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Dear (Insert Name),

Thank you for your letter from December 30th requesting information on Gobies. There are over 2,000 different species of Gobies around the world, so while I was not able to provide information on each individual type, I have focused on those which are most discussed among fellow aquarists.

I first used Encyclopedia Brittanica to answer the question, what is a Goby? The entry is reproduced here -- Goby, any of the more than 2,200 species of fishes of the suborder *Gobioidei* (order *Perciformes*). Gobies are carnivorous, usually small in size, and found throughout the world. Especially abundant in the tropics, they are primarily marine in habit. Most species are bottom-dwellers and have a weak suction cup formed by the fusion of their pelvic fins.

The crystal goby, *Crystallogobius nilssoni.*

The majority of species belong to the family *Gobiidae*. These are typically elongated, sometimes scaleless fishes found along shores and among reefs in tropical and temperate seas.

Pandaka pygmaea.

Among their characteristics are two dorsal fins, the first with several weak spines; lack of a lateral line (series of small sense organs along the head and sides); and, usually, a rounded tail. Many are brightly coloured, and some, such as the crystal goby (*Crystallogobius nilssoni*) of Europe, are transparent. Most adult gobiids are 10 centimetres (4 inches) long or less; the Philippine *Pandaka pygmaea*, one of the smallest living vertebrates, grows no longer than about 13 millimetres (3/8 inch).

The longjaw mudsucker, *Gillichthys mirabilis*.

The blind goby, *Typhlogobius californiensis.*

Many gobies, such as the longjaw mudsucker (*Gillichthys mirabilis*) of the eastern Pacific, inhabit burrows in sand or mud, and some share burrows with other animals. An example of the latter is the blind goby (*Typhlogobius californiensis*), a small, pink fish native to California that lives intertidally in burrows dug by the ghost shrimp, *Callianassa*. Another form of association between gobies and other animals is typified by the neon goby (*Elecatinus oceanops*), a small Caribbean species brilliantly banded with blue. It is one of several members of the genus that function as “cleaners,” picking and eating the parasites from the bodies of larger fishes. Mudskippers (*Periophthalmus*) are amphibious and live in the mudflats of the Indo-

The ghost shrimp, *Callianassa.*

Pacific and eastern Atlantic regions. The gobiids, like other members of the suborder, are egg-laying fishes and commonly guard their eggs, each of which is attached to a shell, rock, or other such site.

Indian Mudskippers, *Periophthalmus Septemradiatus.*

The suborder includes several families other than the Gobiidae: the *Eleotridae* (sleepers), *Microdesmidae* (wormfishes), and *Kraemeriidae* (sand gobies).

As James W. Fatherree states in the online journal *Advanced Aquarist*, "there are so many different types of gobies that it's difficult to make general statements about them." In his article, *Aquarium Fish: A Look at the Gobies*, he chooses a few Goby, reproduced below.

The orange-spotted sleeper/sifter goby, *Valenciennea puellaris.* Sifter gobies feed by gulping sand and sorting out any small, edible invertebrates.

"**The Sifter Gobies**

When it comes to gobies, the sifters (also commonly called sleepers for some reason) can get relatively large, with some species reaching 6 or 7 inches in length. They're generally quite peaceful with other sorts of fishes though, so don't be worried about their size.

They're also a hardy bunch and can be quite useful at times, too.

They feed on tiny sand-dwelling invertebrates, and collect them by scooping up mouthfuls of sand, which is also why they're often called sifters. They'll essentially make a shallow nose dive into sandy substrates, fill their mouth with sand, and then quickly sift through it in order to capture any edible organisms within it. The sorted sand is ejected through the gill slits behind the head, and then they'll take another scoop.

This feeding activity can help to keep the upper layer of a sand bed cleaner, but you should note that if you're trying to maintain a thriving deep sand bed, these fishes will indeed eat some of the beneficial organisms living in it. I've found that they don't really deplete a sand bed of critters if kept in a large enough system housing enough sand, but they can literally clean out a relatively shallow sand bed in a smaller aquarium.

