Supplement 2

CONTENTS

Figure S1 – Select images of collected fish specimens

Text S1 – Primer information for species barcoding

Figure S2 – Environmental conditions for each transect

Table S1 – Expanded table showing demersal fish species capable of living in oxygen minimum zones (OMZs) with species from the Gulf of California added

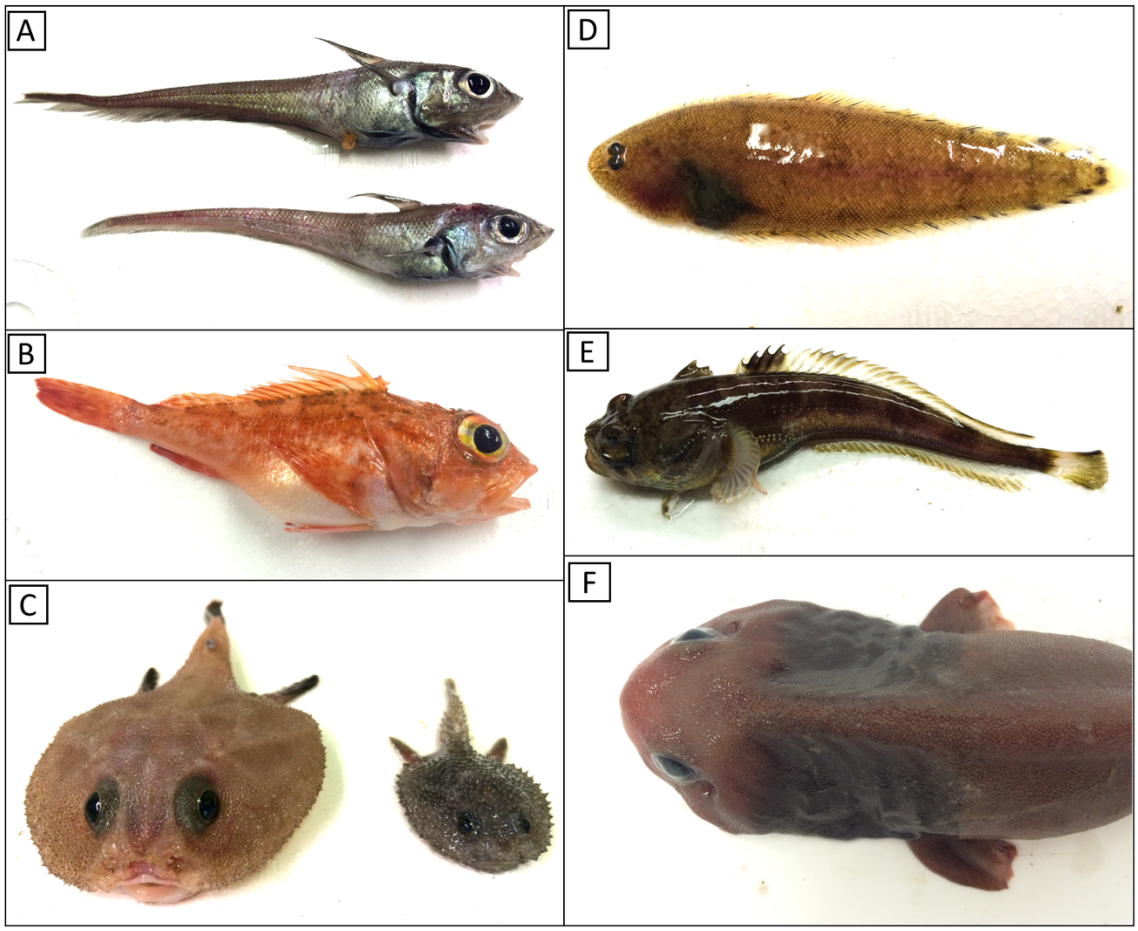

Fig. S1. Collected specimens from the Gulf of California deep-sea demersal fish community, showing examples of several different species and orders. Photographs were taken of fresh, non-preserved specimens immediately after recovery from the ROV. Species are: A) *Coelorinchus scaphopsis*, a common macrourid in the northern Gulf, B) *Pontinus furcirhinus*, a scorpaenid common in the northern and central Gulf, C) two species of ogcocephalid, *Dibranchus spinosus* (left) and *Dibranchus hystrix* (right) that were both common in the southern Gulf, D) *Symphurus oligomerus*, a cynoglossid, common in