</i>	0	1	0	0
<i>Lophogobius</i>	0	0	0	1
<i>Lotilia</i>	1	1	0	0
<i>Luposicya</i>	1	1	0	0
<i>Lythrypnus</i>	0	0	0	1
<i>Macrodonogobius</i>	1	1	0	0

	<i>Microgobius</i>	0	0	0	1
	<i>Minysicya</i>	1	0	0	0
	<i>Nes</i>	0	0	0	1
	<i>Oplopomus</i>	1	1	0	0
	<i>Oxyurichthys</i>	0	1	0	1
	<i>Palatogobius</i>	0	0	0	1
	<i>Palutrus</i>	0	1	0	0
	<i>Paragobiodon</i>	1	1	0	0
	<i>Parrella</i>	0	0	0	1
	<i>Periophthalmus</i>	1	1	0	0
	<i>Phyllogobius</i>	1	0	0	0
	<i>Pleurosicya</i>	1	1	0	0
	<i>Priolepis</i>	1	1	1	1
	<i>Psilogobius</i>	1	1	0	0
	<i>Psilotris</i>	0	0	0	1
	<i>Pycnomma</i>	0	0	0	1
	<i>Risor</i>	0	0	1	1
	<i>Sicydium</i>	0	0	0	1
	<i>Signigobius</i>	1	0	0	0
	<i>Silhouettea</i>	0	1	0	0
	<i>Stonogobiops</i>	1	0	0	0
	<i>Tigrigobius</i>	0	0	0	1
	<i>Tomiyamichthys</i>	0	1	0	0
	<i>Trimma</i>	1	1	0	0
	<i>Trimmatom</i>	1	1	0	0
	<i>Valenciennea</i>	1	1	0	0
	<i>Vanderhorstia</i>	1	1	0	0
	<i>Varicus</i>	0	0	0	1
	<i>Vomerogobius</i>	0	0	0	1
Grammatidae	<i>Gramma</i>	0	0	0	1
	<i>Lipogramma</i>	0	0	0	1
Haemulidae	<i>Anisotremus</i>	0	0	1	1
	<i>Boridia</i>	0	0	1	0
	<i>Conodon</i>	0	0	1	1
	<i>Diagramma</i>	1	1	0	0
	<i>Emmelichthyops</i>	0	0	0	1
	<i>Genyatremus</i>	0	0	1	1
	<i>Haemulon</i>	0	0	1	1
	<i>Orthopristis</i>	0	0	1	1
	<i>Plectorhinchus</i>	1	1	0	0
	<i>Pomadasys</i>	0	0	1	1
Istiophoridae	<i>Istiompax</i>	1	1	0	0
	<i>Istiophorus</i>	1	1	1	1
	<i>Kajikia</i>	1	1	1	1
	<i>Makaira</i>	0	0	1	1
	<i>Tetrapturus</i>	0	0	1	1
Kraemeriidae	<i>Kraemia</i>	0	1	0	0
Kuhliidae	<i>Kuhlia</i>	1	1	0	0

Kyphosidae	<i>Kyphosus</i>	1	1	1	1
	<i>Microcanthus</i>	1	0	0	0
Labridae	<i>Anampses</i>	1	1	0	0
	<i>Bodianus</i>	1	1	1	1
	<i>Bolbometopon</i>	1	1	0	0
	<i>Calotomus</i>	1	1	0	0
	<i>Cetoscarus</i>	1	1	0	0
	<i>Cheilinus</i>	1	0	0	0
	<i>Cheilio</i>	1	1	0	0
	<i>Chlorurus</i>	1	1	0	0
	<i>Choerodon</i>	1	1	0	0
	<i>Cirrhilabrus</i>	1	1	0	0
	<i>Clepticus</i>	0	0	0	1
	<i>Coris</i>	1	1	0	0
	<i>Cryptotomus</i>	0	0	1	1
	<i>Cymolutes</i>	1	0	0	0
	<i>Decodon</i>	0	0	0	1
	<i>Diproctacanthus</i>	1	0	0	0
	<i>Doratonotus</i>	0	0	0	1
	<i>Epibulus</i>	1	1	0	0
	<i>Gomphosus</i>	1	1	0	0
	<i>Halichoeres</i>	1	1	1	1
	<i>Hemigymnus</i>	1	1	0	0
	<i>Hipposcarus</i>	1	1	0	0
	<i>Hologymnosus</i>	1	1	0	0
	<i>Iniistius</i>	1	1	0	0
	<i>Labrichthys</i>	1	0	0	0
	<i>Labroides</i>	1	1	0	0
	<i>Labropsis</i>	1	0	0	0
	<i>Lachnolaimus</i>	0	0	1	1
	<i>Larabicus</i>	0	1	0	0
	<i>Leptojulius</i>	1	0	0	0
	<i>Leptoscarus</i>	1	1	0	0
	<i>Macropharyngodon</i>	1	1	0	0
	<i>Minilabrus</i>	0	1	0	0
	<i>Nicholsina</i>	0	0	1	1
	<i>Novaculichthys</i>	1	1	0	0
	<i>Novaculoides</i>	1	1	0	0
	<i>Oxycheilinus</i>	1	1	0	0
	<i>Paracheilinus</i>	1	1	0	0
	<i>Pseudocheilinus</i>	1	1	0	0
	<i>Pseudocoris</i>	1	0	0	0
	<i>Pseudodax</i>	1	1	0	0
	<i>Pseudojuloides</i>	1	0	0	0
	<i>Pseudolabrus</i>	1	0	0	0
	<i>Pteragogus</i>	1	1	0	0
	<i>Scarus</i>	1	1	1	1
	<i>Sparisoma</i>	0	0	0	1

	<i>Stethojulis</i>	1	1	0	0
	<i>Suezichthys</i>	1	1	0	0
	<i>Thalassoma</i>	1	1	0	1
	<i>Wetmorella</i>	1	1	0	0
	<i>Xiphocheilus</i>	1	0	0	0
	<i>Xyrichtys</i>	0	1	1	1
Labrisomidae	<i>Haptoclinus</i>	0	0	0	1
	<i>Labrisomus</i>	0	0	1	1
	<i>Malacoctenus</i>	0	0	1	1
	<i>Paraclinus</i>	0	0	1	1
	<i>Starksia</i>	0	0	1	1
Lactariidae	<i>Lactarius</i>	0	1	0	0
Latidae	<i>Lates</i>	1	0	0	0
	<i>Psammoperca</i>	1	0	0	0
Leiognathidae	<i>Aurigequula</i>	0	1	0	0
	<i>Equulites</i>	0	1	0	0
	<i>Eubleekeria</i>	0	1	0	0
	<i>Gazza</i>	0	1	0	0
	<i>Leiognathus</i>	0	1	0	0
	<i>Photopectoralis</i>	0	1	0	0
	<i>Secutor</i>	0	1	0	0
Lethrinidae	<i>Gnathodentex</i>	1	0	0	0
	<i>Gymnocranius</i>	1	1	0	0
	<i>Letherinus</i>	1	1	0	0
	<i>Monotaxis</i>	1	1	0	0
	<i>Wattsia</i>	1	0	0	0
Liparidae	<i>Liparis</i>	0	1	0	0
Lobotidae	<i>Lobotes</i>	1	1	1	0
Lutjanidae	<i>Aphareus</i>	1	1	0	0
	<i>Aprion</i>	1	0	0	0
	<i>Apsilus</i>	0	1	0	1
	<i>Etelis</i>	1	0	0	0
	<i>Lipocheilus</i>	1	0	0	0
	<i>Lutjanus</i>	1	1	1	1
	<i>Macolor</i>	1	1	0	0
	<i>Ocyurus</i>	0	0	1	1
	<i>Paracaesio</i>	1	1	0	0
	<i>Parapristipomoides</i>	1	0	0	0
	<i>Pristipomoides</i>	1	1	1	1
	<i>Rhomboplites</i>	0	0	1	1
	<i>Symphorichthys</i>	1	0	0	0
	<i>Symphorus</i>	1	0	0	0
	<i>Pinjalo</i>	0	1	0	0
Malacanthidae	<i>Branchiostegus</i>	1	1	0	0
	<i>Caulolatilus</i>	0	0	1	1
	<i>Hoplolatilus</i>	1	1	0	0
	<i>Lopholatilus</i>	0	0	1	1
	<i>Malacanthus</i>	1	1	1	1

Menidae	<i>Mene</i>	1	1	0	0
Microdesmidae	<i>Aioliops</i>	1	0	0	0
	<i>Cerdale</i>	0	0	0	1
	<i>Gunnellichthys</i>	1	1	0	0
	<i>Microdesmus</i>	0	0	0	1
	<i>Nemateleotris</i>	1	1	0	0
	<i>Paragunnellichthys</i>	1	1	0	0
	<i>Parioglossus</i>	1	0	0	0
	<i>Ptereleotris</i>	1	1	0	1
Monodactylidae	<i>Monodactylus</i>	0	1	0	0
Mugilidae	<i>Agonostomus</i>	0	0	0	1
	<i>Chelon</i>	1	1	0	0
	<i>Crenimugil</i>	1	1	0	0
	<i>Ellochelon</i>	1	1	0	0
	<i>Liza</i>	0	1	0	0
	<i>Moolgarda</i>	1	1	0	0
	<i>Mugil</i>	0	1	1	1
	<i>Oedalechilus</i>	0	1	0	0
Mullidae	<i>Mulloidichthys</i>	1	1	1	1
	<i>Mullus</i>	0	0	1	1
	<i>Parupeneus</i>	1	1	0	0
	<i>Pseudupeneus</i>	0	0	1	1
	<i>Upeneus</i>	1	1	1	1
Nemipteridae	<i>Nemipterus</i>	1	1	0	0
	<i>Parascolopsis</i>	0	1	0	0
	<i>Pentapodus</i>	1	0	0	0
	<i>Scolopsis</i>	1	1	0	0
Notograptidae	<i>Notograptus</i>	1	0	0	0
Opistognathidae	<i>Lonchopisthus</i>	0	0	0	1
	<i>Opistgnathus</i>	0	0	1	
	<i>Opistognathus</i>	1	1	1	1
	<i>Stalix</i>	1	1	0	0
Pempheridae	<i>Parapriacanthus</i>	1	1	0	0
	<i>Pempheris</i>	1	1	1	1
Pentacerotidae	<i>Histioporus</i>	0	1	0	0
Percophidae	<i>Bembrops</i>	0	0	0	1
	<i>Bleekeria</i>	0	1	0	0
Pinguipedidae	<i>Parapercis</i>	1	1	0	0
	<i>Pinguipes</i>	0	0	1	0
	<i>Pseudopercis</i>	0	0	1	0
Platycephalidae	<i>Cociella</i>	1	1	0	0
	<i>Cymbacephalus</i>	1	0	0	0
	<i>Grammoplites</i>	0	1	0	0
	<i>Inegocia</i>	1	0	0	0
	<i>Onigocia</i>	1	1	0	0
	<i>Papilloculiceps</i>	0	1	0	0
	<i>Platycephalus</i>	1	1	0	0
	<i>Rogadius</i>	0	1	0	0

	<i>Sorsogona</i>	1	1	0	0
	<i>Sunagocia</i>	1	0	0	0
	<i>Thysanophrys</i>	1	1	0	0
Plesiopidae	<i>Assessor</i>	1	0	0	0
	<i>Belonepterygion</i>	1	0	0	0
	<i>Calloplesiops</i>	1	1	0	0
	<i>Fraudella</i>	1	0	0	0
	<i>Paraplesiops</i>	1	0	0	0
	<i>Plesiops</i>	1	1	0	0
	<i>Steeneichthys</i>	1	0	0	0
Polynemidae	<i>Polydactylus</i>	1	1	1	1
Polyprionidae	<i>Polyprion</i>	0	0	1	0
Pomacanthidae	<i>Apolemichthys</i>	1	0	0	0
	<i>Centropyge</i>	1	1	0	1
	<i>Chaetodontoplus</i>	1	0	0	0
	<i>Genicanthus</i>	1	1	0	0
	<i>Holacanthus</i>	0	0	1	1
	<i>Paracentropyge</i>	1	0	0	0
	<i>Pomacanthus</i>	1	1	1	1
	<i>Pygoplites</i>	1	1	0	0
Pomacentridae	<i>Abudefduf</i>	1	1	1	1
	<i>Acanthochromis</i>	1	0	0	0
	<i>Amblyglyphidodon</i>	1	1	0	0
	<i>Amblypomacentrus</i>	1	0	0	0
	<i>Amphiprion</i>	1	1	0	0
	<i>Cheiloprion</i>	1	0	0	0
	<i>Chromis</i>	1	1	1	1
	<i>Chrysiptera</i>	1	1	0	0
	<i>Dascyllus</i>	1	1	0	0
	<i>Dischistodus</i>	1	0	0	0
	<i>Hemiglyphidodon</i>	1	0	0	0
	<i>Lepidozygus</i>	1	0	0	0
	<i>Microspathodon</i>	0	0	1	1
	<i>Neoglyphidodon</i>	1	1	0	0
	<i>Neopomacentrus</i>	1	1	0	0
	<i>Parma</i>	1	0	0	0
	<i>Plectroglyphidodon</i>	1	1	0	0
	<i>Pomacentrus</i>	1	1	0	0
	<i>Pomachromis</i>	1	0	0	0
	<i>Premnas</i>	1	0	0	0
	<i>Pristotis</i>	1	1	0	0
	<i>Stegastes</i>	1	1	1	1
	<i>Teixeirichthys</i>	0	1	0	0
Pomatomidae	<i>Pomatomus</i>	0	0	1	1
Priacanthidae	<i>Cookeolus</i>	1	0	1	1
	<i>Heteropriacanthus</i>	1	1	1	1
	<i>Priacanthus</i>	1	1	1	1
	<i>Pristigenys</i>	0	0	0	1