Again, they usually get along fine with other types of fishes, but they may not get along so well with other species of sifters or other individuals of the same species, either. So, it's best to keep just one in a tank, or a mated pair, unless the tank is large and has plenty of room for everyone. They'll typically learn to take a variety of fish foods too, although some hobbyists have reported otherwise on occasion. I've had no problems keeping the two most common species *Valenciennea puellaris* and *V. strigata*, but can't say much for the others.

The dragon goby.

The Dragon Goby

The dragon goby (or brownbarred goby, *Amblygobius phalaena*) is another one that can get big for a goby, sometimes reaching lengths of about 6 inches. This is another a sifter that also scoops up mouthfuls of sand and consumes the creatures living in it, and can thus help keep a sand bed clean, too.

Like the above, they should be kept one to a tank, although they're more likely to get along okay with other sorts of fishes, including other types of sifters, again as long as there's plenty of room for everyone. But, that's not always the case, as they never get along with other dragon gobies best as I can tell, unless they're kept as a mated pair.

The Rainford's goby.

The Rainford's Goby

The Rainford's goby (or Old Glory goby, *Amblygobius rainfordi*), is a beautiful little fish, typically staying under 2.5 inches, but they're especially prone to die from starvation. I've also been told that they don't ship well, either. I've never tried keeping one myself due to the fact that everything I've heard/read about them indicates that they need to graze on green filamentous algae (hair algae) in order to thrive, or even survive. Hair algae is usually something that reef aquarists should try to avoid like the plague, so I think it's safe to say that this fish is a no-go for reef aquariums. Admittedly, I have read one report of a hobbyist that through persistence was able to get one to eat a few types of fish food (Michael, 2005). But, that's just one report.

Still, if you're into taking risks with the lives of fishes, note that these should be kept one per tank, or as mated pairs. However, with that said, Michael (2005) also reported that they usually occur singly, not in pairs, in the wild, and that he purchased a supposed mated pair that didn't get along at all. Just pick something else folks…

The Neon Gobies

These predominantly Caribbean species are some of the smallest, staying under two inches, and are generally quite hardy "cleaners" that help keep other fishes at their

Neon goby of genus *Gobiosoma.*

best. Like the cleaner wrasses, these gobies will eat any parasites or dead skin they can find on another fish, which is why they're all called cleaners.

In the wild they tend to sit around at a "cleaning station", which may be operated by a single neon goby, but more often they're seen hanging around in pairs or in small groups where other fishes know to come for a good going over. These fishes looking for a cleaning recognize the neon gobies for what they are and refrain from harassing or eating them, and the gobies can get a meal out of the deal, of course.

These are far better choices than the cleaner wrasses though, because the wrasses oftentimes will not take any sort of fish foods offered and often end up starving to death in aquariums. To the contrary, the neon gobies will typically eat a variety of fish foods and can be kept with or without other fishes. So, they'll clean if they can, but won't starve if they can't.

The Clown Gobies

The clown gobies (or coral gobies) are also quite small, staying under 2.5 inches in length. In fact, the most common species (*Gobiodon okinawae*) doesn't even reach 1.5 inches, making them well-suited for life in very small tanks. They're brightly colored too, and typically won't bother anyone with the exception of other clown gobies.

Even though they don't get along well with other clown gobies when kept in confined quarters, if a number of them are kept in a large enough tank with plenty of rock and corals, they'll often pair up into male-female couples and will get along well from there. They also have an odd hangout, as they like to perch in the branches of stony corals like *Acropora*, but they don't do any harm to them.

The Clown goby.

About the only other thing to throw in is that they tend to be quite hardy and will eat a wide variety of fish foods, as long as the size is small enough. However, due to their smallness, it's obviously best to keep them with other small, peaceful fishes. Otherwise, they may be harassed by larger tankmates, and more aggressive fishes also tend to get all the food.

The Catalina Goby

The Catalina goby.