the northern and central Gulf, E) *Porichthys mimeticus*, a batrachoidid common in shallower waters in the Southern Gulf, and F) the anterior-dorsal view of *Cephalurus cephalus*, a scyliorhinid common in the central and southern Gulf under low oxygen conditions. Note the very large gill chambers on the *C. cephalus* specimen.

Text S1.

For the majority of the specimens, COI VF1 forward primer (5′-TTCTCAACCAACCACAAAGACATTGG-3’) and COI VR1 reverse primer (5′-TAGACTTCTGGGTGGCCAAAGAATCA-3′) (deWaard et al. 2007) were used for the CO1 gene, and 16Sar forward primer (5’-CGCCTGTTATCAAAAACAT-3’) and 16Sbr reverse primer (5’-CCGGTCTGAACTCAGATCACGT-3’) (Palumbi 1996) were used for the 16S gene. For the rockfish, *Sebastes*-specific CO1 primers, modified from Ward et al. (2005) by J. Hyde (NOAA SWFSC) were used (F: 5'-TCWACCAACCACAAAGAYAT YGGCAC-3’, R: 5'-TARACTTCWGGGTGRCCRAAGAATCA-3’).

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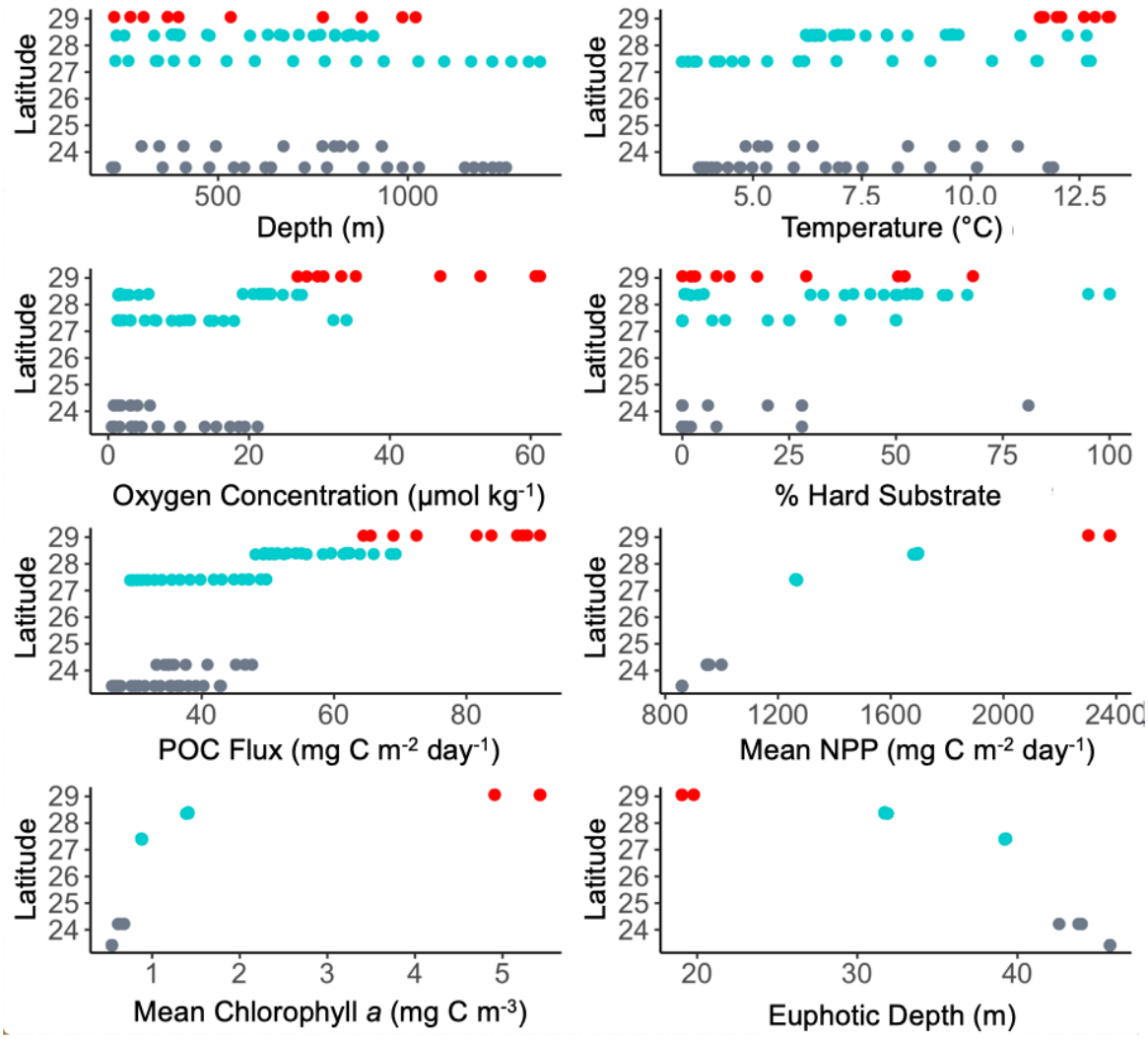

