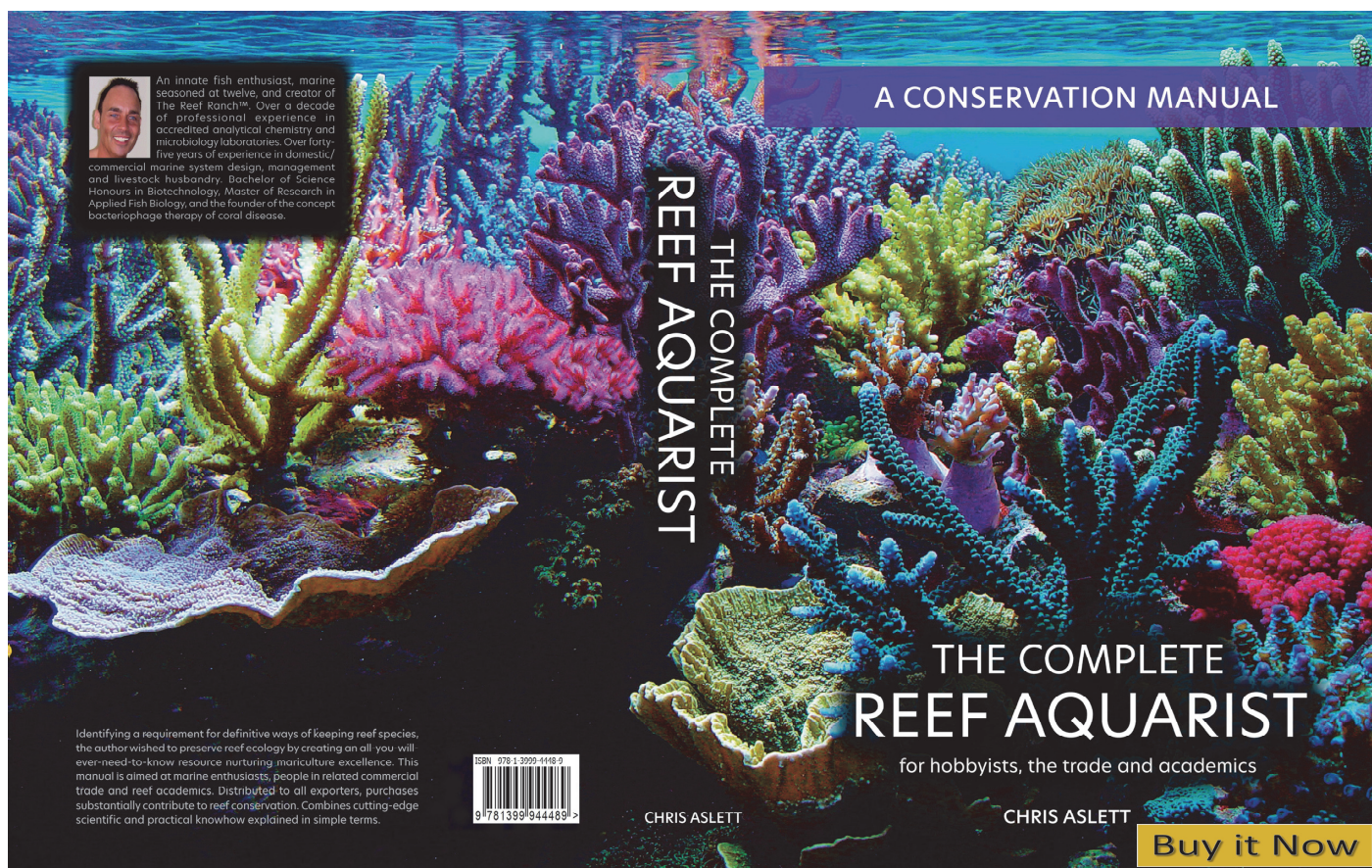




The Complete Reef Aquarist – A Conservation Manual for the hobbyists, the trade and academics

By
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Chapter 7: Fish Compatibility

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Fig 877. Powder blue surgeonfish (*Acanthurus leucosternon*; Acanthuridae) are aggressive yet useful reef janitors.

Corals may be mismatched with your system, fish, and one another; nevertheless, the greatest miscalculations occur when we purchase fish. There are intraspecific traits, yet all are individuals with unique personalities (Budaev & Brown 2011; Tosetto *et al.* 2017).



Fig 878. Regal tang (*Paracanthurus hepatus*; Acanthuridae) are quirky browsers of nuisance "algae".

Teleosts are adapted to a vast range of habitats: oceanic, reef, and kelp forest, are but a few of many, yet most ornamentals originate from reefs (Friedlander 2000). For a better understanding of wild reef ecology see: Introduction, Reef Zones: Macrohabitats.

Reef dwellers are exceedingly competitive because it is where the finest nutrition and nurseries are found, while sustenance and procreation are probably the utmost motivators for viewing others as rivals. Fish compete fiercely for nourishment in captivity, yet for species such as clownfish that readily

reproduce, others appear threatening to their young.



Fig 879. Achilles tang (*Acanthurus achilles*; Acanthuridae) are desirable reef custodians.

Aggression is always directed at the victim due to predation or fear, and thus if not considered food, the assailant feels somehow threatened by their rival. Those that are a comparable size and colour and consume the same diet, or those adapted to similar habitats will be seen as adversaries. Mutual residencies of demersal, pelagic, shallow, and deep-water species incite hostility, and members of the same species appear menacing unless they are the other half of a proven pair.

Competitive Feeding

Acquiring adequate nutrition becomes challenging for species that lack agility, and aquarists cannot satiate the dominant for fear of initiating coral-impairing eutrophy. Do not house seahorses with non-seahorse tankmates, because feeding members of the family Syngnathidae including species of *Hippocampus* is an arduous affair. Mesmerised, they glide slowly up to a single brine shrimp, then pause inordinately, before

ingesting it with a single gulp, whereas toxigenic box- and cowfish (Ostraciidae) with brick-like hydrodynamics must be kept with non-hostile sedate feeders.

Aggressors intentionally intimidate others by nipping them whilst they are eating, and they thus become wary and on the lookout, instead of focussing on their food. Antagonists benefit significantly, but slower-feeding species like dragonets must consume smaller prey. Red plankton, brewer's yeast, and rotifers may be concealed in recesses and crevices; however, this strategy often proves insufficient and they invariably starve, whereas those lucky enough to be caught early may be housed in refugia.

System Volume: Behavioural Effects

Fish housed in large volumes of 500 gallons or more react very differently. Freshwater red bellied piranha (*Pygocentrus nattereri*; Serrasalminidae) mature amicably in sibling groups for finite periods in domestic-sized aquaria, whereafter they brutally attack and ingest one another until merely one satiated fish remains. However, well-fed adults interact and passively shoal with community fish in significant volumes (Schleser 1997).

Lateral line canals facilitate multidimensional awareness of their surroundings by providing neurological evaluation of acceleration, displacement, pressure, and velocity (van Netten 2006). Despite the comparatively compact dimensions of the holding aquaria at the Reef Ranch™, the fish were confident, pugnacious, and poised (Fig 93.). They appeared to perceive the entire volume of the system because the sump was three times larger than the capacity of the displays.

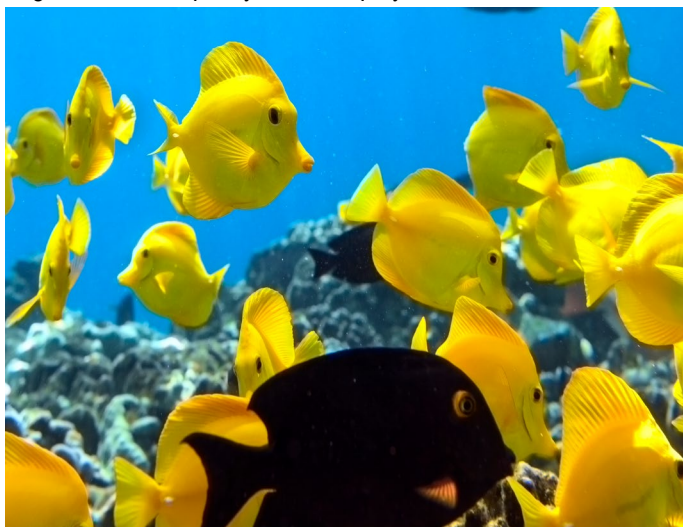


Fig 880. A hostility-free shoal of yellow tang (*Zebrasoma flavescens*; Acanthuridae).

Species-Specific Macrohabitat Requirements

A domestic aquarium must provide contrasting environments which are vital for the wellbeing of the inhabitants because tangs, surgeonfish, and angelfish require microalgae-adorned rocks upon which they browse, while large expanses of substrate are a must for flounder and sole. Blennies, jawfish, and some shrimp require burrows, whereas sand-sifting gobies and wrasse will not thrive without a 2-cm (0.8") depth of sand.

Macrohabitat and Flow

Wavemakers create zones of vigorous to medium flow while tangs, surgeonfish, angelfish, and butterflyfish must enter nocturnal torpors, and thus they rapidly lose weight and are unlikely to survive when moderate to diminished flow is lacking.

Such rockwork grottos are considered essential territory that fish forcefully defend, so construct and reserve the correct amount. Visual health assessments alert aquarists to the needs of their animals, where décor is modified to accommodate species demand. Moreover, avoid the nighttime cycles of flow devices because darkness elevates a requirement for DO.

