



JELLYFISH

HUSBANDRY GUIDE

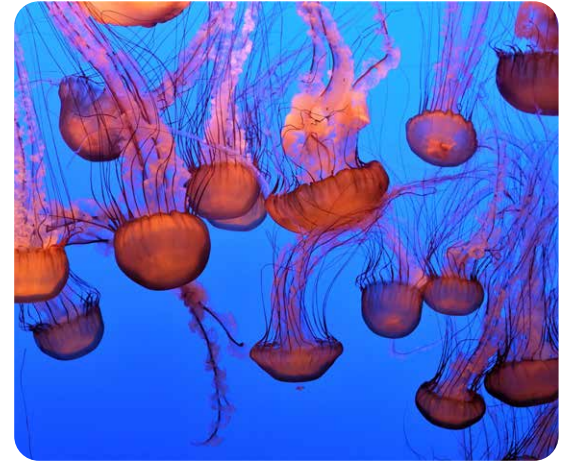
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FORWARD

From the dark and high-pressure deep sea, to shallow tropical lagoons, jellyfish are one of the most widely dispersed animals, well adapted to the various environments of the ocean. Only recently have we started to recognize jellyfish as a beautiful aquarium exhibit instead of just a dangerous stinging creature to be avoided at all costs. Now, jellyfish have become one of the most popular attractions in public aquariums, drawing huge crowds of fascinated onlookers.

What is it about jellyfish that is so appealing to us? Some are mesmerized by the light, producing a rainbow of colours as it passes through their translucent bodies. Others may be relaxed by the way they swim, gracefully pulsing through the water, trailed by an intricate array of delicate tentacles. Jellyfish were first found in the ancient ocean billions of years before humans were on the planet. Since then, they have been pulsing in a steady rhythm. This rhythm might help you relax and forget about your busy life, in fact, there is viable research indicating that the human stress factor can indeed be reduced by watching jellyfish.



When you hear the word jellyfish, you probably imagine the translucent bell-shaped body drifting in the ocean. But in fact, this free-floating (medusa) phase is only a part of the jellyfish life cycle. Perhaps the easiest way to think of the jellyfish lifecycle is like that of a flowering plant on land. You begin with the plant (or polyp in the ocean). The plant produces fertilized fruit as a way of spreading seeds as far as possible from the parent. The fruit is generally eaten by a bird or animal and transported far away, before being deposited onto the soil to hopefully grow into an adult plant itself.

Polyps, which can live for decades, produce medusa/jellyfish (referred to as ephyra in their early stages) to achieve the same goal. Unlike fruit, female medusas are fertilized sexually by the sperm of male medusa as they travel through the oceans. They can travel upon ocean currents for up to a year before releasing planula, their equivalent of seeds. The planula then settle on the sea floor and develop into new polyp colonies to start the cycle all over again.



01

INTRODUCTION TO JELLYFISH

Most jellyfish are technically plankton which is defined as “creatures which are not capable of swimming against ocean currents”. So no matter what the size (lion’s mane jellyfish could be the longest animal in the ocean whose tentacle grow up to 37m, and Nomura’s jellyfish could weigh up to 150 kg), most jellyfish are plankton due to the fact they drift in the ocean current.

Most species of ‘jellyfish’ fall under a phylum called cnidaria, which also covers corals and sea anemones. Jellyfish and corals are closely related, in fact we could consider Jellyfish as a single free-floating coral polyp. They are in most cases having only a rudimentary nervous system designed to perceive the presence of prey and light in the case of some photosynthetic species, and are one of the ocean’s most basic yet beautiful life forms.

Jellyfish were previously considered a difficult animal to keep in captivity until recently, mainly due to their weak swimming ability and fragile body. Although keeping and breeding jellyfish has been commonplace for scientific institutions for many years, there have only been a few aquariums made available to home hobbyists specifically for jellyfish, but most of them could not meet the specific demands of the jellyfish due to common design flaws or lack of adequate filtration. In recent years, jellyfish keeping as a hobby has been getting more popular and a number of companies are selling jellyfish aquariums. Exotic Aquaculture’s all-in-one jellyfish is simple and affordable, yet brings a modern and mystical touch to your home or office space by combining all the features of a modern easy to easy-to-maintain aquarium with the cutting-edge practices employed by expert keepers.

