Exploring potential fish sound producers in Polynesian lower mesophotic coral reefs

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Supplementary material

Table SP1 Sound description of the sonic families found in the deeper part of Polynesian mesophotic reefs.

Family	Genus or species of interest	Genus or species from the litterature	Sonic mechanism	Sound description	Source
Acanthuridae	*Naso hexacanthus*	*Acanthurus bahianus*		Raspy sounds, grunts, knocks, occasionally series of knocks, espace sounds (some double)	[1]
				'Pop-like' sound	[2]
		Acanthurus chirurgus	Dorsal fin spine stridulation?	(Weak) knocks, weak escape sounds,	[1]
		Acanthurus coeruleus	Dorsal fin spine stridulation?	Single grunt,escape sounds, scratches, knocks, weak clicks	[1]
		Acanthurus olivaceus		Pulse	[3]
		Ctenochaetus hawaiiensis		Pulse train Long pulse	[3]
		Ctenochaetus strigosus		Pulse	[3]
		Paracanthurus hepatus	With the strong-spined dorsal fin	Stridulatory sound	[4]
		Zebrasoma flavescens		Pulse, collision	[3]
Apogonidae	*Foa fo*	*Apogonichthyoides niger*	The fish tremble	'Sound'	[5]
Balistidae	*Xanthichthys auromarginatus*	*Xanthichthys auromarginatus*		Pulse or pulse train with 4.8 + 1.1 events	[3]
	Xanthichthys caeruleolineatus				
Blenniidae	*Petroscirtes xestus*	*Chasmodes bosquianus*	Synchronized with a quick sidewise shake of the head.	Non-harmonic low-pitched grunting or thumping sound.	[6]
		Lipophrys pholis	Head raised and mouth opened.	Clacking sound	[7]
		Parablennius parvicornis		Calls solely and repeatedly made of three parts (central part = grunt) with a harmonic structure	[8]
				Call	[9]
Bythitidae	*Tuamotuichthys bispinosus*	*Cataetyx messieri*	Sonic muscles		[10]
Caesionidae	*Caesionidae*	*Caesio caerulaurea*			[11]
	Pterocaesio sp.				
Caproidae	*Antigonia capros*	*Capros aper*	Dorsal and pelvic fin	Stridulatory noise	[4,12]

Carangidae	*Alectis indica*	*Alectis ciliaris*		Sharp bark or scratchy burst	[1,13]
	Atule mate *Decapterus macarellus* *Decapterus tabl* *Uraspis helvola*	*Carangoides bartholomaei*	Swim bladder?	Knocs and thumps	[1]
		Caranx crysos	Swim bladder and adjacent pharyngeal teeth	Low-pitched thump, loud rasps (sometimes prolonged like scraping of rought file), loud bursts of grating, no tooth sounds during feeding, weak scraping followed by loud bursts, weak scraping	[1,13,14]
				Pharyngeal stridulation	[15]
				Horn-like sounds?	[2,16]
		Caranx hippos	Stridulation of weel-toothed mouth reinforced by large swim bladder	Series if grunts, sustained croaking with a marked scratchy quality	[1,4]
			Pharyngeal teeth	Stridulation	[17]
				Series of short, rapid, rasping croaks	[18]
		Caranx latus	Pharyngeal teeth stridulation amplified by swim bladder, swim bladder vibrate also by body muscle contraction	Thumps, escape sounds, feeding sounds, toothy grunts, thump-like	[1]
				Thump, volleys of thump-like sounds, pharyngeal stridulation	[15]
		Caranx ruber	Swim bladder in conjunction with teeth	High-pitched grunts	[1]
			Pharyngeal stridulation	Stridulation	[15]
			Movements of fish bodies in the water	Low-pitched swimming and veering sounds	
			Swimming sound of individuals or schools	‘Blast’	[19]
		Chloroscombrus chrysurus	Swim bladder and pharyngeal teeth	Low-knocking, series of short fast grunts, tiny knocks, raspy grunts	[1]
			Scraping the upper and lower pharyngeal patches together	Stridulatory sound, a harsh, almost continuous croak	[20]
		Elagatis bipinnulata	Swim bladder and pharyngeal teeth	Escape grunts similar to other carangids	[1]