New Additions

Introducing a new fish to the system is a trying time for both aquarist and animal and a pragmatic approach is always advised, because any measures we take must be proportional and minimally-disruptive. For example, if the residents are extraordinarily aggressive, we may have omitted essential habitat, where a disproportionate approach would rearrange the entire display to disorientate those with territory. Which may work; however, it would prove very stressful for all the inhabitants including the new arrival where impacts would likely be chronic.

We may develop strategies that circumvent incompatibility from what we comprehend, although some fish are inherently aggressive, and thus avoid their acquisition. Damselfish embrace several genera of the family Pomacentridae which are conventionally used to mature systems (Fig 885.). These exceptionally territorial and pugnacious fish are unwelcoming to recruits, whose aggression and defence becomes auditory. They ultimately grow large and require euthanising, whereas blue-green chromis (*Chromis viridis*) are hardy, benign, and entirely appropriate for developing a robust nitrogen-cycling consortium in both domestic and large commercial settings (Fig 893.). See: System Maintenance, Maturing Fish-Only Systems.

Clownfish are sufficiently resilient to establish biofilters, without which a reef seems incomplete, while they do not require an anemone. They freely associate with fleshy LPS colonies because anemones have a habit of going "walkabout", stinging corals, and blundering into flow devices where they become macerated suspensions of rotting flesh, whereas carpet anemones are more likely to stay put. Nevertheless, they are exceptionally venomous which capture and eat fish, so only house them with this in mind. See: System Design, Potential Pests: Hitchhikers.

Figures 881. to 884. introduce some species of anemonefish; however, do not buy a proven pair because they are too large and territorial to mature a domestic system. They too, are Pomacentridae affiliates, like damselfish and chromis, which are protandrous sequential hermaphrodites that mate for life. All begin life as males, and when required, the larger of the two transforms into a dominant female (Casa *et al.* 2016).

Maroon clownfish (*Premnas biaculeatus*) are hostile, therefore, purchase two that tolerate one another, but they will be aggressive towards their tankmates particularly if they breed. Always match species, albeit unless several are introduced simultaneously, clownfish will be intolerant of contrasting kinds. Even so, the aquarist must mix approximately ten, hence the system must be very mature and large, and thus acquire a small passive example, mature the system, and obtain a larger.

Undulate triggerfish (*Balistapus undulatus*; Balistidae) will kill anything including venomous volitan lionfish (*Pterois volitans*; Scorpaenidae; Fig 889.; Fig 920.). They require a dedicated aquarium, whereas other triggerfish are not reef safe which includes bluethroat triggerfish (*Xanthichthys auromarginatus*;

Balistidae). Considered compatible by some, they will often consume crustaceans, molluscs, echinoderms, and feather dusters (Fig 887.; Geomans 2012). Remarkably, that includes cleaner shrimp of the genus *Lysmata*.

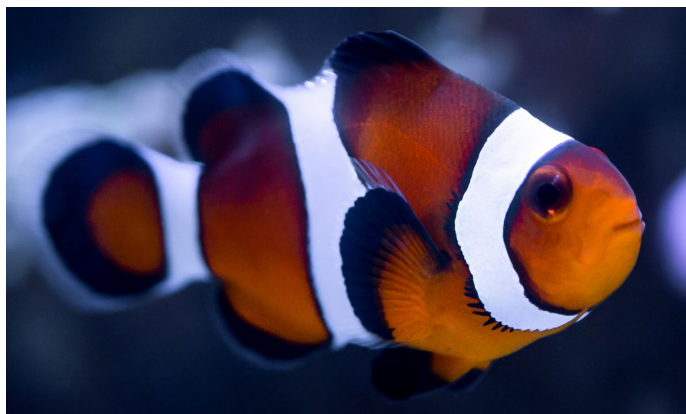


Fig 881. Common clownfish (*Amphiprion ocellaris*; top; Pomacentridae) and less hardy sebae clownfish (*A. sebae*; Sea & Reef Aquaculture 2012).



Fig 882. Tomato clownfish (*Amphiprion frenatus*; top; Pomacentridae) and percula clownfish (*A. percula*).



Fig 883. Skunk anemonefish (*Amphiprion akallopisos*; top; Pomacentridae) and pink skunk clownfish (*A. perideraion*).

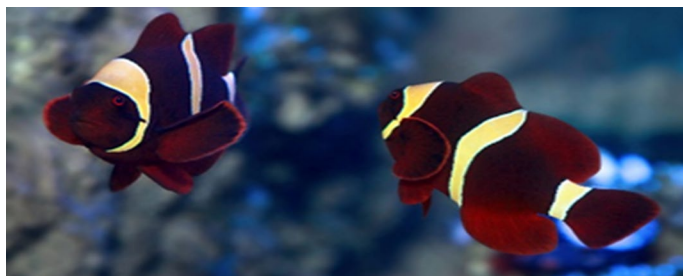


Fig 884. Clark's anemonefish (*Amphiprion clarkia*; top; Pomacentridae) and aggressive maroon clownfish (*Premnas biaculeatus*).



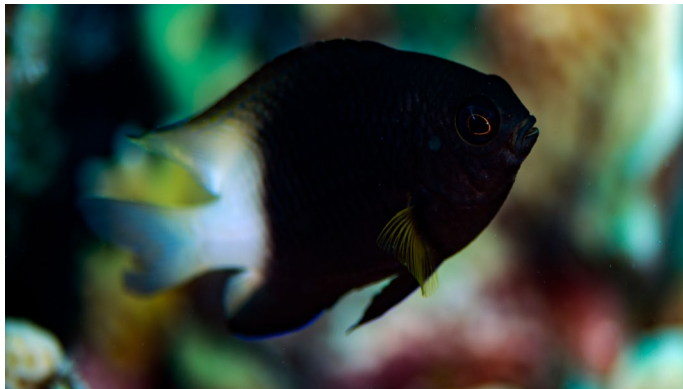


Fig 885. From top to bottom starting on the previous page: humbug damselfish (*Dascyllus aruanus*; Pomacentridae); yellowtail damselfish (*Chrysiptera parasema*); bicolour damselfish (*Stegastes partitus*), and electric blue damselfish (*Pomacentrus coelestis*). All the above and other kinds of damselfish are regarded as too hostile and insufficiently useful.



Fig 886. The problem with guidelines is that fish do not read them. A display accommodating multiple species of anemonefish. The secret to mixing clownfish may lie in purchasing several kinds at once and introducing them to an extensively mature and large system.



Fig 887. Gilded or bluethroat triggerfish (*Xanthichthys auromarginatus*; Balistidae) are ostensibly reef safe yet they consume crustaceans which form part of their natural diet. Surprisingly, members of this species have been known to strike cleaner shrimp, and they will also devour echinoderms, feather dusters, and small molluscs (Geomans 2012).



Fig 888. A captive Mauritius Picasso triggerfish (*Rhinecanthus cinereus*; Balistidae) might be a reef-appropriate species, yet they are likely to prey upon crustaceans, echinoderms, and molluscs. Nonetheless, a video at the following link shows this fish living peacefully with delicate teleosts and corals (<https://youtu.be/IYVWXGZJTjk>).



Fig 889. Undulate triggerfish (*Balistapus undulatus*; Balistidae) must be conserved solo, as they are not reef, invertebrate, or fish safe.



Fig 890. A compatible yellow tang and powder blue surgeonfish because the former is more sizeable and was probably added last.

Groups

Exceptions occur when keeping shoals, because regal tang (*Paracanthurus hepatus*) and yellow tang (*Zebrasoma flavescens*) will tolerate each other with moderate tussling in species-specific groups of five or more, whereas powder blue surgeonfish (*Acanthurus leucosternon*) are very aggressive. Intra- and inter-specific pairings will likely prove unsuccessful unless a resident is challenged with a larger example of a dissimilar-looking fish (Fig 890.). All belong to the family Acanthuridae, where their captive diet consists mainly of sizeable, enriched mysid or brine shrimp which is supplemented with microalgae. An occasional 2.5-cm (1") square of sushi nori proves beneficial, yet these fish are prone to head and lateral line erosion (HLE) caused by the improper use of GAC. See: Reef Lighting, GAC and Head and Lateral Line Erosion (HLE).



Fig 891. An insatiable herbivorous lawnmower blenny (*Salaria fasciatus*; Blenniidae).

Returning Unwanted Fish

The store may not be willing to accept returned livestock when a fish is not well-received, for which the most likely reason is transmissible disease. These retailers are reputable and have acknowledged the importance of controlling pathogens and thus support these businesses. See: Diseases of Fish.



Fig 892. A purpose-made bag intended for the terrestrial transport of fish, which should be filled with less water and more air, where wrinkles indicate insufficient pressure/underinflation.

Telephone ahead to notify the store of an imminent return and ask them how they would like the animal packaged and transported, because inadequately bagged animals expire. See: System Maintenance, Acclimating Fish.

Return Packaging

Fish must be secured in polythene (polyethylene) bags intended for terrestrial transportation, therefore visit the store and acquire a minimum of four (Fig 892.).

These bags are much taller than they are wide which accommodate a small amount of water with a large “head” of compressed air, because water must barely cover the fish’s dorsal fin when the bag is laid sideways.



Fig 893. Blue-green chromis (*Chromis viridis*; Pomacentridae) or their cousins black axle chromis (*Chromis atripectoralis*) are small passive fish with quick metabolisms suitable for maturing systems.



Fig 894. Bristle-tail filefish (*Acreichthys tomentosus*; Monacanthidae) are predators of small stinging nuisance anemones of the genera *Anemonia* and *Exaiptasia* (synonym: *Aiptasia*). See: Reef Pests, *Exaiptasia* species “Glass Anemones” and, Majano Anemones.

