

Culture of Marine Ornamentals:
For love, for money and for science

Martin A. Moe, Jr.

A Survey: Presentation of the Data

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Direct All Comments and Questions To:

Martin A. Moe
Green Turtle Publications
222 Gulfview Drive
Islamorada, FL 33036
PH: 305-517-9085
FAX: 305-664-3902
E-mail: martin_moe@yahoo.com

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A Survey: Presentation of the Data

The purpose of this printed presentation of data and commentary obtained from a survey of scientists, commercial breeders and marine aquarium hobbyists is to make this information immediately available to the attendees at this conference. The culture and propagation arm of the marine ornamental hobby/industry is growing very rapidly from a small stub in the mid 1980's into what is now a formidable appendage. One can almost see growth occurring at a daily pace. In a year or two changes in the hobby may make the data in this survey of only historical value, but at this time, they provide a snapshot of the status of culture and propagation in the hobby and industry. The accelerating growth of biological understanding, and the technology that this knowledge has spawned, is rapidly changing the social and economic structure of the hobby. These changes and developments, although intuitively understood by hobbyists and professionals, are graphically expressed in the data from this survey.

The list of organisms under culture, and the list of those that have been successfully propagated, grows daily. Just recently, November 2001, hobbyist/scientist Frank Baensch of Reef Culture Technologies in Hawaii succeeded in rearing *Centropyge fisherii* through metamorphosis, an exciting breakthrough that will, eventually, open the world of small edged, pelagic marine fish to commercial culture. Successful hobbyists often become commercial breeders, or at least develop into part time entrepreneurs, and often use their propagation skills to fund much if not all of the structure of their hobby. Culture and propagation of corals and some fish is expanding rapidly and the hobby may now be entering a log phase of growth. Soon the infrastructure of the marine ornamental hobby/industry may begin to look much like that of its big brother, the freshwater aquarium industry.

The data are presented here without analysis and interpretation. This survey is not hard science; it was not designed to produce statistically valid data. It did, however, recover the views and reports of a large number of scientists, commercial breeders, and hobbyists who are engaged in the culture of marine ornamentals, and it does provide insight into the current structure, attitudes, and future trends of the hobby/industry. This insight is, of course, subject to wide interpretation (as are the results of all surveys). I will add my own interpretations and insights during the talk and in a later paper, and I am sure that you will have your own opinions on the meaning of these results.

Hobbyist Results

Hobbyist Results

There were 325 responses to the hobbyist questionnaire from hobbyists from all over the world, but mostly from the US. The data compiled from these questionnaires is presented below.

Not all respondents answered all questions. In this hobbyist questionnaire, all questions except number 2 elicited multiple answers from most respondents. I felt that multiple answers to these questions reflected the broad range of experience and opinion among hobbyists and that proportioning the responses to obtain an accurate percentage analysis limited to the respondent universe was not meaningful.

Question 3, however was an exception because that question explored the status of trade and exchange at the hobbyist level. Of the 318 hobbyists that answered that question, 60 indicated that they both gave away and sold excess organisms to other hobbyists. The purpose of the question was to develop an indication of the proportion of hobbyists that obtained some recompense from their activity. Therefore all 60 responses that indicated both sales and gifts were assigned to B (sales to other hobbyists). Fifteen respondents also indicated that they traded organisms with other hobbyists and fifteen also indicated that they sold or traded organisms with local fish stores in addition to sales to other hobbyists. These 30 responses were not listed separately and these respondents were included only under the sales category, B, where they reflect some economic return to the hobbyist.

A percentage analysis of the responses to questions 2 and 3 are presented. Since each respondent contributed only one choice to each question, a percentage analysis of the universe of respondents in these questions is meaningful and interesting.

Some hobbyists were very perfunctory with the questionnaire, indicating an answer with just a mark and providing no comment whatsoever. Others answered every question with an essay. But most did provide a comment or two at various points and these comments were collected, sometimes edited, and were placed in the lists under questions 8 and 10.

Hobbyist questions

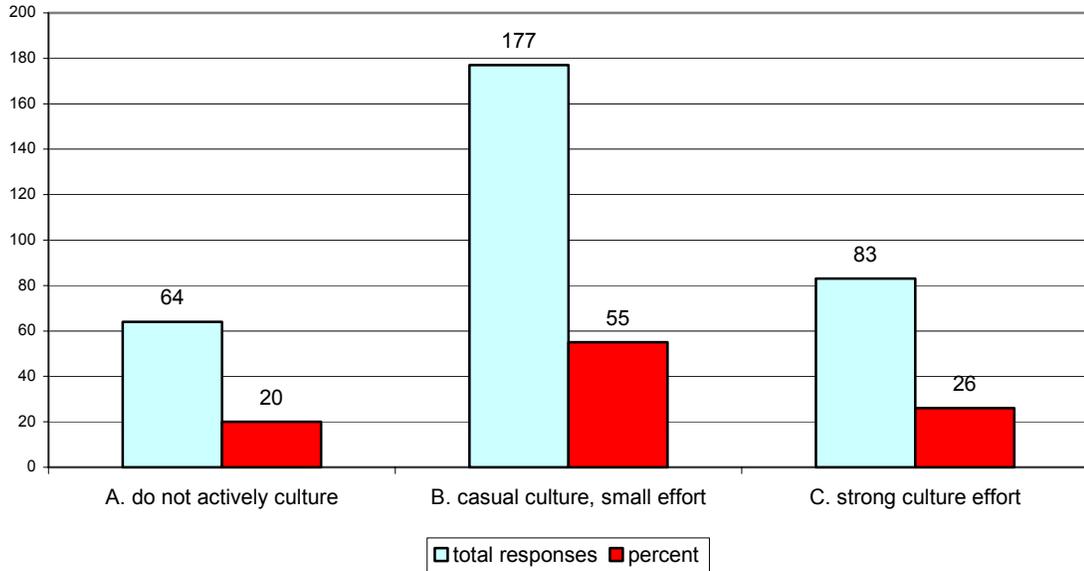
2. As a hobbyist, **(324 respondents, 324 responses)**

A. I do not actively culture marine organisms, but I am interested and support this activity. **(64 responses)**

B. I try to culture marine organisms from time to time, but do not expend much effort. **(177 responses)**

C. I spend too much time with my aquariums, I really work at breeding marine organisms. **(83 responses)**

Hobbyist 2. Intensity of culture effort



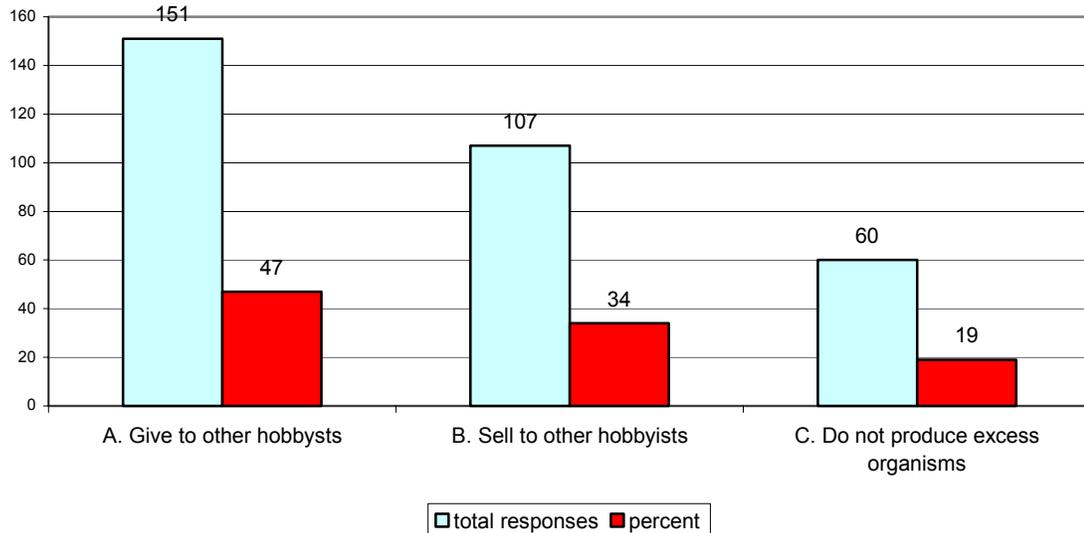
3. As a hobbyist, I dispose of the excess organisms I culture by: **(318 respondents, 318 responses)**

A. Giving them to other hobbyists **151 responses (47% of individuals responding)**

B. Selling them to other hobbyists **107 responses (34% of the individuals responding)**

C. I do not produce excess organisms **60 responses (19% of the individuals responding)**

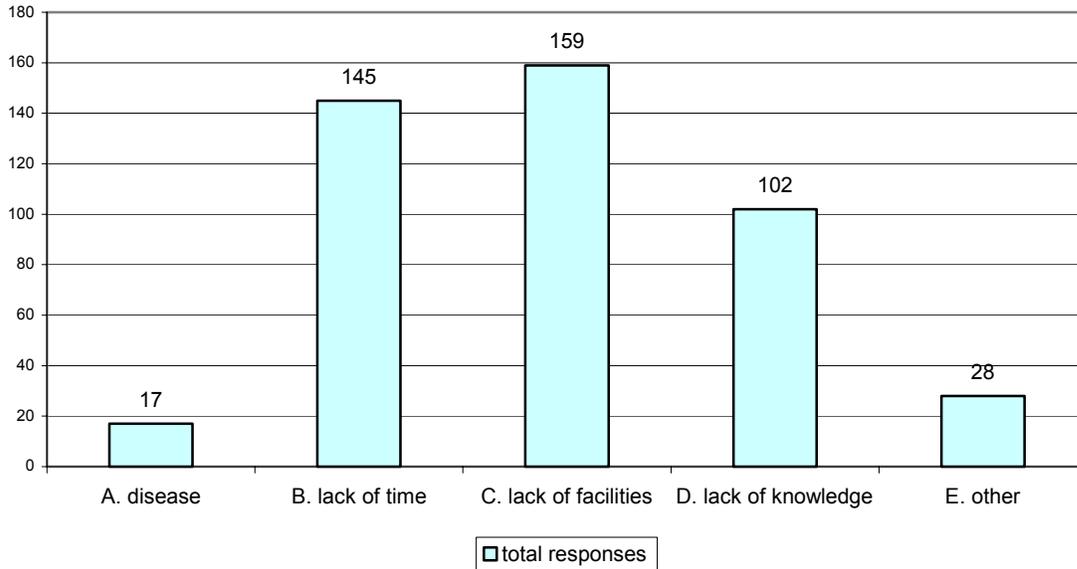
Hobbyist 3. Disposal of cultured organisms



6. As a hobbyist, major problems that affect my breeding success are: **(324 respondents, 451 responses)**

- A. disease **17 responses**
- B. lack of time **145 responses**
- C. lack of facilities **159 responses**
- D. lack of knowledge **102 responses**
- E. other **28 responses (details of "other" responses are included with comments)**

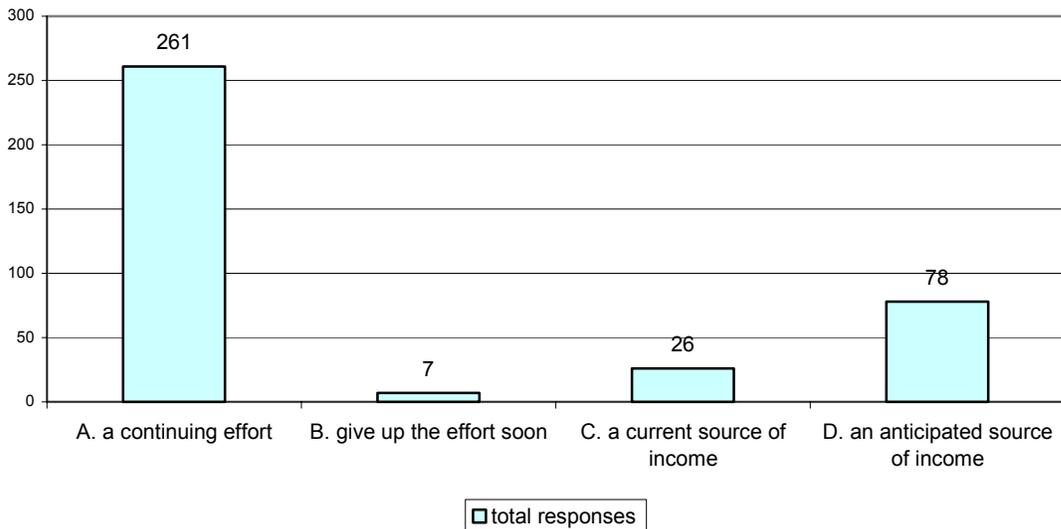
Hobbyist 6. Major problems affecting breeding success



7. As a hobbyist, I see the future of my culture efforts as: **(324 respondents, 372 responses)**

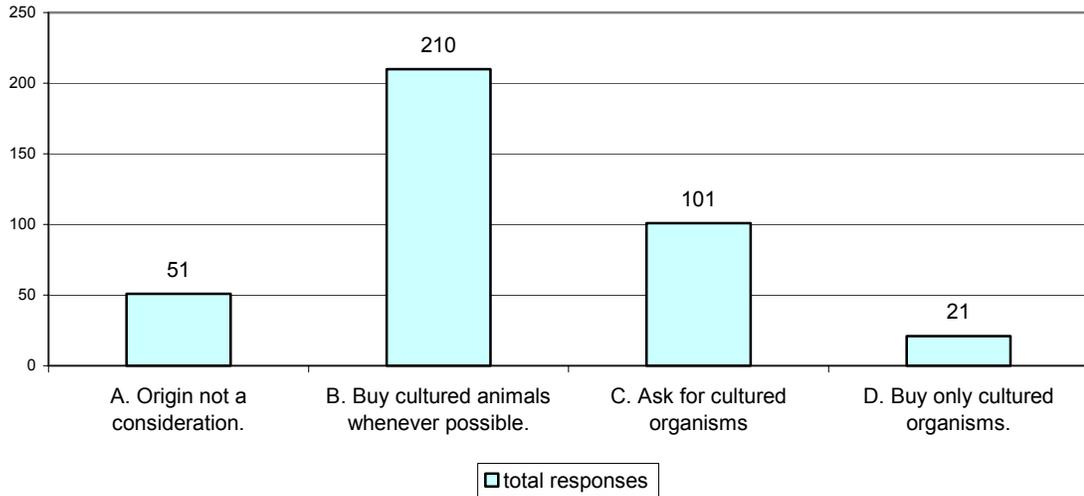
- A. a continuing effort to rear marine organisms **261 responses**
- B. something I will probably soon give up **7 responses**
- C. something that is a source of extra income **26 responses**
- D. something that may become a source of extra income **78 responses**

Hobbyist 7. Future intentions toward culture



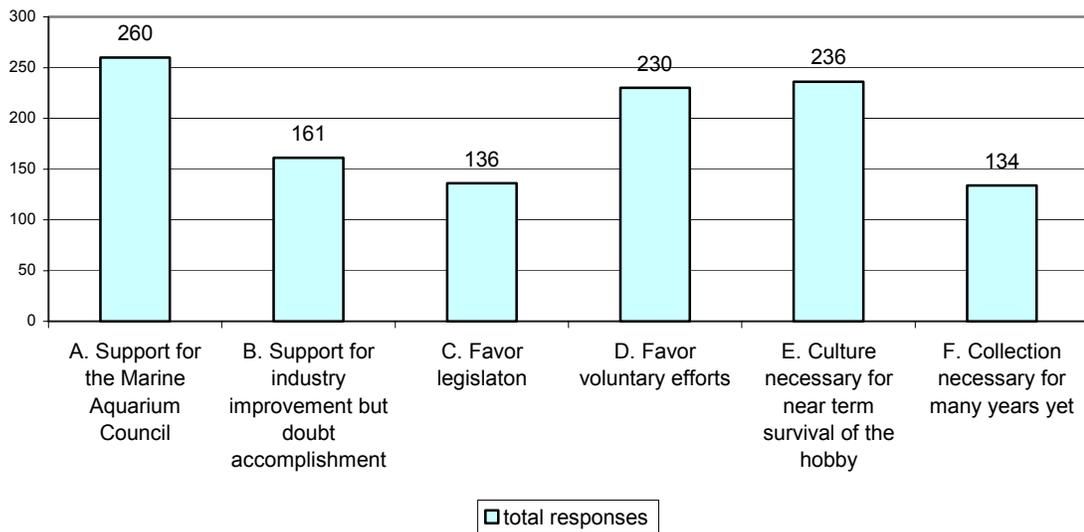
9. My attitude toward cultured “tank raised” marine organisms is: **(324 respondents, 383 responses)**
- A. I buy the best and most economical animals I find, doesn’t matter where they came from. **51 responses**
 - B. I try to buy cultured animals whenever I can. **210 responses**
 - C. I ask my sources for cultured animals and encourage them to provide them. **101 responses**
 - D. I will only buy cultured animals. **21 responses**

Hobbyist 9. Attitude toward purchase of cultured organisms



10. As a hobbyist, (check all that apply) **(324 respondents, 1157 responses)**
- A. I strongly support the efforts of organizations such the Marine Aquarium Council that are working to educate and certify those in the chain of supply of marine organisms. **260 responses**
 - B. I support efforts to improve the capture, transport, and maintenance of marine organisms, but I think that little will be accomplished. **161 responses**
 - C. I favor increased legislation to control abuses in the marine ornamental industry. **136 responses**
 - D. I favor voluntary efforts within the industry to control abuse through education. **230 responses**
 - E. Cultured marine organisms are necessary for the near term survival of the hobby. **236 responses**
 - F. Collection will be the foundation of the hobby for many years to come. **134 responses**

Hobbyist 10. Issues and opinions



Hobbyist 4. Species successfully propagated

4. As a hobbyist, I have successfully spawned and reared the following organisms. (Please list those fish, corals, or other invertebrates that you have propagated. List corals only if you routinely cull, sell, or give away excess growth.)