02

SPECIES AND DISTRIBUTION

From cold to tropical and from coastal to pelagic, you are almost certain to come across jellyfish wherever you are in the ocean. Recently, jellyfish have been discovered to inhabit even the deep sea of the Arctic and Antarctic Oceans. There are even a few species which live in freshwater.

How many species of jellyfish are there in the world? This question is yet to be answered. All so called 'jellyfish' are divided into two groups, cnidarians and ctenophores. Cnidarians have specially developed cells which sting and inject toxic chemicals into their prey. Corals and sea anemones are also categorized into this group, and their body structure is very similar to those of jellyfish. Well-known species of jellyfish such as moon jellies (*Aurelia* sp.), sea nettles (*Crysaora* sp.) and blue blubbers (*Catostylus* sp.) are all categorized in this group, and they are further categorized in a class called Scyphozoa. There are two more classes of Cnidarian jellyfish, Cubozoa and Hydrozoa. Cubozoa are more commonly known as box jellies because of the shape of their bells. They are often harmful to human because of their strong poison. *Chironex fleckeli*, also known as the 'sea wasp', is one of the most venomous creatures in the world. Jellyfish in this class swim very well for jellyfish and are also known to have very developed photo receptors akin to what we would term eyes. Hydrozoa is the least developed class yet covers most species of jellyfish (approx. 2700 species). Jellyfish in this group, such as the Portuguese Man O' War (*Physalia physalis*), can also be very harmful to humans. In total, the number of jellyfish species which are categorized as Cnidarians number approximately 3000.

HOW MANY SPECIES OF JELLYFISH ARE THERE IN THE WORLD? THIS QUESTION IS YET TO BE ANSWERED. ALL SO CALLED 'JELLYFISH' ARE DIVIDED INTO TWO GROUPS, CNIDARIANS AND CTENOPHORES.



Ctenophores, more commonly known as comb jellies, are often called jellyfish but they are very different animals from cnidarians. The most distinctive feature of a ctenophore is the eight strips or 'combs' (groups of cilia) running along their transparent bodies. They swim slowly by waving these cilia which creates a spectacular display of rainbow colours as the light is reflected in them. Until now, there have been about 140 species of comb jellyfish recorded. However, there are a lot more species to be found, as it has recently been discovered that there are a lot of comb jellyfish living in the deep oceans, previously inaccessible to scientists. These jellies are not harmful to humans as they do not possess either stinging cells or poison.



03 BODY STRUCTURE OF THE JELLYFISH

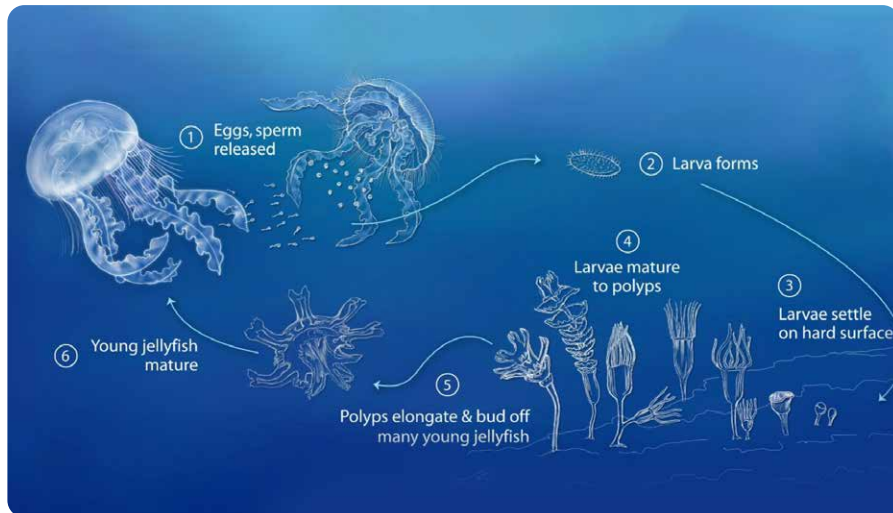
The basic body structure of cnidarian jellyfish is the same as corals and sea anemones. Their body consists of two layers or bags (exoderm and gastroderm membranes), with a gelatinous structure filling the space between. The end with mouth is called the oral end, and the other end (the top of bell for jellyfish) is called the aboral or dorsal end. Whereas jellyfish medusa is usually found swimming with their aboral end in front, coral polyps and sea anemones attach their aboral end to the substrate and face their mouth (oral end) to the water. A number of feeding tentacles elongate from the edge of a jellyfish's bell, and the tentacles are covered in millions of tiny stinging cells called nematocysts. Jellyfish do not have a respiratory system, heart or brain. Oxygen diffuses through their bell membrane and is circulated through the body by their pulsing movement. Jellyfish do not have eyes (except cubozoan jellyfish), but some do have sensory organs which tell them the brightness and the light balance.

