

NAME: _____

ARTICLE: BEAUTIFUL FRIENDSHIP

1. What kind of fish was Nemo? _____ scientific name _____
2. How did clownfish get their name?
3. How many species of clownfish are there?
4. Where do the most clownfish live?
5. Why can't clownfish live without an anemone?
6. Of the thousands of species of anemones, how many species of anemone can host clownfish?
7. how do clownfish avoid being stung?
8. what advantage does the anemone have by having a clownfish live within?
9. How often do clownfish lay eggs?
10. Describe the developmental process of clownfish larvae.
11. How long does the young clownfish have to find an anemone before it dies?
12. how many clownfish can live within a single anemone?
13. What is the diet of a clownfish?

14. What is the lifespan of a typical clownfish?
15. do all clownfish mate? Explain.
16. Describe the "really good adaptive strategy" that clownfish have to ensure that a breeding pair will always be within an anemone.
17. why is it so expensive to sell clownfish raised in captivity?
18. what are three problems seen by wild caught clownfish?

W

HEN ANDREW STANTON set out to make an animated children's movie set in the ocean and faithful to "the real rules of nature," all he needed was the perfect fish for his main character. Combining through coffee table books on sea life, his eye landed on a photo of two fish peeking out of an anemone. "It was so arresting," Stanton says. "I had no idea what kind of fish they were, but I couldn't take my eyes off them." The image

of fish in their natural hiding place perfectly captured the oceanic mystery he wanted to convey. "And as an entertainer, the fact that they were called clownfish—it was perfect. There's almost nothing more appealing than these little fish that want to play peekaboo with you."

So a star was born. *Finding Nemo*, the Pixar movie Stanton wrote and directed, won the 2003 Academy Award for best animated feature and remains one of the highest grossing G-rated films of all time, taking in over \$850 million dollars to date. Nemo—a clownfish of the species *Amphiprion percula*—introduced millions of children around the world to a wondrous tropical ecosystem: the coral reef and its denizens.

Clownfish get their name from the bold color strokes on their body (from rich purplish browns to bright oranges and reds and yellows), often divided by stark lines of white or black, quite like the face paint on a circus clown. Seeing clownfish darting among the tentacled folds of an anemone is like watching butterflies flitting around a flowering plant in a breeze-blown meadow—mesmerizing.

Twenty-nine species of clownfish live among the reefs from East Africa to French Polynesia and from Japan to eastern Australia, with the greatest concentration of diversity on the north coast of New Guinea in the Bismarck Sea (where with a little luck and a competent guide you can see seven species on one reef). On a recent diving trip to Fiji, Gerald Allen—a research

associate at the Western Australian Museum and the world's clownfish authority—discovered the 29th species, *Amphiprion barberi*. That brought his lifetime total to seven clownfish (and nearly 500 species of reef fish). "I still get a huge buzz when I find something new," Allen says. "*Amphiprion barberi* is a beautiful clown, orange and red like a blazing ember on the reef."

AMONG SCIENTISTS and aquarists, clownfish are also known as anemonefish because they can't survive without a host anemone, whose stinging tentacles protect them and their developing eggs from intruders. Of the roughly thousand species of anemones, only ten host clownfish. It's still a mystery exactly how a clownfish avoids being stung by the anemone, but a layer of mucus—possibly developed by the clownfish after it first touches an anemone's tentacles—may afford protection. "It's a slime that inhibits the anemone from firing off its stinging cells," Allen says. "If you ever watch a new little anemonefish coming into an anemone, it makes these very tentative touches. They have to make contact to get this chemical process going." Thus shielded, the clownfish, in effect, becomes an extension of the anemone—another layer of defense against anemone-eating fish, such as the butterflyfish. What's good for the clownfish is good for the anemone, and vice versa.

Clownfish spend their entire lives with their host anemone, rarely straying more than a few yards from it. They lay their eggs about twice a month on the nearest hard surface concealed by the fleshy base of the anemone, and they aggressively protect the developing embryos. Just after a clownfish hatches, it drifts near the surface for

James Prosek's book about eels will be published in September by HarperCollins. David Doubilet has photographed sea life in 55 Geographic articles.

As
ar
sa
AM

a
it
le
re
ar
tv

ci
ir
(
S
a:
c:
tl
it
tl
y

TON set out
l to “the real
cter. Comb-
o of two fish
had no idea
” The image

n Museum and
discovered the
i. That brought
ish (and nearly
et a huge buzz
len says. “Am-
clown, orange
the reef.”

s, clownfish are
ause they can’t
s, whose sting-
eir developing
ghly thousand
ost clownfish.
v a clownfish
me, but a layer
y the clownfish
e’s tentacles—
ne that inhibits
stinging cells,”
ew little anem-
it makes these
e to make con-
s going.” Thus
t, becomes an
other layer of
g fish, such as
the clownfish
e versa.
ives with their
ore than a few
s about twice a
e concealed by
id they aggres-
soryos. Just after
the surface for



As dusk falls, a magnificent sea anemone contracts, resembling a terra-cotta pot. Enough of its tentacles are exposed for the resident percula clownfish, which can grow to about three inches long, to burrow in for safe haven. The color of this anemone species' body varies from orange to pink, blue, green, red, or white.