Naucrates ductor	Pharyngeal teeth stridulation augmented by adjacent swim bladder	Tumping sound? Production of characteristic carangid stridulation possible.	[1,13,14]
Oligoplites saurus	Swim bladder?	Escape thumps, weak knock	[1]
Selene brevoortii	Air bladder resonance? Pharyngeal stridulation?	'Grunt like a young pig'	[4]
Selene peruviana	Scrape upper and lower pharyngeal patches	Almost continuous rasping sound	[4]
Selene setapinnis	Swim bladder and pharyngeal teeth	Almost continuous pig-like grunting, loud scratchy grunting	[1]
	Scrapping the upper and lower pharyngeal patches together	Stridulatory sound: harsh almost continuous croak	[20]
Selene vomer	Swim bladder and pharyngeal teeth	Loud grunts	[1]
Seriola dumerili	Similar to *S. zonata*	Knocks, thumps	[1]
		Tuba-like sound	[2,16]
		Bait-eating and swimming sound	[21]
Seriola lalandi			[22]
Seriola quinqueradiata		Bait-eating and swimming sound	[21]
Seriola rivoliana		Similarity with an unknown sound from the field.	[23]
Seriola zonata	Sound production synchronized with opening of mouth, in which position pharyngeal teeth scraped in close proximity to swim bladder.	Sharp knocks	[1]
Trachinotus falcatus	Similar to *T. goodei*	Consistent weak escape sounds.	[1]
Trachinotus goodei	Swim bladder and pharyngeal teeth in young, mostly swim bladder in older fish	Weak knocks, escape knocks, weak chewing sounds during feeding, escape knocks in rapid series with violent body twisting.	[1]
Trachinotus paitensis	Hitting together of dorsal fins	Grinding and clicking noises	[4]

		Trachurus japonicus	Pharyngeal teeths while feeding	Harsh grating	[4]
			Quick vibrations of the body immediately behind the pectorals, short stretching movements of the lower jaw => friction of pharyngeal teeth and airbladder vibrations	Low snoring, low-pitched sound	[24]
				Bait-eating and swimming sound	[21]
		Trachurus mediterraneus			[25]
		Trachurus trachurus			[26]
		+ *Selar* and *Alectis* species			
	Selar boops	*Selar crumenophthalmus*		Sustained or irregular series of toothy grating sounds and a few knocks	[1]
Carapidae	*Carapus mourlani*	*Carapus mourlani*	Central constriction in their swim bladder	Single and double-pulsed calls	[27]
				Train of 2-6 pulses	[28]
				Suite of double pulses	
				Staccatos of 2-17 weak pulses	
				Hums (rare) usually preceded by a knock	
Chaetodontidae	*Chaetodon* sp.	*Chaetodon auriga*	Vertical elevation of the head and a strong protrusion of the jaws	Head bob–jaw protrusion pulse: pulses and less frequently two-pulse train	[29]
		Chaetodon kleinii	Jaw protusion	Short pulse sound	[29]
				HF pulse	[3]
		Chaetodon multicintus	Motion of the whole body directed at the nearby conspecific	Tail slap	[29]
				Body shake	
			Movements of the caudal peduncle and/or extension of the pelvic fins	Body motion	
				Body motion pulse train	
				Pulse	[3]
				Tail slap	[30]
				Low frequency pulse	

				High frequency click	
				Jump	
				Dorsal-anal fin erect	
				Pelvic fin flick	
				Grunt train	
		Chaetodon ocellatus		Small thumps and knocks, some double and with toothy clicks	[1]
		Chaetodon ornatissimus	Movements of the caudal peduncle and/or extension of the pelvic fins	Body motion = pulse	[29]
			Motion of the whole body directed at the nearby conspecific	Tail slap	
				Pulse	[3]
		Chaetodon striatus		Small knocks, almost inaudible but definite	[1]
		Chaetodon unimaculatus	Clear extension and retraction movement of the jaws	Head-bob-jaw protusion	[29]
			Motion of the whole body directed at the nearby conspecific	Tail slap	
	Heniochus singularius	*Heniochus chrysostomus*	Extrinsic sonic drumming muscles in association with the articulated bones of the ribcage	Isolated pulses	[31]
				Trains of 4 to 11 pulses sometimes preceded by an isolated pulse	
Congridae	*Ariosoma scheelei* *Ariosoma sereti* *Bathyuroconger vicinus* *Congriscus marquesaensis* *Uroconger* sp.	*Conger conger*		Mechanical noise	[13,14]
Dactylopteridae	*Dactyloptena sp.*	*Dactylopterus volitans*		Bursts of barking	[1]
			Intrinsic muscles	*Sons commensurables*	[32]
Diodontidae	Diodontidae	*Diodon hystrix*	Stridulation	Loud toothy scrapes during feeding, jaw stridulation	[1]
				Toothplate stridulation	[17]