Small volumes of air or insufficient pressure lead to hypoxia and asphyxiation, and it is thus crucial to optimise the conditions within which fish are transported, whereas correctly packaged animals may survive many hours to days. Fish haulage was explored in System Maintenance, Acclimating Fish.





Fig 895. Mandarinfish (*Synchiropus splendidus*; previous page; Callionymidae) and *S. picturatus* are picky eaters that are unlikely to cohabit.

Size of Adversary

Larger fish are more intimidating which discourages retaliation; hence purchase smaller fish first, because residents are unlikely to menace sizeable newcomers. A powder blue surgeonfish and regal tang are unlikely to acquiesce; however, congruity may be achieved when a small powder blue encounters a heavyweight regal. Outcomes are variable insofar as each fish is unique, where a younger powder blue may tolerate a more mature yellow tang (Fig 890.).



Fig 896. Sand-sifting gobies of the family Gobiidae: blue cheeked goby (*Valenciennea strigata*; top) and diamond watchman goby (*Valenciennea puellaris*). Watchman gobies pair symbiotically with pistol shrimp of the family Alpheidae, which consume rival crustaceans of the order Decapoda after stunning them with a snap of their oversized claw (Koukouviniis *et al.* 2017).

Plan Ahead

Reef aquarists consider biomass, growth potential, and functional roles which promote ecosystem health. Rarely are fish purchased just to enhance aesthetics, inasmuch as fish are ammoniotelic which liberate significant nitrogenous waste. Their metabolic donation thus demands they compensate the system by undertaking essential housekeeping.



Fig 897. Scooter blenny (*Neosynchiropus ocellatus*; Callionymidae) are incompatible with other dragonets, yet they are gregarious as an intraspecific opposing sex pair, or when a solitary male is housed with a harem. Most male dragonets and gobies are evident because of their prominent anterior dorsal fin (Fig 898.).



Fig 898. Male red scooter blenny (*Synchiropus stellatus*; Callionymidae) are incompatible with other species of dragonet, yet they will cohabit with a female or harem.

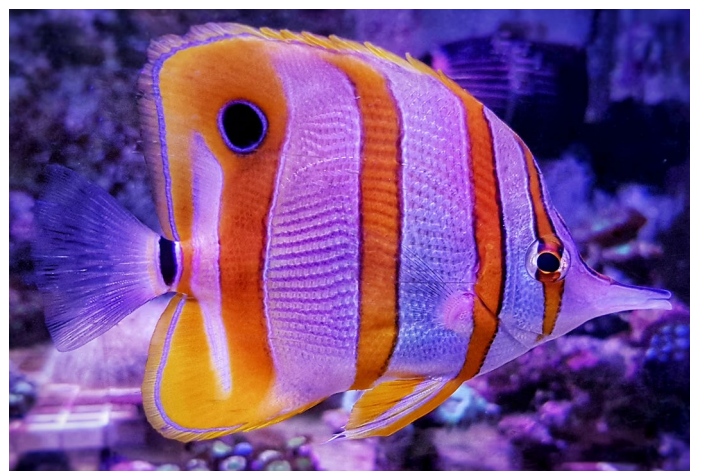


Fig 899. Longnose or forceps butterflyfish (*Forcipiger flavissimus*; top; Chaetodontidae) and copperband butterflyfish (*Chelmon rostratus*) are known to restrict "glass anemones". See: Reef Pests, *Exaiptasia* species "Glass Anemones" and, Majano Anemones. Nevertheless, exercise caution when mixing species that demonstrate a preference for the same prey.

Reef Caretakers

Before purchase, research and ascertain the fish's janitorial and biocontrol competencies as well as any species-specific requirements such as dietary constraints and habitat demands.

Tangs, surgeonfish, and lawnmower blennies (*Salarias fasciatus*; Fig 891.) browse on unsightly microalgae which recycles nutrients while rock and substrate remain "algae"-free.

Dragonettes such as **mandarinfish** (*Synchiropus splendidus* or *S. picturatus*; Fig 895.) and scooter blennies (*Neosynchiropus*

ocellatus or *Synchiropus stellatus*; Fig 897.; Fig 898.) eat very small potentially problematic organisms that might otherwise proliferate uncontrollably. File- and some butterfly-fish consume small troublesome anemones (Fig 894.; Fig 899.) yet some occasionally “nibble” corals.



Fig 900. Blue spotted jawfish (*Opistgnathus rosenblatti*; top; Opistgnathidae) are available as yellow variants, and a jawfish mouthbrooding its progeny.



Fig 901. A yellow tang (*Zebrasoma flavescens*; Acanthuridae) intimidating a flame angel (*Centropyge loriculus*; Pomacanthidae) with its white diamond-shaped scalpel on its caudal peduncle.

Sand-sifting gobies like blue cheeked goby (*Valenciennaea strigata*) and diamond watchman goby (*Valenciennaea puellaris*; Fig 896.) incessantly turbate substrate which forestalls sand bed coalescence, whereas congenial intraspecific goby and dragonette counterparts include contrasting sex pairs or single

male and harem combinations, where males have an enlarged or extended first dorsal fin (Fig 898.).



Fig 902. Sociable Randal's jawfish (*Opistgnathus randalli*; Opistgnathidae).



Fig 903. Potter's angelfish (*Centropyge potteri*; top) and eibli angelfish (*C. eibli*).

Some **Jawfish** of the family Opistgnathidae are excellent sand-sifters whereas others merely burrow, while they nurture their eggs and fry in their mouths like freshwater *Tilapia*. Blue spotted jawfish (*Opistgnathus rosenblatti*) require territory and deep substrate throughout, while they intimidate conspecific examples of the same sex (Fig 900.; Live Aquaria 2020b). Conversely, Randal's jawfish (*Opistgnathus randalli*) have peaceful natures but will be wary of their kind (Fig 902.; Live Aquaria 2020a).

All jawfish prefer a fissure or a burrow constructed from rubble and sand, whereas adding short lengths of narrow pipe to marine systems is potentially harmful, especially when one end is buried. DO in occupied burrows likely remains buoyant; however, those that are uninhabited should be filled. The risk of generating hydrogen sulphide should discourage aquarists from using lengths of pipe.

Jawfish are skittish which when spooked, may launch

themselves skyward from an uncovered aquarium, where covering a display is ill-advised without providing streams of cm-sized bubbles rising from the substrate every three feet. Such aeration *may* prevent air from becoming stale and saturated with carbon dioxide and nitrogen, nevertheless, preclude disruption of substrate. See: System Maintenance, Livestock Husbandry During System Shutdown.



Fig 904. A coral beauty (*Centropyge bispinosa*; top) and lemon peel angel (*C. flavissima*).

Pigmy angels of the genus *Centropyge* and family Pomacanthidae are voracious consumers of algae whose length rarely exceeds 16 cm (6"; Wolfenden 2019). Coral beauty (*Centropyge bispinosa*), lemon peel angelfish (*C. flavissima*; Fig 904.), flame angelfish (*C. loriculus*; Fig 901.), eibli angelfish (*C. eibli*), and Potter's angelfish (*C. potteri*; Fig 903.) are only recommended for large reefs. They may be hostile towards members of the same genus and "nibble" some corals. Colouration disparities *should* ensure congeniality amongst interspecific examples and solitary lemon peels, of which yellow tangs will be intolerant, whereas all will benefit from an occasional treat of sushi nori.

Tangs and surgeonfish have a scalpel on the base of their tail or caudal peduncle. When threatened, they posture by extending their fins whilst reversing their scalpels towards their opponents, where a skilful flick of their tail inflicts an acute laceration, which have been sustained on several aquarists' hands (Fig 901.).

Grammas/dottybacks of the family Pseudochromidae are small, aggressive, and territorial. Strawberry dottyback (*Pictichromis porphyrea*), royal gramma (*P. paccagnellae*), orchid dottyback (*Pseudochromis fridmani*), and candy basslet (*Liopropoma carmabi*; Serranidae) do not "pay for their keep", but some undertake cleaning duties (Fig 905.; Fig 906.). Intolerant of each other, it is suggested they are purchased last.

Reef safe wrasse are exciting additions but they devote few

resources to upkeep; however, some have been known to consume nuisance flatworms of the subphylum Acoelomorpha, whereas all are Labridae affiliates (Fig 907. to Fig 909.). See: Reef Pests, "Red Planaria" *Convolutriloba retrogemma* and Related Genera.

McCosker's flasher wrasse (*Paracheilinus mccoskeri*) are perhaps the most ornate, while six-lined wrasse (*Pseudocheilinus hexataenia*) can allegedly control Acoelomorpha, but they are typically inadequate for their eradication. They are a similar shape to dottybacks and may thus incite hostility (Fig 907.).



Fig 905. Strawberry dottyback (*Pictichromis porphyria*; top; Pseudochromidae) and royal gramma (*P. paccagnellae*).





Fig 906. Candy basslet (*Liopropoma carmabi*; previous page; Serranidae) and orchid dottyback (*Pseudochromis fridmani*; Pseudochromidae).



Fig 907. McCosker's flasher wrasse (*Paracheilinus mccoskeri*; top; Labridae) and six-lined wrasse (*Pseudocheilinus hexataenia*).

Ornate leopard wrasse (*Macropharyngodon ornatus*) and blue striped tamarin wrasse (*Anampses femininus*) are challenging to maintain, because the former arrives infested with internal parasites that instigate eventual mortality, whereas the latter is a delicate species costing upwards of 1,000USD (Fig 908.). Aquarists have greater success if these fish are acquired from retailers controlling disease in the manner described herein, whereas rainbow wrasse (*Halichoeres melanurus*) and red-lined wrasse (*H. biocellatus*) are ostensibly reef safe consumers of "red planaria" (Fig 909.). All wrasse require moderately deep substrate for their nocturnal rest.