Fig. S2. Environmental conditions for each transect are visualized here. Points represent transects (n=88) and are color coded by location in the Gulf of California (red = northern Gulf, turquoise = central Gulf, grey = southern Gulf).

Table S1. Prior to this study, 77 demersal fish species globally were described from OMZ habitats (Gallo and Levin 2016). This study expands this list to 95 species. Newly added species, or species for which new details were added, are indicated in gray.

	Common Name	Location	Depth Range (m)	Temp Range (°C)	Oxygen Range (µmol kg^{-1})	Citations
Myxiniformes						
Myxinidae						
Eptatretus deani	Black hagfish	US Pacific margin (northeastern Pacific)	366-2743	3.6-6.4	13.1-58.2	N.D. Gallo unpublished, Day and Pearcy (1968)
Eptratretus sp.	Hagfish	Canada Pacific margin (northeastern Pacific)	890	3.6-4.0	10.5-15.3	Juniper et al. (2013)
Eptatretus sinus	Cortez hagfish	Gulf of California	263-1080	5.0-12.1	2.7-35.0	This study
Squaliformes						
Etmopteridae						
Etmopterus sp.	Lantern shark	Indian margin (Arabian Sea)	-	-	-	Hunter et al. (2011)
Centroscyllium ornatum	Ornate dogfish	Pakistan margin (Arabian Sea)	1000-1200	7.4-8.7	6.7-17.0	Murty et al. (2009)
Centrophoridae						
Centrophorus granulosus	Gulper shark	Yemen margin (Arabian Sea)	50-1440	5.2-12.9	13.3-212.7	Kukharev (2015)
Carcharhiniformes						
Scyliorhinidae						
Apristurus brunneus	Brown catshark	California margin (northeastern Pacific)	79-1448	2.9-5.4	13.1-70.9	N.D. Gallo unpublished
Parmaturus xaniurus	Filetail catshark	California margin to Gulf of California (northeastern Pacific)	88-1250	3.3-11.59	1.43-143.5	N.D. Gallo unpublished, This study
Cephalurus cephalus	Lollipop shark	Gulf of California	275-927	5.3-9.4	0.8-6.1	Aguirre-Villaseñor and Salas-Singh (2012), Gallo et al. (2018), This study
Halaelurus spp.	Tiger catshark	Yemen margin (Arabian Sea)	-	-	13.3	Kukharev (2015)
Cephalurus sp. cf.	Catshark	Chilean margin (southeastern Pacific)	313-327	10.9-11.5	3.0-3.84	J. Sellanes (UCN) unpublished
Proscylliidae						
Eridacnis radcliffei	Pygmy ribbontail catshark	Yemen margin (Arabian Sea)	71-766	-	13.3-174.9	Kukharev (2015)
Rajiformes						
Arhynchobatidae						
Bathyraja interrupta	Sandpaper skate	Oregon margin (northeastern Pacific)	64-1500	3.1-8.3	13.1-273.4	Day and Pearcy (1968)
Bathyraja trachura	Roughtail skate	Oregon margin (northeastern Pacific)	213-2550	1.6-7.0	18.4-156.2	Day and Pearcy (1968)
Bathyraja sp.	Skate	Indian margin (Arabian Sea)	-	-	-	Hunter et al. (2011)
Pleuronectiformes						
Pleuronectidae						
Microstomus pacificus	Dover sole	US Pacific margin (northeastern Pacific)	10-1370	2.9-11.5	13.1-318.9	Friedman et al. (2012), Day and Pearcy (1968)
Embassichthys bathybius	Deep-sea sole	US and Canada Pacific margin (northeastern Pacific)	125-1800	2.4-6.4	13.1-54.3	N.D. Gallo unpublished, Day and Pearcy (1968), Juniper et al. (2013)
Lyopsetta exilis	Slender sole	US and Saanich Inlet (northeastern Pacific)	25-800	4.2-8.7	14.0-244.6	Matabos et al. (2012), Chu and Tunnicliffe (2015)