Pseudochromidae	<i>Amsichthys</i>	1	0	0	0
	<i>Blennodesmus</i>	1	0	0	0
	<i>Chlidichthys</i>	0	1	0	0
	<i>Congrogadus</i>	1	0	0	0
	<i>Cypho</i>	1	0	0	0
	<i>Haliophis</i>	0	1	0	0
	<i>Lubbockichthys</i>	1	0	0	0
	<i>Manonichthys</i>	1	0	0	0
	<i>Oxycerichthys</i>	1	0	0	0
	<i>Pectinochromis</i>	0	1	0	0
	<i>Pictichromis</i>	1	0	0	0
	<i>Pseudochromis</i>	1	1	0	0
	<i>Pseudoplesiops</i>	1	0	0	0
Rachycentridae	<i>Rachycentron</i>	1	1	1	1
Schindleriidae	<i>Schindleria</i>	1	0	0	0
Sciaenidae	<i>Bairdiella</i>	0	0	1	1
	<i>Corvula</i>	0	0	1	1
	<i>Ctenosciaena</i>	0	0	1	1
	<i>Cynoscion</i>	0	0	1	1
	<i>Equetus</i>	0	0	1	1
	<i>Isopisthus</i>	0	0	1	1
	<i>Larimus</i>	0	0	1	1
	<i>Lonchurus</i>	0	0	1	1
	<i>Macrodon</i>	0	0	1	1
	<i>Menticirrhus</i>	0	0	1	1
	<i>Micropogonias</i>	0	0	1	1
	<i>Nebris</i>	0	0	1	1
	<i>Odontoscion</i>	0	0	1	1
	<i>Ophioscion</i>	0	0	1	1
	<i>Paralonchurus</i>	0	0	1	1
	<i>Pareques</i>	0	0	1	1
	<i>Pogonias</i>	0	0	1	0
	<i>Protosciaena</i>	0	0	1	1
	<i>Stellifer</i>	0	0	1	1
	<i>Umbrina</i>	0	0	1	1
Scombridae	<i>Acanthocybium</i>	1	0	1	1
	<i>Auxis</i>	1	1	1	1
	<i>Euthynnus</i>	1	1	1	1
	<i>Gasterochisma</i>	0	0	1	0
	<i>Grammatorcynus</i>	1	1	0	0
	<i>Gymnosarda</i>	1	1	0	0
	<i>Katsuwonus</i>	1	1	1	1
	<i>Rastrelliger</i>	1	1	0	0
	<i>Sarda</i>	0	1	1	1
	<i>Scomber</i>	0	1	1	1
	<i>Scomberomorus</i>	1	1	1	1
	<i>Thunnus</i>	1	1	1	1
Scorpaenidae	<i>Ablabys</i>	1	0	0	0

	<i>Brachypterois</i>	0	1	0	0
	<i>Caracanthus</i>	1	0	0	0
	<i>Cottapistus</i>	1	0	0	0
	<i>Dendrochirus</i>	1	1	0	0
	<i>Erosa</i>	1	0	0	0
	<i>Liocranium</i>	1	0	0	0
	<i>Minous</i>	1	1	0	0
	<i>Neomerinthe</i>	0	0	0	1
	<i>Parascopaena</i>	1	1	0	0
	<i>Pontinus</i>	0	0	1	1
	<i>Pteroidichthys</i>	0	1	0	0
	<i>Pterois</i>	1	1	0	0
	<i>Rhinopias</i>	1	0	0	0
	<i>Richardsonichthys</i>	1	0	0	0
	<i>Scorpaena</i>	0	1	1	1
	<i>Scorpaenodes</i>	1	1	0	1
	<i>Scorpaenopsis</i>	1	1	0	0
	<i>Sebastapistes</i>	1	1	0	0
	<i>Synanceia</i>	1	1	0	0
	<i>Taenianothus</i>	1	0	0	0
Serranidae	<i>Acanthistius</i>	0	0	1	0
	<i>Aethaloperca</i>	1	1	0	0
	<i>Alphestes</i>	0	0	1	1
	<i>Anthias</i>	0	0	1	0
	<i>Anyperodon</i>	1	1	0	0
	<i>Aporops</i>	1	0	0	0
	<i>Aulacocephalus</i>	0	1	0	0
	<i>Baldwinella</i>	0	0	1	1
	<i>Bathyanthias</i>	0	0	1	1
	<i>Belonoperca</i>	1	0	0	0
	<i>Centropristis</i>	0	0	0	1
	<i>Cephalopholis</i>	1	1	0	1
	<i>Chelidoperca</i>	1	0	0	0
	<i>Cromileptes</i>	1	0	0	0
	<i>Dermatolepis</i>	0	1	1	1
	<i>Diplectrum</i>	0	0	1	1
	<i>Diploprion</i>	1	1	0	0
	<i>Dules</i>	0	0	1	0
	<i>Epinephelus</i>	1	1	1	1
	<i>Gonioplectrus</i>	0	0	1	1
	<i>Gracila</i>	1	0	0	0
	<i>Grammistes</i>	1	1	0	0
	<i>Grammistops</i>	1	0	0	0
	<i>Hemanthias</i>	0	0	1	1
	<i>Hypoplectrus</i>	0	0	0	1
	<i>Hyporthodus</i>	1	0	1	1
	<i>Liopropoma</i>	1	1	0	1
	<i>Luzonichthys</i>	1	0	0	0

	<i>Mycteroperca</i>	0	0	1	1
	<i>Odontanthias</i>	0	0	0	1
	<i>Paralabrax</i>	0	0	1	1
	<i>Paranthias</i>	0	0	1	1
	<i>Parasphyraenops</i>	0	0	0	1
	<i>Plectranthias</i>	1	1	0	1
	<i>Plectropomus</i>	1	1	0	0
	<i>Pronotogrammus</i>	0	0	1	1
	<i>Pseudanthias</i>	1	1	0	0
	<i>Pseudogramma</i>	1	1	0	1
	<i>Rainfordia</i>	1	0	0	0
	<i>Rypticus</i>	0	0	1	1
	<i>Saloptia</i>	1	0	0	0
	<i>Schultzea</i>	0	0	0	1
	<i>Serraniculus</i>	0	0	1	0
	<i>Serranocirrhitus</i>	1	0	0	0
	<i>Serranus</i>	0	1	1	1
	<i>Suttonia</i>	1	0	0	0
	<i>Variola</i>	1	1	0	0
Setarchidae	<i>Setarches</i>	0	1	0	1
Siganidae	<i>Siganus</i>	1	1	0	0
Sillaginidae	<i>Sillago</i>	1	1	0	0
Sparidae	<i>Acanthopagrus</i>	1	1	0	0
	<i>Archosargus</i>	0	0	1	1
	<i>Argyrops</i>	1	1	0	0
	<i>Calamus</i>	0	0	1	1
	<i>Chrysophrys</i>	1	0	0	0
	<i>Diplodus</i>	0	1	1	1
	<i>Lagodon</i>	0	0	0	1
	<i>Lithognathus</i>	0	1	0	0
	<i>Pagrus</i>	0	0	1	1
	<i>Rhabdosargus</i>	0	1	0	0
	<i>Sparus</i>	0	1	0	0
Sphyraenidae	<i>Sphyraena</i>	1	1	1	1
Synanceiidae	<i>Choridactylus</i>	0	1	0	0
	<i>Inimicus</i>	1	1	0	0
Terapontidae	<i>Amniataba</i>	1	0	0	0
	<i>Mesopristes</i>	1	0	0	0
	<i>Pelates</i>	1	1	0	0
	<i>Terapon</i>	1	1	0	0
Trichonotidae	<i>Trichonotus</i>	1	1	0	0
Triglidae	<i>Bellator</i>	0	0	0	1
	<i>Lepidotrigla</i>	0	1	0	0
	<i>Prionotus</i>	0	0	1	1
Tripterygiidae	<i>Ceratobregma</i>	1	0	0	0
	<i>Enneanectes</i>	0	0	0	1
	<i>Enneapterygius</i>	1	1	0	0
	<i>Helcogramma</i>	1	1	0	0

		<i>Norfolkia</i>	1	1	0	0
		<i>Springerichthys</i>	1	0	0	0
		<i>Ucla</i>	1	0	0	0
	Uranoscopidae	<i>Astroscopus</i>	0	0	1	0
		<i>Ichthyoscopus</i>	1	0	0	0
		<i>Uranoscopus</i>	1	1	0	0
	Xenisthmidae	<i>Allomicrodesmus</i>	1	0	0	0
		<i>Xenisthmus</i>	1	1	0	0
	Xiphiidae	<i>Xiphias</i>	1	1	1	1
	Zanclidae	<i>Zanclus</i>	1	0	0	0
Pleuronectiformes	Achiridae	<i>Achirus</i>	0	0	1	1
		<i>Gymnachirus</i>	0	0	1	1
		<i>Trinectes</i>	0	0	1	1
	Bothidae	<i>Asterorhombus</i>	1	1	0	0
		<i>Bothus</i>	1	1	1	1
		<i>Engyophrys</i>	0	0	1	0
		<i>Engyprosopon</i>	1	1	0	0
		<i>Parabothus</i>	0	1	0	0
	Cynoglossidae	<i>Trichopsetta</i>	0	0	1	1
		<i>Cynoglossus</i>	0	1	0	0
		<i>Paraplagusia</i>	0	1	0	0
		<i>Symphurus</i>	0	0	1	1
	Paralichthyidae	<i>Ancylopsetta</i>	0	0	1	1
		<i>Citharichthys</i>	0	0	1	1
		<i>Cyclopsetta</i>	0	0	1	0
		<i>Etropus</i>	0	0	1	0
		<i>Gastropsetta</i>	0	0	0	1
		<i>Paralichthys</i>	0	0	1	1
		<i>Pseudorhombus</i>	0	1	0	0
		<i>Syacium</i>	0	0	1	1
		<i>Oncopterus</i>	0	0	1	0
		<i>Pleuronectes</i>	0	1	0	0
	Psettodidae	<i>Psettodes</i>	0	1	0	0
	Samaridae	<i>Samaris</i>	0	1	0	0
		<i>Samariscus</i>	1	1	0	0
	Soleidae	<i>Aesopia</i>	0	1	0	0
		<i>Aseraggodes</i>	0	1	0	0
		<i>Brachirus</i>	0	1	0	0
		<i>Pardachirus</i>	1	1	0	0
		<i>Soleichthys</i>	0	1	0	0
		<i>Zebrias</i>	0	1	0	0
Syngnathiformes	Aulostomidae	<i>Aulostomus</i>	1	0	1	1
	Centriscidae	<i>Aeoliscus</i>	1	1	0	0
		<i>Centriscus</i>	1	1	0	0
		<i>Macroramphosus</i>	0	0	1	1
	Fistulariidae	<i>Fistularia</i>	1	1	1	1
	Pegasidae	<i>Eurypegasmus</i>	1	1	0	0
	Solenostomidae	<i>Solenostomus</i>	1	1	0	0

Syngnathidae		<i>Acentronura</i>	1	1	0	0
		<i>Amphelikurus</i>	0	0	0	1
		<i>Anarchopterus</i>	0	0	1	1
		<i>Bryx</i>	0	1	1	1
		<i>Campichthys</i>	1	0	0	0
		<i>Choeroichthys</i>	1	1	0	0
		<i>Corythoichthys</i>	1	1	0	0
		<i>Cosmocampus</i>	1	1	0	1
		<i>Doryrhamphus</i>	1	1	0	0
		<i>Dunckerocampus</i>	1	1	0	0
		<i>Halicampus</i>	1	1	0	0
		<i>Haliichthys</i>	1	0	0	0
		<i>Hippichthys</i>	0	1	0	0
		<i>Hippocampus</i>	1	1	1	1
		<i>Kyonemichthys</i>	0	1	0	0
		<i>Lissocampus</i>	0	1	0	0
		<i>Micrognathus</i>	1	1	1	1
		<i>Microphis</i>	0	0	0	1
		<i>Minichthys</i>	0	0	0	1
		<i>Nannocampus</i>	1	0	0	0
		<i>Penetopteryx</i>	0	0	0	1
		<i>Phoxocampus</i>	1	1	0	0
		<i>Siokunichthys</i>	1	1	0	0
		<i>Solegnathus</i>	1	0	0	0
		<i>Syngnathoides</i>	1	1	0	0
		<i>Syngnathus</i>	0	1	1	1
		<i>Trachyrhamphus</i>	1	1	0	0
Tetraodontiformes	Balistidae	<i>Abalistes</i>	1	1	0	0
		<i>Balistapus</i>	1	1	0	0
		<i>Balistes</i>	0	0	1	1
		<i>Balistoides</i>	1	1	0	0
		<i>Canthidermis</i>	0	1	1	1
		<i>Melichthys</i>	1	1	1	1
		<i>Odonus</i>	1	1	0	0
		<i>Pseudobalistes</i>	1	1	0	0
		<i>Rhinecanthus</i>	1	1	0	0
		<i>Sufflamen</i>	1	1	0	0
		<i>Xanthichthys</i>	1	0	1	1
	Diodontidae	<i>Chilomycterus</i>	1	0	0	1
		<i>Cyclichthys</i>	1	1	0	0
		<i>Diodon</i>	1	1	1	1
		<i>Tragulichthys</i>	1	0	0	0
	Monacanthidae	<i>Acreichthys</i>	1	0	0	0
		<i>Aluterus</i>	1	1	1	1
		<i>Amanses</i>	1	1	0	0
		<i>Cantherines</i>	1	1	1	1
		<i>Cantheschenia</i>	1	0	0	0
		<i>Chaetodermis</i>	1	0	0	0

	<i>Monacanthus</i>	1	0	1	1
	<i>Oxymonacanthus</i>	1	1	0	0
	<i>Paraluteres</i>	1	1	0	0
	<i>Paramonacanthus</i>	1	1	0	0
	<i>Pervagor</i>	1	1	0	0
	<i>Pseudomonacanthus</i>	1	1	0	0
	<i>Rudarius</i>	1	0	0	0
	<i>Stephanolepis</i>	0	0	1	1
	<i>Thamnaconus</i>	0	1	0	0
Ostraciidae	<i>Acanthostracion</i>	0	0	1	1
	<i>Lactophrys</i>	0	0	1	1
	<i>Lactoria</i>	1	1	0	0
	<i>Ostracion</i>	1	1	0	0
	<i>Rhinesomus</i>	0	0	1	1
	<i>Rhynchostracion</i>	1	0	0	0
	<i>Tetrosomus</i>	1	1	0	0
Tetraodontidae	<i>Arothron</i>	1	1	0	0
	<i>Canthigaster</i>	1	1	1	1
	<i>Chelonodon</i>	1	0	0	0
	<i>Colomesus</i>	0	0	0	1
	<i>Lagocephalus</i>	0	1	1	1
	<i>Sphoeroides</i>	0	0	1	1
	<i>Torquigener</i>	0	1	0	0
Triacanthodidae	<i>Parahollardia</i>	0	0	0	1

Tab. S2 - Dataset list of fossil taxa included for the morphospace analysis of the Bolca assemblage.