AMPHIPRION PERCULA (PERCULA CLOWNFISH); HETERACTIS MAGNIFICA; GREAT BARRIER REEF, AUSTRALIA

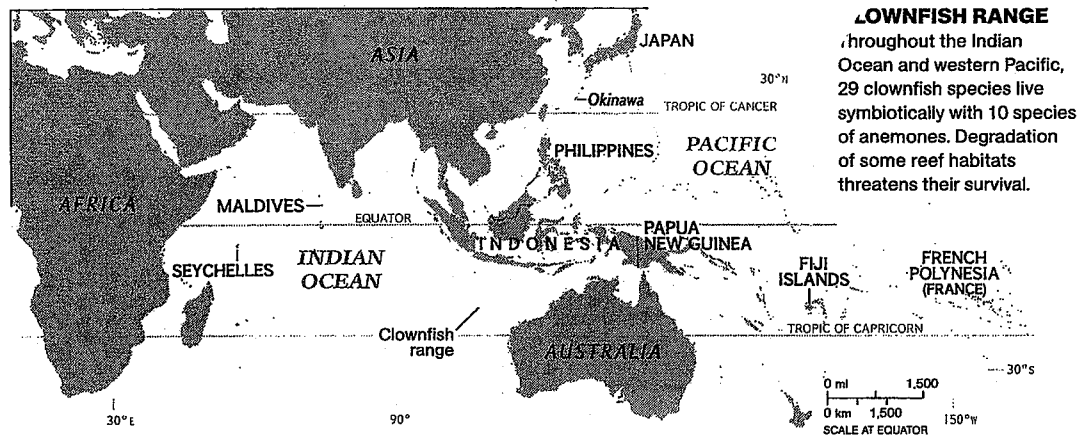
a week or two as a tiny, transparent larva. Then it metamorphoses into a miniature clownfish less than half an inch long that descends to the reef. If the young fish doesn't find an anemone and acclimatize to its new life within a day or two, it will die.

A dozen or more clownfish of the same species, from juveniles to mature adults up to six inches long, can occupy a single anemone. (Allen has seen as many as 30 on specimens of *Stichodactyla haddoni*.) Cruising around their anemone, they snag plankton, algae, and tiny creatures such as copepods, often hiding within the folds of their host to eat the larger food items. In the wild, where grouper or moray eels threaten, clownfish rarely live past seven to ten years, but in the safety of captivity they can go

much longer. My neighbor keeps a spry 25-year-old, which used to bite my knuckles when I cleaned out his reef tank years ago as a kid.

Clownfish may or may not become sexually mature adults. A strict hierarchy exists among the occupants of each anemone, which hosts only one dominant pair at any time. The female is the largest in this “family,” followed by the male and the adolescents. A mature pair assure their continued dominance by chasing the juveniles, causing stress and reduced energy for food foraging. “During courtship especially, there's a lot of chasing between the dominant pair,” Allen says. The female occasionally reminds the male who's boss by nipping at his fins.

Many reef fish have the ability to change from one sex to another. Most, such as wrasses and



JEROME N. COOKSON AND LISA R. RITTER, NG STAFF
SOURCE: GERALD ALLEN, WESTERN AUSTRALIAN MUSEUM

parrotfish, change from female to male. But the clownfish is one of the few known to change from male to female: If a dominant female dies, the dominant male will become the dominant female, and the largest remaining juvenile will assume the role of dominant male. No one has yet identified the hormones responsible for this sexual plasticity. "It's a really good adaptive strategy to make sure the species is perpetuated," Allen says. "There will always be a breeding pair at any given anemone."

THE CLOWNFISH and the anemone—their relationship has captivated home aquarists since the 1970s, when improvements in the shipping of fish and in tank design and filtration caused a boom. But never before has a fish had a bigger boost than the clownfish in the wake of *Finding Nemo* (unlike the notoriety of a very large mechanical killer with teeth). At first, fear spread through the aquarium industry that the story line would cause a backlash: Nemo is captured and held in a tank in a dentist's office, and his father spends the rest of the time trying to rescue him. "I'm here to tell you the opposite happened," says Vince Rado of Oceans, Reefs and Aquariums (ORA), a hobby-fish hatchery and wholesaler in Fort Pierce, Florida, whose sales of *A. ocellaris*—a Nemo look-alike species—jumped by 25 percent. "Thank God for little Nemo!"

Stardom has been a mixed blessing for clownfish themselves. For years it has cost much less to catch and ship wild-caught clownfish than to raise the fish in captivity. Breeding them in tanks presents certain challenges—getting the

larvae to feed, for one—and it takes at least eight months to grow them to marketable size.

But the economics of wild clownfish have been changing: Rising fuel costs have made shipping them more expensive, and populations have been declining. Overharvesting and invasive collection methods, such as the use of cyanide to stun and capture fish, are destroying reefs and their inhabitants. In the Philippines and Indonesia, for instance, clownfish have been severely depleted. Loss of clownfish leaves anemones exposed and vulnerable to predation. When reefs go bad, one of the first things to disappear is anemones—and their clownfish. "They're a really good indicator group," Allen says.

Besides spurring demand for clownfish, *Finding Nemo* helped fuel the explosion of websites and chat rooms devoted to raising reef fish in captivity. ORA breeds 13 clownfish species, as well as designer exotics such as the Picasso clown. Rado says he sells some 300,000 clownfish a year—"that's several hundred thousand that won't be taken from the wild."

Despite the reef degradation Allen has witnessed during his 40-year career, he says that in some areas "there's incredible hope. Many reefs are almost pristine and very healthy." His focus now, as a consultant for Conservation International, is "to identify these areas and help with their preservation before it's too late."

Although the movie may have harmed native populations, Stanton's colorful little character also created a new group of nature lovers, eager to preserve clownfish and their reef homes. "I hope it increased awareness," Stanton says. "I know it's precarious out there." □