Paralichthyidae						
Hippoglossina macrops	Bigeye flounder	Chilean margin (southeastern Pacific)	34-580	10.6-16.5	22-83.5	J. Sellanes (UCN) unpublished
Bothidae						
Monolene maculipinna	Pacific deepwater flounder	Costa Rica to Peru (eastern tropical Pacific)	205-384	13.0-27.5	16.2-175.4	Bianchi et al. (1991)
Soleidae						
Austroglossus microlepis	West coast sole	Namibia to South Africa (southeastern Atlantic)	100-400	7.8-14.5	16.0-218.9	Hamukuaya et al. (2001)
Symphurus spp.	Tonguefish	Gulf of California	224-1010	7.9-13.0	2.69-55.28	This study
Anguilliformes						
Nettastomatidae						
Facciolella equatorialis	Dogface witch-eel	California margin (northeastern Pacific)	500-1000	6.2-8.2	9.2-47.7	N.D. Gallo unpublished
Nettastoma sp.	Duckbill eel	Yemen margin (Arabian Sea)	-	-	13.3	Kukharev (2015)
Congridae						
Congridae sp.	Conger eel	Indian margin (Arabian Sea)	-	-	-	Hunter et al. (2011)
Congridae sp.	Conger eel	Pakistan margin (Arabian Sea)	1200	7.4	13.4-17.0	Murty et al. (2009)
Bathycongrus macrurus	Shorthead conger	Gulf of California	298-544	7.32-11.61	0.65-12.19	This study
Synaphobranchidae						
Synaphobranchus sp.	Cutthroat eel	Indian margin (Arabian Sea)	-	-	-	Hunter et al. (2011)
Serrivomeridae						
Serrivomer sp.	Sawtooth eel	Pakistan margin (Arabian Sea)	1100	8	9.4-11.2	Murty et al. (2009)
Notacanthiformes						
Halosauridae						
Halosaurus sp.	Halosaur	Pakistan margin (Arabian Sea)	1200	7.4	13.4-17.0	Murty et al. (2009)
Notocanthidae						
Notocanthus sp.	Deep-sea spiny eel	Pakistan margin (Arabian Sea)	1100	8	9.4-11.2	Murty et al. (2009)
Aulopiformes						
Synodontidae						
Saurida tumbil	Greater lizardfish	Pakistan margin (Arabian Sea)	4-700	11.0-26.6	4.9-206.5	Murty et al. (2009)
Saurida undosquamis	Brushtooth lizardfish	Yemen margin (Arabian Sea)	1-350	11.3-28.3	13.3-210.9	Kukharev (2015)
Harpadon squamosus	Lizardfish	Yemen margin (Arabian Sea)	-	-	13.3	Kukharev (2015)
Ipnopidae						
Bathypterois sp.	Tripodfish	Gulf of California	863-1356	3.3-5.1	4.1-21.7	This study
Beryciformes						
Trachichthyidae						
Hoplostethus spp.	Roughy	Yemen margin (Arabian Sea)	-	-	13.3	Kukharev (2015)
Perciformes						
Stichaeidae						
Plectobranchus evides	Bluebarred prickleback	Saanich Inlet (northeastern Pacific)	84-368	7.6-8.6	7.9-205.6	Chu and Tunnicliffe (2015), Matabos et al. (2012)
Agonidae						
Xeneretmus latifrons	Blacktip poacher	US Pacific margin, Saanich Inlet (northeastern Pacific)	18-486	4.6-8.7	7.4-244.6	Chu and Tunnicliffe (2015), Matabos et al. (2012)
Bathyagonus nigripinnis	Blackfin starsnout poacher	Canada Pacific margin (northeastern Pacific)	18-1290	3.0-8.3	10.5-201.7	Juniper et al. (2013)
Zoarcidae						
Zoarcid sp.	Eelpout	Canada Pacific margin (northeastern Pacific)	890	3.6-4	10.5-15.3	Juniper et al. (2013)