JELLYFISH DO NOT HAVE A RESPIRATORY SYSTEM, HEART OR BRAIN. OXYGEN DIFFUSES THROUGH THEIR BELL MEMBRANE AND IS CIRCULATED THROUGH THE BODY BY THEIR PULSING MOVEMENT.

04

THE LIFE CYCLE OF JELLYFISH

THIS IS THE GENERALIZED LIFE CYCLE OF SCYPHOZOAN JELLYFISH (E.G. AURELIA). SCYPHOZOAN JELLYFISH HAVE FOUR DISTINCT STAGES IN THEIR LIFE CYCLE.



Planula

Female jellyfish produce eggs and the males produce sperm which combine to produce a larva, called a 'planula' (plural = planulae). A planula is a tiny oval structure whose outer layer is lined with minute hairs called cilia. The cilia beat together to propel the planula through the water, but the motion of the cilia does not carry the planula far, instead, ocean currents are responsible for transporting planulae long distances. The planula floats for a few days in the surface layer of the sea. It then drops downward to settle on a solid substrate where it attaches itself and begins its development into a flower-like 'polyp'.



Polyp

The planula metamorphoses to become a sessile (i.e. fixed-position), usually benthic (i.e. bottom dwelling) polyp. A polyp has an anemone-like body structure with a stalk attached to the substrate. At the top of the stalk, there is a mouth surrounded by stinging tentacles which the polyp uses to feed. The polyp feeds by using its stinging tentacles to catch microscopic organisms from the water column which it passes to its mouth for ingestion.

Polyps can multiply by producing buds or cysts that separate from the first polyp and develop into new polyps to form a colony. These colonies can live for years and each polyp is capable of producing thousands of jellyfish in its lifetime. When a polyp has built up enough stored energy from feeding and it feels the environmental conditions are right, the stalk-like structure begins to develop into a larval stage (the strobila), which resembles a stack of saucers. One at a time, starting from the top, the saucer separates drifting off in the current to become 'ephyra'.

Ephyra

The process by which new medusae are produced is called 'strobilation' and involves the metamorphosis of the end of a polyp into an 'ephyra', an immature medusa that subsequently detaches and swims away. Depending on the species, a single polyp may produce one or many ephyrae all at once, over a period of time, or at different intervals.

Medusa

The ephyra subsequently develops into a mature medusa over a period of weeks to months. This is the stage most people recognize as a 'jellyfish'.

05 GENERAL HUSBANDRY

WATER QUALITY

Temperature: 13-26°C (depending on species, try to adjust the temperature to match the area where from which they were collected). For most Aurelia sp. (commonly known as the Moon Jellyfish) a temperature between 16-20°C is advised. In most situations, this will coincide with the aquarium maintaining a temperature a degree or two below ambient room temperature thereby negating the need for any heating. Should temperatures climb above the desired range, the use of a chiller is advised.