Clade	Family	Taxon
Acanthomorpha incertae sedis		<i>Pietschellus</i>
		<i>Protaulopsis</i>
		<i>Xiphopterus</i>
Anguilliformes	Anguillidae	<i>Eoanguilla</i>
	Anguilliformes incertae sedis	<i>Bolcanguilla</i>
		<i>Gazolapodus</i>
	Anguilloididae	<i>Anguilloides</i>
		<i>Veronanguilla</i>
	Chlopsidae	<i>Whitapodus</i>
	Congridae	<i>Bolcyrus</i>
		<i>Paracongroides</i>
		<i>Voltaconger</i>
	Milananguillidae	<i>Milananguilla</i>
	Ophichthyidae	<i>Goslinophis</i>
	Paranguillidae	<i>Dalpiaziella</i>
		<i>Paranguilla</i>
	Patavichthyidae	<i>Patavichthys</i>
	Proteomyridae	<i>Proteomyrus</i>
Anotophysi	Anotophysi incertae sedis	<i>Coelogaster</i>
Atheriniformes	Atherinidae	<i>'Atherina'</i>

	Mesogasteridae	<i>Latellagnathus</i>
		<i>Mesogaster</i>
	Rhampognathidae	<i>Rhampognathus</i>
Aulopiformes	Paralepididae	<i>Holosteus</i>
Beloniformes	Exocoetidae	Exocoetidae gen. et sp. indet
		<i>Rhamphoexocoetus</i>
	Hemiramphidae	<i>Hemiramphus</i>
Beryciformes	Holocentridae	<i>Berybolcensis</i>
		<i>Eoholocentrum</i>
		<i>Tenuicentrum</i>
Clupeiformes	Clupeidae	<i>Bolcaichthys</i>
		<i>Trollichthys</i>
	Engraulidae	<i>Eoengraulis</i>
Crossognathiformes	Pachyrhizodontidae	<i>Platinx</i>
Dactylopteriformes	Pterygocephalidae	<i>Pterygocephalus</i>
Lampridiformes	Bajaichthyidae	<i>Bajaichthys</i>
	Veliferidae	<i>Velifer</i>
		<i>Veronavelifer</i>
Lophiiformes	Antennariidae	<i>Eophrine</i>
	Brachionichthyidae	<i>Histionotophorus</i>
		<i>Orrichthys</i>
	Lophiidae	<i>Caruso</i>
		<i>Sharfia</i>
	Ogcocephalidae	<i>Tarkus</i>
Ophidiiformes	Ophidiidae	' <i>Ophidium</i> '
Osteoglossiformes	Arapaimidae	<i>Thrissopterus</i>
	Foreyichthyidae	<i>Foreyichthys</i>
	Osteoglossiformes incertae sedis	<i>Monopteros</i>
Otophysi	Chanoididae	<i>Chanoides</i>
"perciforms"	Acanthonemidae	<i>Acanthonemus</i>
	Acanthuridae	<i>Acanthuroides</i>
		<i>Eorandallius</i>
		<i>Frigosorbinia</i>
		<i>Gazolaichthys</i>
		<i>Lehmanichthys</i>
		<i>Metacanthurus</i>
		<i>Metaspisurus</i>
		<i>Padovathurus</i>
		<i>Pesciarichthys</i>
		<i>Proacanthurus</i>
		<i>Protozebrasoma</i>
		<i>Tauichthys</i>
		<i>Tylerichthys</i>
	Acropomatidae	<i>Acropoma</i>
	Apogonidae	<i>Apogoniscus</i>
		<i>Bolcapogon</i>
		<i>Eoapogon</i>
		<i>Eosphaeramia</i>

Blochiidae	<i>Blochius</i>
Callipterygidae	<i>Callipteryx</i>
Caproidae	<i>Eoantigonia</i>
Carangidae	<i>Ceratoichthys</i>
	<i>Eastmanalepes</i>
	<i>Lichia</i>
	<i>Paratrachinotus</i>
	<i>Seriola</i>
	<i>Trachicarax</i>
	<i>Vomeropsis</i>
Carangodidae	<i>Carangodes</i>
Centrolophidae	<i>Zorzinia</i>
Ductoridae	<i>Ductor</i>
Eocottidae	<i>Bassanichthys</i>
	<i>Eocottus</i>
Ephippidae	<i>Archaehippus</i>
	<i>Eoplatax</i>
Euzaphlegidae	<i>Veronaphleges</i>
Exellidae	<i>Exellia</i>
Gerreidae	<i>Aspesiperca</i>
Labridae	<i>Bellwoodlabrius</i>
	<i>Eocoris</i>
	<i>Phyllopharyngodon</i>
Labroidei incertae sedis	<i>Sorbinia</i>
Latidae	<i>Eolates</i>
Leiognathidae	<i>Eolejognathus</i>
Lutjanidae	<i>Goujetia</i>
	<i>Lessinia</i>
	<i>Ottaviana</i>
	<i>Veranichthys</i>
Massalongiidae	<i>Massalongius</i>
Menidae	<i>Mene rhombea</i>
Monodactylidae	<i>Psettopsis</i>
Palaeorhynchidae	<i>Palaeorhynchus</i>
Percichthyidae	<i>Cyclopoma</i>
Percoidei incertae sedis	<i>Blotichthys</i>
	<i>Bradyurus</i>
	<i>Frigoichthys</i>
	<i>Frippia</i>
	<i>Gillidia</i>
	<i>Jimtylerius</i>
	<i>Malacopygaeus</i>
	<i>Montepostalia</i>
	<i>Parapelates</i>
	<i>Pavarottia</i>
	<i>Pygaeus nobilis</i>
	<i>Quasicichla</i>
	<i>Squamibolcoides</i>

		<i>Veronabrax</i>
		<i>Voltamulloides</i>
	Pomacentridae	<i>Lorenzichthys</i>
		<i>Palaeopomacentrus</i>
	Pomatomidae	<i>Carangopsis</i>
	Priacanthidae	<i>Pristigenys</i>
	Quasimullidae	<i>Quasimullus</i>
	Robertanniidae	<i>Hendrixella</i>
		<i>Robertannia</i>
	Scatophagidae	<i>Eoscatophagus</i>
	Scombridae	<i>Auxides</i>
		<i>Godsilia</i>
		<i>Pseudaxides</i>
		<i>Thunnoscomberoides</i>
	Siganidae	<i>Acanthopygaeus</i>
		<i>Aspesiganus</i>
		<i>Ruffoichthys</i>
	Sorbinipercidae	<i>Sorbinicapro</i>
		<i>Sorbiniperca</i>
	Sparidae	<i>Abromasta</i>
		<i>Dentex</i>
		<i>Ellaserrata</i>
		<i>Pseudosparnodus</i>
		<i>Sparnodus</i>
	Sphyaenidae	<i>Sphyaena</i>
	Tortonesidae	<i>Tortonesia</i>
	Zanclidae	<i>Eozanclus</i>
	Zorzinichthyidae	<i>Zorzinichthys</i>
Pleuronectiformes	Amphistiidae	<i>Amphistium</i>
		<i>Heteronectes</i>
	Pleuronectiformes incertae sedis	<i>Eobothus</i>
Pycnodontiformes	Pycnodontidae	<i>Abdabalistum</i>
		<i>Nursallia</i>
		<i>Palaeobalistum</i>
		<i>Pycnodus</i>
Syngnathiformes	Aulorhamphidae	<i>Aulorhamphus</i>
		<i>Pesciarhamphus</i>
		<i>Veronarhamphus</i>
	Aulostomidae	<i>Eoaulostomus</i>
		<i>Jurgersenichthys</i>
		<i>Macraulostomus</i>
		<i>Synhypuralis</i>
	Aulostomoidea incertae sedis	<i>Aulostomoides</i>
	Centriscidae	<i>Aeoliscoides</i>
		<i>Paramphisile</i>
	Fistularioididae	<i>Fistularioides</i>
		<i>Pseudosyngnathus</i>
	Paraeoliscidae	<i>Paraeoliscus</i>

	Parasynarcualidae	<i>Parasynarcualis</i>
	Ramphosidae	<i>Rhamphosus</i>
	Solenostomidae	<i>Solenorhynchus</i>
	Syngnathidae	<i>Prosolenostomus</i>
		<i>Syngnathus</i>
	Syngnathoidei incertae sedis	<i>Calamostoma</i>
	Urosphenidae	<i>Urosphen</i>
Tetraodontiformes	Aracnidae	<i>Proaracana</i>
	Bolcabalistidae	<i>Bolcabalistes</i>
	Diodontidae	<i>Heptadiodon</i>
		<i>Prodiodon</i>
		<i>Zignodon</i>
	Eoplectidae	<i>Eoplectus</i>
	Ostraciidae	<i>Eolactoria</i>
	Protobalistidae	<i>Protobalistum</i>
		<i>Spinacanthus</i>
	Tetraodontidae	<i>Eotetraodon</i>
	Triacanthidae	<i>Protacanthodes</i>
	Zignoichthyidae	<i>Zignoichthys</i>

Landmark and semilandmark configuration

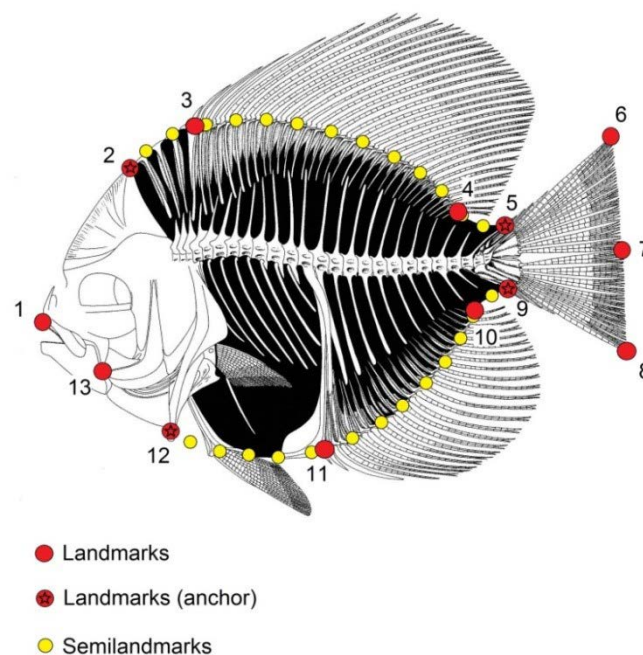


Fig. S1 - Landmarks and semilandmarks configuration (*Psettopsis* from Bolca in the example). Landmarks are represented by red circles with crescent numeration starting from snout; semilandmarks are represented by yellow circles; the stars indicate the landmarks that serve as anchor points for the semilandmarks imputing.

1 - Anterior tip of premaxilla; 2 - Postero-dorsal tip of the skull roof (supraoccipital); 3 - Anterior insertion of dorsal fin; 4 - Posterior insertion of dorsal fin; 5 - Dorsal insertion of caudal fin; 6 - Distal tip of the principal ray of dorsal lobe of caudal fin; 7 - Fork between dorsal and ventral lobe; 8 - Distal tip of the principal ray of ventral lobe of caudal fin; 9 - Ventral insertion of caudal fin; 10 - Posterior insertion of anal fin; 11 - Anterior insertion of anal fin; 12 - Ventral tip of pectoral girdle; 13 - Lower jaw joint.