Lycenchelys spp.	Eelpout	Gulf of California	894-1355	3.3-5.0	4.0-21.9	This study
Derepodichthys alepidotus	Cuskpout	Gulf of California	1182	3.98	16.57	This study
Serranidae						
Diplectrum macropoma	Mexican sand perch	Mexico to Peru (eastern tropical Pacific)	1-220	16.6-16.8	17.5-120.3	Bianchi et al. (1991)
Serranidae sp.	Serranid	Gulf of California	223-227	11.8	3.2-3.5	This study
Trichiuridae						
Trichiurus nitens	Pacific cutlassfish	Mexico to Peru (eastern tropical Pacific)	160-250	13	17.5	Bianchi et al. (1991)
Lepturacanthus spp.	Hairtail	Yemen margin (Arabian Sea)	-	-	13.3	Kukharev (2015)
Gobiidae						
Sufflogobius bibarbatus	Bearded goby	Namibia and South Africa (southeastern Atlantic)	10-340	7.8-14.5	10.0-218.8	Hamukuaya et al. (2001), Mas-Reira et al. (1990), Utne-Palm et al. (2010), Salvanes et al. (2011)
Carangidae						
Trachurus trachurus capensis	Horse mackerel	Gulf of Guinea to South Africa (southeastern Atlantic)	0-500	5.4-22.0	16-252.0	Hamukuaya et al. (2001)
Carangidae sp.	Carangid	Pakistan margin (Indian Ocean)	300	14.8	4.9-5.4	Murty et al. (2009)
Epigonidae						
Epigonus sp.	Deepwater cardinalfish	Pakistan margin (Arabian Sea)	140	18.2	4.9	Murty et al. (2009)
Acropomatidae						
Synagrops adeni	Aden splitfin	Yemen margin (Arabian Sea)	60-600	-	13.3	Kukharev (2015)
Percophidae						
Bembrops caudimacula	Opal fish	Yemen margin (Arabian Sea)	160-505	14.4-17.4	13.3-192.3	Kukharev (2015)
Centrolophidae						
Psenopsis cyanea	Indian ruff	Yemen margin (Arabian Sea)	179-400	-	15.5-55.5	Kukharev (2015)
Scombridae						
Scomber australasicus	Japanese mackerel	Yemen margin (Arabian Sea)	9-494	7.7-24.0	13.3-279.7	Kukharev (2015)
Ophidiiformes						
Bythitidae						
Cataetyx rubrirostris	Rubynose brotula	US Pacific margin (northeastern Pacific)	288-1000	4.9	9.0-20.6	N.D. Gallo unpublished