Next is the Catalina goby (or blue-banded goby, *Lythrypnus dalli*) that hails from the waters off California and Baja Mexico, which is a problem for most of us. This is because these waters are much cooler than our reef aquariums, and even many non-reef marine aquariums. So, our tanks tend to be too warm for these gobies to live in, as they should be kept in the 50's to 60's Fahrenheit and shouldn't be kept at temperatures above the low 70's. I have heard reports of some hobbyists being able to keep them alive at higher temperatures, but I can't help but think they cannot be as healthy or live as long under such conditions. Sorry, but these are unsuitable choices for most us, despite their appearance and availability.

Still, if you have a relatively cool tank, this is another particularly small species (also typically less than two inches length), and several can be kept in one tank. They're actually territorial, but due to their diminutive size, even a 30 gallon tank can be considered plenty big enough to keep a few of them. Of course, you do have think about the other fishes in the tank, which will certainly be larger, and make sure that there's

nothing that will harass these gobies. Oh, and they're typically easy to care for, as they'll take a variety of regular fish foods without issue.

The black-ray shrimp goby (*Stonogobiops nematodes*) and a Randall's pistol shrimp (*Alpheus randalli*) the most commonly offered species.

The Shrimp Gobies

The shrimp gobies (which belong to the genus *Amblyeleotris*, *Cryptocentrus*, or *Stonogobiops*) are also rather small in size, and they all live in close relationships with a number of pistol shrimps. These different animals help each other stay alive and well though, as the gobies have great eyesight, while the shrimps have very poor eyesight, but are excellent diggers. In fact, the shrimps can build and maintain burrows in sandy bottoms that are big enough for themselves and for one or more gobies, too. So, the basis of the relationship is that the goby watches out for any potential predators that come too close to the burrow or the shrimp, and will warn the shrimp that trouble is near, while the shrimp makes a home for both of them. I'll tell you more about this below, but for now I do need to point out that these fishes can be kept without shrimps, too.

Anyway, when they're kept with a shrimp, what you'll see is that the goby is usually out of the burrow, at least partially, but near its entrance, with the shrimp behind it. Sometimes the shrimp will venture out from the goby a few inches at the most while it's working on the burrow, but most of the time it stays close by and maintains physical contact with the goby by touching it with one of its antennae. In the event that the goby feels the need to warn the shrimp of any impending trouble, it'll wiggle its tail or body in

a way that alerts the shrimp, and off it goes into the burrow with the goby typically following right behind.

They'll do this if a potential predator comes too close, but they'll oftentimes scram even when harmless fishes get too close at feeding time, or the goby will do just the opposite depending on the competition. I've got a goby/shrimp pair in my 125 gallon, and another in my 55 gallon, and neither of the gobies is a chicken. I've had others that were, though. I'll explain…

The gobies will both eat anything I put in the tank for fishes, but I've been feeding the shrimps with sinking food pellets for over a year now by using a long piece of rigid airline tubing to drop the pellets right into the burrows opening. Still, when my other fishes smell the pellets they go after them, too. Of course, they aren't after the gobies or the shrimps, but the gobies still send the shrimps scurrying away into the burrow. Then, in both tanks, the gobies will chase off the other fishes in an effort to protect the food pellets. They'll open their mouth as wide as possible and charge at the other fishes to fend them off.

The Broad-Banded Shrimp-Goby (*Amblyeleotris periophthalma*) sharing his burrow with the Fine-striped Snapping Shrimp (*Alpheus ochrostriatus)*.

Despite their going after other fishes trying for their companions' food, none of these gobies really cause any problems with other types of fishes. For the most part they ignore everyone else and mind their own business. Besides, most of these species get no bigger than three to five inches, and are rather

skinny. So, they wouldn't pose much of a threat to anything but the smallest of fishes, anyway.

Unfortunately, the exception here is that some species don't care for other gobies, or other individuals of the same species in particular. While there are some that will actually share a burrow with other gobies of the same or other species, there are some that simply will not tolerate having another shrimp goby in the tank with them. These unsocial species will often go after each other relentlessly, until one is finally convinced to hide all time, or is literally run to death. However, there is an exception to the exception, as you may be lucky enough to come across a mated pair for sale, which should get along fine regardless of the species.