Fig 908. Ornate leopard wrasse (*Macropharyngodon ornatus*; previous column; Labridae) and blue striped tamarin wrasse (*Anampses femininus*).



Fig 909. Rainbow wrasse (*Halichoeres melanurus*; top; Labridae) and red-lined wrasse (*H. biocellatus*) are considered leopard and six-line wrasse alternatives because they may consume flatworms of the subphylum Acoelomorpha.



Exclusively Ornamental Reef Safe Teleosts

Remarkably, teleosts that do not contribute to reef ecology still appear in the hobby. Purple **firefish** (*Nemateleotris decora*; Microdesmidae) and **fire goby** (*N. magnifica*) amicably shoal whilst they retain a passive demeanour, yet they remain outstanding leapers (Fig 910.). Numerous aquarists have lost firefish yet they understand reefs must remain uncovered, whereas braces discourage fish from launching themselves aloft against aquarium panels.

SPS colony-residing **coral gobies** (Gobiidae) may no longer be acquired as "hitchhikers" due to coral antiparasitics, yet they are ideal for nano- or pico-reefs because green clown goby (*Gobiodon histrio*) do not attain lengths exceeding 3 cm (1.2"). Ammonia emanating from fish is essential to sustain healthy populations of nitrogen cycling microorganisms, where reefs benefit from the attenuation of pathogens and enhanced stability. Males are intolerant of males in small aquaria, whereas inter- or intra-specific groups may procreate in large displays where individuals retain the capacity to change sex (Pradhan *et al.* 2015). Blue banded gobies (*Lythrypnus dalli*) grow to just over 6 cm (2.36"; Fig 911.; Froese & Luna 2016).

Pyjama (*Sphaeramia nematoptera*; Apogonidae) and Banggai (*Pterapogon kauderni*) **cardinalfish** are peaceful interspecific shoalers, where the latter abruptly expire when they are exposed to secondary oxidants generated by the misuse of ozone. They are excellent indicator organisms, therefore, keep one Banggai cardinalfish with several pyjamas when applying trioxygen (Fig 912.). See: System Maintenance, Ozone Administration: Commercial Fish-Only Systems and, Ozone in Reefs and, Phenols and Terpenoids: Removal.

Longnose **hawkfish** (*Oxycirrhites typus*; Cirrhitidae) and flame hawkfish (*Neocirrhites armatus*) are ambush predators that

consume shrimp (Fig 913.). They are non-reef-nurturing demersal tankmates that perch on outcrops or substrate awaiting their next meal. Flame hawkfish, albeit potentially more aggressive, have bags of character and are thus arguably more desirable. Nevertheless, the author has seen these species happily coexist in large displays.



Fig 910. Male specimens of purple firefish (*Nemateleotris decora*; top; Microdesmidae) and fire goby (*N. magnifica*).



Fig 911. Green clown goby (*Gobiodon histrio*; previous column; Gobiidae) and blue banded goby (*Lythrypnus dalli*).



Fig 912. Pyjama cardinalfish (*Sphaeramia nematoptera*; top; Apogonidae) and

Banggai cardinalfish (*Pterapogon kauderni*).

Geometric **perchlet** (*Plectranthias inermis*; Serranidae) are reef safe hawkfish alternatives, whereas free-swimming longnose **filefish** (*Oxymonacanthus longirostris*; Monacanthidae) are exquisitely ornamental and gregarious polyp “nippers” that may bioremediate species of *Exaiptasia* and *Anemonia* (Fig 914.). See: Reef Pests, *Exaiptasia* species “Glass Anemones” and, Majano Anemones.

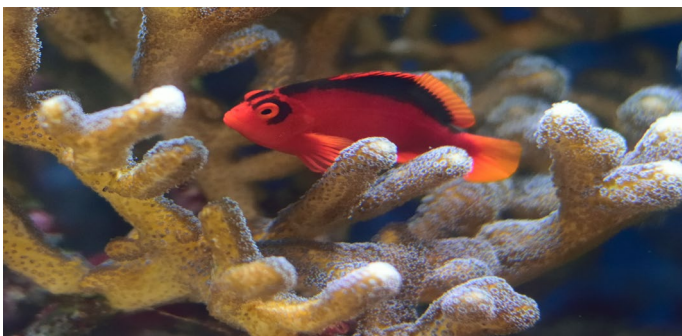


Fig 913. Longnose hawkfish (*Oxycirrhites typus*; top; Cirrhitidae) and flame hawkfish (*Neocirrhites armatus*).



Fig 914. Geometric perchlet (*Plectranthias inermis*; top; Serranidae) are entirely reef safe hawkfish alternatives, whereas longnose filefish (*Oxymonacanthus longirostris*; Monacanthidae) are coral-loitering polyp “nibblers”.

Square **anthias** (*Pseudanthias pleurotaenia*; Serranidae) and sea goldie (*Pseudanthias squamipinnis*) are deep-water gas bubble disease (GBD)-susceptible teleosts (Fig 915.; Fig 916.). Those affected manifest exophthalmia and fin embolisms, yet

they prove unreliable barometers insofar as gas may be supersaturated when they remain symptom-free. Gas vacuoles occur more frequently and inconspicuously at the gill, and although these fish are peaceful shoalers that contribute little to overall ecology, male congeners are intolerant of each other.



Fig 915. Male and female sea goldie (*Pseudanthias squamipinnis*; Serranidae).



Fig 916. Male square anthias (*Pseudanthias pleurotaenia*; Serranidae).

Amiable and quirky ornamental **blennies** of the genus *Ecsenius* and family Blenniidae make intriguing reef inhabitants. They have complex personalities while their facial expressions are analogous to our own, because “the lights are on and the cogs are whirring” (Fig 917.).



Fig 917. Tailspot blenny (*Ecsenius stigmatura*; top; Blenniidae) and Midas blenny (*E. midas*).

Venomous omnivores of the family Siganidae are known as **rabbitfish** or **foxface**, which is considered a misnomer by the author owing to the badger-like visages of foxface rabbitfish (*Siganus vulpinus*), and magnificent foxface (*Siganus*

magnificus; Fig 918.). Exercise care around these fish because the rays of their dorsal fins are supersharp and sting. See: Disclaimer page xvi. They are generally regarded as reef-appropriate herbivores, whereas polyps have been “nibbled” by scribbled rabbitfish (*Siganus doliatus*; Fig 919.). No “right-minded” teleost “picks fights” with venomous fish; however, tangs and surgeonfish might “try their luck”. They are shoalers in the wild that would undoubtedly adopt this demeanour in exceedingly large systems.



Fig 918. A stretching and yawning foxface rabbitfish (*Siganus vulpinus*; top; Siganidae) and magnificent foxface (*Siganus magnificus*) are armed with exceedingly sharp and venomous dorsal spines.



Fig 919. A malnourished venomous scribbled rabbitfish (*Siganus doliatus*; Siganidae).

Non-Reef Safe Fish

Released from the confines of reefs we explore the possibilities afforded by fish-only systems because this freedom accommodates pure aesthetics in numbers that fascinate. Predators can be mixed with the innocuous bar one constraint;

fully-widened piscivorous jaws must be three to four times smaller than the profile of the potential newcomer. With few exceptions, the industry trades in teleosts that swallow their prey whole, whereas victims may be chomped and chewed by large pufferfish, triggerfish, and parrotfish. Given the opportunity, all teleosts consume dead, dying, or smaller fish, because in essence, all are piscivores, whilst individuals remain unique which adapt to extraordinary captive environments.



Fig 920. Red or volitan lionfish (*Pterois volitans*; top; Scorpaenidae) attain or exceed 45.7 cm (18"; Luna & Reyes 2015). Devilfish or black lionfish (*P. miles*) grow up to 35 (13.8; Torres & Kesner-Reyes 2017).

Comparatively large prey must be gulped headfirst, otherwise their fins and scales oppose oesophageal travel; however, their gullet is an expanding muscular bag (Alabssawy *et al.* 2019). All the same, around 90 percent of fish are reorientated before swallowing (Mihalitsis & Bellwood 2017).

Anticipate growth-rapidity because fish such as groupers gain weight readily whilst their potential prey items remain small. Hence moderate the intake of faster-growing predators because they typically eat every third day. Alas, most do not survive long enough to become giants, where many are eaten locally or are exported for food if they do not enter the ornamental trade (Wilson, personal communication; CBI 2017).

Venomous scorpion or **lionfish** span several genera nested in the family Scorpaenidae, where hurricanes have disseminated volitan lionfish (*Pterois volitans*) throughout the Atlantic (Johnston & Purkis 2015). Their recent cosmopolitan status is disastrous for reef ecology inasmuch as their carnivory is unrelenting and indiscriminate. It is cruel and foolhardy to suggest importing and selling fish that are guaranteed to outgrow systems; however, conservation advocates insulating another volitan lionfish from the wild. Furthermore, they can be hand-fed

in a short while which resemble a dog wagging its tail. The author has a genuine affection and respect for these animals, albeit regrettably, their size eventually necessitates euthanasia. Venomous fish are well-tolerated by others and tend not to incite hostility. See: Introduction, The Release of Non-Native (Invasive) Species: A Real Threat and, Diseases of Fish, Sedation.