These are the species reported in the 325 responses from hobbyists as the organisms that they have successfully cultured. The number by the species and/or common name indicates the number of respondents that cultured that species. No number indicates one report. There was a wide variation in the detail of the responses. Some were very general, listing only a broad category such as SPS corals and some were extremely detailed and comprehensive. Many responses reported with only common names, some with scientific names (some spelled correctly and some not). Identification of many corals is quite difficult and most identifications by hobbyists to the species level, and many to the genus, are suspect. However, the broad category indicated by the identification is usually accurate. The same comment also applies to fish, but to a lesser extent.

Note that this list does not include every species that has been successfully propagated by hobbyists. Also the definition of a successful propagation varies among hobbyists. Some reports are certainly suspect, but those species listed by many hobbyists are certainly successfully propagated. Although not comprehensive, this list provides at least a summary of the species that have been successfully bred by hobbyist breeders. Hobbyists are proud of their accomplishments in the maintenance and culture of many species of corals. Even though I asked for those species that were produced in quantities in excess of their needs, I strongly suspect that many species were listed that reproduce in only limited quantities.

Propagation reports by hobbyists (and others also for that matter) are certainly not an assurance that that species can be reared commercially. Numerous reports of propagation of a specific species are an indication that the conditions for propagation of that species (or genus) can be met in relatively small, contained systems. Single reports of propagation of species known to be difficult to reproduce are suspect (but intriguing), and may possibly represent misidentification or mistaken reproductive activity.

Stomatella varians ?
Acrossata ?
Pinnigorgia ?
Corky sea finger ?

Caulerpa mexicana
Caulerpa racemosa, 3 grape
Caulerpa spp. 10
Caulerpa, 2 razor

Live Rock / Sand (total responses, 12)
Diversely populated live sand 11
Live rock

Coelothrix
Halimeda spp., 6
Halymenia
Hypnea
Isochloropsis
Kalymenia

Algae (total responses, 39)
Algae, macro 9
Algae, macro, red and green

Algae, continued

Nannochloropsis 2
 Valonia ventricosa, sea bottles, sailor's eyeballs

Sponges/Tunicates (total responses, 5)

Sponges 3
 Sponges, white
 Sponges, blue

Jellyfish

Aurelia aurita

Anemones (total responses, 15)

Anemones
 Sebae anemones
 Green finger anemone
 Entacmea quadricolor, 12 bubble tip anemone

Corals (total responses, 1023)**Soft corals (total responses, 701)**

Soft corals, 17 (species unspecified)
 Anthelia spp. 19
 Anthelia glauca
 Briopsis, spp.
 Capnella spp. 16 Kenya tree coral
 Capnella imbricata
 Capnella sp. green
 Caulastrea sp. 2 candy cane
 Caulastrea echinulata
 Caulastrea furcata 4 trumpet

Grouped Mushroom corals, (total responses, 124)

Mushroom corals, 91 all colors
 Actinodiscus mushrooms 6
 Discosmoa sp., red mushroom
 Discosoma sp., elephant ear mushroom
 Discosoma sp., green striped mushroom
 Discosoma spp. 13 mushroom
 Rhodactis spp., 3 mushroom anemones
 Ricordea spp., 7 hairy, fuzzy mushroom
 Ricordea florida

Grouped Gorgonians, (total responses, 27)

Gorgonians, 6 encrusting
 Gorgonians, 16 various
 Gorgonian, purple deadmans finger
 Muricea spp., spiny sea fan (gorgonian)
 Pleudoplexaura sp., porous sea rod (gorgonian)
 Psuedopterogorgia sp., 2 sea plume (gorgonian)
 Heliopora coerulea, 4 blue ridge coral
 Helipora spp.
 Hydnohpora
 Lemnalia spp. 3
 Nemenzophyllia turbida, fox coral
 Nepthea spp., 12 green tree coral
 Paralemnalia spp. finger coral

Grouped Leather corals, (total responses, 169)

Sarcophyton spp. 72 leather (many species)
 Alcyonium spp., seamans hand, colt
 Cladiella spp., cauliflower coral
 Cladiella, spp., 32 colt coral
 Litophyton spp. 6 crown leather
 Lobophytum spp., 25 devils hand
 Sarcophyton elegans 2
 Sinularia brassica
 Sinularia dura, 2 cabbage leather
 Sinularia sp., 3 green
 Sinularia spp. 24, cabbage, finger, lettuce
 Tubipora musica, 2 pipe organ coral
 Turbinaria reniformis 3

Grouped Xenia, pulsing hand, (total responses, 134)

Xenia spp. 104
 Xenia elongata 17
 Xenia sp. (brown)
 Xenia umbelata 2
 Xenia sp., 4 Fiji "pom pom"
 Xenia, 6 Red Sea

Grouped polyps, (total responses, 88)

Clavularia spp. 165 clove polyps
Clavularia viridis, 3 green star polyps
Colonial anemones (palythoa, sea mat,
Tonga, Button)
Button polyps, 3
Button polyps, green
Button polyps, cinnamon
Briaerium sp., 32 green star polyps
Briaerium abestinum, green star polyp
Sea mat 3
Star polyps 7
Star polyps, pink
Polyps 10, red, brown, yellow
Pacyclavularia violacea, 15 green star
polyps
Palythoa spp. 8 sea mat, button polyps
Parazoanthus gracilis
Parazoanthus spp. 3 yellow polyps
Protopalmythoa spp. 2 button polyps
Parazoanthus gracillis, 12 yellow polyps
Zoanthus spp. 33 button polyps
Zoanthus sp. purple polyps
Zooanthus sociatus

Stony corals (total responses, 313)

Stony corals, 2 (species unspecified)
Small pored stony corals (SPS), 18
(species unspecified)
Large pored stony corals (LPS), 3
(species unspecified)

**Grouped Acropora,
(total responses, 87)**

Acropora spp. 60 staghorn, bottle brush,
table (10 species or more reported
propagated by many hobbyists)
Acropora chesterfieldensis,
Acropora loripes
Acropora millepora, 2
Acropora nana, 2
Acropora, secale, with shelf coralites
Acropora cerealis, 2
Acropora formosa 2
Acropora humulus, 2
Acropora latistella, 2

Acropora microphthalma 3
Acropora microthalmus 3
Acropora sp. green 3
Acropora stubers 3
Bali stag (green, yellow, blue tip)
Blastomussa spp., 2 pineapple, open
brain
Blastomussa merletti, 3
Blastomussa wellsi, 4
Catalaphyllia jardenei, elegance coral
Caulastrea spp., 3 candy cane, trumpet
coral
Caulastrea furcata, 6
Duncanopsammia axifuga, 2 whisker
coral
Ecninophyllia spp. encrusting coral

**Grouped Euphyllia,
(total responses, 32)**

Euphyllia ancora, 3 hammer
Euphyllia divisa, 9 frogspawn
Euphyllia glabrescens, 4 branch torch
coral
Euphyllia paradivisa, 4 frogspawn
Euphyllia, spp. 7 branching hammer
Torch coral 5
Favia spp., 3 moon, pineapple, corals
Favites sp. moonstone coral
Fungia sp. plate, disk, mushroom
Galaxea sp., 2 star coral
Galaxea fascicularis, galaxy, crystal
Green brain coral
Green moon rocks
Hydnophora exesa, 2 green velvet horn
Hydnophora sp., 4 horn coral
Leptosera sp., leaf coral, sunray
Millepora alcicornis, 3 fire coral
(Hydrozoa)

**Grouped Montipora,
(total responses, 71)**

Montipora spp. 36 (5 species or more
reported propagated by many
hobbyists)
Montipora capricornis, 9 (3 varieties,
orange, brown)

Stony corals, continued

Montipora digitata 23 branching, various colors
 Montipora foliate, 2 plating
 Montipora samerensis
 Pachyclavularia sp.
 Parvona spp. 3 cactus
 Plerogyra spp., 4 bubble coral
 Pocillopora, spp. 9
 Pocillopora sp., pink with green polyps
 Pocillopora damicornis, 9 cauliflower coral
 Porities spp. 5 finger, jeweled, yellow
 Porites lichen
 Psammocora sp. 2
 Psammocora contigua
 Seriatopora spp. 5 birdsnest
 Seriatopora hystrix, 7 pink birdsnest
 Stylophora pistillata 2
 Stylophora spp., 4 finger, cluster, brush
 Tubastrea spp. Orange cup, sun

Annelids (total responses, 16)

Hermodice spp., Eurythoe spp., 6 bristle worms
 Notaulax spp., 2 feather dusters, dwarf red
 Polychaetes
 Sabella spp., 2 tube worms
 Sabellastarte magnifica, 2 fan worms
 Spirobranchus sp. Christmas tree worm
 Terebellid worms, 2 spaghetti worms

Mollusks (total responses, 34)

Berghia verrucicornis, 2
 Chitons
 Limpets, keyhole (Diodora sp.?)
 Limpets, 2 black
 Limpets, dwarf
 Limpets, sp.
 Octopus spp.
 Octopus voraiuns ?
 Opisthobranchs
 Snails 9
 Snails, cerith 7
 Snails, star

Snails, turbo
 Snails, vermetid
 Snails, nassarius
 Strombus maculatus, 2
 T. crispate?, algae eating seaslugs

Crustaceans (total responses, 25)

Amphipods
 Brine shrimp, 2
 Cleaner shrimp, blood
 Copepods, 8
 Emerald crabs
 Harlequin shrimp
 Hawaiian red shrimp
 Lysmata wurdemanni, 5 peppermint shrimp
 Mysid shrimp, 3
 Rhynchocinetes durbanensis, camel shrimp
 Shrimp

Echinoderms (total responses, 12)

Brittle stars, 3
 Brittle stars, dwarf white
 Holothuria ? sp., Tiger tail cucumber
 Mini stars
 Ophiarachna incrassata, fish eating brittlestar
 Starfish, 4
 Tripneustes sp., sea urchin

Fish (total responses, 111)

Amphiprion spp., 4
 Amphiprion akindynos
 Amphiprion clarkii, 4 Clark's clownfish
 Amphiprion ephippium
 Amphiprion frenatus, 9 tomato clownfish
 Amphiprion melanopus, (Fiji)
 Amphiprion melanopus, 2
 Amphiprion ocellaris, 19 common clownfish
 Amphiprion percula, 4 percula clownfish
 Amphiprion perideraion, pink skunk clownfish
 Amphiprion sp., sebae? Clownfish

Fish, continued

Centropyge fisheri, Fisher's angel
Gramma melacara, black cap basslet
Gramma loreto, royal gramma
Blennies, (Mediterranean)
Meiacanthus ovalaunensis ?, canary
blenny
Chrisiptera parasema, yellowtail blue
damsel
Gobiodon citrinus, citron goby
Flying fish (?)
Gobiosoma oceanops, 3 neon goby
Gobiosoma multifasciatum, Green
banded goby
Hippocampus spp., 3 seahorse
Hippocampus abdominalis, 3 pot-bellied
seahorse
Hippocampus babouri
Hippocampus reidi

Hippocampus zosterae, 2 dwarf seahorse
Mollies, salt water
Pipefish
Premnas biaculatus, 8 maroon clownfish
Pseudochromis aldabraensis, neon
dottyback
Pseudochromis flavivertex, sunrise
dottyback
Pseudochromis fridmani, 2 orchid
dottyback
Pseudochromis splendens, splendid
dottyback
Pseudochromis springeri, Springer's
dottyback
Red sea dottyback
Pterapogon kauderni, 24 Banggai
cardinalfish
Synchiropus splendidus, green
mandarinfish

Hobbyist 5. Species attempted and failed

5. As a hobbyist, I have tried and failed to rear the following organisms. (Please list those fish, corals or other invertebrates that you have seriously tried and failed to propagate.)

Hobbyists seem to have relatively few failures. This is perhaps because only a few hobbyists have the time and motivation to work with species resistant or difficult to culture. Organisms that reproduce naturally under the environmental conditions typically maintained in small reef aquariums are those most commonly propagated by hobbyists.

LPS corals 4
Acropora spp. 3
Acropora, spp. 2 (certain species)
Catalaphyllia jardenei, 2 elegance coral
Goniopora sp. 4
Nemenzoophyllia turbida, fox coral
Orange plate
Seriatorpora sp., birdsnest
Scarcophyton elegans
Trumpet corals
Zooanthids

Puellaris valcienna ?
Trachaphyllia ?

Live Rock / Sand

Algae

Sponges/Tunicates

Jellyfish

Anemones

Carpet anemones
Carpet anemones, Haddoni

Corals (total responses, 44)

Soft (total responses, 19)

Green star polyps
Candy coral
Colt coral
Green colt coral
Dendronephthya sp., strawberry coral
Diodogorgia nodulifera, yellow sea rod
Sarcophyton spp. 2 leather coral
Leather, pink
Leather, yellow
Leather, yellow Tonga
Mushrooms
Ricordia spp., 3
Stereonepthea ?
Xenia, long
Xenia 2

Stony (total responses, 25)

SPS corals 4

Annelids

Mollusks (total responses, 6)

Clams
Octopus 2
Flame scallops 2
Nudibranchs

Crustaceans (total responses, 40)

Shrimp 5
Cleaner shrimp 5
Enoplometopus debelius, reef lobster
Enoplometopus occidentalis, reef lobster
Lysmata ambionensis, 6 scarlet lady
shrimp
Lysmata debelius, 2 fire shrimp
Lysmata wordmanii, 9 peppermint
shrimp
Lysmata californica
Lysmata rathbunae, camel shrimp
Mithrax sculptus
Mysid shrimp
Periclimenes pedersoni
Periclimenes yucatanus
Stenopis hispidus, 5

Echinoderms

Blue linkia starfish

Fish (total responses, 100)

Amphiprion spp., 6

Amphiprion clarkii, 2 Clark's clownfish

Amphiprion frenatus, 2 tomato clown

Amphiprion ocellaris, 7 Common clownfish

Amphiprion percula, 5 percula clown

Amphiprion sp., blue striped clowns

Amphiprion polynemus, 2 saddleback

Angels 2

Arothron nigropunctatus

Balistoides conspicillum, clown trigger

Bicolor blennies

Gramma melacara, blackcap basslets

Chaetodontidae, butterflyfish

Centropyge spp.

Centropyge acanthops

Centropyge argi, cherubfish 4

Centropyge bispinosa

Centropyge fisherii, Fisher's angel

Centropyge flavissima, lemonpeel angel

Centropyge loriculus, 6 flame angel

Centropyge resplendens,

Chilomycterus antiga

Cryptocentrus cintus, yellow shrimp goby

Damselfish

Damsels

Damsel, blue

Diodon holocanthus

Diodon hystrix

Gobies

Gobiosoma oceanops, 2 neon goby

Green chromis

Lionfish 2

Mieacanthus grammistes, striped fang blenny

Mieacanthus mossambicus, Mosambique fang blenny

Nemateleotris magnifica, firefish

Opistognathus aurifrons, 2 yellowhead jawfish

Pholidichthys leucotaenia, convict blenny

Premnas biaculatus, 3 maroon clown

Pseudochromis aldabraensis, 3 neon (Arabian) dottyback

Pseudochromis fridmani, 5 orchid dottyback

Pseudochromis sp. 2 (dilectus ?)