Anyway, back to burrows. While you may only see one or two small entrances to a burrow, they're actually much larger than you might expect. At first I wondered how they managed to keep such structures open in a bed of fine sand, but quickly realized that they're quite good at using little bits and pieces of coral rubble, shell, rock, etc. to reinforce the roof and sides of the burrow. They can stack and arrange all sorts of things in ways that give some permanence to the burrows, and constantly work to keep them in good shape.

The Dracula shrimp goby, *Stonogobiops dracula*.

With this in mind, it's essential to supply some rubble for a shrimp by placing a pile of such stuff near a burrow's entrance. I've provided them with the shells of deceased snails, a good amount of manually broken up pieces of clam shell from the beach, some small pieces (an inch or two) of coral skeleton of various shapes, and

similarly sized bits of rock, and they sort through everything for use like a contractor building a stone fence would. Usually, surprisingly quickly, anything I put near a burrow is used somewhere out of sight never to be seen again, and I've provided a heck of a lot of material for them.

I have provided both of my shrimps with large quantities of crushed up clam shell, which they've readily used to support their burrows.

Still, at night the burrows' entrances usually cave in or are closed with the goby and shrimp safely inside. Then, when the lights come on, the shrimps quickly get back to work. They'll dig tirelessly during the day, moving sand around from place to place to clean out and re-open the entrances, and will usually keep it open until the lights go off again. In fact, they stay so busy that it seems as if they actually enjoy the work. They're fun to watch for sure, and I'd say that out of all the things in my aquariums, I spend more time watching the activities of my gobies and shrimps than anything else in the tanks.

If this sounds like something you'd enjoy too, do keep in mind that the gobies typically pair with only certain species of shrimp. So, you'll need to do some further homework before buying anything to make sure you get the right kinds together. If you look around enough, you may be able to buy them together though, which is what I had the good fortune to do in both cases. I'll also throw in that as far as marine fishes go, many gobies are being reared in captivity, and there are numerous such specimens available to us. So, if possible, shop for these in particular. And that's your look at the gobies."

Though Fatherree mentions many types of Gobies, he does not discuss the Mandarin Goby, which you had asked for specific information about. I've reproduced the article about Mandarin Gobies from *Aquarium Domain* here —

Green Mandarin Dragonets (*Synchiropus splendidus*), or as they are also commonly referred to, Striped Mandarinfish or Green Mandarinfish have a very unusual pattern of colors that has made them a popular aquarium fish species. While this species is very beautiful, it does have some special care requirements including excellent water conditions and a live food source of copepods and amphipods. In the wild this species is found in shallow lagoons or bay environments, where it lives in areas covered with branching corals and encrusted rock. It hunts for small invertebrates among the algae covered rock and amongst the corals. This species is best suited for established reef aquariums and FOWLR aquariums with peaceful community fish species.

The Green Mandarin goby, *Synchiropus splendidus.*

Green Mandarins have a cylindrical body with an angular shaped head, with large pectoral fins. Their coloration is a unique pattern of blue, green, orange and purple stripes and dots, that run the entire body and finnage. The pattern is similar to that of the ancient Chinese Mandarin dresses, hence the common name for this species.

Green Mandarin Dragonets require established reef aquariums or fish-only aquariums with an abundance of live rock & live sand and excellent water conditions in order to do well in the home aquarium. This species is considered difficult to keep

mostly because it feeds primarily on live foods such as, copepods and amphipods. It is important to have lots of live rock & live sand and if possible a refugium in order to provide habitat for enough copepods and amphipods to live and reproduce in numbers large enough to provide a continual food source for the Green Mandarin Dragonet. This species also needs peaceful tankmates, as it will shy away from much larger more boisterous fish species.

Green Mandarin Dragonets feed on small organisms living on live rock, such as amphipods and copepods. This species should ideally only be kept in established reef or fish only aquariums with a large amount of live rock & live sand. They will also eat mysid shrimp, brine shrimp and live black worms, but this should be used to supplement their natural diet. Refugiums are beneficial for the Green Mandarin Dragonet, since they provide a sheltered area for amphipods and copepods to breed without being decimated by the fish population.