		Chilomycterus schoepfii	Stridulation	Toothy whines, pronounced thump	[1,13,14]
		Chilomycterus reticulatus	Stridulation	Erking series, rasps, toothy sounds	[1]
		Chilomycterus spinosus	Grating of the incisor teeth, during and after inflation	Stridulatory sound: high-pitched nasal whining scrape	[20]
Gobiidae	*Gnatholepis anjerensis* *Gunnellichthys monostigma* *Kraemeria bryani* *Oxyurichthys notonema* *Priolepis farcimen* *Priolepis sp.* *Valenciennea strigata*	**Numerous species from genera *Bathygobius, Gobiosoma, Gobius, Gobiusculus, Knipowitschia, Neogobius, Padogobius, Periophthalmodon, Pomatoschistus, Ponticola,* and *Zosterisessor* emit low-intensity sounds.**			
Holocentridae	*Myripristis chryseres*	*Myripristis jacobus*	Sonic muscles	Grunts, singly produced or in bursts, toothy clicks, short bursts of grunting	[1]
		Myripristis parlinia *Myripristis violacea*		Grunts	[33]
		Myripristis berndti	Sonic muscles	Knocks, growls, grunts, and staccatos	[34]
				Knock, growl, grunt, staccato	[3]
		Myripristis amaena		Growl, grunt, staccato	[3]
		Myripristis kuntee *Myripristis violacea*	Extrinsic sonic muscles	Harmonic train of pulses = grunts	[35]
	Ostichthys archiepiscopus *Ostichthys ovaloculus* *Pristilepis* sp.	*Holocentrus adcensionis*	Vibration by body musculature of very large swim bladder	Series of grunts, isolated grunts, prolonged grunting, thumps, bursts of 2-5 grunts, low grumbling, single and volleyed grunts?	[1]
			Stridulation of pharyngeal teeth reinforced by swim bladder	Higher-pitched rasping grunts	
			Swim bladder embraced by modified ribs expanded and flattened to serve	Thumps repeated singly at irregular intervals or volleyed (4-20), volleys (3-20)	[17]

	as drumheads activated by attached musculature		
		Narrow-band, short pulses, regularly repeated in short bursts of 10-20, fundamental frequency ca. 75 Hz	[16]
	Sonic muscles		[36]
Holocentrus rufus	Swim bladder vibrate by simultaneous contractions of paired bilateral muscles		[37]
	Fast-contracting sonic muscles.	Harmonic sounds made of a variable number of pulses with gradually increasing periods towards the end of the call.	[35]
			[38]
	Sonic muscles		[36,39]
Neoniphon aurolineatus		Grunt, knock, staccato, train of grunts, train of staccato Growl= rapid series of contiguous pulses that decreased in rate over time	[3]
Neoniphon sammara		Growl, knock, staccato, train of staccato	[3]
	Fast-contracting sonic muscles.	Harmonic sounds made of a variable number of pulses with gradually increasing periods towards the end of the call.	[35]
	Sonic muscles		[39]
Sargocentron cornutum	Sonic muscles		[39]
Sargocentron diadema	Fast-contracting sonic muscles.	Harmonic sounds made of a variable number of pulses with gradually increasing periods towards the end of the call.	[35]
Sargocentron seychellense	Sonic muscles		[39]
Sargocentron spiniferum		Sounds	[3]
	Fast-contracting sonic muscles.	Harmonic sounds made of a variable number of pulses with gradually increasing periods towards the end of the call.	[35]
Sargocentron tiere		Growl, grunt, knock, series of growl, series og knock	[3]
	Fast-contracting sonic muscles.	Harmonic sounds made of a variable number of pulses with	[35]

				gradually increasing periods towards the end of the call.	
		Sargocentron wantherythrum	Sonic muscles		[39]
		+ *Myripristis* species.			
Labridae	*Bodianus bilunulatus*	*Bodianus rufus*		Only feeding noises	[1]
	Bodianus paraleucostictic us				
	Cirrhilabrus claire *Oxycheilinus lineatus* *Polylepion russelli*	*Gomphosus varius*		Pulse I, pulse II, buzz, train of pulse I, train of pulse II	[3]
				Pulse train (type I and II)	[40]
		Halichoeres bivittatus	Swibladder? Strong teeth?	Feeble knocks and thumps, small toothy feeding sounds	[1]
			Moving contact of teeth on rock, conchs etc during feeding	Stridulatory rasping	[2]
		Halichoeres garnoti		Feeding noises	[1]
		Halichoeres radiatus	Swibladder? Strong teeth?	Thumps, knocks, toothy feeding noises	[1]
				Feeding sounds	[17]
		Labrux mixtus *Symphodus melops*			[41]
		Labrus viridis			[26]
		Lachnolaimus maximus	Large swim bladder? Strong jaw and pharyngeal teeth?	Escape sounds, knocks coincident with body twist	[1]
		Symphodus cinereus *Symphodus ocellatus* *Symphodus tinca*			[42]
		Tautogra onitis	Swim bladder vibrates by violent contraction of skeletal muscles, slight striking or possible rubbing of ribs, and drum-beating motion of opercula	Deep thumps, bark-like grunts, loud noise from crushing and dragging shells on bottom, escape sounds, thumps, mechanical noise incident to feeding, loud thumps	[1,13,14]
		Tautogolabrus adspersus	Swim bladder compressed by violent contraction	Low-frequency knocks synchronized with muscular twinge and vibratory shudder,	[1,13,14]