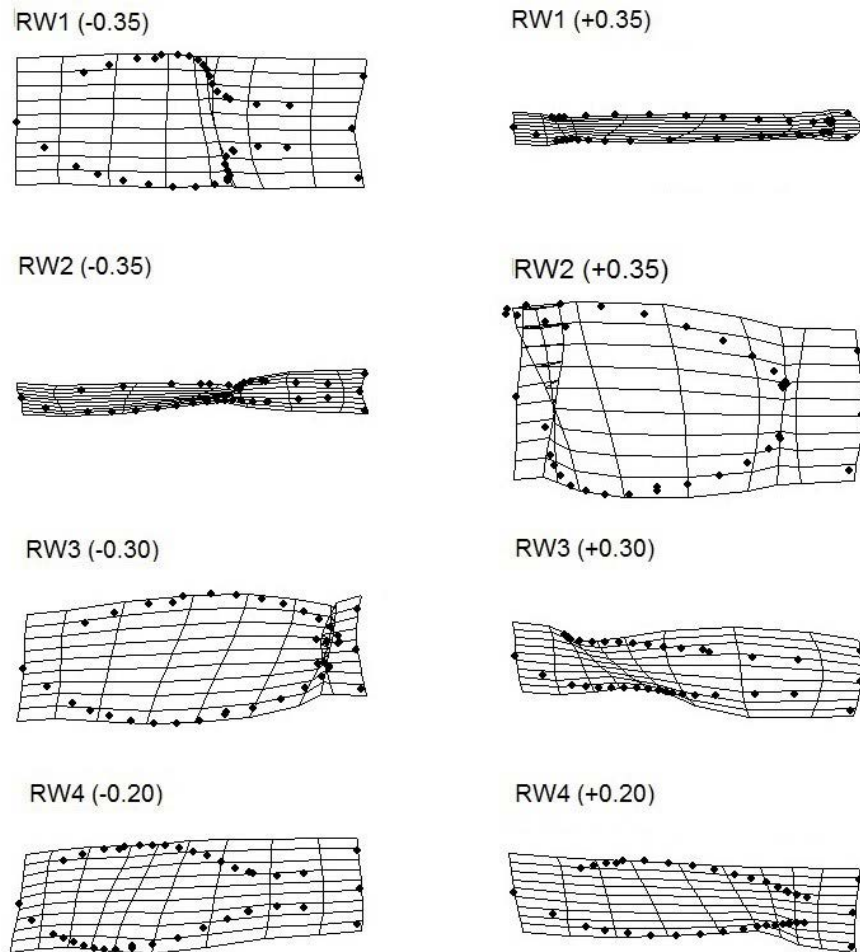
Deformation grid plots

Fig. S2 - Deformation grids of the first four relative warp axes (explaining over 86% of the total variance) shown as thin-plate splines for positive and negative scores along each axis. The first two RW axes (66.7% of overall variance) describe the correlation between elongation of fish and median fin length. Positive scores of RW1 (39.4% of variance) are related to slender and elongate bodies with long median fins (e.g., Anguilliformes and Ophidiiformes), while negative values are related to deep-bodied fishes with short median fins (e.g., Tetraodontiformes). Positive scores of RW2 (27.3% of total variance) are related to taxa with slender body and short dorsal and anal fins (e.g., Syngnathiformes), while on negative values lie deep-bodied fish with long median fins (e.g., Pleuronectiformes). The RW3 (12.7% of variance) describes caudal peduncle length (short at negative and long at positive scores) while the RW4 axis (6.9% of total variance) explains the preanal distance (short at negative and long at positive scores).

Statistical significance in morphospace occupation: PERMANOVA and ANOSIM

Statistical significance in morphospace occupation was calculated with the non-parametric multivariate analysis of variance (PERMANOVA) that is a non-parametric test for significant difference between two or more group centroids (Anderson, 2001). The PERMANOVA analysis calculates an F value analogue to the F value of ANOVA because Euclidean distance measures were used. The null hypothesis (H0) is the similarity of group centroids.

PERMANOVA					
	BOL	GBR	RS	EBS	CS
Total sum of squares	13.79	30.14	29.56	18.89	25.55
Within-group sum of squares	6.366	17.15	15.28	8.259	12.08
F	18.39	37.61	42.71	35.01	41.24
p (same)	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*

Tab. S3 - Results of PERMANOVA applied to the different clades within the own ecosystem. The significance is computed by permutation of group membership, with 9,999 replicates. Asterisk (*) indicates very low probability that clades within each assemblage have the same group centroids. BOL=Bolca, GBR = Great Barrier Reef, RS = Red Sea, EBS = East Brazil Shelf, CS = Carribean Sea.

PERMANOVA		GBR	RS	EBS	CS
Anguilliformes	F value	5.86	4.52	4.84	4.84
	p (same)	0.0034*	0.0094*	0.0059*	0.0064*
Atheriniformes	F value	2.45	2.713	6.31	6.451
	p (same)	0.0251*	0.0659	0.0291*	0.0064*
Beloniformes	F value	2.928	1.999	2.793	1.854
	p (same)	0.0406*	0.1198	0.0617	0.1167
Beryciformes	F value	1.157	0.984	1.804	1.81
	p (same)	0.306	0.4533	0.1457	0.0888
Clupeiformes	F value	1.09	0.7433	2.77	2.615
	p (same)	0.3298	0.5296	0.0557	0.088
Lophiiformes	F value	6.492	4.038	1.502	1.673
	p (same)	0.0068*	0.2550	0.2156	0.1865
Ophidiiformes	F value	0.2512	0.2819	0.7226	0.4545
	p (same)	1	0.6645	0.6065	0.761
"perciforms"	F value	32.24	31.49	27.74	41.12
	p (same)	0.0001*	0.0001*	0.0001*	0.0001*
Pleuronectiformes	F value	6.97	8.337	5.513	5.27
	p (same)	0.018*	0.003*	0.006*	0.012*
Syngnathiformes	F value	7.388	9.302	2.993	7.576
	p (same)	0.0008*	0.0002*	0.0366*	0.0007*
Tetraodontiformes	F value	4.933	5.023	3.139	2.961
	p (same)	0.0051*	0.0046*	0.0345*	0.0366*

Tab. S4 - Results of PERMANOVA showing differences in group centroids between the Bolca and Recent convex hulls of the same clade. The significance is computed by permutation of group membership with 9,999 replicates. Asterisk (*) indicates significant low probability that, for each clade, Eocene and Recent convex hulls have the same group centroids. GBR = Great Barrier Reef, RS = Red Sea, EBS = East Brazil Shelf, CS = Carribean Sea.

The analysis of similarities (**ANOSIM**; Clarke, 1993) tests for significant differences in the distribution of taxa in morphospace. In ANOSIM, comparison of pair-wise R values, measuring how separate groups are, on a scale of 0 (the groups are fully overlapped and then indistinguishables) to 1 (the distance between groups is higher than distance between taxa, meaning that group are not overlapped). The null hypothesis (H_0) is the equal median and ranges for within-group ranked dissimilarities among groups and, in analogy with ANOVA, the test is based on comparing distances between groups with distances within groups.

The test statistic R is then defined as:

$$R = \frac{r_b - r_w}{N(N-1) / 4}$$

where r_b is the mean rank of all distances between groups, and r_w the mean rank of all distances within groups. Large positive values of R ($R > 0.75$) mean high dissimilarity between groups. With $R > 0.5$ groups are overlapping but clearly different; with $R > 0.25$, groups are strongly overlapped and with $R < 0.25$ groups are barely distinguishable (Clarke, 1993). The significance is computed by permutation of group membership with 9,999 replicates. Alpha was set at 0.05.

ANOSIM		BOL	GBR	RS	EBS	CS
Mean rank within		3771	4.569E04	3.592E04	1.108E04	2.166E04
Mean rank between		8443	8.768E04	7.317E04	2.557E04	4.583E04
R		0.6906	0.652	0.6818	0.726	0.6679
p (same)		0.0001*	0.0001*	0.0001*	0.0001*	0.0001*

Tab. S5 - ANOSIM test showing the separation between clades in each assemblage. The high value of R ($0.50 < R < 0.75$) suggest that clades in each assemblage are generally overlapped but clearly and significantly different ($p = 0.0001$). The significance is computed by permutation of group membership, with 9,999 replicates. BOL = Bolca, GBR = Great Barrier Reef, RS = Red Sea, EBS = East Brazil Shelf, CS = Carribean Sea.

ANOSIM		GBR	RS	EBS	CS
Anguilliformes	R value	0.2118	0.1503	0.1253	0.1299
	p (same)	0.0047*	0.0228*	0.0274*	0.0507
Atheriniformes	R value	0.375	0.4286	0.9444	0.8
	p (same)	0.0278*	0.1265	0.027*	0.0076*
Beloniformes	R value	0.3222	0.1369	0.2497	0.1263
	p (same)	0.0516	0.2194	0.1101	0.186
Beryciformes	R value	-0.0753	-0.1173	0.2923	0.2581
	p (same)	0.6371	0.6379	0.1109	0.098
Clupeiformes	R value	-0.0764	-0.0829	0.1992	0.0955
	p (same)	0.5624	0.5692	0.1402	0.2105
Lophiiformes	R value	0.4853	0.3968	0.1307	0.0675
	p (same)	0.0132*	0.0489*	0.1774	0.2155
Ophidiiformes	R value	-0.2054	-0.1518	-0.1728	-0.2229
	p (same)	0.7752	0.5608	0.593	0.7658
"perciforms"	R value	0.1874	0.1802	0.1976	0.2218
	p (same)	0.0001*	0.0001*	0.0001*	0.0001*
Pleuronectiformes	R value	0.7538	0.6575	0.5628	0.5643
	p (same)	0.0191*	0.0044*	0.0196*	0.0114*
Syngnathiformes	R value	0.2003	0.2523	0.2032	0.301
	p (same)	0.0011*	0.0002*	0.0322*	0.0007*
Tetraodontiformes	R value	0.2622	0.2827	0.1566	0.1549
	p (same)	0.0016*	0.0008*	0.0226*	0.0237*

Tab. S6 - ANOSIM showing the separation between Eocene and Recent convex hulls of each clade. Large positive values of R ($R > 0.75$) means high dissimilarity between Eocene and Recent convex hulls. With $R > 0.50$ convex hulls are overlapped but clearly different; with $R > 0.25$, convex hulls are strongly overlapped and with $R < 0.25$ they are barely distinguishable (Clarke, 1993). The significance is computed by permutation with 9,999 replicates. GBR = Great Barrier Reef, EBS = East Brazil Shelf, CS = Carribean Sea, RS = Red Sea.

Morphospace structure

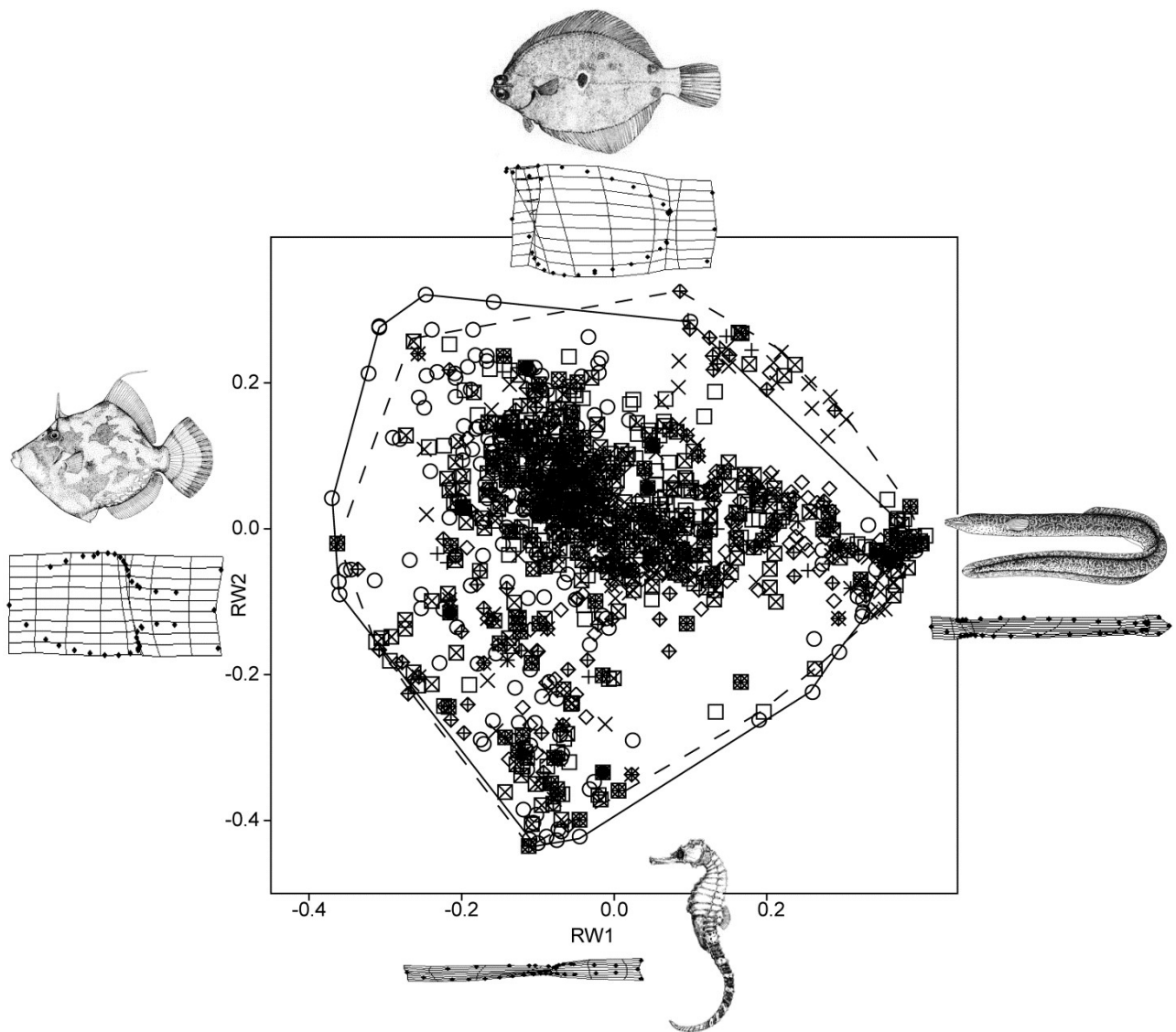


Fig. S3 - Overlapping convex hull of all fish assemblages analyzed plotted on the first two RW axes explaining the greatest variance (66.7%) (Marramà et al., 2016). The full line represents the convex hull of the Bolca fish assemblage; the dashed line encloses all modern fish taxa. The illustrated fishes are some representatives of the extreme shapes that lie along extreme values of each axis, also visualized through deformation grids. Note the pronounced excursion of Eocene convex hull in the region of morphospace characterized by deep-bodied shapes (upper left), no longer filled by extant taxa. Bolca = circle; Great Barrier Reef = square; Red Sea = x-cross; Caribbean Sea = diamond; East Brazil Shelf = cross.