The Spotted Mandarin goby, *Synchiropus picturatus.*

Regarding the general temperament and care of Gobies, I've reproduced portions of an article from *The Aquarium Guide* here —

"**Tank Requirements**

Gobies are usually very small fish and will not grow long therefore you will not need to have a very large tank. A small tank will readily do as long as you have kept the

tank requirements as advised by experts. Another good characteristic of the fish is that they are hardy and will survive in a variety of conditions but this is not supposed to be taken for offering them poor care. When they are properly taken care of, the fish have the capability of living up to ten years long!

Avoid keeping the fish with large and aggressive fish in a community tank. They are slow swimmers and can easily make a meal to large fish. Because gobies prefer residing on the bottom parts even in the wild, it is best to provide them with a softer substrate. The fish can easily dig holes in the substrate where they can hide when feeling threatened.

The Green Clown goby, also known as the Broad-Barred goby or Goral goby, *Gobiodon histrio.*

Gobies are usually peaceful but this doesn't mean that they can sometimes turn territorial and even aggressive against other fish. This therefore means that if you plan to host more gobies in the same tank it will be best to have a bigger tank.

For the marine type of goby, providing marine environment such as coral reef where they can easily hide when being chased around is good. Have a quality water filter or skimmer installed in the tank to help keep the water quality great and healthy for the fish. You can provide some rocks in the aquarium as these will help to replicate the natural for the fish.

Feeding

Goby fish are carnivorous fish that will eat both plant and animals. Feeding the fish pellet or artificial food and live foods is just okay. Some of the common foods that

The Engineer goby, *Pholidichthys leucotaenia*.

they can be offered include; daphnia, live brine shrimp, blood worms, and Cyclops. You can also feed them live Tubifex which they will eat graciously. If you wish to feed them frozen food, ensure that there is slight current in the tank to make the food appear moving. Gobies are very funny in their feeding habits and may not east food offered to them that appear still. You can also offer the goby live fry of cichlid."

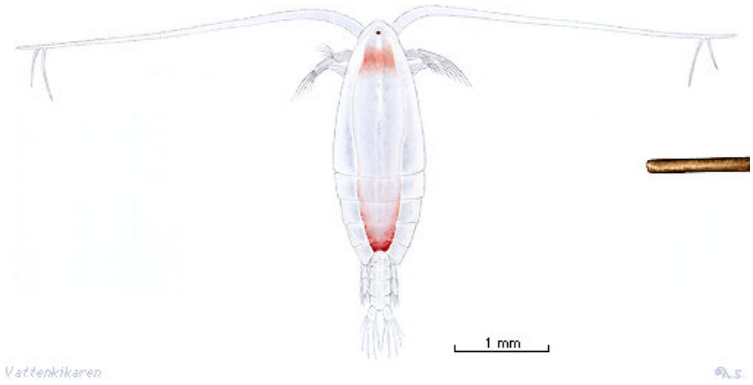
As for breeding Gobies, I've reproduced portions of Noel Heinsohn's guide, *Rearing Gobies: Tips For Beginner Breeders* here —

"Before you can get your gobies to spawn, you will need to pair them up, but pairing up gobies can be difficult, since most species have no external dimorphism. However, these fish can change their sex, giving you a better chance of making a successful pair.

Engineer gobies with eggs.

Gobies mainly change sex from female to male in a process called protogyny, which often follows the death of the male from a pair. The

most dominant female in the area turns into a male, the opposite of what happens with clownfish. There are also a few species that can exhibit bi-directional changes, meaning they can switch back and forth as the need arises, but this doesn't occur very often. I recommend getting the largest and the smallest gobies to pair together, which will give you a better chance of obtaining a bonded pair.

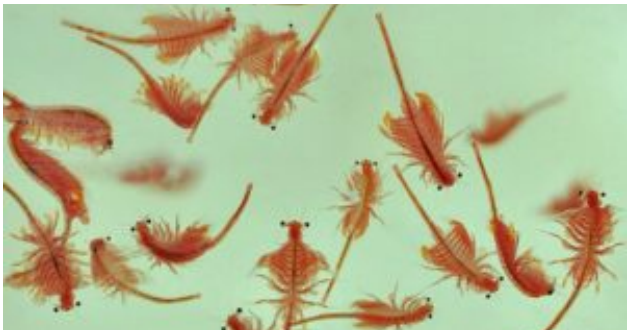


Copepod with scale.