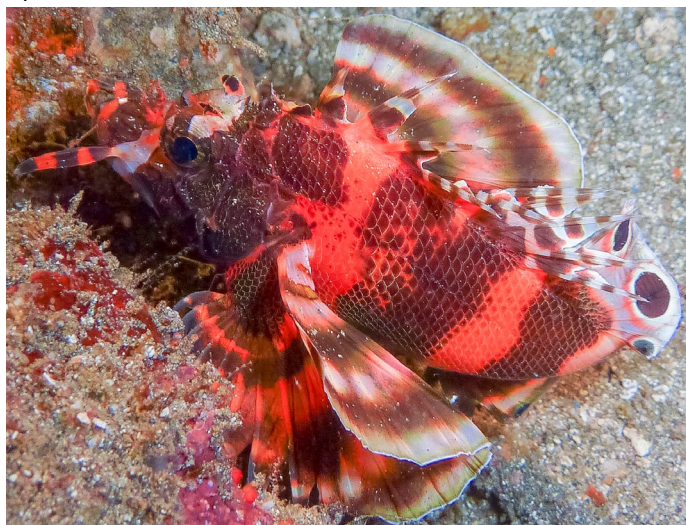


Fig 921. Twinspot lionfish (*Dendrochirus biocellatus*; top; Scorpaenidae) grow to 13 cm (5"; Capuli & Valdestamon 2015a). Zebra lionfish (*D. zebra*) reach 25 (9.8; Capuli & Keshner-Reyes 2015).

They must actively consume or be weaned onto thawed lance fish (Ammodytidae) insomuch as they are hardy yet accustomed to the sporadic consumption of living prey. Numerous efforts to domesticate lionfish have ended in them starving to death. Given that infrequent "spikes" of ammonia are unlikely to support the logarithmic growth of a nitrogen-cycling consortium, their donations of dissolved inorganic nitrogen (DIN) are intermittent and substantial which makes them inappropriate for reefs.

Weaning Lionfish and Carnivores

Lionfish and other piscivores ordinarily feed on every third day, while many fish will stop feeding in poor conditions. Water quality must remain satisfactory, because ideally, ammonia and nitrite are undetectable, where quashing the latter frequently demands supplementary aeration. A freshly fully-thawed piece of lance fish is dangled headfirst at the surface until the recipient "hovers"

expectantly from beneath, then drop the bait on its snout. Lionfish initially follow it to the bottom where they stare mesmerised perhaps waiting for movement, while some may reluctantly gulp the fish from substrate but who wants a mouth full of sand?



Fig 922. Clearfin lionfish (*Pterois radiata*; top; Scorpaenidae) become 24 cm (9.5"; Luna & Casal 2015). Dwarf lionfish (*Dendrochirus brachypterus*) attain 17 (6.7; Luna & Valdestamon 2015).

Immediately remove discarded morsels preferably without a net because they invoke negative recollections, but do not get stung because lionfish venom is injected by an upward reflex of their dorsal spines; however calm, happy fish are unlikely to attack yet there are always exceptions. *Neither the author nor Reef Ranch Publishing Ltd can be held responsible for injuries inflicted by venomous fish.* See: Disclaimer page xvi.

Those that wean gulp the fish from the bottom or take them as they descend, because we are trying to reinforce positive experiences, where lionfish and others are prone to gluttony after the first successful feed.

All life requires varied nourishment where fish viscera, skin, eyes, and scales contain everything that piscivores need, hence not fish flesh but fishmeals, form the foundation of outstanding diets. Chopped muscle, cockle, shrimp, and squid are readily available, but ensure all foods are purposely packaged for feeding fish, because those suitable for humans carry aquatic diseases which are not killed in a deepfreeze. Hence dietary items must be gamma irradiated, uncooked, and freshly-thawed. See: System Maintenance, Maturing Fish-Only Systems.

Recent evidence suggests that *Pterois volitans* and *P. miles* are distinct species naturalised to different parts of the world (Freshwater *et al.* 2020). Originally endemic to the Red Sea and the northern Indian Ocean, the range of *P. miles* now extends to Africa, Sri Lanka, the Mediterranean, western Indonesia, the

western Atlantic, the Caribbean, and Bermuda (Studholme 2017; Goodbody-Gringley *et al.* 2019; Freshwater *et al.* 2020; Savva *et al.* 2020).



Fig 923. The 5-mm fry of warty frogfish (*Antennarius maculatus*; top; Antennariidae) and painted frogfish (*A. pictus*). The former grow to 15 cm (5.9"; Froese & Valdestamon 2016a) whereas the latter reach 30 (12; Luna & Kesner-Reyes 2016).

Despite an apparent colour disparity, these scorpionfish are not easily differentiated. *P. volitans* has 11 dorsal spines as opposed to the 10 of *P. miles*, whose soft dorsal and anal fins begin with a spine. Moreover, the anal fins of *P. miles* and *P. volitans* have six and seven rays respectively (Lowe 2016). Figures 920. to 922. illuminate several species and their maximum size, whereas those featured in the latter two, are not as robust and are less likely to wean or thrive.

Frogfish of the family Antennariidae are fascinating ambush predators which use their modified pelvic and pectoral fins like feet to amble over substrate, yet they retain a graceful swimming competence. The first ray of their dorsal fin may be fashioned into a lure, and they will eat anything they can engulf with their expansive mouths. Nevertheless, benthopelagic fish are predisposed to gas bubble disease (GBD).

Some mucosal microbiome-inhabiting bacteria and dinoflagellates manufacture neuropathological tetrodotoxin (TTX) which is the most potent of marine neurotoxins and is deadly to most life (Katikou *et al.* 2022). Antennariidae, pufferfish (Tetraodontidae), box- and cow-fish (Ostraciidae) and others amass TTX in their muscles and mucus which some liberate when stressed. The current hypothesis proposes food chain-accumulated or holobiont affiliate-derived toxins are amassed to discourage predation (Williams 2010; Katikou *et al.* 2022).

Often motionless and peaceful, frogfish must be kept with voluminous fish over twice their length that are unlikely to investigate or challenge them, while their dietary requirements are akin to lionfish and are thus not recommended for reefs. Some remarkable examples are featured in figures 923. and 924.



Fig 924. Giant frogfish (*Antennarius commerson*; top; Antennariidae) attain 45 cm (17.7"; Winterbottom & Valdestamon 2016) while sargassum frogfish (*Histrio histrio*) become 20 (7.9; Froese & Geelhand 2013).

Labrid **hogfish** are housed exclusively with sizeable teleosts because they may be hostile toward smaller fish and will likely view crustaceans and other invertebrates as food (Aquarium Creations Online 2018). They are foragers that prefer aquaria laden with rubble (Maidenhead Aquatics 2000) like alphagrog, which is a glass-based nitrogen-cycling medium used for freshwater ponds that becomes inhabited with coralline algae (Fig 925. to Fig 927.).

Non-reef safe wrasse of the family Labridae are ornamental and

entertaining when they rearrange décor, yet they are intolerant of their kind unless opposing-sex pairs are added simultaneously, whereas some grow to 12" (30 cm). They are best kept in dedicated fish systems with venomous or similar-sized tankmates (Live Aquaria 2020), yet like other wrasse, they require areas of relatively deep substrate and a varied carnivorous diet (Fig 928. to 930.).

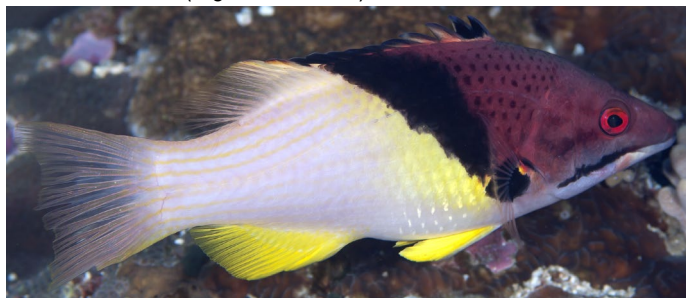


Fig 925. Coral hogfish (*Bodianus mesothorax*; top; Labridae) reach 5" (13 cm) and Cuban hogfish (*B. pulchellus*) grow to 8 (20), albeit ostensibly unsuitable, they are often purchased for reefs (Aquarium Creations Online 2018).



Fig 926. Tarry hogfish (*Bodianus bilunulatus*; top; Labridae) reach 55 cm (21.6"; Capuli & Olisa 2008) while lyretail hogfish (*B. anthioides*) attain 24 (9.5; Capuli & Luna 2006).

Some **parrotfish** of the family Scaridae have been described as reef safe; however, these fish naturally dine on stony corals from which they take large chops with their beaks. As intimated by their familiar classification, they leave feeding scars which have been mistaken for a coral ailment named rapid wasting disease, while here we present two examples that mature to over a foot (Fig 931.; Capuli & Santos 2008; Luna & Reyes 2009). The author has observed these fish mix peacefully with reef safe teleosts of a similar size, although predicting how a fish behaves once its nutritional source is withdrawn, is at best impractical. Parrotfish, triggerfish, and pufferfish bear dental armature capable of removing chunks of flesh, therefore, offer them a

range of meaty foods. Rubbing soft pelletised marine diets into the surface of cuttlefish bones may facilitate beak management.



Fig 927. Harlequin tusk (*Choerodon fasciatus*; Labridae) are ostensibly reef safe hogfish, yet their menacing-looking teeth will incise shrimp and other crustaceans.



Fig 928. Moon wrasse (*Thalassoma lunare*; top; Labridae) and fivestripe wrasse (*T. quinquevittatum*).