Pseudochromis splendens, splendid dottyback

Pseudochromis springeri, Springer's dottyback

Pseudochromis sunrise dottyback

Pterapogon kauderni, 10 Bangaii cardinalfish

Seahorses 3

Signigobius biocellatus, twin spot goby

Stegastes bipartitus ? bicolor damsel

Striped hawkfish (to day 12)

Zebrosoma xanthurum, purple tang

Hobbyist comments

Hobbyists are complex creatures. They have differing motivations, attitudes, ideas, interests, and resources. Some hobbyists are unknowing and naive, some are casual and some are intense, some are realistic, some idealistic, some carry idealism through obsession and onto the edge of fanaticism, and some are at the cutting edge of the science of marine aquaristics. Some are right and some are wrong, and it is often difficult to tell the difference. Collectively, however, their attitudes, desires, skills, opinions and resources create the structure and the face of the hobby. The comments listed below are not “gospel”, they cover the whole range of truth, perspicacity, misinformation, and opinion, but they do reflect the desires and perceptions of hobbyists, and as such, are of interest to all of us concerned with the current status and the future of the marine aquarium hobby.

Hobbyist 8. “Wish list” for propagation

8. As a hobbyist, I would be more successful with culture of marine organisms and enjoy it more if I had the following: (Give me a brief “wish list”.)

Time

More time to culture 72

I wish I could take care of things when I’m at work.

I wish someone could take care of things while I’m on vacation.

Financial

Money (duh!) 54

Funding 4

Less expensive electricity 7

Less expensive lighting 2

I wish electricity was cheap.

Less expensive calcium addition

Less expensive livestock

Cheaper calcium reactors 3

Reasonably priced hardware

Lower prices on food supplements, DT’s and Selcon

More sources to buy cultured corals

I wish there was a bartering web board.

I would love it if propagation was my livelihood

How about grants for private hobbyist research?

Federal grants!

We need some kind of a universal basic price list. Some stores will boost prices right in front of you if they think they can get away with it.

Facilities and equipment

Facilities, larger and better, 35

More space 34

A fish room 3

Facilities and equipment, continued

Finish the fish room

I wish I had better facilities.

A huge fish room with 4' by 2' by 1' tanks with MH, VHO and PC lighting and all the other necessary equipment.

A wet lab with floor drains and filtered seawater on tap.

A 100 foot research vessel with a wet laboratory, seaplane, crew and dive staff, and, perhaps afternoon massages.

As long as you're asking, Santa, a 15,000 gallon greenhouse enclosed breeding facility. Sunlight (greenhouse)

A large outdoor greenhouse culture tank, 4000 gallons with sulfur lamps

A large greenhouse and time to run it

A large grow out area with free light and clean salt water

All the funds and resources to build a \$10,000 tank in my basement and set up a real marine system.

My own house with an aquarium room and a centralized filter system

Larger house with a fish room

Permanent location for tanks

Geothermal water

Supply of natural seawater 2

A helper to do water changes, 3 (labor)

Better and/or more equipment, 5

Bigger/more tanks 21

Another tank with lights 10

A larger tank with lighting (because they don't sell this at Costco!)

Breeding tanks

A large propagation only tank , complete with liverock, pumps, eggcrate shelving and metal halide lights. And a dealer willing to buy the frags.

Grow-out tank 5

A 40 gallon long tank with MH lighting for coral frags

Sump in basement with MH and grow out tank

A refugium

Fish breeding tanks

Mag Drive 2400 gph pumps

Bigger, better pumps

Pumps that don't destroy plankton

A reliable lunar cycle lighting system and good moon simulation lamps

A grow-out system with lighting bright enough to sustain coloration.

A couple more icecap 660 with uri bulbs

Access to less expensive equipment, especially lighting 2

Better lighting 12

Metal halide lighting 4

Facilities and equipment, continued

Two large central filter systems
A method of filtering a larvae tank
More stability in my tank/system 2
Ecosystem filtration, W/ATS, to reduce impact on plankton and eliminate the need for a protein skimmer
Downdraft skimmer

Miniature belt feeders
A computer for the internet
RO/DI water purifier
Better temperature control
Quality microscope
Refractometer
Quality test kits
Hobbyist test kit for cyanide
Probes for measuring tank conditions
Calcium reactor 5
Chiller

Food organism culture and availability

A good source of nutritious food organisms smaller than rotifers
A variety of small foods beyond rotifers and Nanachloropsis algae
Copepod cultures, more abundant
Copepod culture, a productive method
Phytoplankton/rotifer culture setup 6
Source of live plankton 4
Large quantities of cheap zoo/phytoplankton 2
Easy access to live foods 4
Easy rotifer culture techniques 2
Easy mysid shrimp culture
Microorganism culture area
Good frozen plankton food
Micro plankton sized dry foods
Easily stored and usable food for larvae
Places to get larval food and supplies
A nutritionally complete planktonic fry food
Low cost plankton product
Frozen foods (hard to get in Argentina)
Supply of small first food organisms, dinoflagellates, ciliates, 5
Supply of food organisms for each stage of an invertebrate larvae
An easy to use food for clownfish larvae
Plankton enrichment products (difficult to get in Australia)
Access to new products (genetically engineered chlorella and nannotropolis that metabolize sugar from the water instead of photosynthesis
More algae for snail food

Broodstock and livestock

More broodstock 3

Good broodstock of rare species

A good supply of healthy broodstock

Cheaper, more abundant broodstock

Greater variety of organisms available locally

Mated pairs of fish

Marine fish that are easier to sex and pair up, and that produce larvae that are easy to feed and have strong immune systems (you said “wish” list).

Get eels to breed

Ability to sex puffers

Clownfish that actually spawn 2

A male Hippocampus reidi that carries his fry to term

A good source of livestock, few fish arrive healthy in southern Oregon

Better quality of livestock

I failed at first with Xenia but then I learned to take off the holding net at the right time and now things go well.

General propagation

Soft coral propagation

Specific set up for coral frags

Xenia propagation

More or better coral propagation facilities 7

Fish production system 2

Live rock culture station

More efficient/safer methods of shipping

Better market for hobbyist cultured fish and corals 2

A network for trading cultured corals

Less expensive shipping and better survival of shipped corals

Information

More knowledge and education 13

Information on filtration

Information on coral structure and reproduction

Knowledge of planktonic stages of invertebrates and fish 2

Knowledge of present state of various species in the wild. Knowledge of any unusual microorganisms of concern found in different areas of the ocean.

Books 2

Better books, a great majority of the current books are too narrow 2

Books on breeding 3

A book on rearing different marine fish

A library of aquaculture and reproductive biology of aquatic animals

Instruction, 6 (step by step manual on culture, corals and fish)

Access to leading, cutting edge research and scientists. Publishing the latest scientific information in layman’s language and making it accessible will help the hobby. 2

Information, continued

Easier access to scientific journals.

Food culture knowledge 3

Better knowledge of cleaning methods of rearing tanks

Reproductive information on various fish species

Larval rearing information 3

More knowledge on disease of eggs and larvae

General knowledge on rearing fish 2

In depth information on how to maintain each organism

Better single source of information 3

Better collaboration with other breeders 5

Culture room in the Reef Central Board

Much of what is online is dated.

A degree in marine biology

A mentor

“How to” instruction in a club or meeting environment. Seeing first hand rearing/propagation methods is better than reading.

The folks who are breeding do not share their knowledge with the hobbyists, probably because there is money involved. It seems to be like it was with angels and discus years ago, since when you learned the secrets you found out it was not that hard.

Domestic/social/supernatural

Luck

More patience

More support

Less flack from my wife

A wife not grossed out by phytoplankton

An understanding wife

More enthusiastic support from my wife

Have not tried to culture corals as my wife would kill me.

A wife who would not mind the extra time it takes to maintain a large system and ideally would even offer to help out!

I recently got engaged and will probably be cutting back on aquarium work.

I'd love to branch out but my wife limits the square footage based on the old days of 13 tanks and shoeboxes with killis all over the house.

More money for tanks and a wife that would let me have them.

The day to day care of a marine system has been too much since I got married and moved into a house that needs a lot of work.

Have a club/group for share/trade/sell frags to each other, 2

A club with a facility so group projects could be run

A local group to share resources, knowledge and information

Access to the ocean from Louisville, KY

An ocean nearby for live food and seawater

A bit of fire under my butt

Hobbyist 10. General comments

(Note: LFS is an acronym for Local Fish Store)

Environmental concerns

Coral collectors should not take complete coral formations

Coral collectors should be educated in proper collection techniques

We should be able to enjoy marine aquariums without environmental damage.

Ban imports from areas where destructive collection occurs

I try to buy only net caught fish.

The public should be made aware of the abuses of other industries, food fishing, mining, logging, and farming. The aquarium industry seems to be the scapegoat for these other abuses.

Captive culture of all marine animals seems to be the ethical and intelligent future path.

Cultured organisms are not necessarily aquarium bred. The coral reef environment can supply cultured organisms and help the native people.

I discourage purchase of wild caught seahorses, because of great demand, their numbers are decreasing.

I believe we are raping the reefs just like our forests. I am willing to do whatever I can to stop this practice.

I refuse to buy species that do poorly in captivity. I believe that this is an important aspect of our hobby.

Hopefully in years to come we won't have to collect anything from the reefs.

Comments and concerns on retailers/wholesalers

Retailers should quarantine corals for two weeks

Retailers should be certified

Retailers should be educated on proper techniques for maintaining marine species

Retailers and wholesalers should participate in hobbyist events

Retailers should better advise hobbyists on which species will survive best in tanks.

Retailers should not sell animals that will not survive in tanks.

Don't trust information provided by stores

Disgusted with low quality aquarium stores. Some certification for stores should be required.

I've seen too many fish stores give terrible advice.

When trying to sell tank raised fish, I encountered LFS's that don't want captive bred fish, that won't pay extra for captive bred fish (the majority), and only one that appreciates captive bred fish.

I can't get LFS to take an interest in smaller captive grown corals.

Also blame the LFS and the hobbyists for the high death rate. I know of too many creatures that are placed in inappropriate tanks due to the ignorance of the LFS and the hobbyist.

There is too much mortality with wild collected organisms. I believe the problem is with the wholesalers. They buy animals they know, or should know, won't survive. If they didn't buy these animals, the collectors wouldn't collect them.

Comments and concerns on retailers/wholesalers, continued

I will go into a local fish store and see 15 tangs in a 20 gallon tank, diseased fish and coral tanks that do not have the proper lighting. I think this is wrong, but you mention it to the manager and they don't do anything. It's all about making money.

Many of the people who work at pet shops do not know much at all about the animals and organisms they sell. This may be changing but it has a long way to go.

I wish there were more education for the employees of fish stores so they could tell customers exactly what an animal needs and not sell it to the customer if they can't supply its needs.

There are very few cultured corals in the stores near me, but they do have a good number of cultured fish.

Most retailers in my area are hesitant to provide information on the source of livestock. Few are interested in captive raised stock, at least from hobbyists.

None of the stores I have been to in South Florida offer cultured animals regularly.

Most pet stores won't deal with hobbyists, they just want to sell, not to buy.

I am finding everywhere I go to see or buy marine animals retail that there is little respect for the animals. There does not seem to be very good control either.

I try to buy cultured organisms but I realize that although there are good intentions, the sales person is either making minimum wage or trying to keep the shop open, and this sometimes equals a captive reared adult Moorish Idol.

I feel it is important to support the local retailer, thus I have encouraged them to provide cultured animals and buy them when they come in, but I do buy wild caught fish from them as well.

Some stores are now marketing tank raised organisms as "captive bred" and charging more since they are better, sort of like the organic label for foods.

Trade, marketing, legislation concerns and comments

Trade with other hobbyists more than purchase

Trade with other hobbyists rather than give

Sell or trade organisms with fish store

Little profit made from fish and coral production is a deterrent to development.

Taxation and tariffs on wild caught organisms need to be implemented to make propagation more economically feasible 2

Too many extreme positions, i. e., preservationists and exploiters, need better middle road position

Legislation means taxation!

I don't want legislative action on sales, but I do favor minor regulations to reduce the staggering losses due to lack of knowledge and effort.

I am afraid of legislation enacted in ignorance. 2

Legislation and controls are really necessary if we are to sustain this hobby.

Legislation may be required to stop collection of certain species, gonipora, elegance. 2

I don't approve of any legislation that implies that hobbyists are the cause of declining reefs. I support marine parks and conservation efforts that apply to everyone.

I do not think legislation will help anything.

Legislation should be a last resort.

Trade, marketing, legislation concerns and comments, continued

I am against government regulation because I fear that the people involved will not be knowledgeable.

I hesitate to say that I support government legislation. Usually when the government becomes involved things evolve into much more than the original intent. However, something should be done to eliminate cyanide capture, over culling and culling of endangered species.

After the many years I have been involved with these issues, I have come to the conclusion that only legislation has any hope of making significant changes in this industry. That said, I doubt seriously that legislation will be forthcoming, because of the relatively minuscule economic impact the industry represents globally. The last time I checked, annual livestock sales at retail in the US were about \$400 million. Alan Greenspan can fart, and this much money changes hands on the stock market in an hour. So I do not think the industry issues will be very bright on the radar screen of legislators, particularly during the current administration. This was a well-designed survey, and I hope that my sketchy answers are of some benefit

I'm sick of the raving against some form of controls on marine life collection and trade. The market must force a change, most stores and people will buy the cheapest product available.

Pressure should be placed on the importer to assure that only legal organisms are imported.

Things should be better with AMDA efforts and MAC certification

Try voluntary efforts first, forced legislation will cost too much.

Banggai cardinalfish are easy to raise, becoming endangered, and collection should be banned.

Some species of LPS have a miserable survival rate and collection should be banned.

I have a real fear that the hobby will diminish because of bans on importing specimens.

I would like to see the collection of adult wild fish (vs. larvae) and corals eventually banned, except for scientific studies and small stocks for professional breeders.

There is no need to import any fish or coral if it can be propagated in captivity. Those corals/fish that can't be propagated or successfully kept in captivity with the possibility of one day being propagated should be left in the wild.

I strongly believe that domestic propagation is the ONLY way for the hobby to continue in the long run.

While I favor voluntary conservation of the reefs I am enough of a realist to conclude that strong government enforced laws are necessary. I do not come to this conclusion lightly, but after a recent discussion with one of my clients in Hawaii, I came to see that certain persons will not voluntarily conserve the reefs and its animals and that protection must be enforced (sometimes at gunpoint!). All human activity that impacts the sea must be strictly regulated as voluntary programs have failed and will continue to fail. The future of this hobby, of this industry, depends on aquaculture alone.

I doubt that voluntary efforts to improve industry abuses will work.

Trade, marketing, legislation concerns and comments, continued

Increased pressure from legislative forces may help the hobby further pursue captive breeding of tropical marine fishes. With that said, governments involved in the collection/exportation/importation of marine ornamentals must be properly informed of the state of reef ecosystems and the true impact the aquarium hobby has on them. I feel that with the recent "bad" publicity surrounding our hobby many uninformed government officials and the general population will cause serious restrictions on all collection of marine animals because of their lack of knowledge. I also feel that the people who wish to ban the collection of marine animals for the hobby need to wake up and take a serious look at the other elements that are the real cause of the destruction of our reefs such as, wastewater runoff from factories, collection for the curio trade, dragging of boat anchors, improper fishing practices and the lack of serious fines or prison sentences for the people or companies that follow such practices. What I have said above reinforces my feelings about the need for cultured marine organisms and without them the reef keeping hobby may not survive and any chance of the reef keeping hobby ever giving back and repopulating the natural reefs will be lost.

Education/certification, hobbyists and professionals

Tank reared organisms survive better in the hobby. This has to be made known.
Certification program for captive bred animals, no cheating
Education is most important. Hobbyists and retailers both need education.
Cultured organisms are appreciated by hobbyists and retailers who are educated.
I don't think change for the better can occur until there is a change in buying habits, which best comes through widespread education, not legislation.

I am appalled at the mortality rate caused by capture and transport and by uneducated aquarists.

Education in this hobby is essential.

Education is key! The internet BBs are a great resource for education. 3

Wide spread, easily accessible education is the key.

Proper education is necessary so that hobbyists will not waste fish because they don't know the specific needs of that species.

The internet is a wealth of information.

The exchange of information on the internet is changing attitudes toward breeding.

There should be a certification program for retailers and consumers to assure a minimal level of education before a sale to improve survival rates in hobbyists tanks.

I think the best first step for change would be to make shop owners apply for a license based on a test of knowledge.

A licensing program within the hobby would benefit the hobby from the collector to the hobbyist.