Salinity: 25-35ppt

pH: 8.0 - 8.4

Other water parameters:

NH3 = 0.0 ppm

NO2 < 0.05 ppm

NO3 < 20.0 ppm

PO4 < 2.0 ppm

Alkalinity 7.4 - 8.4 DkH

Note: Maintaining alkalinity by way of a suitable Alkalinity buffer will help stabilize pH between water changes. Phosphate (PO4) and Nitrate (NO3) are known contributors to increased algae populations. These should be monitored and maintained by way of regular partial water changes and if necessary in the case of heavy stocking or feeding, the additional use of relevant media's that can be added to the rear filtration chamber of the aquarium in a permeable media bag, or used in a remote power filter attached to the rear inlet and outlet ports provided.

Warning

Water quality should be tested regularly using test kits which are available at most local aquarium stores. It is a good procedure to test your water quality every few days for at least two weeks after first adding jellyfish to ensure levels stay within the recommended parameters. Once it is established that the water parameters are stable you can reduce testing accordingly. Please refer to the 'problem-solving' section if your water quality strays from recommended levels.

FEEDING

Most planktivore jellyfish need to be fed live baby brine shrimp (or frozen brine shrimp/ copepods/ mysids). Try not to overfeed, a general feed of once per day will be sufficient in most cases. It is good practice to remove as much uneaten food as possible from the aquarium when the jellies stomachs are full to ensure ongoing good water quality.

We also recommend 'Medusa-G' from Exotic Aquaculture. This food is more nutritious than live baby brine shrimp. It tested for moon jellyfish and they showed better growth compared to live baby brine shrimp. You will need to clean your tank more often as jellyfish produce more fecal pellets when you feed this food. This food is available from our online shop.



Important:

The term Plankton and Planktivore used in this manual refers specifically to 'Zooplankton', i.e. animal planktonic organisms, and NOT phytoplankton (algal Planktonic organisms).

BOWL METHOD

This method is the most efficient and results in less pollution of the main aquarium water over time. Using a ladle or a fine mesh net, transfer all jellyfish from the aquarium to a bowl filled with seawater (from the aquarium). Feed jellyfish in the bowl until their stomachs are visually full (10-15 mins). Transfer jellyfish back to the aquarium using the ladle, taking care to avoid transferring any uneaten food back into the aquarium. It is also important to note that the jellyfish, at no time, should be taken out of the water as this can cause damage to their delicate tissues. With this method, you lose a bit of seawater each feeding because you leave a percentage behind in the bowl. It is recommended to have some seawater prepared to replace this water at each feeding.

BROADCAST FEEDING METHOD

Prepare the correct amount of food for jellyfish in a cup, and slowly pour it evenly over the surface of the water. To avoid overfeeding, pour little by little until you see the stomachs of the jellyfish become full. This method is the most convenient but it also has the potential to leave the largest amount of uneaten food which can result in more rapid degradation of water quality. If you use this method you will need to carry out larger more frequent water changes than the other two methods.

WATER CHANGES

We recommend carrying out a 10-20% water change every 2 weeks depending on your aquarium's water quality. The frequency of water changes will depend largely on how heavily stocked your aquarium is, and how much you feed. Test the water quality regularly to ensure it stays within the recommended ranges.

Prepare seawater at the latest one day before doing a water change and leave it overnight with aeration. Some of the elements in sea salt take a long time (24h +) to fully dissolve, even if it looks like all the salt has disappeared. Newly mixed saltwater is very unstable and can cause stress to your jellyfish or in extreme cases death.

When you do a water change, stop the pump and other accessories such as the heater or chiller. Using a small jug or a cup, scoop and take the seawater out from the aquarium.

After you have taken out 10-20% of seawater from the aquarium, add the prepared seawater to the tank slowly via the rear filter compartment which will limit the chances of any air bubbles getting to the jellies. Turn on the pump and other accessories. If air bubbles get trapped inside the bell of a jellyfish, use a baster or mesh net to gently turn the jelly over to let the bubbles free.

CLEANING

Over time, uneaten food and general debris may build up on the bottom of the aquarium and algae may begin to grow on the tank wall. Remove debris from the bottom of the tank using a baster, pipette or siphon hose being careful not to damage any jellies.