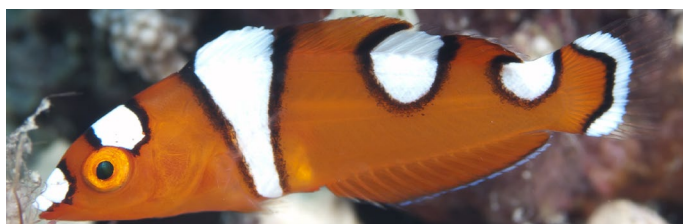


Fig 929. Juvenile coris or yellowtail wrasse (*Coris gaimard*; top; Labridae) and adult.

Squirrelfish or **soldierfish** of the family Holocentridae are gregarious shoalers which dine upon small fish and invertebrates or zooplankton. Longjaw squirrelfish (*Sargocentron spiniferum*) attain 61 cm (2'; Berg 1958) which will typically wean onto

anything that will fit in their mouths, while two examples are featured in figure 932.



Fig 930. Dragon wrasse (*Novaculichthys taeniourus*; top; Labridae), albeit nominally ornate, are exceedingly entertaining insofar as their swimming is snake- or eel-like (anguilliform) while they rearrange décor including large coral fragments. Ornate wrasse (*Thalassoma pavo*).



Fig 931. Quoy's parrotfish (*Scarus quoyi*; top; Scaridae) and princess parrotfish (*S. taeniopterus*) have been declared by some as reef-appropriate which is not sanctioned here, while they grow to 40 (16) and 35 cm (14"); Capuli & Santos 2008; Luna & Reyes 2009).

Lutjanid **snappers** are considered food fish; however, a couple of examples adapt well to captivity and make excellent predatory tankmates, yet they have sizeable mouths and will consume anything they can engulf apart from venomous teleosts. Figure 933. features examples of emperor snapper (*Lutjanus sebae*) and threadfin snapper (*Symphoricthys spilurus*).

All **triggerfish** of the family Balistidae are hardy and have similar requirements; however, undulate triggerfish (*Balistapus undulatus*) are best kept in solitude, as they often pursue other animals to extinction. Triggerfish acquired their name from their modified first dorsal fin comprising two rays. The second or trigger locks the first into an upright position (Moyle & Cech Jr. 2000) which in combination with their prominent pelvic spine, safeguards against nocturnal predation. These fish find a hole

within which they scarcely fit before entering nightly torpors, where their adapted dorsal and pelvic fins secure them in place (Scott 1999).



Fig 932. Crowned squirrelfish (*Sargocentron diadema*; top; Holocentridae) and blackbar soldierfish (*Myripristis jacobus*).



Fig 933. Emperor snapper (*Lutjanus sebae*; top; Lutjanidae) and threadfin snapper (*Symphoricthys spilurus*).



Fit triggerfish are formidable and pugnacious, while Picasso (*Rhinecanthus aculeatus*) and clown triggerfish (*Balistoides conspicillum*) are popular and cohabit peacefully with contrasting species. They eat crustaceans which is an essential part of their

diet. Thus feed them appropriate freshly-thawed gamma irradiated foods. Figures 887. and 934. to 936. particularise some colourful and fascinating examples, although due to their prominent red canine-like teeth, red-toothed triggerfish (*Odonus niger*) are also referred to as “vampire” triggerfish (Fig 936.).



Fig 934. A yawning Picasso triggerfish (*Rhinecanthus aculeatus*; top; Balistidae) and clown triggerfish (*Balistoides conspicillum*).



Fig 935. Blue-lined triggerfish (*Pseudobalistes fuscus*; top; Balistidae) and red-toothed or “vampire” triggerfish (*Odonus niger*).

As their name suggests, **puffer-** or **blow-fish** inflate when threatened which optimises their size, which must not be

encouraged because they find it stressful. Contented fish do not assume defensive postures.



Fig 936. Queen triggerfish (*Balistes vetula*; top; Balistidae) and a “mugshot” of the red-toothed or “vampire” triggerfish, *Odonus niger* (Fig 935.).

Members of the family Tetraodontidae include ostensibly reef safe valentine pufferfish (*Canthigaster valentini*), blue spotted pufferfish (*C. solandri*), and reef-inappropriate black-spotted dogface pufferfish (*Arothron nigropunctatus*). The latter may fin nip, thus house them with moderately aggressive large specimens, whereas the former two will devour molluscs, echinoderms, bivalves, and crustaceans and are slow, deliberate feeders. Extra care must be taken to ensure they receive ample nutrition, where handfeeding is a viable option. See above: Competitive Feeding. Perhaps the most beguiling with its charming smile and big blue eyes, is the iconic but non-reef safe porcupine pufferfish (*Diodon holocanthus*; Diodontidae; Fig 937.; Fig 938.).

Tetraodon- and Diodon-tidae bioaccumulate deadly neuropathological tetrodotoxin (TTX) whose liberation may be triggered by stress. Toxigenic fish have been held responsible for “crashes”, where aquarists venture that death or anxiousness leads to the release of dissolved organic biocides that wipe out the entire system. Notwithstanding, most incidences are likely due to a lack of maturity, ammonia, overstocking, poor design and husbandry. Honest and fearless appraisals prevent catastrophic reoccurrences. See above: Frogfish.

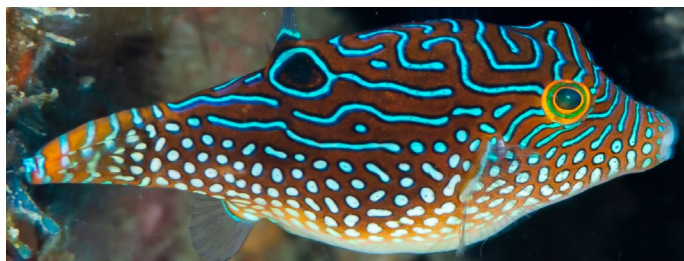


Fig 937. The modest departments of valentine pufferfish (*Canthigaster valentini*; top; Tetraodontidae) and spotted toby (*C. solandri*).

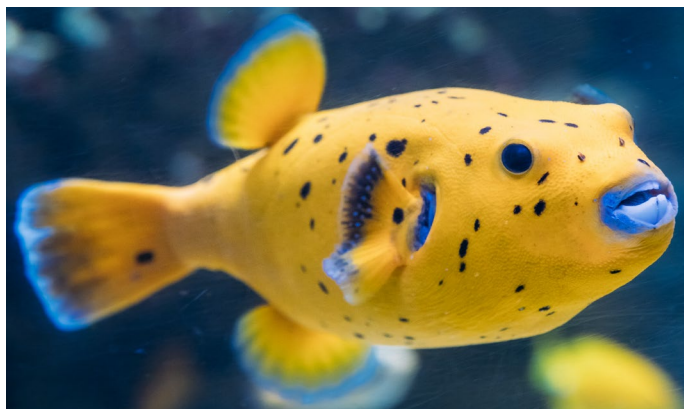


Fig 938. Black-spotted dogface pufferfish (*Arothron nigropunctatus*; top; Tetraodontidae) and porcupine pufferfish (*Diodon holocanthus*; Diodontidae).

Box- and **cow-fish** belong to the family Ostraciidae where figure 939. features yellow spotted boxfish (*Ostracion cubicum*) and

Hawaiian boxfish (*O. meleagris*), whereas longhorn cowfish (*Lactoria cornuta*) and thornback cowfish (*L. fornasini*) are illustrated in figure 940. These fish slough mucus-bound pahutoxins when threatened or stressed, which like TTXs, have been implicated in mass mortalities of captive animals.



Fig 939. Juvenile yellow spotted boxfish (*Ostracion cubicum*; top; Ostraciidae) and adult Hawaiian boxfish (*O. meleagris*).



Fig 940. Previous page, longhorn cowfish (*Lactoria cornuta*; top; Ostraciidae) and thornback cowfish (*L. fornasini*; bottom).

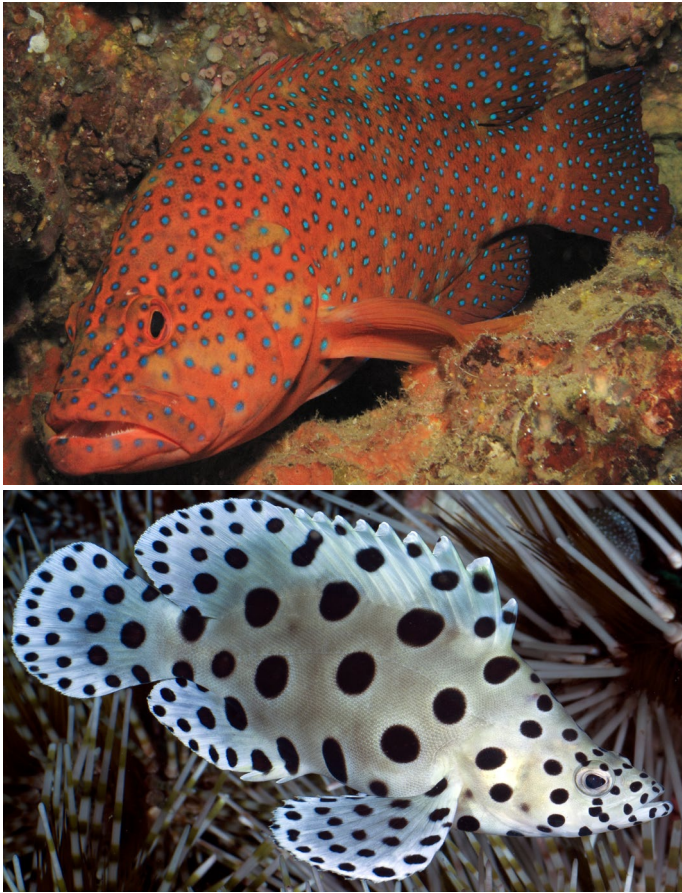


Fig 941. Leopard coral grouper (*Plectropomus leopardus*; top; Serranidae) and barramundi cod or humpbacked grouper (*Cromileptes altivelis*).