Education/certification, hobbyists and professionals, continued

While I think that MAC is a great idea, I am not yet convinced at the implementation.

The initial explicit exclusion of captive-reared animals from their program is a prime example of why I have some misgivings about just how that great idea is being implemented... I think that the biggest problem facing the industry is the rate of turn-over of hobbyists and retailers. The old-timers are few and far between, and more often than not these days, it seems to be the blind leading the blind when it comes to reef aquaria. My impression is that there is more loss as a result of ignorance and apathy than abuse in the industry. I support and actively participate in hobbyist education as a more powerful means to influence the industry than legislation (which I feel is too often a political solution rather than a sound scientific one).

Comments on cultured organisms

More species need to be cultured

Buy tank reared organisms first

I work part time at an LFS and have been trying to get the owner to carry more captive raised corals and fish. He has started to get more captive raised fish and it is working out great with less mortality thus making more money.

Cultured marine organisms vital for long term survival of the hobby

Culture is necessary for the LONG term survival of the hobby.

Necessary to urge suppliers to obtain stock from tank raised sources

Cultured organism are a very good idea, but not absolutely necessary

Aquaculture has a long way to go before it can meet the demand for quantity and variety

2

Aquacultured stock survives far better in the hobby than wild stock 2

First choice is to buy ocean cultured stock, second domestically tank cultured

The awareness of the hobby is shifting toward tank reared stock.

Lack of availability prevents buying tank raised, especially with fish

Hopefully culture will alleviate stress on the reefs

If hobbyists work as a group to breed marine organisms, tank reared will be a better alternative to wild collection

I will buy cultured stock as long as prices aren't double or ridiculous.

Increase the demand for tank raised corals and fish 2

Tank raised survive much better

Would like to buy all cultured, but not all good species are cultured yet. 2

Cultured stock will be the majority of the hobby in 5 years.

I see bans on importing many species coming.

Cultured fish are ugly compared to wild fish, their behavior is also different. Cultured corals, however, are better than wild corals.

Cultured organisms are best if they are healthy and good quality. Some farmed fish and coral need to be culled before selling. Some farmed product is contaminated with pests, Aiptasia, Dictyota, Valonia, and worst of all, planaria. I am concerned about cloning and inbreeding.

All my livestock was bought from other hobbyists.

I would love the hobby to get to the point where everything is tank reared. Unfortunately this still isn't possible.

Comments on cultured organisms, continued

Many marine fish are not yet tank raised.

Most folks not in the hobby don't know that many corals are now propagated.

Marine dealers in South Africa have little interest in tank reared fish. Wild caught are much cheaper.

Native people should be trained to culture ornamental marine organisms. 2

The biggest holdup for routine, successful marine fish culture is lack of a nutritionally complete planktonic food for marine larvae.

I mostly trade cultured corals with friends. We have shared most cultured organisms so that we still have it if a tank crashes.

I have 5 (out of 8) fish in my tank that are captive bred from ORA and I am very happy with these fish.

I am actively breeding seahorses so that tank reared seahorses will become available.

I do not believe that wild caught seahorses should be readily available and inexpensive to amateur aquarists.

I think it would be great if all the basic species were propagated.

Research is still too costly and time consuming.

I try to purchase cultured animals whenever the cost is not prohibitive. I will typically spend up to 150% more than the wild caught cost for a reasonable size animal.

I hope I can encourage others to propagate or buy only cultured animals. In my experience, others don't yet realize the importance of aquaculture.

Support the reef by aquaculture cause the lives we save may be our own if the reefs are destroyed!!!

I work for my local fish store and we find it very difficult to find cultured animals that are competitively priced. We can not afford to make an entire shipment of clownfish and dottybacks.

Obviously the more organisms we can learn to culture, the more organisms we leave in the wild, benefiting both the hobby and the environment.

I will do anything I can to help increase the availability of captive bred corals and fish.

I have a hard time refusing to buy a coral or a fish because it is not tank raised, but I know that propagated animals are healthier and happier in our tanks.

My shipping technique for mail order sales is to break off a 1 to 2 inch frag within a few hours of shipment, individually bag each piece and ship overnight, max 18 hours transit time.

It is not good to have only aquacultured organisms because of genetic problems from inbreeding. Wild strains must be continuously introduced for genetic diversity.

If we don't buy and try to culture organisms that aren't commonly bred, who will?

The gene pool of cultured corals may become a problem in the future.

Although cultured animals are readily available, the choice is limited. Therefore I am sometimes forced to buy wild collected, but given a choice I would always choose cultured.

Tank raised corals seem to be stronger than wild collected.

I look to buy the best quality organisms, whether they are tank raised or wild caught. I like tank raised spp. corals because they are hardy and often include specially chosen colored varieties. I like wild caught corals because they include new varieties. For me cost is not the issue, quality is.

Comments on cultured organisms, continued

Though I don't agree that culture of marine ornamentals is necessary, I do believe it is worthwhile for many reasons, such as: 1. The activity promotes a positive feeling within and outside the aquarium industry. 2. If the activity is based in the country where the creatures are normally harvested, it promotes a conservation ethic without robbing the country of income for its natural resources. 3. Aquaculture of any organism provides countless ways to learn about their biology or to learn new techniques to culture other organisms (for food, scientific research, etc.). 4. Aquaculture of reef organisms provides a platform for supplying material or species for reef restoration or preservation of endangered species.

I support captive rearing programs whole-heartedly and both of my reef tanks on campus are stocked entirely from donations of aquacultured rock and animals.

My own efforts have lately been directed toward producing books that are intended to help hobbyists keep their animals healthy and thriving for the maximum period of time. While I encourage hobbyists to purchase propagated material, it is inevitable that they will purchase collected animals, since these represent at least 90% of the market. Personally, however, I don't plan to maintain collected animals again, unless for genuine research purposes.

I would prefer that everything I buy would be cultured, however, I don't think we are there yet, as a hobby.

I would hope that some day, SOON, hobbyists would purchase ONLY cultured marine organisms so the reefs would be able to thrive for many generations to come. If certain species were not able to eventually be cultured, then I would hope that rules/laws would be in place for selective harvesting to stop the decimation of all the reefs.

How about returning frags to the reef once in a while to "mix it up", evolutionarily speaking.

I think cultured corals will be all that exist one day, sort of like animals that only live in zoos. But for now, cultured corals will greatly reduce pressure on "wild" corals.

Comments on collection from wild sources

Sustainable wild collection is necessary to keep the hobby moving forward

Demand determines extent of collection

Difficult to propagate species will be collected, so collection will be the basis of the hobby as long as supply is limited. 2

Hobby in this area seems to promote less expensive wild stock

I support banning collection of certain key species for several reasons.

I want to avoid wild collected organisms whenever possible

I support cultured animals, but I feel that if there is truly a sustainable harvest of a certain species, I would buy wild caught.

LPS may be the easiest category to pigeon hole as "unsustainable".

I work at an LFS and people buy the cheapest fish, not necessarily the cultured fish.

If collection of marine ornamentals is shut down, there will be less incentive for native people to protect their reefs.

Sustainable harvest of wild caught animals should be continue with regulation that protects the resource.

Comments on collection from wild sources, continued

Too many people are buying wild collected “trophy” corals”.

I disagree with environmental organizations that discourage captive breeding efforts because they believe that such efforts will only increase market size.

I wish that collection would not persist for long, but I think the profit motive makes this unrealistic.

Maybe we should teach collectors how to culture their organisms.

Collectors need to realize that they are causing their own demise as well as the demise of the reefs by their unsafe collection practices.

Collection will be an important part of the hobby for a long time because, unfortunately, many of the “rarer” species, especially LPS, come only from the wild since culture is not yet possible for these species.

I’m a biologist and in the future I plan to build a tropical aquaculture center. I strongly believe that collection of wild caught fish is going to end or be greatly reduced.

I just don’t think people care about these animals as much as they should. I feel that they are a gift to us and when we buy them we should be serious enough to take good care of them.

I try to collect wild corals to widen the range of corals available for culture in the future.

Hobbyist propagation

I only purchase corals I know I can propagate.

I don’t put much effort into “rearing” organisms. When they reproduce, I give away the excess.

I have never run a skimmer and I believe that that helps.

I REALLY believe that propagation is necessary because of environmental restrictions.

Most of my corals are obtained through trades with other hobbyists.

I buy cultured brood stock only if I think they will be easier to pair than wild collected.

My reef has grown to the point of over crowding and I find it critical to keep it groomed to prevent “coral wars”.

I enjoy this hobby of underwater gardening. I’m glad to see propagation making a difference in an alternate source of available livestock.

I try to make enough money to pay for the upkeep of the tank. If I have excess or if someone needs help, I will give them away.

Things are going great. No complaints, corals just grow by themselves.

I’ve gotten a modest income from sales of captive corals, but not enough to turn a profit. I do it mostly for the contact with other hobbyists.

I often trade cuttings for new varieties of corals. This is an important means of acquiring more diversity at minimum expense.

I love the challenge of culturing marine animals. I believe there is a great future in especially culturing corals for medicine. I believe the key to many cures is in the ocean. I think we have taken so much from the ocean, if we don't start to learn how to give back it will soon be gone. When I saw the MACNA talk on the coral bleaching in Palau and Fiji, and how they were using tank raised specimens to replant the ocean, I felt like what I'm doing in my little tank is making a difference. When I started my first coral tank five or so years ago, all my corals were from the wild, now I am proud to say 90% of my corals are cultured, either they came from other tanks or their

Hobbyist propagation, continued

offspring have gone to other tanks. I love this hobby and hope to one day be in the ocean replanting corals from my own tanks. I'm in it for the long haul.

I think that it is a natural progression that hobbyists will propagate soft and SPS corals because it is so easy. To this end, I find it likely that the market for wild caught specimens of these animals will eventually dry up as the hobby grows; I think that wild caught organisms won't be able to compete with captive grown organisms on a price basis. There are already successful businesses doing this (GARF and Dr. Mac & sons spring to mind), but even these won't survive if propping of these becomes widespread. The trade in (now only available as wild caught) LPS corals, fish and inverts will continue as long as it remains good business, but I think that breeders will eventually capture a large part of the fish market--there is just too much money to be made there. Especially as the hobby grows and breeding can be done on a larger scale, people will do it because it will pay. There will, however, always be a trade in 'unbreedable' organisms, and this may drive legislative efforts to fruition. I think education is ****crucial****. I really believe that if hobbyists are given the facts they will believe there is a problem, and I believe that if given the choice (i. e., a reasonable variety of organisms available at reasonable prices), they will then purchase cultured organisms and purchase few or no wild caught organisms. When this is the case, there will be only a small market for wild caught organisms, which I think the reefs can sustain.

I don't like to clutter the show tank with healing frags. I do it usually when I have arranged with someone to swap, or else when I frag I do a lot at once and then not again for 2 or 3 months.

I will mostly propagate coral only since it doesn't require daily attention beyond that available to me while I travel.

Difficulties

As a hobbyist, it is difficult to gain access to specialized university libraries
Commercial aquaculturists are often not forthcoming with technical information.
Researchers and aquaculturists often do not take hobbyists seriously.

Cultured marine fishes are not readily available, but cultured inverts are a big help
I have trouble getting healthy animals, mail order is an option, but I like to see what I'm getting.

Lack of adequate water, I live in the high desert in a rural area, I am on a well: the water is extremely hard; I soften, use reverse osmosis, use a deionizer and several meters for ph and conductivity. This is a major water chemistry problem/project that I am trying to conduct. I have a BS in biology and have researched articles on water chemistry. The problem is not insolvable its just difficult. Right now I travel some 60 miles round trip to buy real ocean water, this will stop once I crack the well water problem which is basically high ph after all the above mentioned treatments.

I have a hard time finding knowledgeable people and information.

Straight answers are hard to come by. The BB people wind up arguing with each other rather than answering the question.

Just got married, if we have kids, I'll probably give up the hobby, but if not, I'll continue to try to raise fish.

Difficulties, continued

Ice storm

I can get good organisms from the Red Sea, Indo Pacific, Australia, and Caribbean, but certain areas, like the Philippines and Haiti, I can't keep the fish alive for even a month.

Bought the tank before I knew what I was doing. Read 3 books and then set it up. I bought equipment big enough to handle 300 gallons. Now I am relocating to Big D in a month or so and I have to sell my livestock and live rock! Crud!!!!

AAAAAAARRRRRRRRRGGGGGGGG!!!!!! But maybe I'll stumble onto a sale out there.

Commercial Results

Commercial Results

There were 34 responses to the culture questionnaire from commercial breeders from all over the world, but mostly from the US. The data compiled from these questionnaires is presented below.

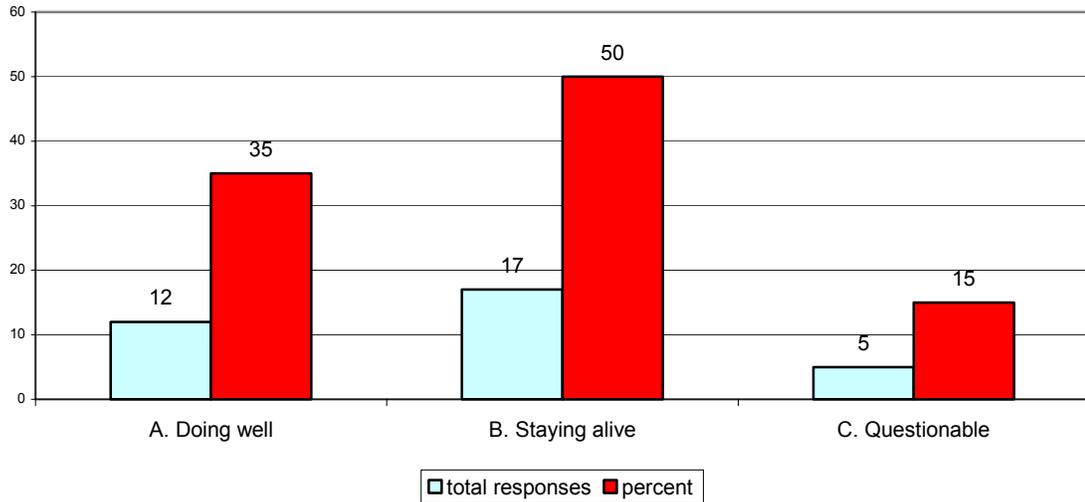
Not all respondents answered all questions. In some instances, a question elicited multiple answers from the respondents. To make a percentage analysis of these results more meaningful in those instances where percentage analysis was interesting, multiple answers to most questions were given values proportional to one. For example, when two answers were given to a single question, each answer was assigned a value of 0.5 rather than 1.0 (three answers to one question were given 0.3 each), thus the total number of responses to that question equaled the number of individuals that responded to that question. Thus the percent analysis for that question accurately reflected the input of the individuals responding rather than the total number of answers each question received.

Questions 14, 19, and 20 are species lists and commentary. They are on separate pages following the graphed data.