Warning

Always use cleaning equipment designed specifically for use with acrylic. Scourers and other rough or sharp cleaning products will scratch acrylic. We recommend using melanin sponges and microfiber cloth to clean and dry the acrylic surfaces.

WATER FLOW

With the EA's all-in-one jellyfish aquarium, you can adjust the pump speed with the controller. The low pump speed setting should be sufficient to keep jellyfish in suspension, and this speed is optimal in most cases because the jellyfish move slowly which is relaxing to watch. You may however want faster flow occasionally to achieve special requirements or for different species of jellyfish. The following is the list of advantages and disadvantages of having a faster flow.

Advantages

- Food stays in suspension for longer periods.
- Lighter debris stays in suspension and doesn't settle on the bottom (the debris filtered out more quickly)
- Faster water turnover rate keeps water cleaner (occasionally it may be a good idea to increase the flow speed for a while after cleaning to filter out any suspended debris)
- Some jellyfish with strong swimming ability such as blue blubbers prefer strong flow to swim against

Disadvantages

- Increase the risk of jellyfish getting damaged by the water jet, especially in the case of weak swimmers such as moon jellyfish
- Food can be filtered out before the jellyfish has had a chance to catch it (more waste of food)
- Less relaxing to look at as jellies move around the tank much more quickly

06

HUSBANDRY FOR COMMON JELLYFISH SPECIES



MOON JELLYFISH (AURELIA SP.)

Overview: Moon jellyfish are the most common jellyfish to find in the aquarium trade. Yet common, moon jellyfish are one of the most popular species because of their opaque white colour and relaxing movement. This species is relatively easy to keep, and the husbandry for this species is well established. They usually come from cold to temperate waters and

are bred commercially making them an ideal and environmentally friendly animal to keep. EA's moon jellyfish are Japanese strain, which requires the temperature range of 16-24C. If cold water strains are kept, it will be necessary to have a chiller running on your aquarium. For temperate strains, this may not be required under ambient room temperatures of up to 22-24°C.

Distribution: Throughout world's ocean, from cold to tropic, coastal area including estuaries and harbours

Temperature: 15-25°C (depending on where they were collected or the strain cultured)

Feeding: Live baby brine shrimp, frozen baby/adult brine shrimp, frozen copepods, Medusa-G, 1-2 times a day

Life span: 1-2 years

Maximum size: Bell diameter up to 40 cm (16 inches)

Flow speed: Weak to medium

Harmful to human: No

Photosynthetic: No

Other notes:

Because of their bell shape, they can occasionally suck themselves against the walls or bottom of the aquarium, and may be unable to move away. When you see this, move them away gently by blowing water using a pipette or by wafting water across them. They can also catch air bubbles inside their bells. Avoid creating air bubbles as much as possible. When you see air bubbles caught under the bell, gently turn them upside down and let the air free.



BLUE BLUBBER JELLYFISH (CATO-STYLUS MOSAICUS)

Overview: Blue blubbers are also common species for jellyfish aquariums and are relatively easy to keep. This species is distinguished by their dome-shaped bell with eight oral arms which look like cauliflowers. They are popular for their variety of colours from light blue to dark purple and burgundy. There are sometimes white and brown colour variants as well, and what makes this colour differences within this species is unknown. They are strong and active swimmers.



Distribution: East coast of Australia, Philippines

Temperature: 20-26°C

Feeding: Live baby brine shrimp, frozen baby brine shrimp, Medusa-G, frozen copepods, 1-2 times a day

Life span: 4-6 months in captivity

Maximum size: Bell diameter up to 15 cm (6 inches) in captivity

Flow speed: Medium to strong

Harmful to human: No

Photosynthetic: No

Other notes:

It used to be thought that they have symbiotic algae inside their body, but recent studies showed that this is not the case and they can healthily grow and thrive with just feeding without a full-spectrum lighting. As they are strong swimmers, the top of their bells get easily damaged by hitting the bottom and walls of the aquarium. Keep the bottom and walls of your tank as smooth/clean as possible, and keep jellyfish away from the bottom and walls by adjusting flow speed.