Such anecdotes remain unobjective and unsubstantiated; however, due to the possibility of deadly toxins wiping out the entire system, it is suggested they are not kept in reefs. Furthermore, they would not thrive because they have the hydrodynamics and swimming competency of a brick. Reef environments are extraordinarily turbulent and highly competitive which cannot fail to induce anxiety, whereas limitless dilution thwarts catastrophe in the wild.

Assuring adequate nutrition is challenging, therefore, house them with slow passive feeders such as dragonets and valentine or blue spotted pufferfish. See above: Competitive Feeding. Avoid surface nourishment as ingestion of air causes abnormal buoyancy, so ensure protein skimmers are of modest stature and air driven limewood diffuser or single-pass venturi, and banish microbubbles from open water.

Several Serranidae are food fish and popular ornamentals where figures 941. and 942. introduce coral trout or leopard coral grouper (*Plectropomus leopardus*), humpbacked grouper (*Cromileptes altivelis*), clown grouper (*Pogonoperca punctata*), and blue spotted grouper (*Cephalopholis argus*). The jaws of these fish enlarge severalfold, while they stalk their victims and swallow them headfirst (Fig 11.; Fig 581.). Any fish far larger than their mouths will be safe and tolerated; however, they grow rapidly and outsize smaller candidate prey, whereas they thrive on lionfish feeding methodologies and diets. Therefore, provide them with adequate nutrition yet avoid satiation.

Notwithstanding stunning blue striped grunts (*Plectorhinchus chrysotaenia*), juvenile harlequin sweetlips (*Plectorhinchus chaetodonoides*) are unusual and charming, while the

colourations of oriental sweetlips (*Plectorhinchus vittatus*) are sustained for life. These popular members of the family Haemulidae are featured in figures 943. and 944. Observe grouper compatibility and care, yet verify new specimens are much larger than the resident carnivores but are insufficiently sizeable to swallow the inhabitants whole.



Fig 942. Spotted soapfish or clown grouper (*Pogonoperca punctata*; top; Serranidae) and peacock hind or blue spotted grouper (*Cephalopholis argus*).

The family Muraenidae comprises teleosts commonly referred to as **moray eels**, while snowflake eels (*Echidna nebulosa*) and ribbon eels (*Rhinomuraena quaesita*) are particularly hostile and may bite the hand that feeds. They require a covered display as they launch themselves skyward (Fig 945.). They are not recommended here or as tankmates of other species unless housed with extraordinarily large angelfish and tangs, where most demand a sizeable dedicated system and specialist care.

Butterflyfish are varied and colourful deep-water members of the family Chaetodontidae, yet most are inappropriate for reefs as they eat coral polyps. Several are obligate corallivores partial to SPS colonies which makes them virtually impossible to maintain in captivity. Such are exquisite blacktail butterflyfish (*Chaetodon austriacus*) and orangeface butterflyfish (*Chaetodon larvatus*), albeit endemic to the Red Sea, Mediterranean sightings are redolent of their migration through the Suez Canal. They may, therefore, be dietarily plastic where the author hopes that someday, they might thrive in captivity (Fig 951.; Adams 2018a). Butterflyfish are susceptible to gas bubble disease (GBD) and mate for life, and thus purchase juveniles because estranged, sizeable examples are unlikely to thrive. See: System Maintenance, Gas Bubble Disease (GBD): Diagnosis.



Fig 943. Juvenile harlequin sweetlips (*Plectorhinchus chaetodonoides*; top; Haemulidae) and adult.

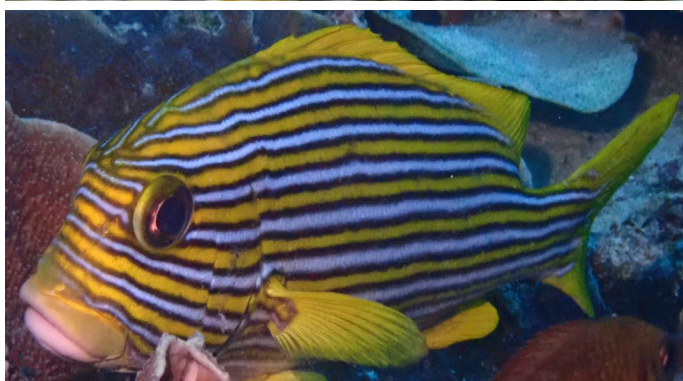


Fig 944. Oriental sweetlips (*Plectorhinchus vittatus*; top; Haemulidae) and blue striped grunt (*Haemulon sciurus*).

Akin to members of the genus *Chaetodon*, schooling **bannerfish** (*Heniochus diphreutes*) remain non-reef safe as they sometimes “nibble” polyps. Nonetheless, hobbyists report they do not eat corals, but all fish are independently accustomed to consuming regionally available species, whereas captivity alters their preferences. Other butterfly morphotypes include the scalpel-less surgeonfish, **Moorish idol** (*Zanclus cornutus*) of the suborder Acanthuroidei and family Zaclidae which have inhabited reefs without harming corals (Fig 946.; Fig 947.). Popular butterflyfish feature in figures 899., 948. to 950. and 952.



Fig 945. Snowflake eel (*Echidna nebulosa*; top; Teleostei: Muraenidae) and ribbon eel (*Rhinomuraena quaesita*).



Fig 946. Schooling bannerfish (*Heniochus diphreutes*; Chaetodontidae) assume cleaning duties and feasibly “nip” polyps (Fig 10.).



Fig 947. Ostensibly reef safe Moorish idol (*Zanclus cornutus*; Zaclidae).

Batfish of the family Ehippidae become giants, and despite the extraordinary appearance of their juveniles, they remain frail and poorly-adjusted to captivity. Importing fish destined to outgrow their accommodation is cruel and unnecessary (Fig 953.; Fig 954.). Aquarists with extensive systems may justify acquisitions yet airfreight will guarantee prices remain sky high, because litres of water and individuals must be packaged one or two per box. These deep-water teleosts are vulnerable to gas supersaturation

and GBD; which are best confined to unfathomable exhibits into which they can descend and reach adulthood. They will be hostile to contrasting kinds and pose a threat to smaller fish.



Fig 950. Klein's butterflyfish (*Chaetodon kleinii*; previous column; Chaetodontidae) and pearlscale butterflyfish (*C. xanthurus*).

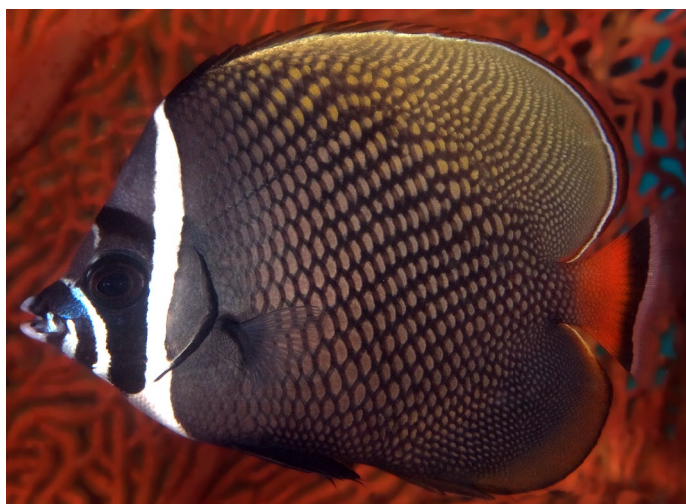


Fig 948. Masked butterflyfish (*Chaetodon semilarvatus*; top; Chaetodontidae) and redtail butterflyfish (*C. collare*).



Fig 949. Raccoon butterflyfish (*Chaetodon lunula*; left; Chaetodontidae) and vagabond butterflyfish (*C. vagabundus*).



Fig 951. Blacktail butterflyfish (*Chaetodon austriacus*; top; Chaetodontidae) and orangeface butterflyfish (*Chaetodon larvatus*) are arguably the most ornate. Yet as obligate corallivores, they cannot be maintained in captivity. Nonetheless, the latter's recent migration into European waters has revealed

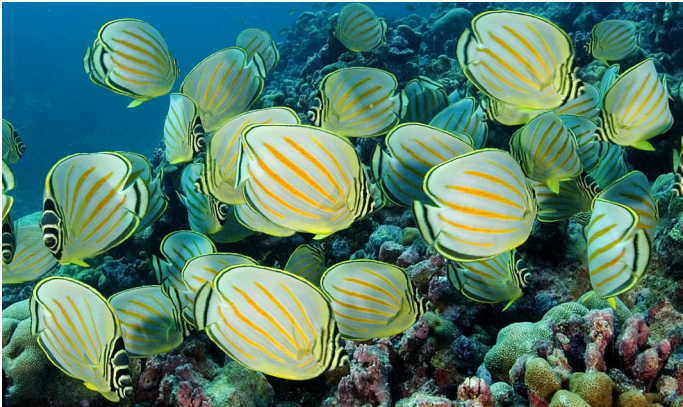


Fig 952. A shoal of ornate butterflyfish (*Chaetodon ornatissimus*; Chaetodontidae) off the Pacific Ocean's Kirimati atoll.