Commercial breeder questions

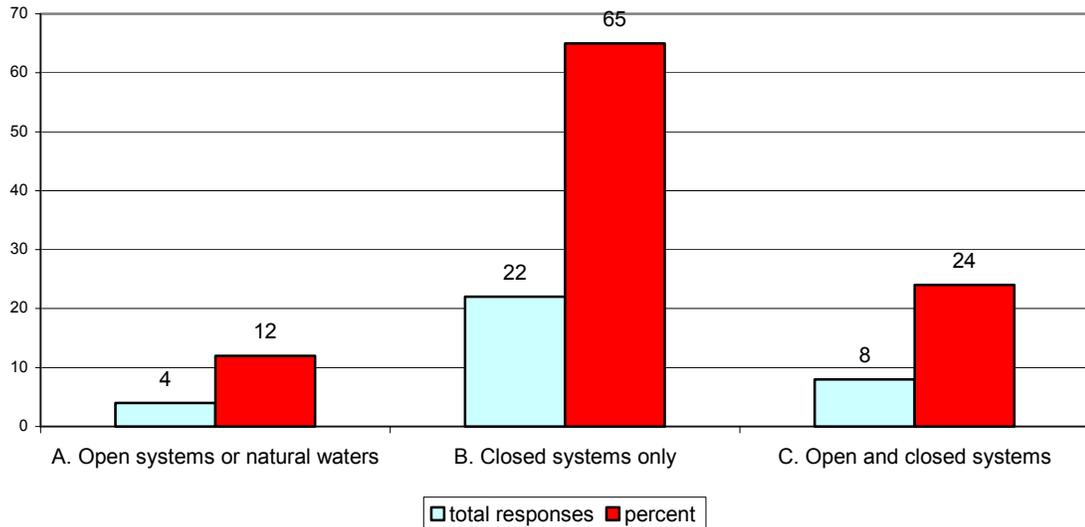
11. As commercial breeders of marine organisms, we are: **(34 respondents, no multiple responses)**
 A. doing well **12 respondents (35% of individuals responding)**
 B. hanging in there **17 responses (50% of individuals responding)**
 C. checking the want ads **5 responses (15 % of individuals responding)**

Commercial 11. Business status



12. As a commercial breeder, we: **(34 respondents, no multiple responses)**
 A. work near the sea in open systems or at culture sites located in natural waters **4 responses (12% of individuals responding)**
 B. work only with closed systems in areas remote from the sea **22 responses (65% of individuals responding)**
 C. work with both open and closed systems, depending on the species under culture **8 responses (24% of individuals responding)**

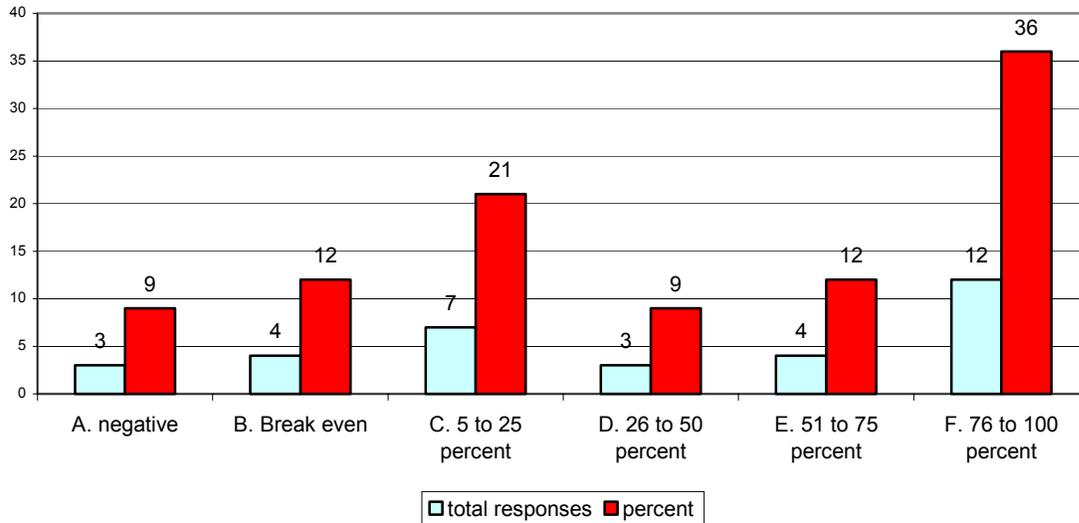
Commercial 12. Operational location



15. If, as a commercial breeder, production of cultured stock is only a portion of your business, to what extent does your breeding contribute to your bottom line? **(33 respondents, no multiple responses)**

- A. It is a negative factor. **3 responses (9% of individuals responding)**
- B. Break even **4 responses (12% of individuals responding)**
- C. 5 to 25% **7 responses (21% of individuals responding)**
- D. 26 to 50% **3 responses (9% of individuals responding)**
- E. 51 to 75% **4 responses (12% of individuals responding)**
- F. 76 to 100% **12 responses (36% of individuals responding)**

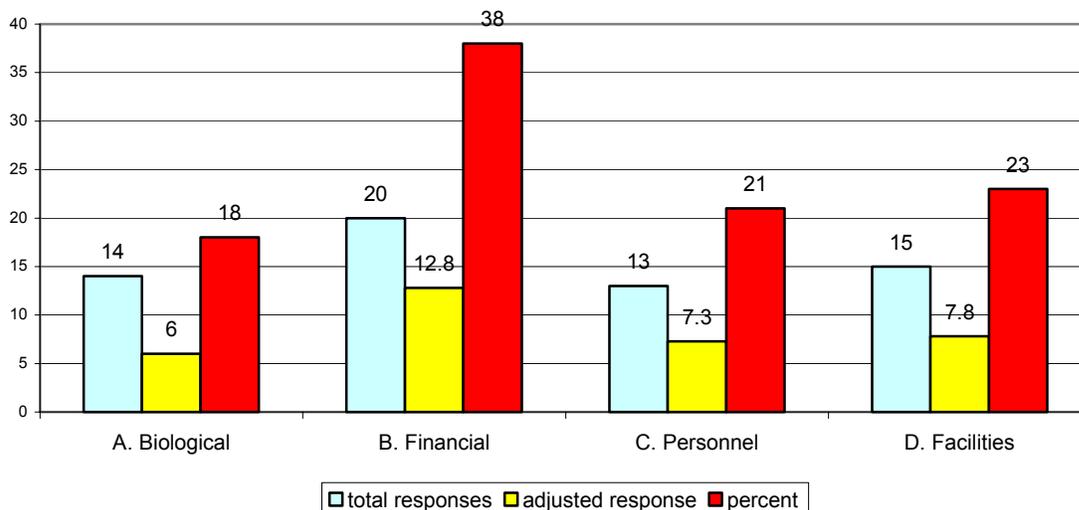
Commercial 15. Income from cultured organisms



16. As a commercial breeder, our major problems are in the areas of: **(34 respondents, 62 multiple responses)**

- A. biological **14 responses (6 adjusted, 18 percent of individuals responding)**
- B. financial **20 responses (12.8 adjusted, 38% of individuals responding)**
- C. personnel **13 responses (7.3 adjusted, 21% of individuals responding)**
- D. facilities **15 responses (7.8 adjusted, 23% of individuals responding)**

Commercial 16. Major problem areas



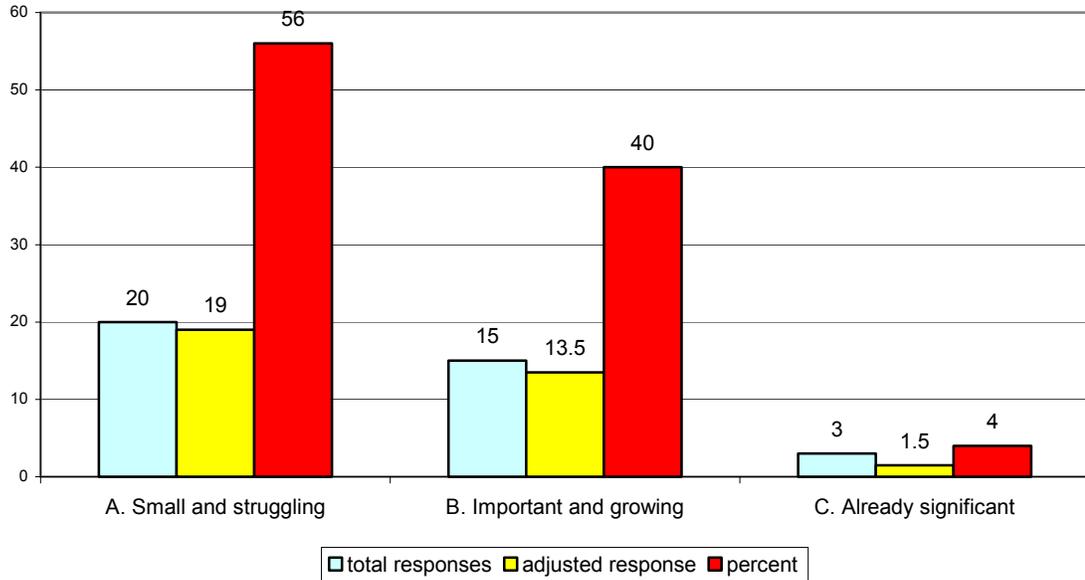
17. As a commercial breeder, I think that the current status of marine organism culture in the overall marine ornamental industry is: **(34 respondents, 38 multiple responses)**

A. a small and struggling sector in a large and varied industry **20 responses (19 adjusted, 56% of individuals responding)**

B. an important and growing sector of the industry **15 responses (13.5 adjusted, 40% of individuals responding)**

C. already a significant sector of the industry **3 responses (1.5 adjusted, 4% of individuals responding)**

Commercial 17. Status of commercial culture



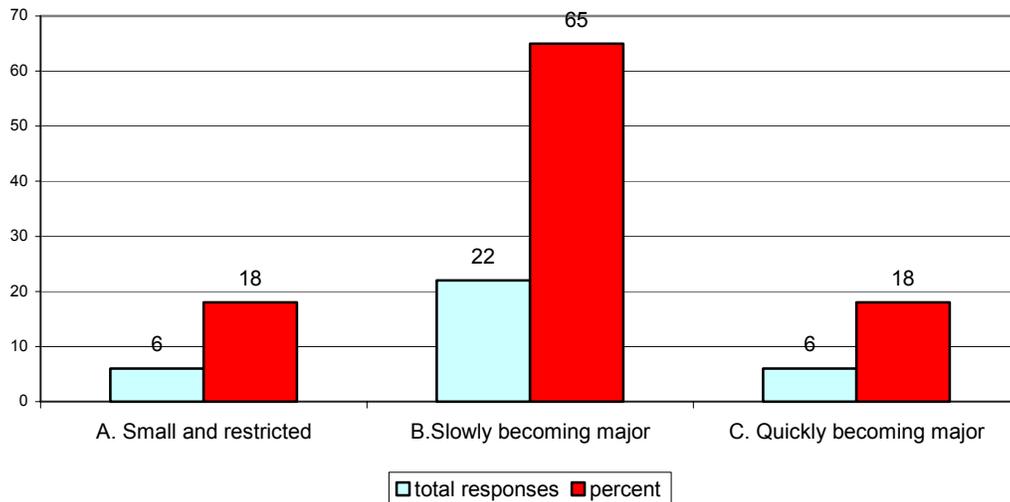
18. As a commercial breeder, I see the future of culturing marine organisms as: **34 respondents, no multiple responses)**

A. a small and restricted part of the total industry **6 responses (18% of individuals responding)**

B. slowly developing into a major sector of the industry **22 respondents (65% of individuals responding)**

C. becoming a major part of the industry in the relatively near future **6 respondents (18% of individuals)**

Commercial 18. Future of commercial culture



Commercial 13. Successful species for commercial breeders

13. As a commercial breeder, the species we are most successful with are:
(Please list the species, up to 10, that provide your greatest financial return)

These are the species reported in the 34 responses from commercial breeders as the species under culture that are the most financially successful in their operation. The number indicates the number of responses referred to that species. No number indicates one report. There were some responses that included just common names, some with just scientific names (some spelled correctly and some not), and some listed just as broad categories. Note that this list does not include every species that is successful in commercial culture. Although certainly not complete, this list provides a summary of the species that have been successfully bred by commercial breeders.

Live Rock / Sand

Live rock 4

Xenia sp., 2 white and brown
Zooanthids, 5 (button polyps)

Algae

Caulerpa spp. green macro algae
Macroalgae, various

Stony (total responses, 51)

SPS corals, various 2
Various stony corals
Acropora spp., 10
Acropora chesterfieldensis
Acropora sp., Florida (?)
Acropora spp., Formosa 2
Acropora millepora
Acropora tenuis
Acropora trochuosa, 3
Acropora valida
Acropora yongeei
Alveopora spp., daisy, ball coral
Blastomussa sp., pineapple coral
Caulestrea furcata, trumpet, torch
Caulestrea spp., trumpet, torch coral
Euphyllia ancora, hammer, anchor
Euphyllia divisa, frogspawn
Fungia spp., disk, mushroom, plate
Gonipora spp., flowerpot, ball, daisy
Hydnophora spp., 2 horn coral
Lobophyllia spp., flat brain, meat
Merulina sp. ruffled, ridge coral
Montipora spp. 3 velvet coral
Montipora capricornis, green/purple,
orange
Montipora capricornis, velvet
Montipora digitata 2
Montipora tuberculosa

Anemones

Entacmea quadricolor

Corals (total responses, 110)

Soft (total responses, 59)

Various soft corals 3
Actinodiscus spp., 2 mushroom corals
Actinodiscus/Discomas spp. 2 mushroom
Capnella spp., tree, Kenya tree coral
Cladiella, spp., colt corals 2
Clavularias spp., clove, glove polyps
Corallimorphs, 5 various mushroom
Dendronephea spp., tree, carnation coral
Gorgonians (Gorgonacea) 4
Lobophytons, spp. finger leather coral
Nephtea spp. tree, cauliflower coral
Nephtea spp., 3 (2 types)
Pachyclavularia viridis, star polyps
Palythoa spp., sea mat, button polyps
Ricordia sp. mushroom
Sarcophyton spp., 7 leather corals
Sinularia spp., 3 cabbage, leather, finger
Sinularia sp., green
Stylasteria spp., lace, fire corals
Xenia spp., 11

Stony, continued

Parvona spp. cactus, lettuce
 Platygyra spp., brain, closed brain, maze
 Pocillopora damicornis, cauliflower coral
 Pocillopora spp., birds nest, brush, cluster
 Porites spp., finger, jeweled, rock, boulder
 Tubastria spp., sun coral
 Turbinara spp., yellow cup, pagoda, turban

Mollusks

Strombus gigas, queen conch
 Trochus spp. grazing snails

Crustaceans (total responses, 10)

Artemia salina, brine shrimp
 Hymenocera picta, 3 harlequin shrimp
 Lysmata ambionensis, scarlet lady shrimp
 Lysmata grabhami, candy striped shrimp
 Lysmata wordemanni, 3 peppermint shrimp
 Stenopus hispidus, banded coral shrimp

Fish (total responses, 72)

Amphiprion allardi, Allard's clownfish
 Amphiprion clarkii, 6 Clark's clownfish
 Amphiprion ephippium, 2 fire coral clownfish
 Amphiprion frenatus, 5 tomato clownfish
 Amphiprion latezonatus, wide-banded clownfish
 Amphiprion leucokranos, white bonnet clownfish
 Amphiprion melanopus, 4 red and black clownfish
 Amphiprion melanopus, clownfish (Fiji)
 Amphiprion ocellaris, 11 common clownfish

Amphiprion percula, 4 percula clownfish
 Amphiprion perideraion, pink skunk clownfish
 Amphiprion polymnus, saddleback
 Amphiprion sandaracinos, orange skunk clown
 Chiloscylidium plagiosum, bamboo shark
 Chiloscylidium punctatum, bamboo shark
 Clownfish (various species)
 Cypho purpurascens, flame dottyback
 Doryrhamphus multiannulatus, banded pipefish
 Dottybacks (various species)
 Gnathanodon speciosus, golden jack
 Gobies (various species)
 Gobiosoma evelynae
 Gobiosoma oceanops 2
 Hippocampus reidi, longsnout seahorse
 Polydactylus sexfilis., moi, Pacific threadfin
 Pomacanthus maculosus, half moon angelfish
 Premnus biaculatus, 3 yellow stripe maroon
 Premnus biaculatus, 4 maroon clown
 Pseudochromis aldabraensis, 2 bluelined dottyback
 Pseudochromis flavivertex, sunrise dottyback
 Pseudochromis fridmani, 3 orchid dottyback
 Pseudochromis sankeyi, Sankey's dottyback
 Pseudochromis splendens, splendid dottyback
 Pseudochromis springeri, Springer's dottyback
 Pterapogon kauderni, 3 Banggai cardinalfish

Commercial 14. Species most desired for new culture.

14. As a commercial breeder, the species that we do not breed commercially, but would most like to breed are: (Please list the species, up to 10, that you would most like to successfully breed.)

These are the species reported in the 34 responses from commercial breeders as the species most desired for culture but not now under culture. The number indicates the number of responses referred to that species. No number indicates one report. There were some responses that included just common names, some with just scientific names (some spelled correctly and some not), and some listed just as broad categories. Note that this list does not include every species that is desired for commercial culture. Also, because one commercial breeder desires to breed a particular species does not mean that the species has not, or cannot be bred, or even that the species is difficult to breed. This list is an indication, however, of those species that some commercial breeders have had difficulty breeding.