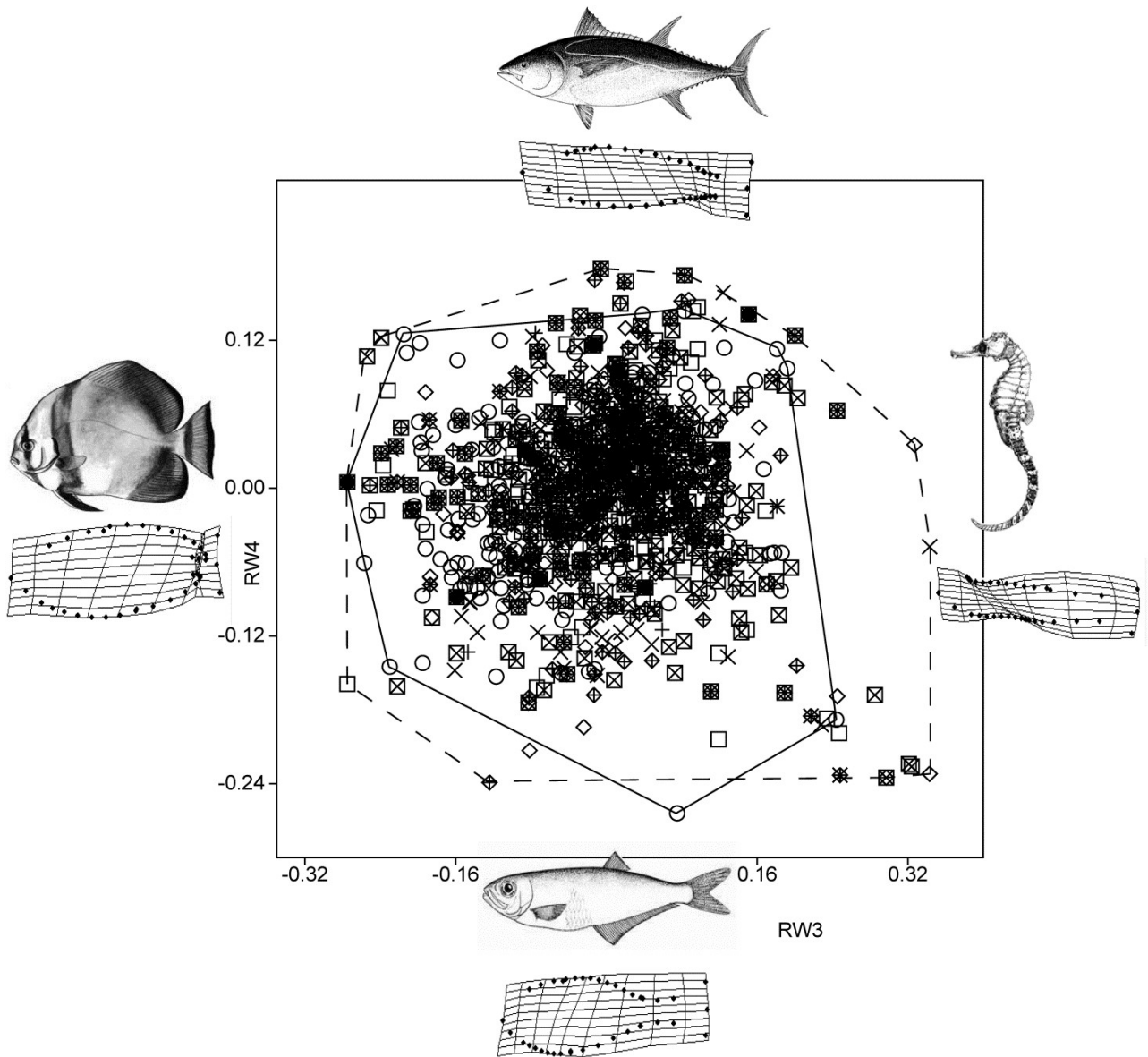


Fig. S4 - Overlapping convex hull of all fish assemblages analyzed plotted on the third and fourth RW axes explaining 20.4% of the variance (Marramà et al., 2016). The full line represents the convex hull of the Bolca fish assemblage; the dashed line encloses of all modern fish taxa. The illustrated fishes are some representatives of the extreme shapes that lie along extreme values of each axis, also visualized through deformation grids. Bolca = circle; Great Barrier Reef = square; Red Sea = x-cross; Caribbean Sea = diamond; East Brazil Shelf = cross.

The patterning: Kernel density and Ripley's K plots

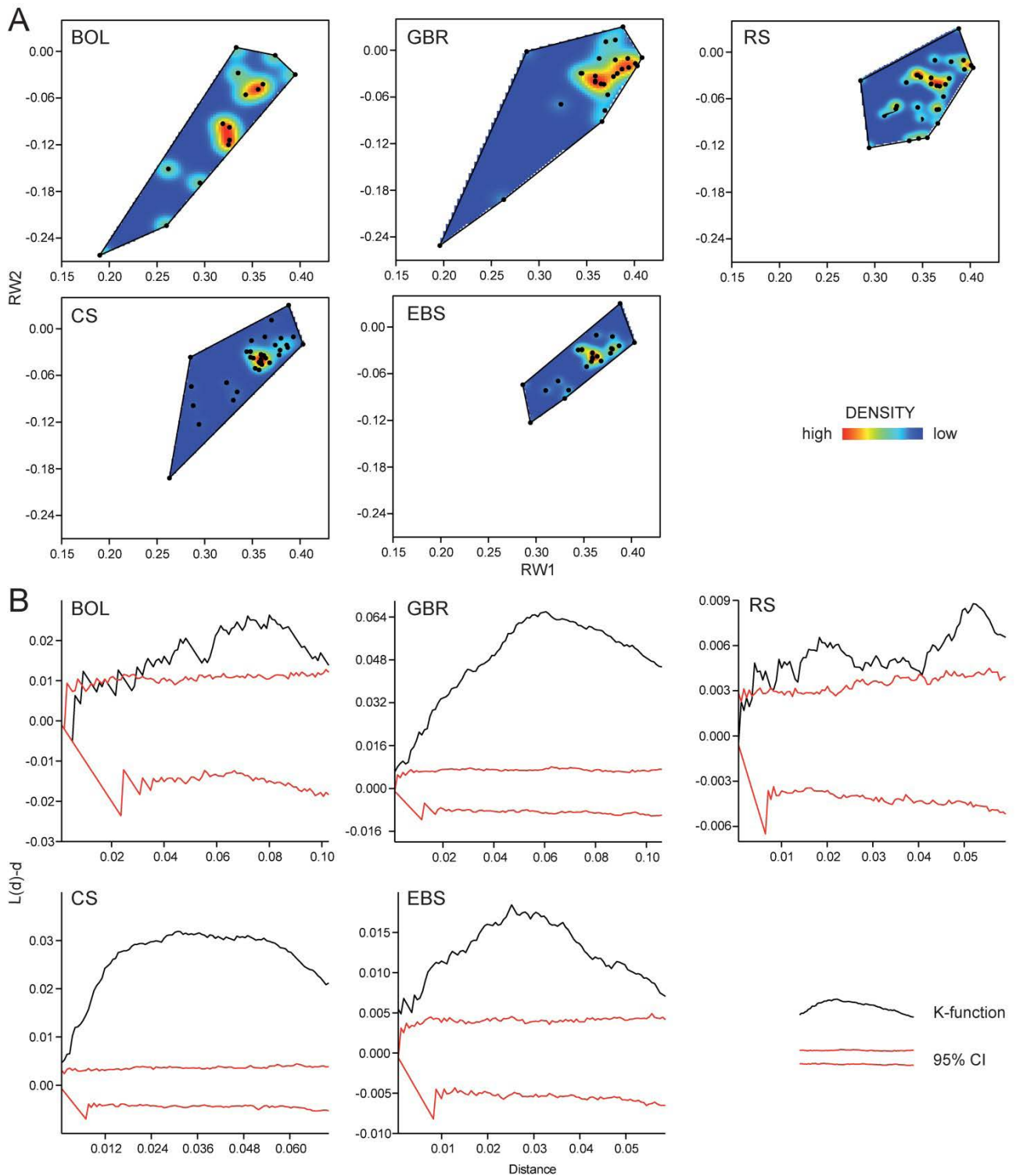


Fig. S5 - Patterning of anguilliform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

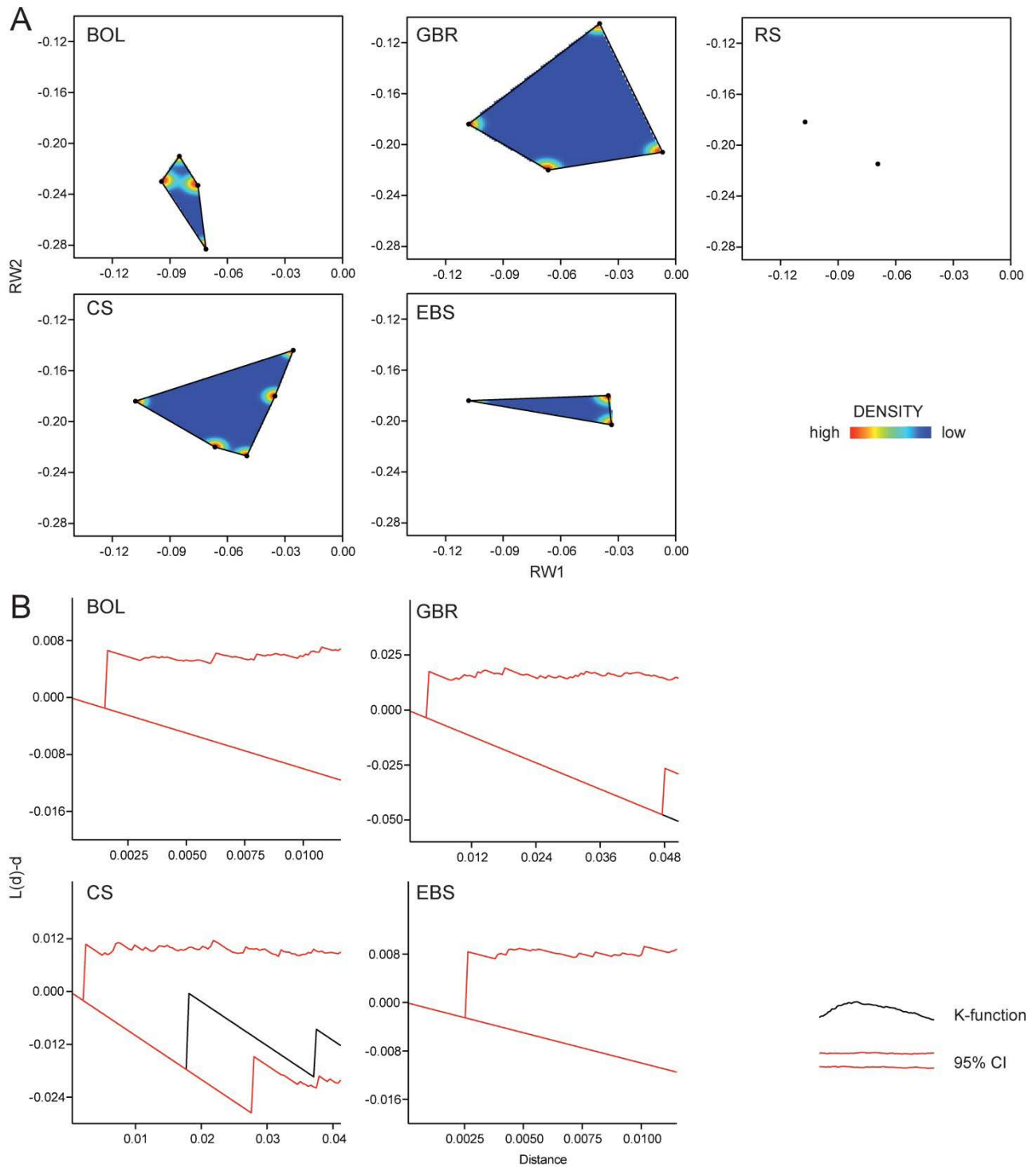


Fig. S6 - Patterning of atheriniform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