			of skeletal muscles; teeth in jaws and granular pharyngeals adapted for crushing	loud scrunching noise during feeding	
		Thalassoma bifasciatum		Feeding noise	[1]
		Thalassoma duperrey		Pulse I, pulse I blended, pulse II, train of pulse I, train of pulse II	[3]
				Pulse train (type I and II)	[40]
		And *Bodianus*			
Leiognathidae	*Deveximentum insidiator*	*Leiognathus equula*		Soniferous	[43]
	Gazza minuta		Friction of premaxilla and frontal	Noise	[24]
Lethrinidae	*Gymnocranius confer grandoculis* *Lethrinus rubrioperculatus*	*Lethrinidae*			[44]
Lutjanidae	*Lutjanus kasmira*	*Lutjanus kasmira*		Pulse	[3]
	Lutjanus argentimaculatus	*Lutjanus griseus*	‘Swim bladder’	Low thumps and knocks, sometimes followed by growls	[1]
	Lutjanus sp.	*Lutjanus jocu*	‘Swim bladder’	Thumps	
		Lutjanus apodus	‘Swim bladder’	Thumps, knocks, singly or in short series, booms	
		Lutjanus analis	‘Swim bladder’	Knock, thump, toothy scraping	
		Lutjanus synagris	‘Swim bladder’	Knocks	
		Lutjanus mahogoni	‘Swim bladder’	Possibly thump	
	Aphareus furca *Aphareus rutilans* *Etelis carbunculus* *Etelis coruscans* *Etelis radiosus* *Aphareus furca* *Parapristipomoides squamimaxillaris*	*Hoplopagrus guentherii*		Maybe sound during feeding	[1]
		Ocyurus chrysurus	Swim bladder?	Low-pitched thrumps, escape sounds, toothy clicks, weak knocks, weak knocks, some louder bumps, very feeble thumps	[1]
		Rhomboplites aurorubens	Swim bladder?	Feeble knocks and thumps	[1]

	Pristipomoides argyrogrammicus *Pristipomoides auricilla* *Pristipomoides filamentosus* *Pristipomoides flavipinnis* *Pristipomoides sieboldii* *Pristipomoides zonatus* *Randallichthys filamentosus*	And ***Lutjanus*** species.			
Macrouridae	*Malacocephalus laevis*	*Malacocephalus laevis*	Drumming muscles (swim bladder to body wall)		[45]
	Malacocephalus nipponensis *Malacocephalus sp.*	*Malacocephalus laevis* *Malacocephalus occidentalis*			
			Drumming muscles		
Mullidae	*Mulloidichthys pfluegeri*	*Mulloidichthys flavolineatus*		One poor quality sound	[3]
	Mulloidichthys sp. *Mulloidichthys vanicolensis*	*Mulloidichthys martinicus*	Muscles + teeth	Thumps, knocks, scratchy sounds	[1]
	Parupeneus sp.	*Parupeneus insularis*		Pulse, pulse train	[3]
		Parupeneus multifasciatus		Pulse, pulse train, HF pulse	
		Parupeneus porphyreus		Pulse, pulse train	
Myctophidae	*Benthosema fibulatum* *Diaphus splendidus* *Lampadena luminosa* *Symbolophorus evermanni*	Myctophidae		The most likely chorus source is considered to be fishes of the family Myctophidae foraging in the water column	[46]
Ophidiidae	*Brotula multibarbata*	*Acanthonus armatus*	The swim bladder is apparently unfit as a soundproducing organ, but perhaps the pharyngeal teeth can produce sound by stridulation		[47]
		Barathrodemus manatinus	Two pairs of sonic muscles:		[48]