Corals

Interesting and hardy stony corals
All corals important to the hobby

Soft (total responses, 5)

Cespitularia sp., Blue cespitularia
Corallimorphs, Atlantic
Dendronepthea spp.
Stylasteria spp.
Various soft corals

Stony (total responses, 20)

Acropora echinata
Acropora loripes
Acropora spp., 3 various
Acropora, 2 table formations
Atlantic stony corals, hardy species
Blastomussa wellsi, pineapple coral
Plerogyra sinuosa, bubble coral
Catalaphyllia spp., 2 elegance
Euphyllia, spp. hammer, anchor, grape
Fungia spp. disc, plate, mushroom
Heliofungia, spp. plate, disk, mushroom
Lobophyllia spp., lobed brain, flat brain
Madracis spp., finger, pencil, cactus
Porites branneri
SPS (small polyped stony) corals,
various
Trachyphyllia spp., open brain, folded
brain

Mollusks (total responses, 4)

Clams
Snails (grazers)
Tridacna spp., clams, 2

Crustaceans (total responses, 7)

Lysmata debelius, 2 fire shrimp
Lysmata amboinensis, scarlet cleaner
shrimp
Stenopus hispidus, banded coral shrimp
Enoplometopus debelius, Debelius' reef
lobster
Enoplometopus occidentalis, Hawaii reef
lobster
Hymenocera picta, Harlequin shrimp

Echinoderms

Diadema antillarum, longspine sea
urchin

Fish (total responses, 53)

Fish (in general)
Any angelfish
Any clownfish
Acanthurids, tangs and surgeonfishes
Acanthurus coeruleus, blue tang
Acanthurus leucosternon, powder blue
tang
Amphiprion chrysopterus, orange-fin
clownfish
Angelfish 3

Fish, continued

Anthias spp.
Bramidae pomfret
Centropyge bicolor, bicolor/oriole
 angelfish
Centropyge loriculus, flame angel
Centropyge spp. 5 Pigmy angels
Chaetodon semilarvatus, masked
 butterflyfish
Chaetodontidae, butterfly fish
Cirrhitidae, hawkfishes
Cromileptes altivelis panther grouper
Dascyllus spp., damsels
Diamond trevally
Equetus lanceolatus, jackknifefish
Gobies, various
Gobiosoma oceanops, neon goby
Gramma basslets
Gramma loreto, royal gramma

Holocanthus ciliaris, Queen angel
Hypsypops rubicunda, Garibaldi
Liopropoma carmabi, candy bass
Liopropona, basslets
Neocirrhitus armatus, flame hawkfish
Paracanthurus hepatus, palette
 surgeonfish
Pomacanthus hepatus, regal blue tang
Pomacanthus imperator, imperator
 angelfish
Pomacanthus, 2 angelfish
Pterapogon kauderni, Banggai cardinalfish
Tangs 4
Wrasses
Wrasses, cleaner
Zebrasoma flavescens, 4 yellow tang
Zebrasoma xanthurus, purple tang
Zebrasomas xanthurus, sailfin tang

Commercial 19. Desired breakthrough development in marine culture
(listed in order of number of responses)

19. As a commercial breeder, the breakthrough development in marine culture that I would most like to see is:

New and better larval food organisms 7
Affordable lighting 4
Successful culture of fish with small pelagic eggs 3
Get new species under culture 3
Sustainable sexual reproduction of corals 2
More effective disease control 2
Reduction and restriction of wild collection and importation 2
Availability of larval rearing information 1
Better communication between hobby and science 1
Better pricing structure 1
Copepod culture 1
Enhanced cultured coral product 1
Enhanced value of cultured corals 1
Greater respect and financial support for coral culture 1
Improved spawning technology 1
More successful hobbyists 1

Commercial 20. Major impediments to success
(listed in order of number of responses)

20. As a commercial breeder, our major impediment to great financial success is:
(Please skip this question if you are already successful beyond your wildest dreams.)

Competition with low price of wild collected stock 6
Funding not sufficient 6
Limited facilities and/or personnel 5
Problems marketing the product 4
Greater awareness of the importance of aquaculture is needed 3
High production costs for corals 1
Large specimens available inexpensively from wild collection 1
Level of required dedication and hard work excludes many from success 1
Limited production 1
Need improvement in quality of aquarium shops 1
Need more fish species under culture 1
Poor location 1
Problems with raw seawater 1
Propagation and marketing in countries other than the US 1
Rotifer culture in sufficient quantity 1
Shipping problems and potential restrictive legislation 1
Small size at market (fish) 1
Weather (hurricanes and storms)

Science Results

Science Results

There were 49 responses to the culture questionnaire from scientists and professional aquarists from all over the world, but mostly from the US. The data compiled from these questionnaires is presented below.

In some instances, a question elicited multiple answers from the respondents. To make a percentage analysis of these results more meaningful in those instances where percentage analysis was interesting, multiple answers to most questions were given values proportional to one. For example, when two answers were given to a single question, each answer was assigned a value of 0.5 rather than 1.0 (three answers to one question were given 0.3 each), thus the total number of responses to that question then equaled the number of individuals that responded to that question. Thus the percent analysis for that question accurately reflected the universe of individuals responding rather than the total number of answers each question received.

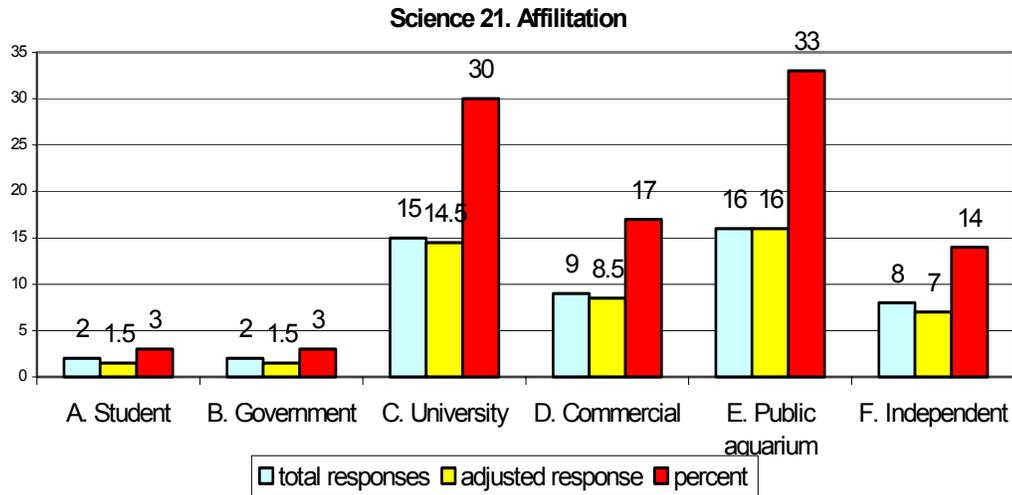
Questions 24, 25, 26, and 30 are species lists and commentary. They are on separate pages following the graphed data.

Science/research questions

21. My research work in the culture of ornamental marine organisms is as:

(49 respondents, 52 total responses)

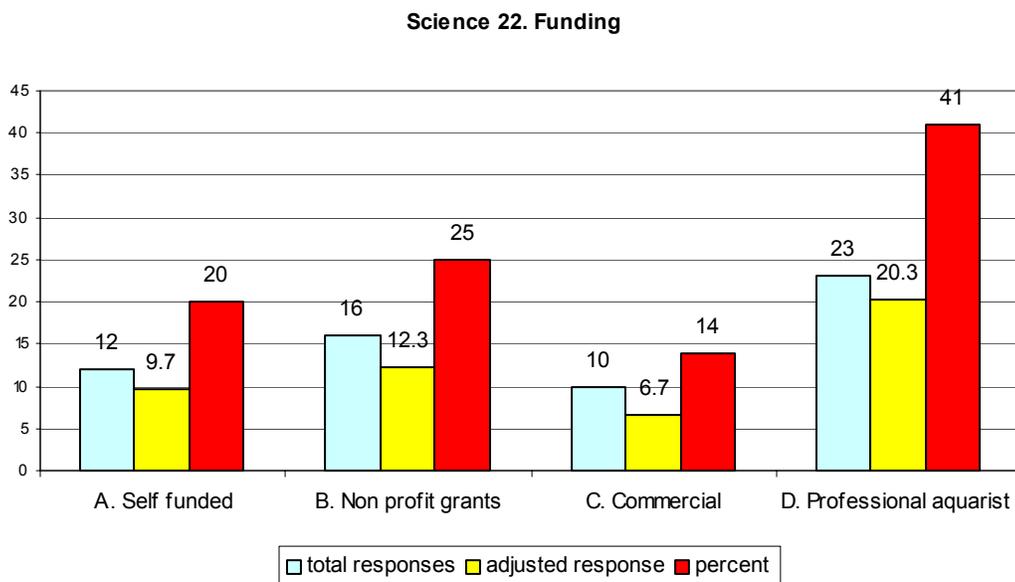
- A. a student project **2 responses (1.5 adjusted, 3% of individuals responding)**
- B. a researcher at a government laboratory **2 responses (1.5 adjusted, 3% of individuals responding)**
- C. a researcher at a university **15 responses (14.5 adjusted, 30% of individuals responding)**
- D. a researcher at a commercial company **9 responses (8.5 adjusted, 17% of individuals responding)**
- E. an aquarist at a public aquarium **16 responses (16 adjusted, 33% of individuals responding)**
- F. an independent non funded research scientists **8 responses (7 adjusted, 14% of individuals responding)**



22. As a scientist doing research on the culture of marine organisms:

(49 respondents, 61 total responses)

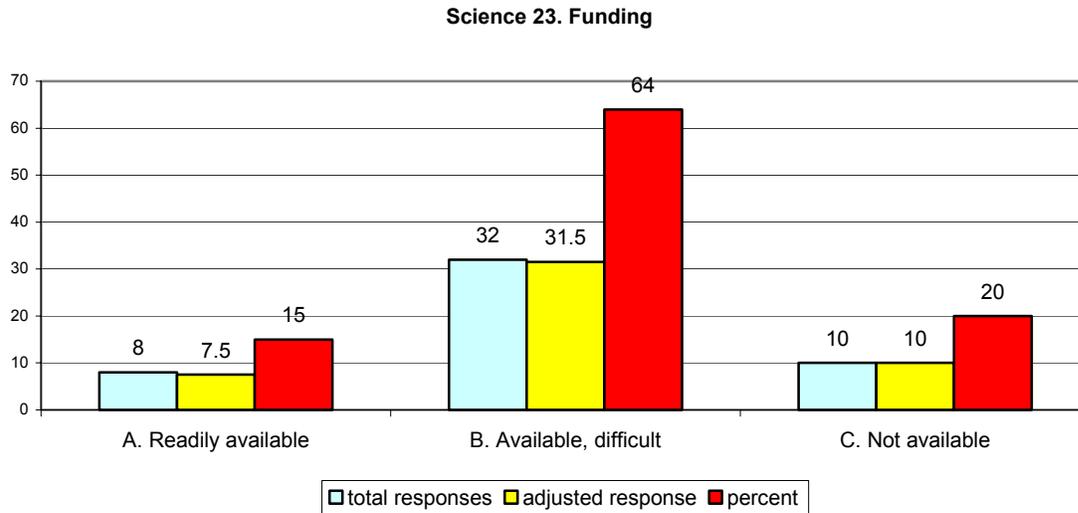
- A. I am self funded **12 responses (9.7 adjusted, 20% of individuals responding)**
- B. I am supported by non profit grants **16 responses (12.3 adjusted, 25% of individuals responding)**
- C. I am supported by grants or employment from commercial companies **10 responses (6.7 adjusted, 14% of individuals responding)**
- D. My research is part of my regular job as an aquarist **23 responses (20.3 adjusted, 41% of individuals)**



23. As a scientist doing research on the culture of marine organisms:

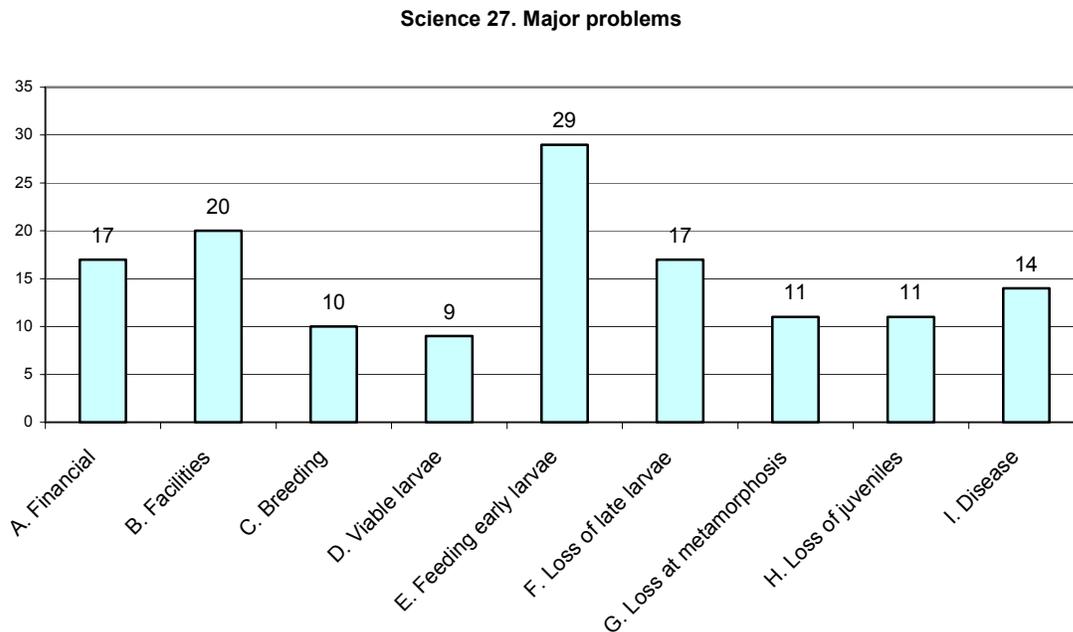
(49 respondents, 61 total responses)

- A. it is easy to find financial support for my work **8 responses (7.5 adjusted, 15% of individuals)**
- B. financial support is available but difficult to find **32 responses (31.5 adjusted, 64% of individuals)**
- C. I cannot obtain financial support for my work **10 responses (10 adjusted, 20% of individuals)**



27. The major problems I have encountered in working with the culture of marine ornamental organisms are: **(49 respondents, 148 total responses, only total responses graphed)**

- A. lack of funding **4 responses**
- B. lack of facilities **20 responses**
- C. adults in breeding condition **10 responses**
- D. obtaining viable larvae **9 responses**
- E. feeding early larvae **29 responses**
- F. survival of late larvae **17 responses**
- G. loss at metamorphosis **11 responses**
- H. loss at early juvenile stage **11 responses**
- I. disease **14 responses**
- J. other (comments?) **10 responses** (time management, animal quality, livefeed availability, shipping, knowledge)



28. The object of my work

is: **(49 respondents, 68 total responses)**

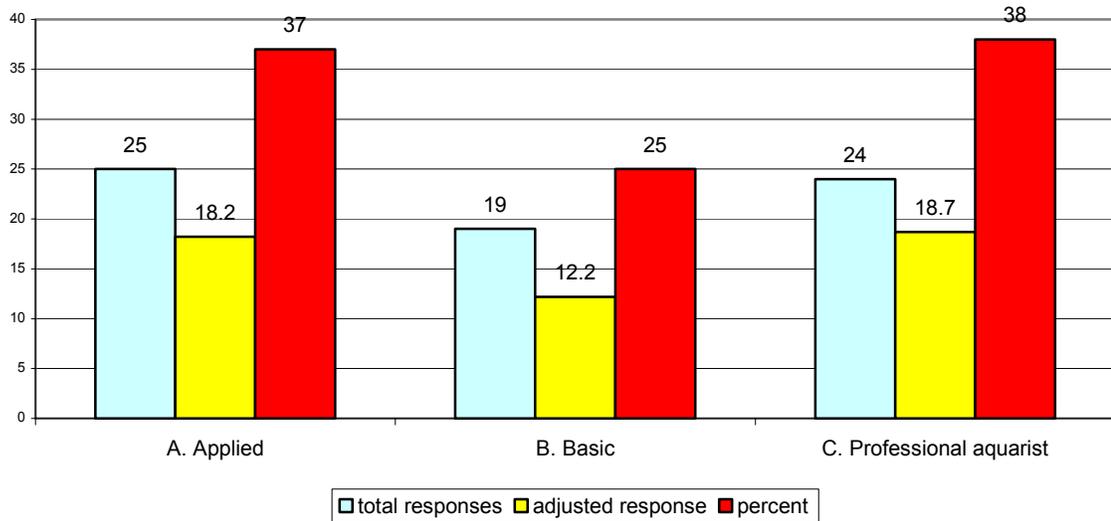
A. applied research (solve problems in the commercial culture of marine organisms), **25 responses (18.2 adjusted, 37% of individuals responding)**

B. basic research (investigate the reproductive biology of interesting marine animals), **19 responses, 12.2 adjusted, 25% of individuals responding)**

C. aquaristic purposes (maintain endangered species in captivity, and/or develop the technology to maintain captive populations for display purposes), **24 responses (18.7 adjusted, 38% of individuals responding)**