SPOTTED JELLYFISH (MASTIGIAS PAPUA)

Overview: Spotted jellyfish (or lagoon jellyfish) inhabit quiet bays, harbors and lagoons of the South Pacific. They are easily distinguished by the white spots throughout their body and the eight appendages hanging down from oral arms. They are very popular in aquarium trades for their variation of colour, which are pale blue, green, pink, orange and yellow, on their semi-translucent body covered with white spots. Instead of a single mouth, they have many small mouth openings on their oral arms, which capture small zooplankton. As they depend on photosynthesis by symbiotic algae for their energy requirements, full-spectrum lighting is required in aquariums.



Distribution: Indian Ocean, China Sea to Japan, and outward over the Pacific to the Fiji Islands

Temperature: 22-26°C

Feeding: Feeding: Live baby brine shrimp, frozen baby/adult brine shrimp, frozen copepods, Medusa-G, 1-2 times a day, and full spectrum lighting for photosynthesis for 12hs per day

Life span: Up to 14 months

Maximum size: Bell diameter of 14-16 cm (5.5 inches)

Flow speed: Weak to medium

Harmful to human: No

Photosynthetic: Yes

Other notes:

Their relative kin Australian spotted jellyfish (*Phylloriza punctata*) can be kept in the same conditions.

UPSIDE DOWN JELLYFISH (CASSIOPEASP.)

Overview: The upside-down jellyfish is so called because it spends most of its time on mudflats with its bell against the sea bed and its tentacles pointed towards the water surface. This jellyfish is one of the easiest species to keep as it does not require a kreisel system. They could be kept even in plastic bottles when they are small as long as water changes are performed as necessary. The variation in their colour is one of their attractions, such as blue, green, orange and brown, usually with white stripes on their bells. Even though they are photosynthetic, they still require to be fed baby brine shrimp regularly to grow healthily.



Distribution: Upside down jellyfish are commonly found in mangrove swamps and mud flats in tropical waters over the world, such as Caribbean Sea, West Atlantic Sea, Indo-Pacific, Gulf of Mexico and South of Japan.

Temperature: 22-26°C

Feeding: Live baby brine shrimp, frozen baby/adult brine shrimp, frozen copepods, Medusa-G, 1-2 times a day, and full spectrum lighting for photosynthesis for 12 hours per day

Life span: Up to 2 years

Maximum size: 30 - 35 cm (12-14 inches)

Flow speed: weak to medium

Harmful to human: No

Other notes:

Upside down jellyfish can be kept in a reef aquarium with other fish and corals. Just make sure to create a spot for them with less flow so they can settle and will not be blown away. They can look very similar the 'Hellfire' sea anemone which has a very strong poison (Phyllodiscussemoni). Please do not touch them in the sea unless you are absolutely sure that they are upside-down jellyfish.

SOUTH AMERICAN SEA NETTLE (CHRYSAORA PLOCAMIA)

Overview: South American sea nettles is a large sea nettle with a bell diameter typically 50-60cm with the oral arms reaching lengths of 2-3 m. Rare specimens attain diameters of about 1 m with oral arms extending more than 3m. The colour of the bell is light pink to white until they grow to the size of 10cm, then they will develop the red or brown 16 triangular streaks radially distributed on their bells. The wild specimen can be intensely pigmented from dark red to brown on its whole body.



Relatively easy to breed and grow. The healthy polyps can spread fast and produce jellyfish quickly. Newly born ephyrae are already capable of feeding baby brine shrimp well. They grow well on feeding solely on live baby brine shrimps, and are not capable of feeding on other jellyfish unlike other sea nettles. They feed also other types of food such as adult brine shrimp, mysids and seafood shakes.

Distribution:

Temperature: 15-22°C

Feeding: Live baby brine shrimp, frozen baby/adult brine shrimp, frozen copepods, Seafood shake, 1-2 times a day

Life span: Up to 1 year

Flow speed: Weak to medium

Harmful to human: Partially - Stings from captive bred species are usually undetectable, however may cause irritation to those with sensitive skin

Other notes:

Although most Chrysaora species of jellyfish prefer to feed on gelatinous plankton over crustaceans, South American sea nettle is not capable of feeding on other jellyfish.





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