Ophidiidae						
Cherublemma emmelas	Black brotula	Baja California to Northern Chile (eastern tropical Pacific)	15-902	4.7-20.4	0.5-219.6	Aguirre-Villaseñor and Castillo-Velázquez (2011), Bianchi et al. (1991), Gallo et al. (2018), Stromme and Saetersdal (1988), This study
Holcomycteronus sp.	Cusk-eel	Indian margin (Arabian Sea)	-	-	-	Hunter et al. (2011)
Brotulotaenia sp.	Cusk-eel	Pakistan margin (Arabian Sea)	1000-1200	7.4-8.7	6.7-17.0	Murty et al. (2009)
Genypterus maculatus	Black cusk-eel	Chilean margin (southeastern Pacific)	82-328	9.2-11.8	17.9-50.9	Chilean Fisheries Development Program, FIP2004-09
Genypterus blacodes	Rock ling	Chilean margin (southeastern Pacific)	58-450	7.2-11.3	21.7-110.4	Chilean Fisheries Development Program, FIP2004-09
Eretmichthys pinnatus	Cusk-eel	Gulf of California	867-1264	3.7-5.1	4.2-21.4	This study
Gadiformes						
Macrouridae						
Nezumia liolepis	Smooth grenadier	Volcano 7 (eastern equatorial Pacific), US Pacific margin (northeastern Pacific), Gulf of California	450-1660	4.5-6.5	3.5-43.8	Friedman et al. (2012), Wishner et al. (1990, 1995), Levin et al. (1991), This study
Coryphaenoides acrolepis	Strong-scaled rattail	Oregon margin (northeastern Pacific)	300-3700	1.7-6.9	18.8-158.8	Day and Pearcy (1968)
Coryphaenoides pectoralis	Pectoral rattail	Oregon margin (northeastern Pacific)	140-3500	1.8-4.6	17.1-256.4	Day and Pearcy (1968)
Coryphaenoides sp.	Grenadier	Indian margin (Arabian Sea)	-	-	-	Hunter et al. (2011)
Coryphaenoides capito	Bighead grenadier	Gulf of California	921	5	4.1	This study
Trachyrincus villegai	Grey grenadier	Northern Peru to Central Chile (southeastern Pacific)	250-980	-	2.6	Quiroga et al. (2009)
Merlucciidae						
Merluccius productus	North Pacific hake	US Pacific margin (northeastern Pacific), Saanich Inlet	3-1000	1.6-23.0	13.1-241.1	Chu and Tunnicliffe (2015)
Merluccius angustimanus	Panama hake	Mexico-Columbia (eastern tropical Pacific)	2-523	15.4-21.1	17.5-222.7	Bianchi et al. (1991), Stromme and Saetersdal (1988)
Merluccius capensis	Cape hake	Angola to South Africa (southeastern Atlantic)	20-512	6.1-19.8	10.9-236.7	Hamukuaya et al. (2001), Mas-Reira et al. (1990), Woodhead et al. (1996)
Merluccius gayi gayi	Whiting	Chilean margin (southeastern Pacific)	58-450	6.4-12.3	16.8-253.0	Chilean Fisheries Development Program, FIP2004-09
Merluccius sp.	Hake	Gulf of California	339-457	8.2-11.5	5.3-28.5	This study
Bregmacerotidae						
Bregmaceros bathymaster	East Pacific codlet	Gulf of California (eastern tropical Pacific)	32-500	7.6-15.4	9.2-31.5	Davies et al. (2015)
Bregmaceros cantori	Striped codlet	Cariaco Trench, Venezuela to Brazil (western Atlantic)	450-846	14.2-26.9	4.0-222.7	Baird et al. (1973), Milliken and Houde (1984), Love et al. (2004)
Bregmaceros sp.	Codlet	Indian margin (Arabian Sea)	540	12.1	0.34	Hunter et al. (2011)
Bregmaceros sp.	Codlet	Pakistan margin (Indian Ocean)	300	14.8	4.9-5.4	Murty et al. (2009)
Moridae						
Physiculus roseus	Rosy cod	Yemen margin (Arabian Sea)	277-510	-	13.3	Kukharev (2015)
Physiculus rastrelliger	Hundred fathom mora	Gulf of California	216-483	8.3-13.5	1.1-69.0	This study