D. other (comment?) (fun 3, education 2, larval nutrition, coral biology)

Science 28. Work objective



29. I plan to publish my work in: **(49 respondents, 69 total responses)**

A. a college thesis or a course report **5 responses (3.1 adjusted, 6% of individuals responding)**

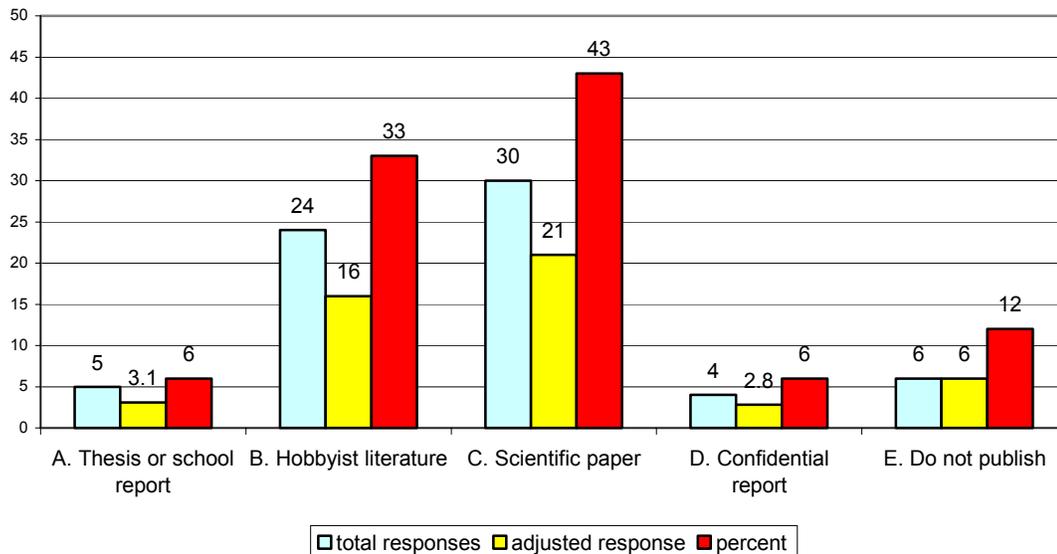
B. the hobbyist literature **24 responses (16 adjusted, 33% of individuals responding)**

C. as a scientific paper **30 responses (21 adjusted, 43% of individuals responding)**

D. as a confidential company report **4 responses (2.8 adjusted, 6% of individuals responding)**

E. I do not publish my work **6 responses (6 adjusted, 12% of individuals responding)**

Science 29. Publication method



31. As a scientist doing research on the culture of ornamental marine organisms:

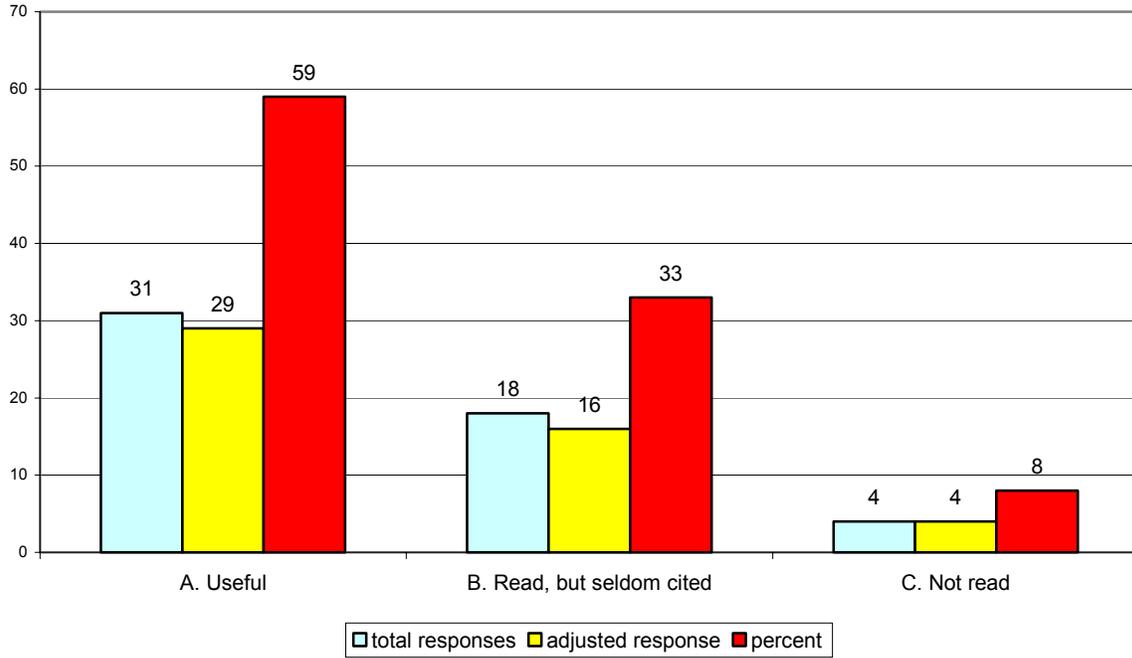
(49 total respondents, 53 total responses)

A. I find the hobbyist literature very useful **31 responses (29 adjusted, 59% of individuals responding)**

B. I read the hobbyist literature but seldom cite it because it is not peer reviewed **18 responses (16 adjusted, 33% of individuals responding)**

C. I pay no attention to the hobbyist literature **4 respondents (4 adjusted, 8% of individuals responding)**

Science 31. Value of hobbyist literature



Science 24. Research organisms currently under culture

24. I am working with the following organisms. (Please list those species that are the subjects of your research.)

These are the species reported in the 49 responses from scientists and aquarists as currently the subject of breeding efforts. The number indicates the number of responses referred to that species. No number indicates one report. There were some responses that included just common names, some with just scientific names (some spelled correctly and some not), and some listed only as broad categories. Although this list is not complete, it provides a summary of the species that scientists and aquarists are working with at this time.

Live Rock / Sand

Live rock

Algae (total responses, 10)

Green water/rotifers

Micro algae and rotifers

Red macro algae

Rotifers 5

Rotifers (dwarf)

Various macro algae

Sponges/Tunicates

Jellyfish (total responses, 10)

Aurelia aurita 2

Catostylus tagi

Chrysaora achlyos

Chrysaora fuscescens

Chrysaora quinquecirra

Cyanea capillata

Pelagia colorata

Phyllorhiza punctata

Anemones

Stichodactyla haddoni

Unspecified anemones

Corals (total responses, 39)

Various corals, 3

Soft (total responses, 13)

Unspecified soft corals 3

Anthelia sp.

Litophyton spp.

Lobophytum spp., 2

Nephtea spp.

Pachyclavularia

Sarcophyton spp., 2

Sinularia spp.

Xenia spp.

Stony (total responses, 23)

Unspecified Florida species

Unspecified stony corals

Acropora sp., (Red Sea)

Acropora sp., 3

Agaricia sp., lettuce coral

Euphyllia spp.

Heliopora spp.

Manicina areolata, rose coral

Millepora spp.

Montipora aquietuberculata

Montipora capricornis

Montipora digitata

Murelina sp.

Pocillopora damicornis

Pocillopora (Red Sea)

Porites spp.

Porites cylindrica

Seriatopora (Red Sea)

Seriatopora hystrix

Stylophora (Red Sea)

Turbinaria sp.

Annelids

Sabellidae, feather duster worms

Mollusks (total responses, 10)

Aplysia brasiliiana
 Aplysia californica
 Berghia verrucicornis
 Euprymna sp.

Mollusks, continued

Nautilus
 Octopus
 Octopus sp.
 Sepia officinalis
 Sepia sp.
 Sepiateuthis

Crustaceans (total responses, 32)

Artemia 2
 Copepods 4
 Harlequin shrimp
 Hawaiian red shrimp
 Lysmata amboinensis, 2 scarlet cleaner shrimp
 Lysmata debelius, 4 fire shrimp
 Lysmata grabhami, 2
 Lysmata rathbunae,
 Lysmata wurdemanni 6, peppermint shrimp
 Palaemon serratus
 Palaemonetes pugio, grass shrimp
 Rhynchocinetes durbanensis, 2 camel shrimp
 Stenopus hispidus, 2 banded coral shrimp
 unspecified shrimps 3

Echinoderms

Diadema antillarum
 Linychinus urchins

Fish (total responses, 142)

Acanthuridae 2
 Acanthurus coeruleus, Blue Tang
 Amphiprion spp., 6 various species
 Amphiprion clarkii Clark's anemonefish
 Amphiprion frenatus, tomato anemonefish
 Amphiprion ocellaris, 2 common anemonefish

Amphiprion melanopus 2, cinnamon
 Balistes vetula, 2 queen triggerfish
 Calloplelesops altivelis, 3 comet
 Canos chanos, milkfish
 Caranx melampygus, bluefin trevaly
 Bodianus pulchellus, Cuban hogfish
 Centropyge sp., various species
 Centropyge elbi, Eibl's angelfish
 Centropyge fisheri, Fishers angel
 Centropyge loriculus, 4 flame angelfish
 Centropyge potteri, 2 Potters angel
 Centropyge flavissima, 2 lemonpeel angel
 Chaetodontidae, butterflyfish
 Chaetodon capistratus, foureye butterflyfish
 Chiloscylidium plagiosum, White-spotted shark
 Chiloscylidium punctatus, 2 Bamboo Shark
 Chromis viridis, Green chromis
 Chrysiptera parasema, yellowtail blue damsel
 Cirrhitops fasciatus, Striped hawkfish
 Cyprinodon variegatus, sheepshead minnow
 Dascyllus trimaculatus, threespot damsel
 Equetus lanceolatus, Jackknife fish
 Equetus sp., Cubbyu
 Equetus umbrosus, Cubbyu
 Gadus morhua, codfish
 Genicanthus personatus,
 Gnathanodon sp., diamond trevally
 Gnathanodon speciosus, Golden trevally
 Gobies, various
 Gobiosoma oceanops, 2 neon goby
 Gulf red snapper
 Halichoeres bivittatus, puddingwife
 Halichoeres garnoti, slipperydick
 Halichoeres maculapina, clown wrasse
 Halichoeres radiata, yellowhead wrasse
 Haploblepharus edwardsii
 Haploblepharus pictus
 Hippocampus abdominalis, 5
 Hippocampus breviceps
 Hippocampus capensis

Fish, continued

Hippocampus coronatus
Hippocampus erectus, 6 lined seahorse
Hippocampus ingens
Hippocampus kuda, 3 Spotted Seahorse
Hippocampus reidi, 5
Hippocampus zosterae, 2 dwarf seahorse
Hypleurochilus geminatus
Longnose butterflyfishes
Longnose hawkfish
Lutjanus analis, mutton snapper
Lutjanus decussates, Checkered seaperch
Lythrypnus dalli, Catalina goby
Monodactylus argenteus, silver batfish
Mugil cephalus, striped mullet
Myliobatis aquila
Nemateleotris magnifica, fire fish
Opistognathus aurifrons, 2 yellowhead
 jawfish
Opistognathus maculates, banded
 jawfish
Oreochromis mossambicus, Tilapia
Pseudochromids
Pholidichthys leucotaenia
Plectorhinchus gibbosus, brown
Plectorhinchus chaetodonoides,
 sweetlips
Plectorhinchus picus, dotted sweetlips
Polkadot grouper
Polydactylus sexfilis, moi, Pacific
 threadfin
Pomacanthidae
Pomacanthidae, angelfish
Pomacentrus auriventris
Poroderma pantherium
Premnas biaculatus, 2 maroon clown
Priolepis aureoviridis
Psammoperca waigiensis, Sand Bass
Pseudochromis spp. dottybacks, various
Pseudochromis fridmani, 2 orchid
 dottyback
Pseudochromis polymnus
Pterapogon kauderni, 2 Bangii
 cardinalfish
Raja clavata, 2 skate
Rhamphocottus richardsoni
Rivulus marmoratus
Scyliorhinus canicula
Seabass
Seahorses, various
Selene vomer, lookdown
Seriola dumerili, 2 amberjack
Serranus subligarius, mousefish
Spotfin butterflyfish
Stonogobius sp.
Sygnathids, various
Syngnathus acus
Syngnathus fuscus
Syngnathus floridae
Syngnathus louisianide
Thalassoma bifasciatum, blue head
 wrasse
Trachinotus carolinus, pompano
Zebrasoma flavescens, yellow tang

Science 25. Research organisms successfully cultured

25. I have been successful in the controlled culture of the following organisms. (Please list those species that you have successfully spawned and reared into the juvenile stage.)

These are the species reported in the 49 responses from scientists and aquarists as successfully bred. The number indicates the number of responses referred to that species. No number indicates one report. There were some responses that included just common names, some with just scientific names (some spelled correctly and some not), and some listed as just broad categories. Note that this list does not include every species that has been captive bred and some of the species on the list may not meet a stringent criteria for captive bred. Although certainly not complete, this list provides a summary of the species that have been successfully bred by scientists and aquarists.

Live Rock / Sand

Live rock, 5
Algae/rotifers
Red macro algae
Micro algae, 2
Rotifers 3

Metridium senile, white plumose
anemone
Stoichactis helianthus
Urticina crassicornis

Corals (total responses, 38)

Sponges/Tunicates

Cnidarians

Jellyfish (total responses, 19)

Actinia equina
Aurellia aurita, 7 moon jelly
Cassiopea sp.
Chrysaora achlyos, 2 Black jelly

Chrysaora fuscens, Sea nettle

Chrysaora quinquecirra
Cyanea capillata, 2 Lion's mane jelly
Pelagia colorata, Purple-striped jelly
Phyllorhiza punctata
Proboscidactyla flavicirrata (Hydrozoan
jellyfish - no common name)
Catostylus tagi

Soft (total responses, 18)

Various species 3
Actinodiscus sp., mushroom anemone
Clavularia sp., star polyp
Corallimorph sp., mushroom anemone
Lithophyton sp.
Lobophytum spp.
Nephtea sp.
Parazoanthus gracilis, yellow polyps
Plexaura sp.
Ricordia sp.
Sarcophyton spp.
Sarcophyton lobulatum, 2 leather coral
Sinularia, spp.
Zooanthus pulchellus, green button
polyps
Zooanthus sociatus, brown button polyps

Anemones (total responses, 8)

Aiptasia diaphana, small rock anemone
Condylactis gigantean
Corynactis californica, strawberry
anemone
Entacmaea quadricolor, bulb anemone
Metridium gigantea

Stony (total responses, 20)

Various species 2
Acropora (Red Sea)
Acropora sp. 3 staghorn coral
Agaricia sp., lettuce coral
Fungia sp. 2 disc coral
Hydnophora spp. horn coral
Lithophyton sp. finger coral

Stony, continued

Manicina areolata, rose coral
 Millipora alaicornis fire coral
 Montipora sp. Staghorn coral
 Pocillopora damicornis, 2 cauliflower
 Pocillorpora (Red Sea)
 Seriatopora (Red Sea)
 Sinularia sp. finger coral
 Stylophora (Red Sea)

Annelids (total responses, 5)

Platynereis bicanaliculata
 Serpula vermicularis
 Phragmatopoma lapidosa (Sabellariidae
 - Sandcastle worms)
 Hydroides dianthus (Sabellidae)

Mollusks (total responses, 22)

Aplysia californica
 Calliostoma ligatum
 Chlamys hastate
 Euprymna
 Haliotis kamtschatkana
 Haminoea callideginata, paper bubble
 sea slug
 Haliotis rufescens, red abalone
 Katharina tunicata
 Mytilus trosilus
 Neptunea lyrata
 Neptunea pribiloffensis
 Neptunea tabulata
 Octopus bimaculatus, two-spotted
 octopus
 Octopus sp. 2
 Oenopota levidensis
 Sepia officinalis 2
 Sepia officinalis, European cuttlefish
 Sepia sp. (16 species)
 Sepiateuthis
 Sepioteuthis sepioides, reef squid

Crustaceans (total responses, 32)

Ampelisca abdita, amphipod
 cleaner shrimp, unspecified
 copepods 2
 Emerita analoga, mole crab

Petrolisthes cinctipes, porcelain shore
 crab
 Cancer magister, dungeness crab
 Hawaiian red shrimp
 Hyalella azteca, amphipod (freshwater)
 Hymenocera picta, 3 harlequin shrimp
 Lysmata debelius, 3 fire shrimp
 Lysmata rathbunae, 2
 Lysmata wurdemanni, 6 peppermint
 shrimp
 Lysmata, californica
 Lysmata amboinensis, 3 scarlet cleaner
 shrimp
 Mastigias papua
 Palaemon serratus
 Palaemonetes pugio, grass shrimp
 Rhynchocinetes durbanensis, camel
 shrimp
 Tozeuma carolinensis, arrow shrimp