	ventrolateral sound producing muscles (skull => swim bladder) and ventromedial muscles (skull => ribs attached to the 4th vertebra) in males, in females: only 1 pair (ventromedial)		
Bathyonus pectoralis	Single pair of ventral medial muscles that connects to a smaller and thinner swim bladder via a long tendon, Larger muscle fibers suggesting an adaptation to facilitate rapid bladder movement for sound production		[49]
Dicrolene introniger	Four pairs of sonic muscles: two ventral muscles (ventral medial and ventral lateral) and two intermediate muscles (intermediate medial and intermediate lateral)		[49]
Genypterus chilensis	Modified vertebra, three pairs of sonic muscles and the swim bladder	Calls made of 7-19 units	[50]
Genypterus maculatus		Sound 1 = train of pulses that vary in amplitude and pacing	[50]
		Call 2 = growl (harmonic, tonal)	
Hoplobrotula armata	Four pairs of sonic muscles	Sounds suggested to be more intense than in Neobytites	[51]
Lepophidium jeannae		Maybe produce 100 Hz Pulsing	[52]

	Lepophidium profundorum	Ventral and dorsal antagonistic sonic muscles		[53,54]
	Monomitopus metriostoma	Sonic muscles		[10]
	Neobythites longipes		Sounds suggested to be longer than in *Hoplobrotula armata*	[51]
	Neobythites unimaculatus			[51]
	Parophidion vasali			[55]
	Neobythites gilli	Four pairs of sonic muscles (ventral and intermediate)		[56]
	Neobythites steatiticus	Sonic muscles		[10]
	Porogadus miles	Single pair of ventral medial muscles that connects to a smaller and thinner swim bladder via a long tendon		[49]
	Typhlonus nasus	Might be able to produce sound by stridulation with the teeth		[47]
	And ***Ophidion*** species			
Ophidion muraenolepis	*Ophidion rochei*		Long, multiple-pulsed calls	[57]
		Three pairs of sonic muscles		[58]
		Sonic muscles and rocker bone	Mate calls	[59]
		Differences in morphology of sonic muscles, swim bladder, supraoccipital crest, first vertebrae and associated ribs (rocker bone present vs. absent)	Males: Non harmonic multiple-pulsed sounds	[60]
			Females and juveniles harmonic sounds	
		Three pairs of sonic muscles, rocker bone, modified neural arch	Male courtship calls = train of pulses that increase in amplitude and decrease in rate	[61]
			Long trains of Low-frequency pulses	[62]

				Pulses series with alternating pulse period (APPPS)	[63]
		Ophidion barbatum	Three pairs of sonic muscles		[64]
		Ophidion marginatum			[65,66]
				Mainly crepuscular repeated pulses	[67]
			Sonic muscles associated with the swim bladder and vertebral components.	Chatter sound	[68]
				Croaking sound	[69]
			2 or 3 pairs of sonic muscles	Broad-band pulsed calls at dusk	[70]
			Specialized musculature, swim bladder and modified anterior vertebral components		[71]
Ostraciidae	*Lactoria* sp.	*Lactoria cornuta*	Extrinsic and intrinsic sonic muscles	Hums (= long train of pulses) and clicks	[72]
		Lactoria fornasini		Spawning sound (= a highpitched hum),	[73]
	Ostracion sp.	*Ostracion cubicus*	Extrinsic and intrinsic sonic muscles	Hums (= long train of pulses) and clicks	[74]
		Ostracion meleagris	Extrinsic and intrinsic sonic muscles	Spawning sound, bump, and buzz. Hums (= long train of pulses) and clicks	[74,75]
	Tetrosomus sp.	*Acanthostracion quadricornis*	Swim bladder and associated muscles, stridulating teeth	Short growls, some in long series, clicks, sustained rasping, chewing noise, loud growling	[1]
				Chorus of nocturnal ‘frog-like’ sounds (1000-3400 Hz) tentatively attributed to this species?	[2]
		Lactophrys bicaudalis	Vibration of swim bladder anticipated, stridulation of teeth.	Clicks, scrapes, toothy grunts during feeding, clicks, scrapes	[1]
		Lactophrys trigonus	Swim bladder and associated muscles, stridulating teeth	Feeding noise only, low-frequency groans, toothy scrapes singly or in combination, groans, rasps, scrapes	[1]