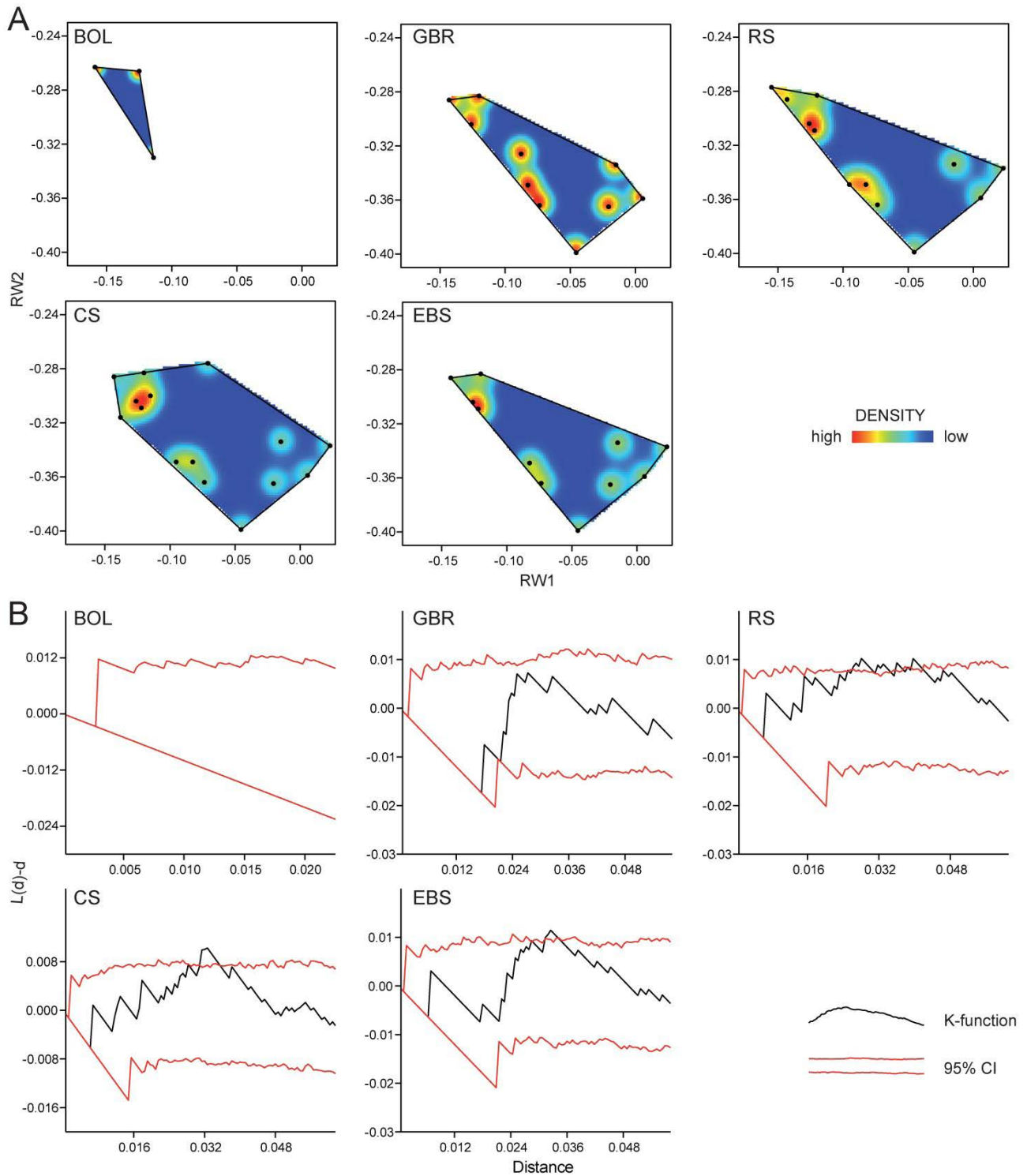


Fig. S7 - Patterning of beloniform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

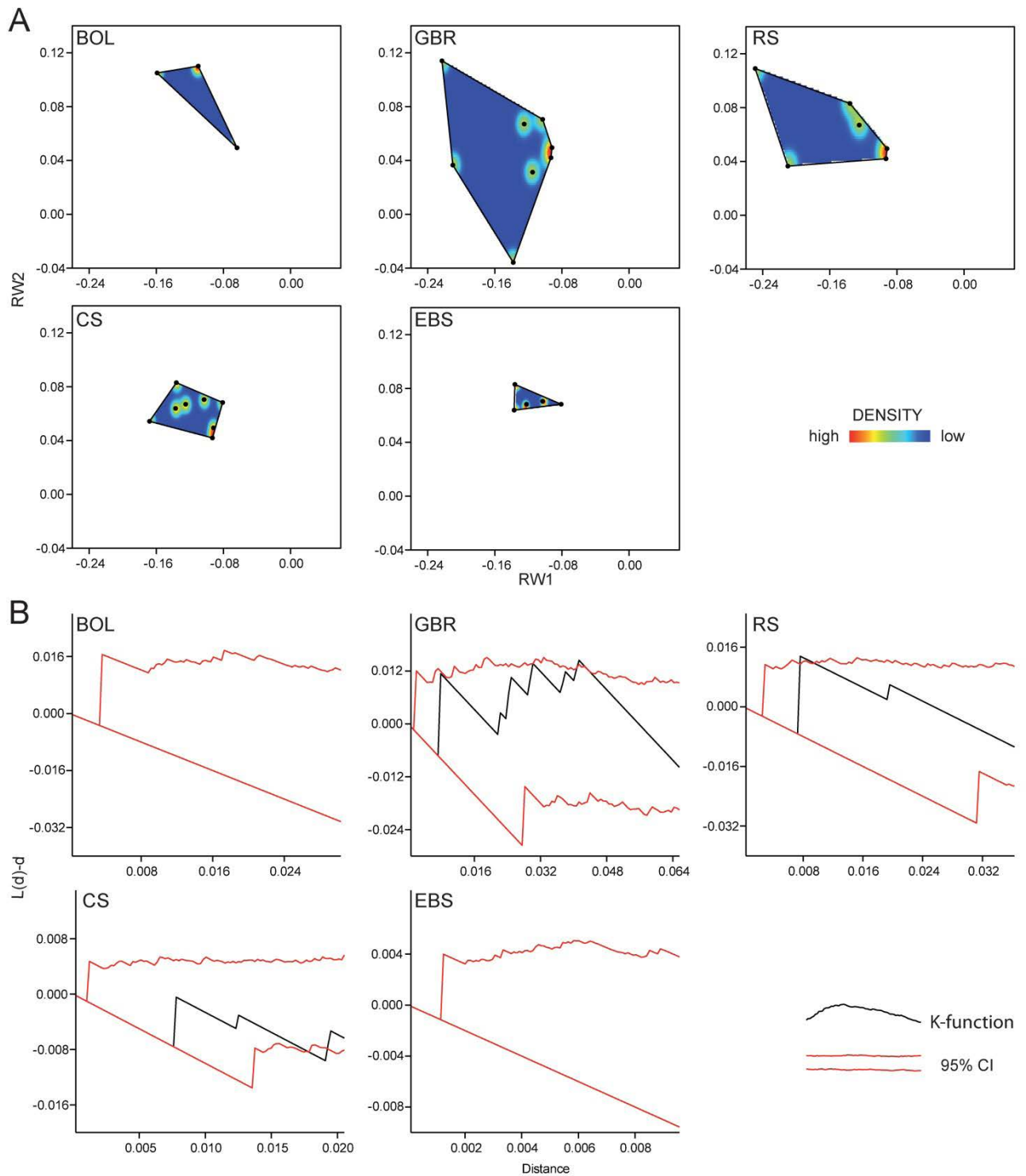


Fig. S8 - Patterning of beryciform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

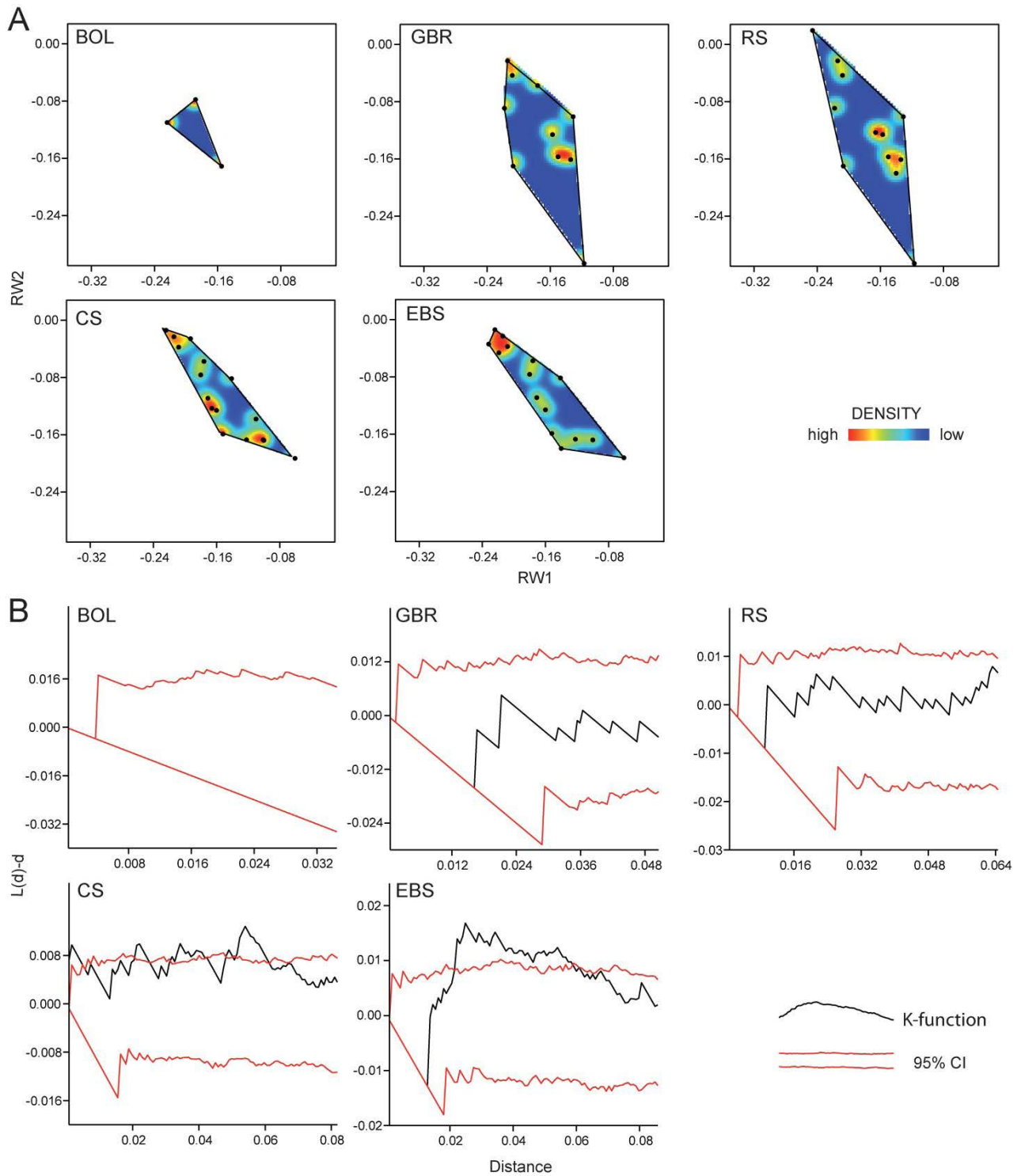


Fig. S9 - Patterning of clupeiform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

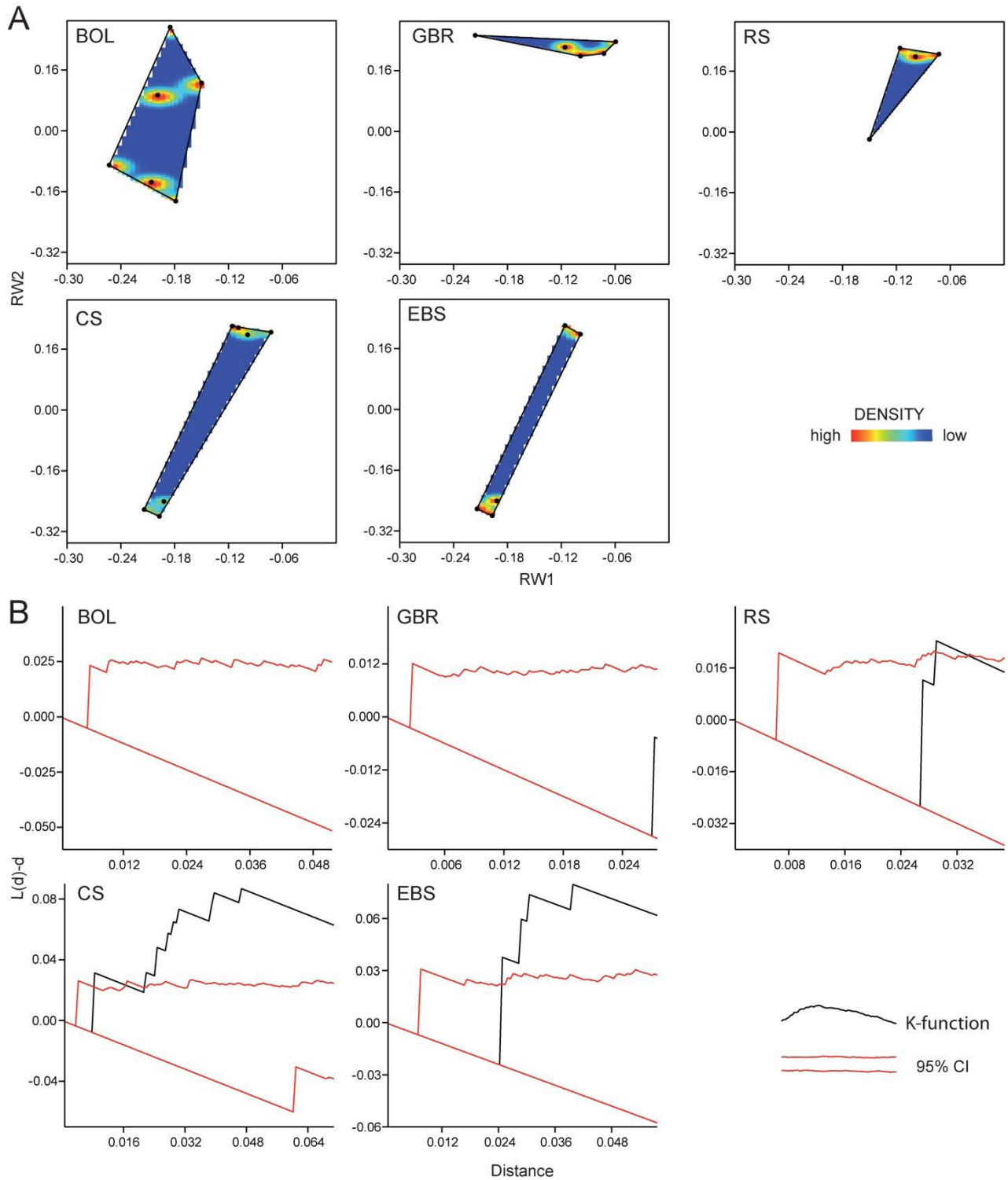


Fig. S10 - Patterning of lophiiform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

