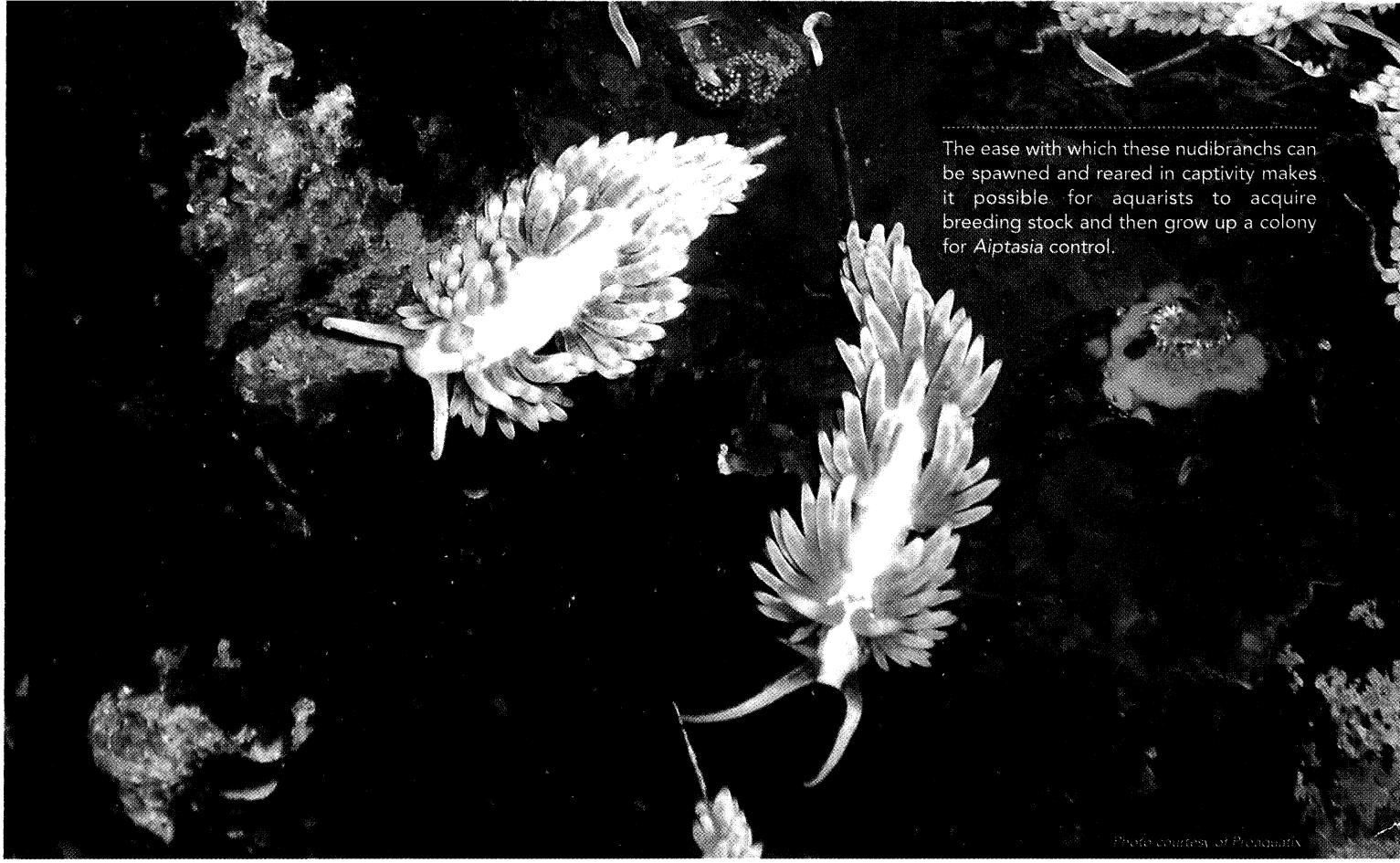

The ease with which these nudibranchs can be spawned and reared in captivity makes it possible for aquarists to acquire breeding stock and then grow up a colony for *Aiptasia* control.

Biological *Aiptasia* Control: Commercial Availability of *Berghia verrucicornis*

Jonathan Fung, courtesy of Proaquatix

Glassrose anemones (*Aiptasia* spp.) are prolific pests in coral reef aquaria. These anemones have powerful stings that discourage polyp extension and local colonization of ornamental corals and zoanthids. Furthermore, they are unsightly, and their stings may harm fishes that are closely associated with the benthos (e.g., seahorses).

Asexual propagation of *Aiptasia* by pedal laceration is reminiscent of Greek mythology's Hydra and its regenerating heads. Since every piece of their pedal tissue has the ability to develop into complete anemones, every piece of *Aiptasia* tissue must be removed from an aquarium for effective eradication.

Aiptasia are commonly seeded inadvertently when benthic structures such as live rock and corals are introduced into the home aquarium. Preventing *Aiptasia* introduction cannot be guaranteed unless the substrate to be added is sterilized, a procedure that runs contradictory to the idea of a natural reef aquarium. The presence of *Aiptasia* in reef aquaria can almost be considered inevitable, due to the remarkable prevalence of infesting propagules in the aquarium trade.

Enter the Sea Slug

Berghia verrucicornis is a white-colored sea slug of the family Aeolidiidae, found in the shallow reef flats of the Caribbean (Kempf, 2002). This sea slug reaches a maximum size of approximately one and a half inches and specializes in eating *Aiptasia*. The zooxanthellae ingested with *Aiptasia* reside within a *Berghia*'s gills briefly before being expelled (Kempf, 2002), thus a lack of brown color in its gills indicates that the *Berghia* either fed on photo-independent *Aiptasia* or that it is starved. It is not known whether *Berghia* utilize photosynthates from these zooxanthellae or whether the algal endosymbionts are simply passing through, but *Berghia* are likely not dependent on their resident zooxanthellae, since they often hide in dark recesses and survive even in dimly lit tanks. In fact, *Berghia* will often hide during the day, only coming out to feed on *Aiptasia* in the dark.