Gobies are demersal spawners that will attach their eggs to substrate. This substrate can be rocks, sand, shells, coral, or PVC. They can lay anywhere from five to a few thousand eggs, depending on the species. After a pair of gobies have spawned, the male guards the eggs from predation, cleans them, and fans the eggs to keep them oxygenated. Depending on the species of goby, the eggs will hatch between a few days and a few weeks after they have been fertilized. Some species, like the Catalina goby, are very easy to raise; only a few weeks after they settle, they will begin to breed!

Since gobies are small fish, they have small larvae. The small larvae have small mouths, which means that they require small food. The most easily obtainable "small" food is copepods, and while there are many species of copepods available, the one I use most often is *Parvocalnus crassirostris*. This is a great pod that is fairly simple to culture and has adequately small nauplii. I suggest adding about 5 copepods per ml. After adding the copepods to your rearing culture, you need to add in algae for them to eat; I recommend *T. isochrosis*, a very nutritional algae for your copepods. And you know what they say, a fat copepod makes for a fat larvae (ok, maybe I am the only one who says that).

Keep an eye on your rearing culture; it should always have a brown tint, which means that there is enough algae to keep your pods enriched at all times. Depending on your copepod, larval densities, and rearing culture size, you will need to do a water change daily or weekly. In my 40 gallon vat I do weekly 25% water changes. When performing water changes be very careful, not only to avoid siphoning any larvae, but to avoid agitating the water where the larvae have concentrated. They are delicate – just because you aren't sucking up the larvae doesn't mean you aren't damaging them. Finally, when you add water back in, make sure the flow is very low, again to avoid damaging the larvae. I drip my water back in 5 gallons at a time through a length of small-diameter airline tubing.



Brine shrimp, *artemia nauplii.*

I hatch out my *E. oceanops* eggs in a small piece of PVC with aeration passing through it. I remove the eggs from the brooding parents a day before I think they will hatch, place them into the vat, and then aerate them. Once the goby larvae have reached the 20-25 days post-hatch mark, I begin to offer them other foods such as crushed pellets or brine shrimp (*artemia*). When the goby larvae have really started to grow and darken in color, they are preparing to settle out. This is the time for metamorphosis, and you could see some high mortality rates. As soon as you notice the larvae acting or looking different, add a bit more food then you normally would to give them an energy boost. That extra food might be the difference between life or death!

One of the easiest and most common species of gobies to breed is *E. oceanops*, the Neon Goby. This species might be small, but it is a very hardy fish, and easily spawns in an aquarium. They lay large clutches of eggs, and their larvae are fairly large given the adult size. You can get a high survival rate out of them with the proper foods; I

get around a 80% survival just feeding them *Parvocalonus crassirostris* for the first few weeks. Around 12-16 days I start offering rotifers, and at 20 days, *artemia nauplii*. Their metamorphosis happens at 28-32 days. These guys can be so hardy that I have ventured to test their survivability. I've let the salinity rise up to 38 parts per thousand, with a room temperature of 68-70 Fahrenheit. I fed them one initial startup of copepods, and threw in some algae here and there. I still ended up with a 40% survival rate. Now, I am not telling you this to promote improper culturing, but to encourage you to try something out of the box, and to show you how easy some species can be. Obviously, not all species of gobies are going to be this simple, but you never know.

The Yellow Prawn goby, *Cryptocentrus cinctus*.

You can get your feet wet with a goby species that has already been accomplished, or you can take the helm and try to claim a species first for yourself. I encourage you to try something out of your comfort zone. You might be surprised at what you can achieve!"

I hope this has answered all of your questions. Gobies will be impressive inhabitants for your aquarium indeed. Please let us know if we can be of any assistance in the future.

Sincerely,

Lisa
MSLIS Student, Pratt Institute, School of Information
Correctional Library Services
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