		Lactophrys triqueter	Swim bladder and associated muscles, stridulating teeth	Single faint clicks, low-pitched growls, loud scrapes	[1]
		See *Ostracion* and *Lactoria* species			
Peristediidae	*Satyrichthys* sp.	*Satyrichthys rieffeli* *Satyrichthys welchi*	Not reported sonic family but close relationship to known sound-makers.		[4]
Pleuronectidae	*Nematops nanosquama*	*Hippoglossoides platessoides*		Mechanical noise	[13,14]
		Pseudopleuronectes americanus		Mechanical noise	[13,14]
Pomacanthidae	*Centropyge boylei*	*Centropyge loriculus*		Pulse	[3]
	Centropyge narcosis				
	Genicanthus bellus	*Apolemichthys arcuatus*		Pulse	[3]
		Holacanthus bermudensis	Swim bladder?	Thumps, rasps, series of scratchy grunts	[1]
		Holacanthus ciliaris	Swim bladder? Body twist	Knocks, (small) thumps	[1]
				Grunt single or repeated (vibrant, deep grunts not easily distinguished from those of serranids)	[17]
		Holacanthus tricolor	Swim bladder?	Escape sounds, weak knocks	[1]
		Pomacanthus arcuatus	Swim bladder?	Thumps, knocks, quick escape	[1]
		Pomacanthus paru		Thumps, (low) knocks, escape sounds, feeding sounds	[1]
			Swim bladder vibrate by adjacent axial muscles	Grunts (change of signals from short grunt to moan-like sound?)	[17]
		See *Centropyge*			
Pomacentridae	*Chromis* sp. 2 (Tahiti Island)	*Chromis chromis*		Pop made of a single pulse	[76]
		Chromis hanui		Pulse	[3]
		Chromis ovalis			
		Chromis verater		Pulse Pulse train	
		Chromis atripectoralis *Chromis viridis*			[77]
	Pomacentridae sp. (Rapa Is.)	**See *Chromis* species in addition to numerous sonic species from *Dascyllus, Hypsypops, Plectroglyphidodon, Pomacentrus, Premnas, Stegastes, Pomatomus, Abudefduf, Similiparma* and *Amphiprion*.**			

Priacanthidae	*Cookeolus japonicus*	*Heteropriacanthus cruentatus*	Muscle (swim bladder – body wall)	Sounds composed of a rapid series of pulses	[78]
		See *Priacanthus* species			
	Priacanthus hamrur	*Priacanthus meeki*	Muscle (swim bladder – body wall)	Sounds composed of a rapid series of pulses	[78]
		Priacanthus macracanthus	Muscles		[79,80]
Scombridae	*Thunnus maccoyii* *Thunnus obesus*	*Thunnus albacares* *Thunnus thynnus*	Possibly caused by contraction of muscles about the swim bladder	Low-frequency pulses usually single, double pulses, quadruple pulse train, high frequency (= jaw snap sounds)	[81]
Scorpaenidae	*Neomerinthe naevosa*	*Neomerinthe beanorum*	Similar to *Aleutianus-zacentrus* type 1 (cranium, vertebral parapophyses)		[82]
	Pontinus macrocephalus	*Pontinus longispinis*	*Aleutianus-zacentrus* type 1 extrinsic gasblader muscle, attached to vertebra 8, 9 and 10 and the cranium		[82]
	Pteroidichthys amboinensis *Pteroidichthys caussei*	*Brachypterois serrulifer*	Two large gasbladder muscles (type II, Taczanowskii subdivision) originating on the cranium and inserting usually on the swim bladder. No connection to the pectoral girdle.		[82]
		Dendrochirus zebra	Two large gasbladder muscles (type II, Taczanowskii subdivision) originating on the cranium and inserting usually on the swim bladder. No connection to the pectoral girdle.	Train of 4 to 25 pulses	[82,83]

	Iracundus signifer	Possibly caused by contraction of muscles about the swim bladder		[82]
	Pterois miles	Similar to *Aleutianus-zacentrus* type 1 (cranium, vertebral parapophyses)	Repetitive pulse call (1 to 4 pulses = knocks) with occasional occurrences of up to 8 pulses Hum + intermittent pulses	[84]
	Pterois radiata	Two large gasbladder muscles (type II, Taczanowskii subdivision) originating on the cranium and inserting usually on the swim bladder. No connection to the pectoral girdle.	Knocks and hums	[82,83]
	Pterois volitans	Muscles closely associated with the swim bladder	Repetitive pulse call (1 to 4 pulses = knocks) with occasional occurrences of up to 8 pulses Hum + intermittent pulses	[83,84]
	Scorpaenodes parvipinnis	Two large gasbladder muscles (type II, Taczanowskii subdivision) originating on the cranium and inserting usually on the swim bladder. No connection to the pectoral girdle.		[82]
	Sebastapistes cyanostigma	Similar to *Aleutianus-zacentrus* type 1 (cranium, vertebral parapophyses)		[82]
	+ *Scorpaena, Scorpaenopsis, Pontinus*, and *Neomerinthe* species			
Scorpaena lacrimata	*Scorpaena plumieri*		Low-pitched growl (questionable)	[1]
	Scorpaena agassizii	Similar to *Aleutianus-zacentrus* type 1 (cranium, vertebral		[82]
	Scorpaena brasiliensis			
	Scorpaena elongata			
	Scorpaena guttata			