Osmeriformes						
Argentinidae						
Argentina aliceae	Alice argentina	Nicaragua to Peru (eastern tropical Pacific)	73-300	13.8-17.1	16.2-46.4	Bianchi et al. (1991)
Cottiformes						
Liparidae						
Careproctus melanurus	Blacktail snailfish	US Pacific margin (northeastern Pacific)	89-2286	1.8-7.2	13.1-133.0	Friedman et al. (2012), Day and Pearcy (1968), Stein et al. (2006)
Liparidae sp.	Snailfish	Indian margin (Arabian Sea)	540	12.1	0.34	Hunter et al. (2011)
Paraliparis rosaceus	Pink snailfish	Gulf of California	935-1348	3.4-4.8	6.5-17.8	This study
Scorpaeniformes						
Scorpaenidae						
Pontinus sierra	Speckled scorpionfish	Gulf of CA to Panama (eastern tropical Pacific)	15-307	11.1-13.6	1.8-20.1	Bianchi et al. (1991), This study
Pontinus furcirhinus	Red scorpionfish	Gulf of California	197-387	10.4-13.9	6.4-79.4	This study
Sebastidae						
Sebastolobus alascanus	Shortspine thornyhead	US Pacific margin (northeastern Pacific)	54-1600	3.5-7.8	13.1-171.9	Friedman et al. (2012), Day and Pearcy (1968)
Sebastolobus altivelis	Longspine thornyhead	US Pacific margin (northeastern Pacific)	201-1757	2.7-8.6	13.1-112.4	Friedman et al. (2012), Day and Pearcy (1968)
Sebastolobus sp.	Thornyhead	Canada Pacific margin (northeastern Pacific)	890	3.6-4	10.5-15.3	Juniper et al. (2013)
Sebastes cortezi	Cortez rockfish	Gulf of California	199-1448	7.3-14.3	1.8-91.1	This study
Anoplopomatidae						
Anoplopoma fimbria	Sablefish	US and Canada Pacific margin (northeastern Pacific)	175-2740	1.8-14.6	13.1-318.9	Friedman et al. (2012), Day and Pearcy (1968), Juniper et al. (2013)
Triglidae						
Chelidonichthys capensis	Gurnard	Southeastern Atlantic and Western Indian Ocean	10-390	6.1-20.5	16-222.3	Hamukuaya et al. (2001), Mas-Reira et al. (1990)
Peristediidae						
Satyrichthys adeni	Yellowfinned searobin	Yemen margin (Arabian Sea)	71-378	7.9-17.3	13.3-213.1	Kukharev (2015)
Batrachoidiformes						
Batrachoididae						
Aphos porosus	Banded toadfish	Chilean margin (southeastern Pacific)	11-120	14.8-16.5	22-84.4	J. Sellanes (UCN) unpublished
Porichthys mimeticus	Mimetic midshipman	Gulf of California	223-229	11.6-11.8	3.1-3.7	This study
Lophiiformes						
Ogcocephalidae						
Dibranchus spinosus	Batfish	Gulf of California	723-1243	3.8-6.1	1.3-19.4	This study
Dibranchus hystrix	Batfish	Gulf of California	922-1184	3.9-5.0	4.0-16.7	This study
Lophiidae						
Lophiodes caulinaris	Spottedtail angler	Gulf of California	217-888	10.5-12.1	3.0-29.5	This study

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