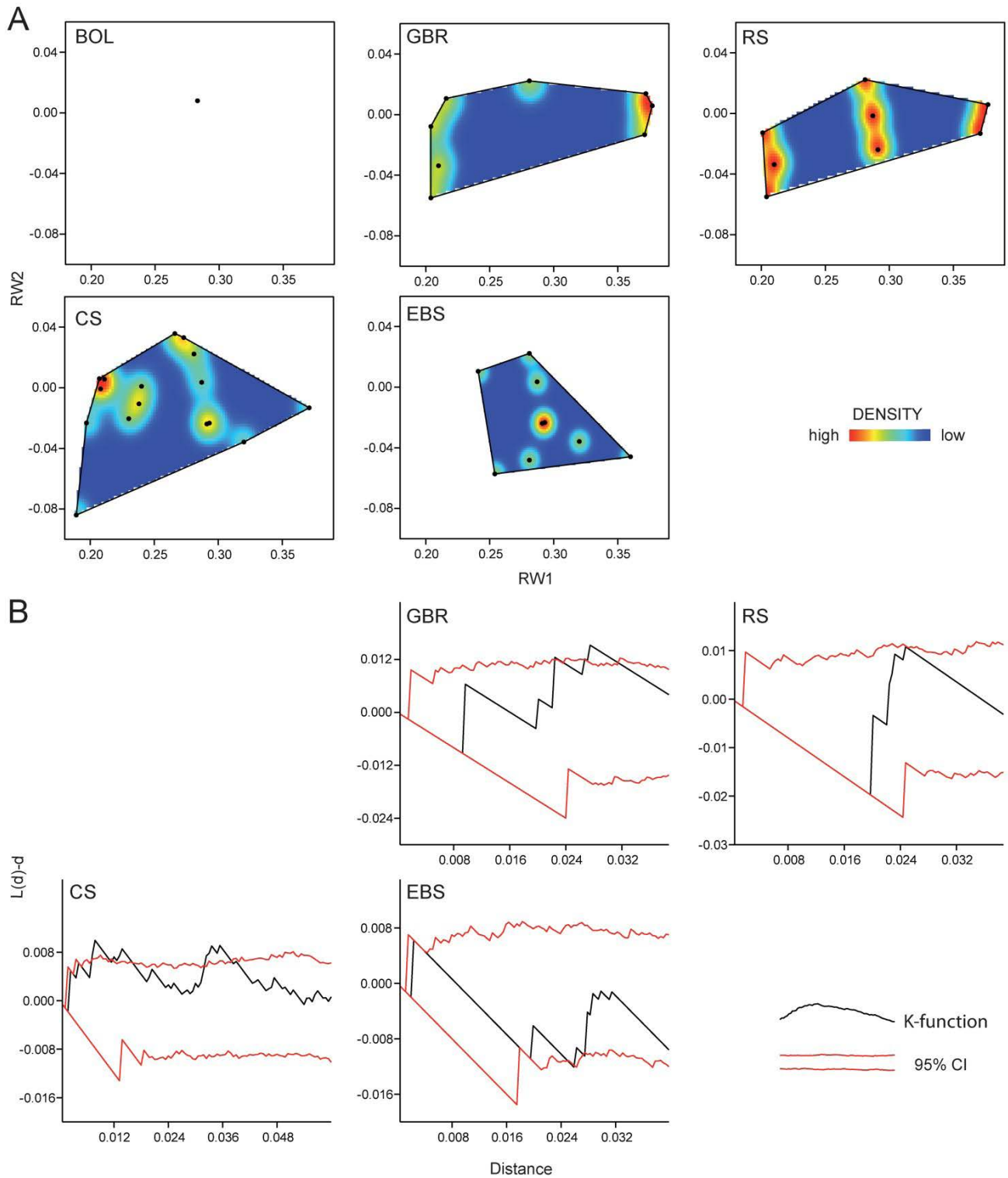


Fig. S11 - Patterning of ophioid morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). The only one taxon for Bolca assemblage makes uninterpretable the patterning of Eocene ophioids. BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

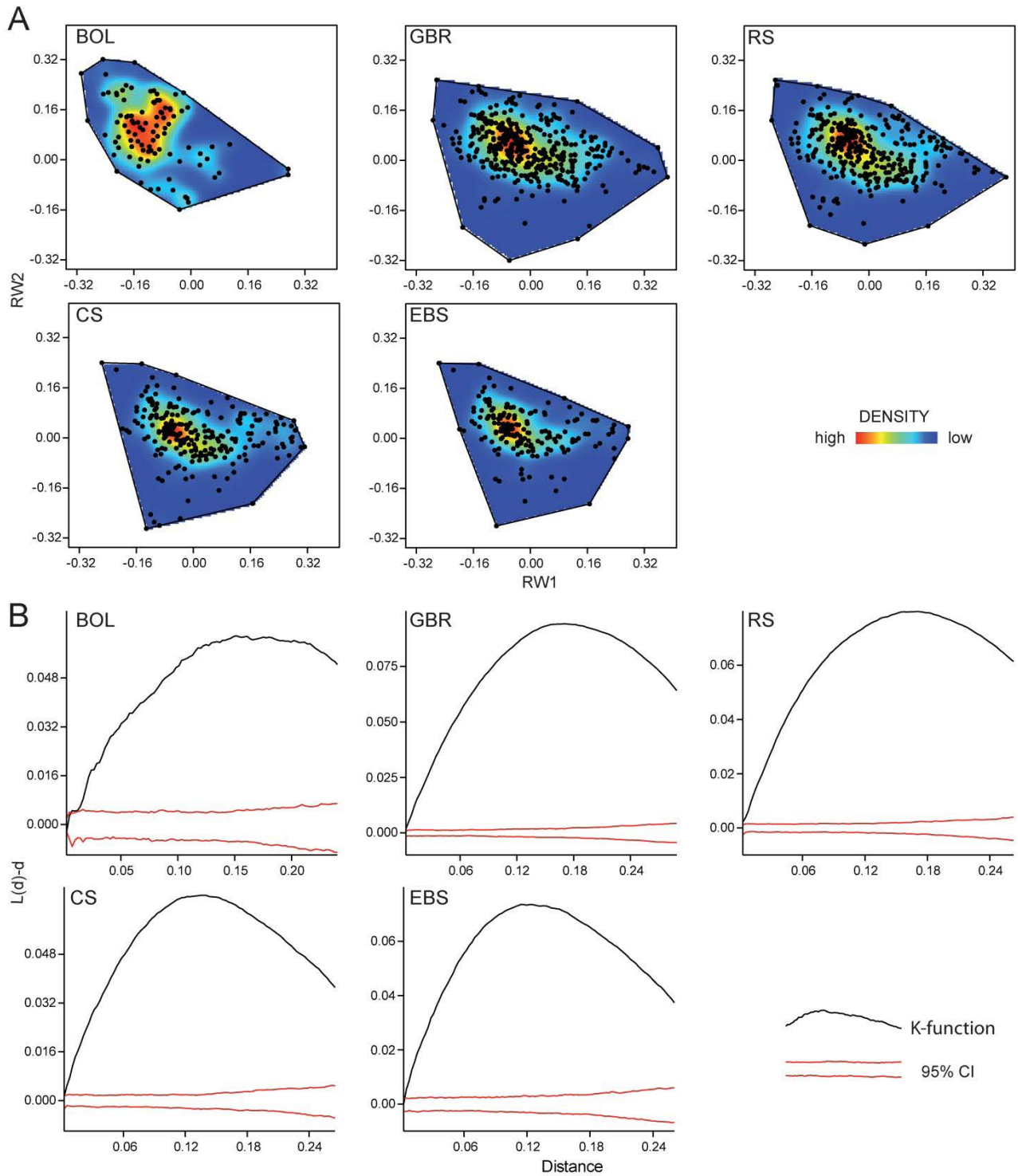


Fig. S12 - Patterning of “perciform” morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley’s K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

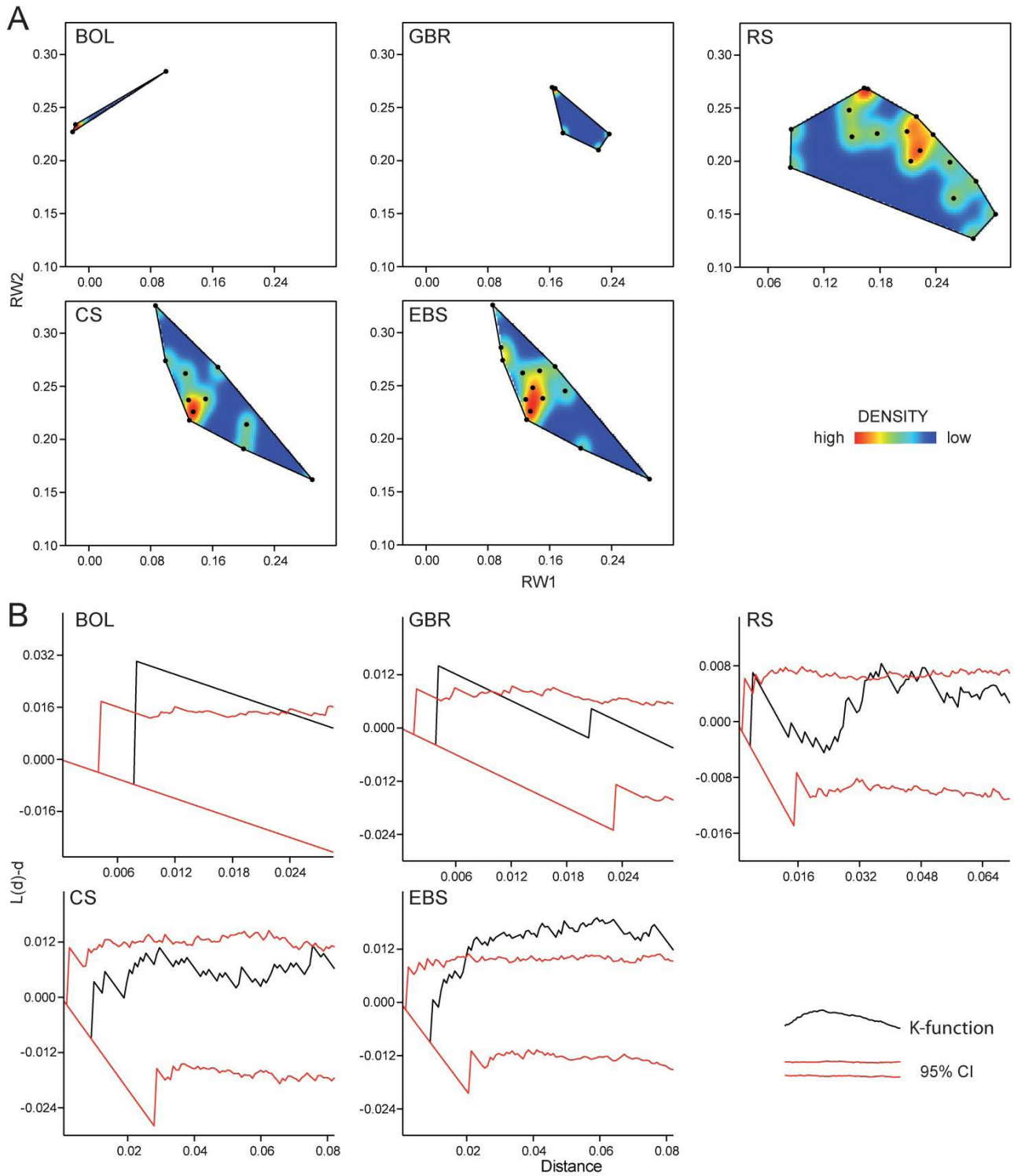


Fig. S13 - Patterning of pleuronectiform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