		Scorpaena mystes	parapophyses) with 4 tendons, one attached to each of the parapophyses of the 6th, 7th, 8th, 9th vertebrae		
		Scorpaena russula			
		Scorpaena porcus			
		Scorpaena scrofa	Muscles that originate on the exoccipital bone and insert on the anterior part of the backbone, from the sixth to the ninth vertebrae. The complete apparatus consists of bilaterally symmetric muscular bundles (three muscular bundles on each side), connected to four long tendons, which insert on lateral branches of the haemal arch (vertebrae VI and VII) or on haemal spines (vertebrae VIII and IX) underneath different vertebral bodies No swim bladder	/kwa/	[85]
		Scorpaena notata		/kwa/	[85]
	Scorpaenopsis pusilla	*Scorpaenopsis gibbosa*		Low grinding noise	[1,4]
Serranidae	*Cephalopholis aurantia*	*Cephalopholis formosa*			[86]
	Cephalopholis igarashiensis	*Cephalopholis cruentata*	Swim bladder vibrate by contraction of body muscles.	Thumps, rumbles, knocks?	[1]
	Cephalopholis sexmaculata	*Cephalopholis fulva*	Swim bladder vibrate by	Boom, thumps, knocks, escape sounds	

		contraction of associated axial muscles.		
	Cephalopholis argus		Pulse	[3]
Epinephelus morrhua *Epinephelus retouti* *Epinephelus tuamotuensis*	*Epinephelus adscensionis*	Swim bladder vibrate by axial muscles	Long loud bursts of vibrant grunting, single thumps, knocks, grunts	[1,17]
	Epinephelus drummondhayi	Swim bladder vibrate by associated muscles	Vibrant grunting	[1]
	Epinephelus erythrurus			[86]
	Epinephelus guttatus		Low-frequency series of pulses repeated at a variable rate, one or moreportions of the call had a high pulse rate, whichappears tonal	[87]
		Swim bladder vibrate by associated musles	Series of grunts during feeding, deep grunt, boom, thump, escape sounds	[1]
			Narrow-band short pulses (grunt-like sounds) single or in irregular groups	[16]
				[38,88–90]
	Epinephelus itajara	Swim bladder and associated musles	Boom sometimes followed by two grunts, bursts	[1]
			Single-pulse calls with a low dominant frequency	[91]
				[92,93]
	Epinephelus marginatus		Single booms, serial booms (rarely recorded), growls (= short multi-harmonic calls with a slight downward frequency modulation)	[94]
			Low-frequency downsweep (LDS)	[63]
			Low-frequency pulse sequence (LPS)	
	Epinephelus polyphekadion			[95]
	Epinephelus morio	Swim bladder vibrate by associated muscles	One loud boom	[1]
			Low-frequency pulses, short calls (=1 to 4 brief pulses followed by a growl), pulse train calls (=a short call immediately followed by a	[96]

			rapid series of broadband bursts)	
				[38,97–100]
	Epinephelus striatus		Deep booms, sustained rumbles, loud grunts, loud grinding of teeth, low grunts, vibrant grunts (single or in rapid series), serranid-like grunts	[1]
		Swim bladder vibrate by contraction of attached axial muscle fibers.	Vibrant grunt (single or repeated)	[17]
			Deep booms, sustained rumbles, loud grunts, loud grinding of teeth, low grunts	[14]
		Single bilateral muscle vibrate inact swim bladder.		[101]
			Mooing-like sound maybe produced by this species.	[2]
				[38,89,90,102]
			Pulse train	[103]
			Tonal sound	
Hyporthodus octofasciatus	*Hyporthodus nigritus*	Swim bladder vibrated by associated muscles	Booms, thumps	[1]
Belonoperca pylei	*Alphestes afer*	Swim bladder and associated muscles	Escape sounds, knocks and low thumps	[1]
Liopropoma erythraeum	*Anthias anthias*		Potentially sonic	[23]
Liopropoma lunulatum	*Centropristis striata*	Swim bladder vibrates by general body contraction and striking of opercula against body, pharyngeal teeth stridulation	Single weak grunts, small thumps, low thumps, possible scrapes	[1,13,14]
Odontanthias tapui				
Plectranthias bennetti				
Plectranthias kamii	*Diplectrum formosum*	Swim bladder vibrate by contraction of body musculature	Single escape sound, rasp, burst of one-five low grunts	[1]
Plectranthias rubrifasciatus				
Plectranthias sp.	*Hypoplectrus unicolor*	Contraction of the abdominal musculature externally observed.	Series of sound pulses	[104]
Plectranthias taylori			Short duration frequency modulated downward (600 Hz to 200 Hz) tonal sweep followed by a longer broadband noise	
Pogonoperca punctata				
Saloptia powelli	*Mycteroperca bonaci*	Swim bladder vibrate by sudden	Spontaneous single booms, sustained thundering rolls, loud	[1]