Fig 953. Juvenile ephippid teira batfish (*Platax teira*; left) and pinnate batfish (*Platax pinnatus*).



Fig 954. Adult teira batfish (*Platax teira*; previous column) and pinnate batfish (*Platax pinnatus*).

Sole and **flounder** of the families Soleidae and Bothidae are uncommon in aquaria due to their requirement for significant expanses of sand (Bray 2020). They naturally dine on shrimp, invertebrates, and small fish. Peaceful but not reef safe (Berg 1958), residents with limited territory may be hostile to flatfish recruits (Fig 955.).

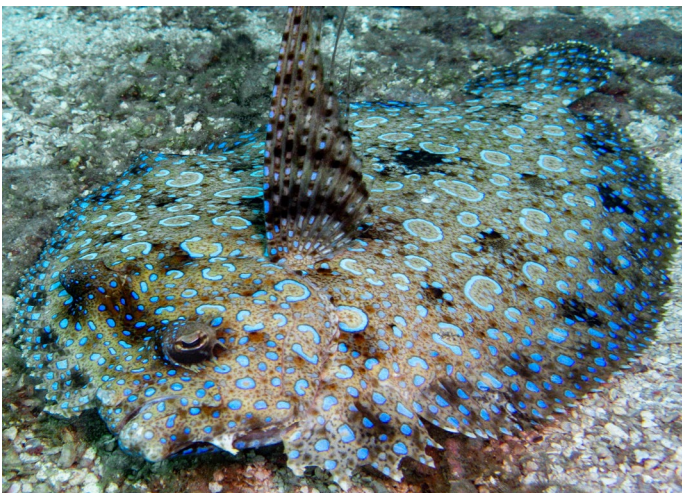


Fig 955. Banded sole (*Soleichthys heterorhinos*; top; Soleidae) and peacock flounder (*Bothus lunatus*; Bothidae).



Fig 956. Juvenile annularis angelfish (*Pomacanthus annularis*; top; Pomacanthidae) and adult.



Fig 957. Juvenile emperor angelfish (*Pomacanthus imperator*; top; Pomacanthidae) and adult.



Fig 958. Reef safe bellus angelfish (*Genicanthus bellus*; top; Pomacanthidae) and non-reef safe yellowtail angelfish (*Apolemichthys xanthurus*).



Fig 959. Ostensibly reef safe juvenile bluefaced angelfish (*Pomacanthus xanthurus*; top; Pomacanthidae) and adult.

One cannot fail to be in awe of aquaria that are home to large **angelfish** of the family Pomacanthidae, where several change their appearance as they mature (Fig 956.; Fig 957.; Fig 959. to 962.). They are challenging to house because similar looking same-sex fish of equal size, dietary preference, and natural habitat make questionable tankmates. Purchasing juveniles may

circumvent hostility; however, immature annularis angelfish (*Pomacanthus annularis*), emperor angelfish (*P. imperator*), bluefaced angelfish (*P. xanthurus*), and majestic angelfish (*P. navarchus*) appear much alike (Fig 956.; Fig 957.; Fig 959.; Fig 960.). Purchase small examples first because these fish mix peacefully with other smaller fish. Nevertheless, transient aggression may arise with pugnacious tangs and surgeonfish, whereas reef safe angelfish of the genus *Genicanthus* include bellus angelfish (*G. bellus*; Fig 958.) and Lamarck's angelfish (*G. Lamarck*; Fig 963.). See: Disclaimer page xvi.

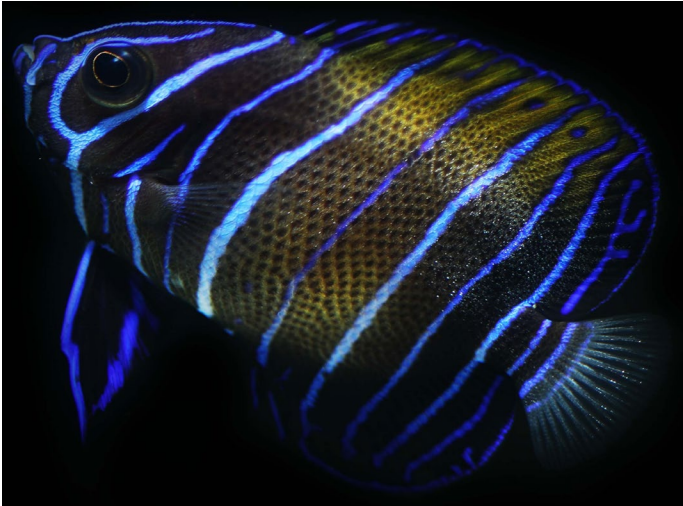


Fig 960. Juvenile majestic angelfish (*Pomacanthus navarchus*; top; Pomacanthidae) and adult.



Fig 961. Juvenile royal angelfish (*Pygoplites diacanthus*; left; Pomacanthidae) and adult.

Most require a several hundred-gallon dedicated fish system which is fed repeatedly with meaty foods throughout the day. Provide them with an occasional treat of sushi nori and rocks from which they can browse macro- and micro-algae.

Fish Compatibility Chart

The grid conveys the most likely outcomes of housing the fish on either axis with the candidate tankmate which includes their interactions with corals and invertebrates (Table 6.). Where fish fall into the category of "caution", most instances require the aquarist to make sound judgments on size, whereas "likely" does not guarantee congeniality. All fish are piscivores, and while the chart remains helpful, it is not entirely dependable insofar as

aquarists must familiarise themselves with the information contained herein. These schematics are notoriously misleading, for instance, some wrasse will be passive towards invertebrates, yet the chart reflects an overall demeanour. Any fish regarded as reef safe *should* be non-hostile towards ornamental animals, and despite the uniqueness of aggregate data, the first of its kind was most likely composed by Mohammadi & Jafari in 2014.



Fig 962. Juvenile queen angelfish (*Holacanthus ciliaris*; top; Pomacanthidae) and adult.

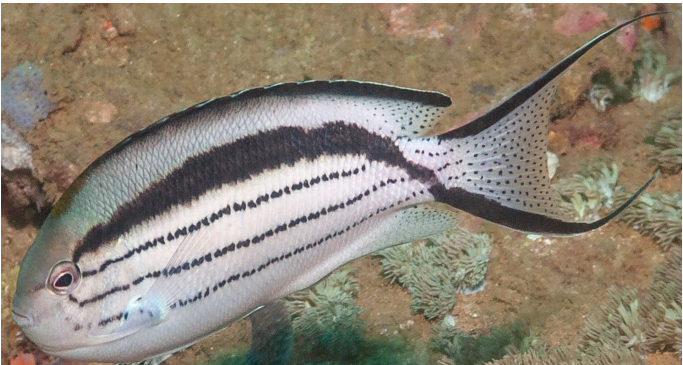


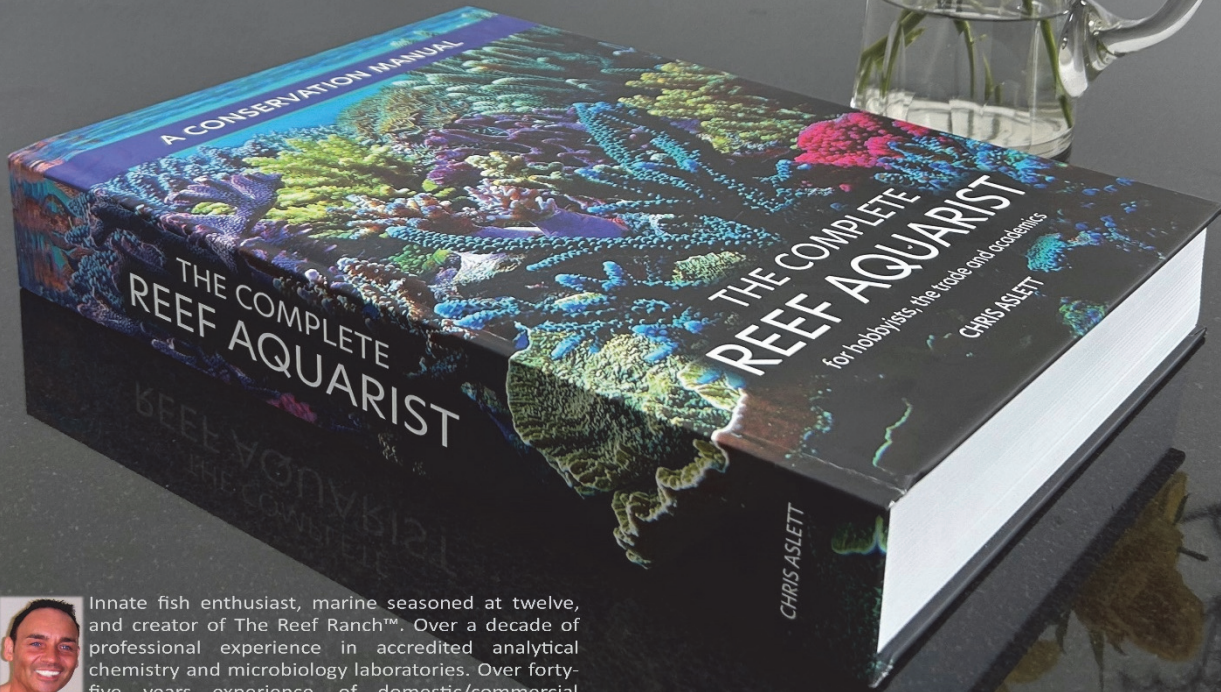
Fig 963. Reef safe Lamarck's angelfish (*Genicanthus Lamarck*; Pomacanthidae).

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