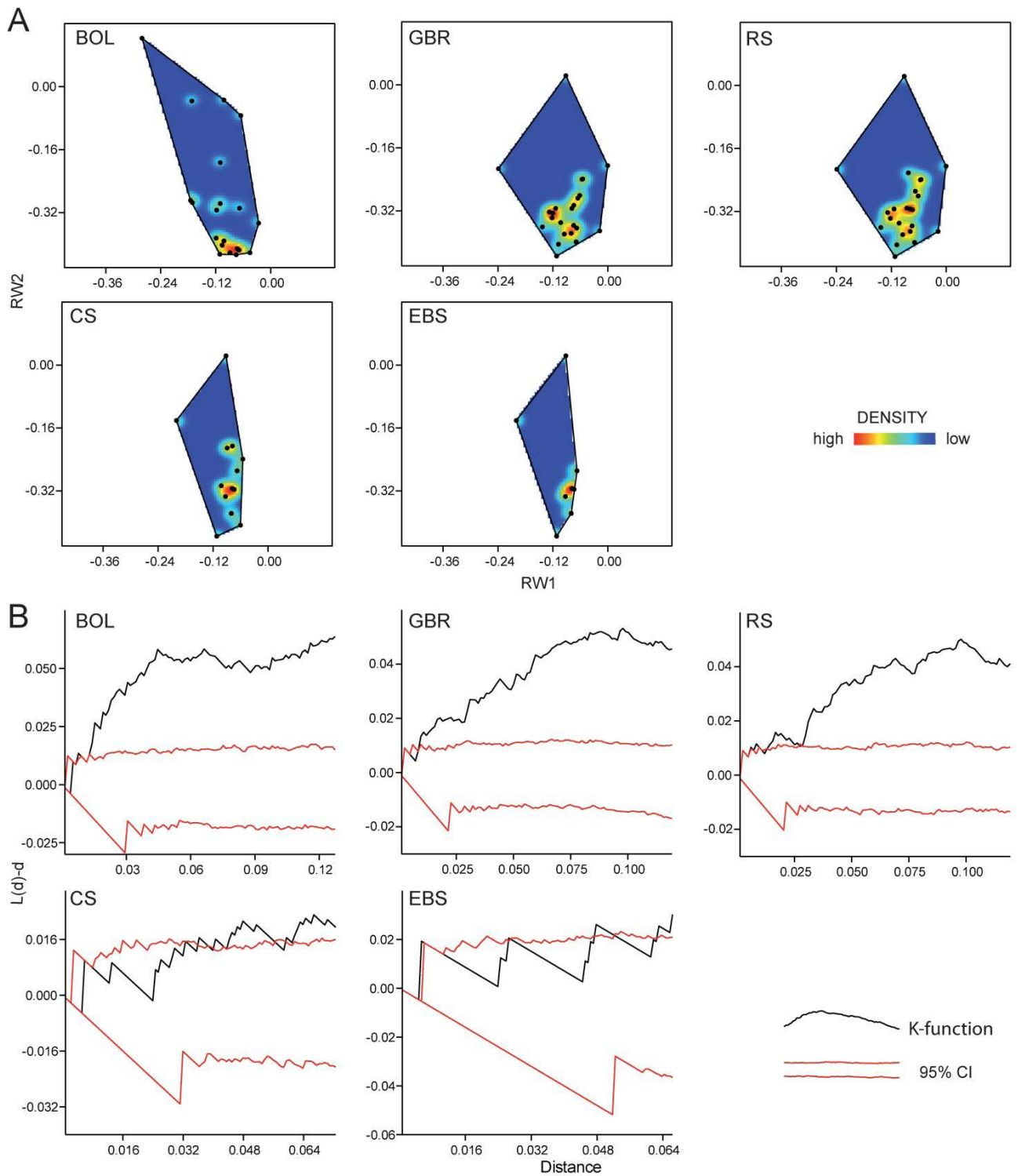


Fig. S14 - Patterning of syngnathiform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

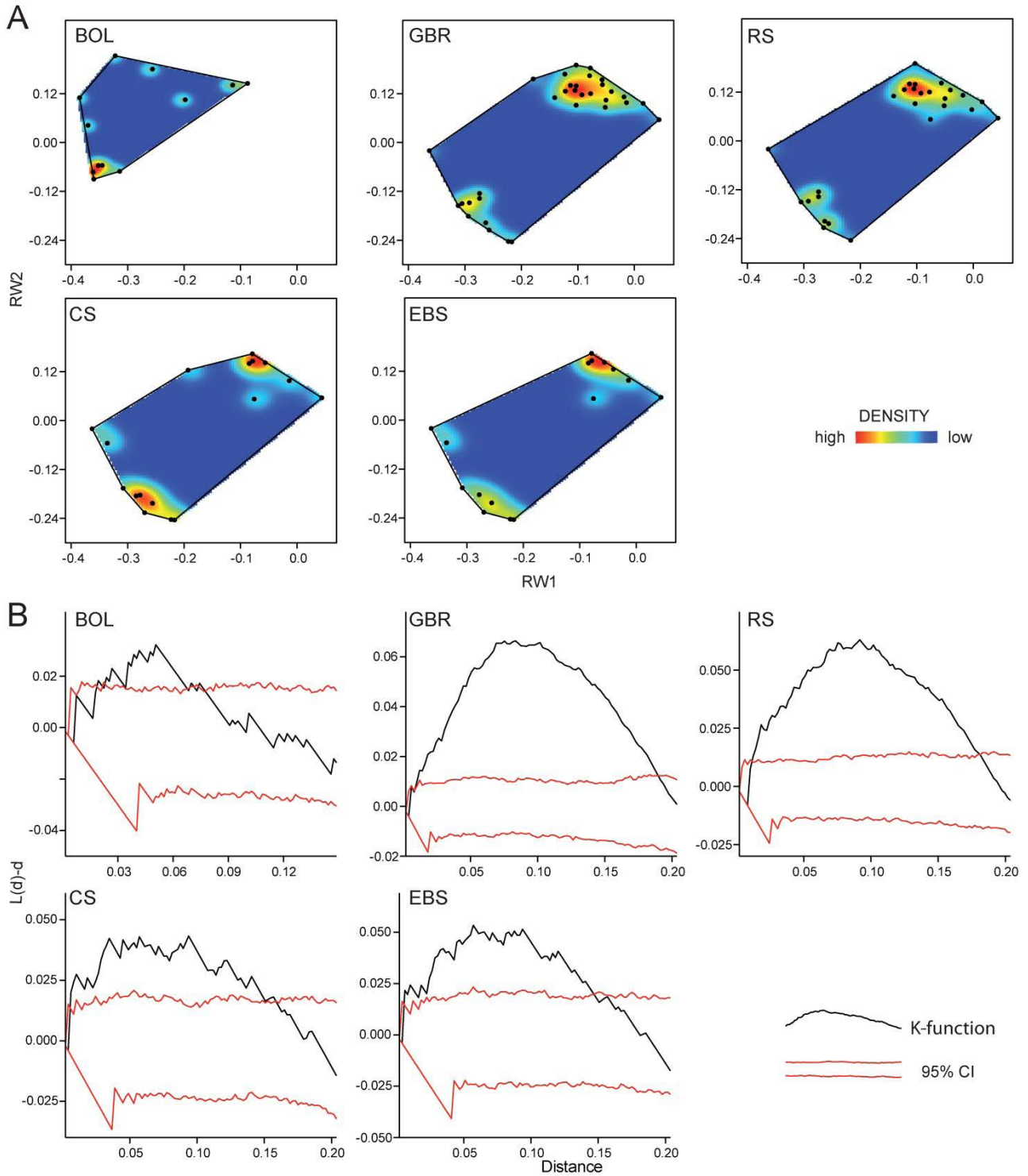


Fig. S15 - Patterning of tetraodontiform morphospace calculated on first two RW axes. A) Kernel density plots. B) Ripley's K plots with 95% confidence interval bands (red lines). BOL = Bolca; GBR = Great Barrier Reef; RS = Red Sea; CS = Caribbean Sea; EBS = East Brazil Shelf.

Total partial disparity

Clade	Ecosystem	Total partial disparity			Overall ecosystem disparity		Significance
		Observed value	Lower 95% CI	Upper 95% CI	Lower 95% CI	Upper 95% CI	
Anguilliformes	BOL	0.0765	0.0699	0.0831	0.0779	0.0955	
	GBR	0.0544	0.0507	0.0581	0.0550	0.0647	
	RS	0.0585	0.0545	0.0625	0.0593	0.0691	
	CS	0.0612	0.0572	0.0652	0.0625	0.0727	
	EBS	0.0609	0.0569	0.0649	0.0617	0.0735	
Atheriniformes	BOL	0.0875	0.0803	0.0947	0.0779	0.0955	
	GBR	0.0601	0.0555	0.0647	0.0550	0.0647	
	RS	0.0641	0.059	0.0692	0.0593	0.0691	
	CS	0.0677	0.0622	0.0732	0.0625	0.0727	
	EBS	0.0680	0.0626	0.0734	0.0617	0.0735	
Beloniformes	BOL	0.0867	0.0796	0.0938	0.0779	0.0955	
	GBR	0.0574	0.0529	0.0619	0.0550	0.0647	
	RS	0.0610	0.0561	0.0659	0.0593	0.0691	
	CS	0.0636	0.0583	0.0689	0.0625	0.0727	
	EBS	0.0636	0.0584	0.0688	0.0617	0.0735	
Beryciformes	BOL	0.0883	0.0811	0.0955	0.0779	0.0955	
	GBR	0.0603	0.0556	0.065	0.0550	0.0647	
	RS	0.0642	0.0592	0.0692	0.0593	0.0691	
	CS	0.0680	0.0625	0.0735	0.0625	0.0727	
	EBS	0.0683	0.0628	0.0738	0.0617	0.0735	
Clupeiformes	BOL	0.0865	0.0792	0.0938	0.0779	0.0955	
	GBR	0.0590	0.0544	0.0636	0.0550	0.0647	
	RS	0.0626	0.0576	0.0676	0.0593	0.0691	
	CS	0.0656	0.0601	0.0711	0.0625	0.0727	
	EBS	0.0661	0.0606	0.0716	0.0617	0.0735	
Lophiiformes	BOL	0.0879	0.0806	0.0952	0.0779	0.0955	
	GBR	0.0596	0.055	0.0642	0.0550	0.0647	
	RS	0.0639	0.0588	0.069	0.0593	0.0691	
	CS	0.0665	0.0611	0.0719	0.0625	0.0727	
	EBS	0.0668	0.0614	0.0722	0.0617	0.0735	
Ophidiiformes	BOL	0.0869	0.0797	0.0941	0.0779	0.0955	
	GBR	0.0593	0.0548	0.0638	0.0550	0.0647	
	RS	0.0635	0.0587	0.0683	0.0593	0.0691	

Tab. S7 - Values of total partial disparity and related 95% CI calculated as the overall disparity of each ecosystem without the clade named in column. If the 95% CI falls outside the 95% confidence interval of the overall morphological disparity then the clade have a significant effect on overall disparity of own ecosystem. Asterisks (*) mark the Total partial disparity falling outside the 95% CI of the overall morphospace, suggesting that clades have a significant influence on the overall morphological disparity in their own ecosystem (only “perciformes” contribute significantly on the overall morphospace disparity).

	CS	0.0673	0.0618	0.0728	0.0625	0.0727	
	EBS	0.0670	0.0619	0.0721	0.0617	0.0735	
"perciforms"							
Pleuronectiformes	BOL	0.1173	0.1077	0.1269	0.0779	0.0955	*(0.0955<0.1077)
	GBR	0.1161	0.1062	0.1260	0.0550	0.0647	*(0.0647<0.1062)
	RS	0.1172	0.1072	0.1272	0.0593	0.0691	*(0.0691<0.1072)
	CS	0.1059	0.0964	0.1154	0.0625	0.0727	*(0.0727<0.0964)
	EBS	0.1093	0.0992	0.1194	0.0617	0.0735	*(0.0735<0.0992)
Syngnathiformes	BOL	0.0869	0.0797	0.0941	0.0779	0.0955	
	GBR	0.0594	0.0548	0.064	0.0550	0.0647	
	RS	0.0621	0.0573	0.0669	0.0593	0.0691	
	CS	0.0660	0.0605	0.0715	0.0625	0.0727	
	EBS	0.0651	0.0598	0.0704	0.0617	0.0735	
Tetraodontiformes	BOL	0.0766	0.0704	0.0828	0.0779	0.0955	
	GBR	0.0535	0.049	0.058	0.0550	0.0647	
	RS	0.0573	0.0524	0.0622	0.0593	0.0691	
	CS	0.0632	0.0578	0.0686	0.0625	0.0727	
	EBS	0.0646	0.0593	0.0699	0.0617	0.0735	
	BOL	0.0854	0.078	0.0928	0.0779	0.0955	
	GBR	0.0587	0.0543	0.0631	0.0550	0.0647	
	RS	0.0633	0.0584	0.0682	0.0593	0.0691	
	CS	0.0658	0.0607	0.0709	0.0625	0.0727	
	EBS	0.0663	0.0611	0.0715	0.0617	0.0735	

Tab. S7 - Continuation.

SUPPLEMENTARY REFERENCES

- Anderson M.J. (2001). A new method for non-parametric multivariate analysis of variance. *Austral Ecology*, 26: 32-46.
- Clarke K.R. (1993). Non-parametric multivariate analysis of changes in community structure. *Australian Journal of Ecology*, 18: 117-143.
- Marramà G., Garbelli C. & Carnevale G. (2016). A morphospace for the Eocene fish assemblage of Bolca, Italy: A window into the diversification and ecological rise to dominance of modern tropical marine fishes. *Bollettino della Società Paleontologica Italiana*, 55: 11-21.