Photo courtesy of Proaquatix

Above: Not only is *Berghia verrucicornis* an exception to the rule that nudibranchs are not suitable for the aquarium, it is also an extremely useful addition to a reef tank, since it selectively preys on pest anemone.

Below: Unlike other animals purported to eat *Aiptasia*, this nudibranch will not sample other sessile invertebrates.

Berghia may be forced to forage even during lit hours, however, as their population grows and *Aiptasia* prey becomes scarce. The tendency for *Berghia* to hide during the day is likely an adaptation to avoid predators, although common reef aquarium fishes usually ignore *Berghia*. While it has been said that *Berghia* are easily lost in a reef tank, they are more likely hiding or have been killed by powerheads and filter intakes. The use of a coarse sponge pre-filter on intakes can prevent the death of these and other small critters. Note also that *Berghia* should not be allowed to fall directly on large *Aiptasia* when introducing them into an aquarium, as this may result in fatter *Aiptasia* and fewer *Berghia*.

Eradication Solutions

Berghia are the most effective means of *Aiptasia* eradication because they exclusively eat *Aiptasia* and ignore all other invertebrates, corals, and foods. Other natural predators of *Aiptasia*, including the copperband butterfly *Chelmon rostratus* and the peppermint shrimp *Lysmata wurdemanni*, are less desirable for *Aiptasia* eradication because these animals also graze on ornamental corals or eat fish foods in preference to *Aiptasia*. With the exception of tank-raised specimens, healthy butterflyfishes are also notoriously difficult to acquire due to problems associated with wild capture and food weaning.

Photo courtesy of Proaquatix

OBLIGATE FEEDERS

Berghia verrucicornis *have no choice: They eat* Aiptasia, *or they die. This makes them ideal for anemone control in the reef tank, but it also dooms them to starvation once they've done their job. Continuously passing them from one infected aquarium to another not only preserves the nudibranchs' lives, it allows aquarists to always have a sizeable number on hand, ready to immediately attack even serious* Aiptasia *infestations.—Eds.*

The relatively simple life cycle of *Berghia* enables their rapid expansion within aquarium environments, allowing the *Berghia* population to overwhelm the *Aiptasia* infestation. Unlike the self-propagating *Berghia*,

Photo courtesy of Proaquatix

A welcome sight for many beleaguered aquarists—a *B. verrucicornis* with an egg string.

neither the copperband butterfly nor the peppermint shrimp has demonstrated consistency in complete *Aiptasia* eradication. Their control of *Aiptasia* is more appropriately described as grazing that discourages *Aiptasia* population growth, rather than a means of eradication.

Also, it is an unspoken, universal, industry understanding that the arduous task of manual *Aiptasia* removal, often by attack with hot water or chemical injections, is only appropriate as a means of punishment for surly aquarium shop staff.

Stocking

Effective and quick eradication of most *Aiptasia* problems can be achieved by stocking one *Berghia* per five gallons of aquarium volume. If a speedy solution is less important than saving money, at least three to six *Berghia* are needed to begin a culture in an aquarium. These sea slugs are simultaneous hermaphrodites (Kempf, 2002) and will mate upon most encounters. The resulting egg masses are laid in a white strand that adheres to hard substrate in an expanding circle pattern. Their life cycle is considered relatively simple because a portion of these eggs will hatch as a benthic organism without a planktonic development phase (Carroll and Kempf, 1990).

Note that sexual maturity of a *Berghia* cohort occurs one and a half months from the date that they were laid as eggs (Carroll and Kempf, 1990), and the effect of *Berghia* on an *Aiptasia* infestation will not be substantial for several generations. When deciding on the number of *Berghia* with which to seed an aquarium, evaluate the importance of time and aesthetics, the degree of *Aiptasia* infestation, the lag time between seeding and population growth of *Berghia*, and the detrimental effect of *Aiptasia* on corals in the meantime. Obviously, the probability of establishing a reproductive *Berghia* population increases as the seeding cohort size is increased.

Proaquatix

Proaquatix is steadily increasing the number of tank-bred species available to the pet trade. As of this writing, Proaquatix is the world leader in the aquaculture of marine aquarium fish, having the most species available. It is the vision of Proaquatix to advocate for all things that contribute to a better and enduring aquarium trade.

Retailers, wholesalers, and public aquariums that wish to stock tank-bred *Berghia verrucicornis* or tank-bred marine ornamental fishes should call 1.888.SALT.H2O or send an e-mail to info@proaquatix.com. Visit www.proaquatix.com for details on Proaquatix and species being raised.

References

Carroll, David J. and Stephen C. Kempf. 1990. Laboratory Culture of the Aeolid Nudibranch *Berghia verrucicornis* (Mollusca, Opisthobranchia): Some Aspects of its Development and Life History. *Biol. Bull. 179:* 243-253.

Kempf, Stephen C. 2002. *In:* Fossa, Svein A. and Alf Jacob Nilsen. 2002. The Modern Coral Reef Aquarium, Volume 4. Birgit Schmettkamp Verlag, Bornheim, Germany. Pp.143-145.

Proaquatix has close to 50 species on its list of available captive-bred fishes and invertebrates, with more being added all the time. Most of these are aquarium ornamentals, though they also raise captive-bred commercial species. For more information, check them out at proaquatix.com.