			contraction of body musculature	feeding noises, loud percussive sound	
				Ocassional single, 4-beat and 6-beat but usually 5-beat burst of sounds. Each of the five 'drum-beats' consists of five sound pulses with rapidly dropping pitch	Tavolga 1958 IN [1]
				Pulse train undulation	[105]
				Series of pulses followed by a longer tonal section, Not all signals included the discrete pulses prior to the tonal section	[106]
					[38,90]
		Mycteroperca interstitialis	Swim bladder and associated muscles	Low-pitched serranid grunt	[1]
		Mycteroperca jordani		Short and long tonal sounds, as well as multiple combinations, preceded and followed by a variable number of short, low frequency, repeated pulses	[107,108]
		Mycteroperca microlepis	Swim bladder and associated muscles	Weak typical serranid thump	[1]
		Mycteroperca venenosa	Swim bladder and associated muscles	Feeding noise Loud deep booms similar to other groupers	[1]
					[102]
					[38,89,90]
				Pulse train calls, tonal call and sequential combination	[109]
		Rypticus bistrispinus	As other serranids	Very weak knocks	[1]
		Rypticus saponaceus	As other serranids	Small hollow knocks	[1]
		Serranus tigrinus	Probably swim bladder vibrate as in other serranids	Weak knocks and thumps	[1]
		See *Cephalopholis, Epinephelus, Hyporthodus* and *Pseudanthias,*			
	Pseudanthias privitera	*Pseudanthias bicolor*		Pulse	[3]
	Pseudanthias ventralis				
Setarchidae	*Setarches guentheri*	*Setarches guentheri*	Two large gasbladder muscles (type II, Taczanowskii subdivision) originating on the cranium and inserting usually on the swim		[82]

			bladder. No connection to the pectoral girdle.		
Sphyraenidae	*Sphyraena acutipinnis*	*Sphyraena viridensis*		Sounds maybe produced by this species.	[23]
		Sphyraena barracuda		Thumps, knocks during swift motion	[1]
		Sphyraena guachancho	As *S. barracuda*		[1]
Syngnathidae	*Hippocampus kuda* *Hippocampus* sp.	*Hippocampus erectus*	Sharp flexion of head and rapid movement of mouth parts	Loud clicks similar to snapping of finger against thumb, snaps	[1,13,14, 110]
			Supraoccipital-coronet articulation (stridulation)	Clicks	[111]
		Hippocampus sp.	Muscular closing and sudden expansion of lower jaw	Snaps, resembled in strength and tone the snapping sound produced by *Alpheus ruber.*	[112]
		Hippocampus hippocampus		Tambour-like	[32]
		Hippocampus zosterae	Supraoccipital-coronet articulation (stridulation)	Feeding clicks	[111]
		Hippocampus comes	Likely come from two sound producing mechanisms	Click	[113]
			Vibration observed at the cheek	Growling	
		Hippocampus guttulatus			[42]
		Hippocampus reidi		Click	[114]
			Body vibrations	Growl (= serie of sound pulses)	
Tetraodontidae	*Sphoeroides pachygaster*	*Sphoeroides nephelus*	Grating of the incisor teeth	Stridulatory sound (high-pitched, nasal, whining scrape)	[20]
		Sphoeroides testudineus	Jaw stridulation	Loud single scrapes, erks, rapid paris of low-high pitch	[1]
		Sphoeroides maculatus	Grinding of upper and lower plates in mouth. Possible participation of swim bladder	Long bursts of creaking erk-erks, scrapes, erls, low dull thumps, double erks	[1,13,14]
		Sphoeroides spengleri	Jaw stridulation		[1]
			Toothplate stridulation		[17]
Uranoscopidae	*Genyagnus monopterygius*	*Uranoscopus scaber*	Sonic morphology		[115]

Zanclidae	*Zanclus cornutus*	*Zanclus cornutus*	Pulse, pulse train (2 events per train)	[3]
Zeidae	*Cyttomimus affinis*	*Zeus faber*	Barks	[116,117]
				[32]

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