Echinoderms (total responses, 13)

Arbacia punctulata, sea urchin
 Cucumaria miniata
 Dendraster excentricus
 Diadema antillarum, longspine sea
 urchin
 Florametra serratissima
 Linychinus sp., urchins
 Parastichopus californicus, 2 spiny sea
 cucumber
 Cucumaria miniata, orange sea
 cucumber
 Cucumaria pseudocurata, brooding sea
 cucumber
 Pisaster ochraceous
 Strongylocentrotus droebachiensis
 Strongylocentrotus pallidus

Fish (total responses, 283)

Abedefduf spp., damsels
 Acanthochromis polyacanthus
 Amblyeleotris randalli, 2 Randall's
 prawn goby
 Amblygobius phalaena, brownbarred
 goby

Fish, continued

- Amblygobius rainfordi, Rainford's goby
Amphiprion spp., 16 clownfish
Amphiprion allardi, Allard's clownfish
Amphiprion clarkii, 6 Clark's clownfish
Amphiprion frenatus, 4 tomato clownfish
Amphiprion latezonatus wide-banded clownfish
Amphiprion leucokranos, white bonnet clownfish
Amphiprion melanopus, 5 red and black clownfish
Amphiprion melanopus, clownfish (Fiji)
Amphiprion ocellaris, 9 common clownfish
Amphiprion percula, 4 percula clownfish
Amphiprion perideraion, pink skunk clownfish
Amphiprion polymnus, saddleback clownfish
Anarrhichthys ocellatus Wolf eel
Anisotremus virginicus, 2 porkfish
Antennarius hispidus, hispid frogfish
Atherinops affinis, topsmelt
Aulorhynchus flavidus
Bluefin trevally
Bovichthys argentinus, Thunnus thynnus
Calloplelesops altivelis, 3 comet
Canary Blenny (Melacanthus oualanensis?)
Careproctus trachysoma
Centropyge fisheri, Fisher's angel
Cephalocyllium ventriosum swell shark
Chaetodipterus faber, Atlantic spadefish
Chanos chanos, milkfish
Chasmodes suburrae, Florida blenny
Chiloscyllium plagiosum, 2 white-spotted bamboo shark
Chiloscyllium punctatus, 2 bamboo shark
Chrysiptera prasema, 2
Coryphaena hippurus, 2 mahimahi
Cyclopterus lumpus, 2 lumpfish
Cymatogaster aggregata, shiner perch
Cynoscion nebulosus, spotted sea trout
Cyprinodon variegatus, 2 sheephead minnow
Dascyllus albisella, Hawaiian threespot damsel
Dascyllus trimaculatus, threespot damsel
Diplodus argenteus
Doryrhamphus excisus, blue striped pipefish
Doryrhamphus multiannulatus, banded pipefish
E. lineatus, lined perch
Embiotoca jacksoni, black perch
Enoplosus armatus
Equetus acuminatus, 2 hi hat, cubbyu
Equetus lanceolatus, 6 jackknife fish
Equetus punctatus, spotted drum
Equetus umbrosus, 2 Cubbyu flying fish
Gnathanodon speciosus, golden trevally
Gobiodon citrinus, citron goby
Gobiodon okinawae, yellow coral goby
Gobiosoma bosc
Gobiosoma chancei
Gobiosoma evelynae, 3 sharknosed goby
Gobiosoma figaro
Gobiosoma genie
Gobiosoma horsti, yellowline goby
Gobiosoma multifasciatum, 3 greenband goby
Gobiosoma oceanops, 4 neon goby
Gobiosoma prochilus
Gobiosoma puncticulatus, redhead goby
Gobiosoma sp. (Elactinus per VanTassell, 2000)
Grama loreto, 3 royal gramma
Fairy basslet (Grama loreto ?)
Grama melacara, black cap basslet
Haemulon flavolineatum
Haemulon plumieri, white grunt
Haploblepharus edwardsii
Haploblepharus pictus
Heteroconger canabus, Cortez garden eels
Heterodontus francisci Horn shark

Fish, continued

Hippocampus abdominalis, 3 pot-bellied seahorse
Hippocampus barbouri, 3 Barbour's seahorse
Hippocampus breviceps
Hippocampus capensis, South African seahorse
Hippocampus coronatus, 2
Hippocampus erectus, 9 lined seahorse

Hippocampus fisheri
Hippocampus fuscus
Hippocampus ingens, 2 Pacific seahorse

Hippocampus kuda complex, seahorses
Hippocampus kuda, 5 spotted seahorse
Hippocampus reidi, 6 longsnout seahorse
Hippocampus sp. 2 seahorses
Hippocampus spinosissimus, hedgehog seahorse
Hippocampus subelongatus, West Australian seahorse
Hippocampus zosterae, 5 dwarf seahorse
Hippovampus whitei, White's seahorse

Hypseleotichthys geminatus
Hypoplectrus unicolor, hamlet
Hypsyrus caryi, rainbow perch
Katsuwonis pelamis, tuna
Lachnolaimus maximus, hogfish
Leuresthes tenuis, California grunion
Lutjanus analis, mutton snapper
Lutjanus decussates, checkered seaperch
Lutjanus grissus, gray snapper
Lythrypnus dalli, Catalina goby
Lythrypnus pulchellus, gorgeous goby
Micrometrus minimus Dwarf perch
Microspathodon chrysurus, Jewelfish
Mnidia beryllina, silverside
Monodactylus argenteus, Silver Batfish
Mugil sp., striped mullet
Myliobatis aquila
Myoxocephalus aenus, Grubby Sculpin
Myoxocephalus scorpius, Short Horned Sculpin
Ocyurus chrysurus, yellowtail snapper
Opistognathus aurifrons, 2 yellowhead jawfish
Oreochromis mossambicus, tilapia
Pagrus major
Paralichthys lethostigma, southern flounder
Pheusochromis aldbrensis
Pholis laeta, crescent gunnel
Phyllopteryx taeniolatus pipefish
Plectorhinchus gibbosus, brown sweetlips
Plectorhinchus picus, dotted Sweetlips
Pleuronectes platessa
Polydactylus sp., Pacific threadfin
Pomacanthus arcuatus, grey angelfish
Pomacanthus maculosus, half moon
Pomacanthus paru, French angelfish
Poroderma pantherium
Premnas biaculeatus 6 maroon clownfish
Premnas, all forms
Psammoperca waigiensis, sand bass
Pseudochromis aldabrensis
Pseudochromis flavivertex
Pseudochromis fridmani, 4 orchid dottyback
Pseudochromis novaehollandae
Pseudochromis olivaceus
Pseudochromis paccagnellae
Pseudochromis sankeyi
Pseudochromis sp., dottybacks
Pseudochromis springeri
Pterapogon kauderni, 8 Banggai cardinalfish
Puffers
Rafa clavata, 2 skate
Raja erinacea, little skate
Raja ocellatus, winter skate
Rivulus marmoratus
Sarda orientalis
Sciaenops ocellatus, 2 red drum
Scyliorhinus canicula
Seriola dorsalis, jack

Fish, continued

Seriola dumdumerili, greater amberjack
soles

Strongylura marina, Atlantic Needlefish

Synchiropus splendidus, green
mandarinfish

Syngnathus californiensis Kelp pipefish

Syngnathus floridae

Syngnathus fuscus

Syngnathus fuscus

Syngnathus leptorhynchus Bay pipefish

Syngnathus louisianide

Syngnathus scovelli, Gulf pipefish

Takifugu niphobles

Tigrigobius macrodon

Tigrigobius multifasciatum

Tigrigobius puncticulatum

Trachinotus carolinus, pompano

Trachinotus falcatus, Permit

Triakis semifasciata Leopard shark

Urolophus halleri Round stingray

Urophycis chuss, Red Hake

Science 26. Research organisms that failed culture

26. I have tried and failed in the controlled culture of the following organisms. (Please list those species)

These are the species reported in the 49 responses from scientists and aquarists as failures in breeding efforts. The number indicates the number of responses referred to that species. No number indicates one report. There were some responses that included just common names, some with just scientific names (some spelled correctly and some not), and some listed just as broad categories. Note that this list does not include every species for which captive breeding has been attempted and has failed. Also a reported failure does not mean that the species has not, or cannot, be bred or even that the species is difficult to breed. This list is an indication, however, to species that some scientists and aquarists have had difficulty breeding.

Live Rock / Sand

Algae

Sponges/Tunicates

Some sponges

Jellyfish

Chrysaora achlyos

Anemones

Stichodactyla haddoni

Corals

Various corals

Soft

Stony

Acropora sp. (sexual reproduction)

Annelids

Mollusks (total responses, 4)

Berghia verrucicornis

Octopus

Sepia (cuttlefish)

Some nudibranches

Crustaceans (total responses, 14)

Lysmata amboinensis, 2 scarlet cleaner

Lysmata debelius, 2 fire shrimp

Lysmata grabhami, 3

Lysmata wurdemanni, peppermint shrimp

Shrimp, 4 various sp.

Stenopus hispidus, 2 banded coral shrimp

Echinoderms

Fish (total responses, 123)

Abudefduf saxatilis, 2 sergeant major

Abudefduf sp.

Acanthurus, unspecified

Amphiprion latozonatus, wide band clownfish

Anarhichas lupus, wolfish

Angelfish sp., unspecified

Antennarius commersoni

Assessor flavissimus

Balistes vetula, queen triggerfish

Bodianus pulchellus, 2 Cuban hogfish

Butterflyfish, unspecified

Canthidermis sufflamen, ocean triggerfish

Centropyge argi, 3 cherubfish

Centropyge bispinosus

Centropyge elbi, Elbi's angelfish

Centropyge fisheri, 2 Fisher's angel

Centropyge flavissimus, 2 lemonpeel

Centropyge loriculus, 4 flame angel

Centropyge potteri, 3 Potter's angel

Centropyge tibicen, keyhole angel

Centropyge, 2

Chaetodon sp. Butterflyfish

Fish, continued

Chromis cyanea, 2 blue chromis
Chromis enchrysurus, yellowtail reeffish
Chromis insolatus, sunshine fish
Chromis multilineata, brown chromis
Chromis scotti, purple reeffish
Chromis sp., unspecified
Chromis vanderbilti
Chromis viridis, Green chromis
Chrysiptera starcki, Starck's damselfish
Cirrhitops fasciatus, striped hawkfish
Coris venusta, elegant choris
Damsel, unspecified
Dascyllus trimaculatus, Domino damsel
Doryrhamphus dactyliophorus, 2 banded pipefish
Doryrhamphus excisus, blue stripe
Doryrhamphus janssi, Janss pipefish
Entacmea quadricolor
Forcipiger flavissimus, longnose butterflyfish
Gadus morhua, codfish
Genicanthus personatus, masked angelfish
Genicanthus, sp
Grama loreto, blackcap basslet
Halichoeres bivittatus, puddingwife
Halichoeres garnoti, slippery dick
Halichoeres maculapina, 2 clown wrasse
Halichoeres radiata, yellowhead wrasse
Hippocampus abdominalis, pot bellied
Hippocampus erectus, 2 lined seahorse
Hippocampus kuda, spotted seahorse
Hippocampus reidi, longsnout seahorse
Histrio histrio, sargassum fish
Holocanthus ciliaris, queen angel
Holocanthus tricolor, rock beauty
Hypsypops rubicundus, Garibaldi
Labroides dimidiatus
Leafy seadragons
Lophius americanus, goosefish
Lythrypnus dalli, Catalina goby
Lythrypnus zebra, zebra goby
Melichthys niger, black durgon
Microspathodon chrysurus, yellowtail damselfish
mystery larvae from outdoor exhibit
Naso
Nemateleotris magnifica, 3 fire fish
Orangetail damsel
Oxycirrhites typus, longnose hawkfish
Oxycirrhites typus, longnosed hawkfish
Oxycirrhites typus, longnosed hawkfish
Paracanthurus hepatus, blue surgeonfish
Pogonias cromis, black drum
Pomacentrus diencaceus, longfin damselfish, unspecified
Pomacentrus fuscus, dusky damselfish
Pomacentrus leucostictus, beaugregory
Pomacentrus partitus, bicolor damselfish
Pomacentrus planifrons, three spot
Pomacentrus variabilis, cocoa damsel
Prioleps aureoviridis
Pseudochromis polynnus
Pseudochromis squamipinnis
Red snapper
Rhamphocottus richardsoni
Rhinecanthus assasi
Scorpeonichthys marmoratus, cabezon
Selene vomar, 2 lookdown
Serranus subligarius, mousefish
Serranus tigrinus, harlequin bass
Signigobius biocellatus, signal goby
Sphaeramia nematoptera
Synchiropus splendidus X Synchiropus picturatus (hybrid failure)
Thalassoma bifasciatum, 2 bluehead wrasse
Weedy seadragons
Xanthichthys ringens, sargassum triggerfish
Zebrasoma flavescens, 7 yellow tang
Zebrasoma sp.

Science 30. Publications

30. Scientists and professional aquarists reported publishing their work in the following publications. A number indicates the number of times that publication was reported. No number indicates one mention.

American Naturalist	Journal of Experimental Marine Biology and Ecology
Aquaculture 5	Journal of Molluscan Studies
Aquaculture Magazine	Journal of the World Aquaculture Society 7
Aquaculture Research	Journal of Wildlife Disease
Aquarium Fish Magazine 7	Journal of Zoos and Wildlife Management
Aquarium Frontiers 2	Koralle
Aquarium Science and Conservation	“MAKAI”
AZA conferences and publications 1	Malacologia 2
Books 3	Marine and Reef USA Annual
Breeders Registry (Journal of MaquaCulture) 8	Marine Aquarist (Japan)
Bulletin of Marine Science 2	Marine Biology 3
Center for Tropical and Subtropical Aquaculture	Marine Ecology Progress Series
Conferences, Poster Presentations	Molecular Ecology
Copeia 2	Oceanography
Coral Reefs	Popular magazines
Coralrealms.com	Progressive Fish Culture
Drum and Croaker 4	RAW 1 (?)
Environmental Biology of Fishes 2	Safari Magazine
Evolution	Sea Grant publications
Fisheries Bulletin	Sea Scope 3
Freshwater and Marine Aquarium Magazine 10	Sea Star Newsletter
Hobbyist Newsletters	TAFS
Honolulu Aquarium Society Newsletter	The Cephalopod Page
Ichthyological Research	Today’s Aquarist
International Aquafeeds	Tropical Fish Hobbyist 5
International Aquarium Congress	University of Hawaii Sea Grant
International Journal of Invertebrate Reproduction and Development	University of Washington Press
Journal of Applied Aquaculture 2	Veliger 2
Journal of Applied Phycology	Zoo Biology 2
Journal of Aquarium Science and Conservation	Zoomorphology

Original Survey

Survey Introduction

The 2nd International conference on Marine Ornamentals (Marine Ornamentals 2001) will take place in Orlando, FL on November 26 through December 1. The theme for the conference is “Collection, Culture, and Conservation”. Hobbyists, environmentalists, commercial interests, and marine scientists from all over the world will come together to discuss and analyze the current state of the hobby, and to look into the future to see where we should be going and how we are going to get there. Ornamental marine organisms support an amazing mosaic of business, science, environmental concerns, and hobbyist pursuits. This conference provides a unique venue for these diverse interests to come together and advance the state of the art. If you are interested in attending this conference, go to the web site, www.ifas.ufl.edu/conferweb/MO for more information.

I have been invited to give the plenary talk on Culture. A great honor, but I need a little help. You can't look into the future without knowing where you came from or where you are now, and I can only get this information from you. So I have put together a brief questionnaire that I hope will help me create an overview of the current state of the culture of marine organisms in the marine hobby/industry. If you culture marine ornamental organisms for fun, for science, or for profit, please take a minute or two to fill out the following questionnaire and send it back to me at this email address martin_moe@yahoo.com. (The questionnaire is not as long as it looks, there are only about 10 questions in each section and you probably need answer only those in one section (probably only 10 – 15 minutes). Even if you are a marine aquarist who doesn't actively culture marine organisms, there are a few questions in the hobbyist section that you can answer that will be helpful. Also, if you know of someone or some place where this questionnaire should be directed, please do so. The more questionnaires I receive, the more interesting the survey will be.

Thank you,

Martin A. Moe, Jr.

Original Survey

Please answer the questions that pertain to your situation. Indicate your answer clearly if multiple choice (all that apply), and/or write out your comment under the question. Please comment on any questions where clarification or additional information may be helpful. If possible, please return only the set of questions that you answered.

For the most part, all contributed information will be used only as data to prepare an overall sense of the current status of culture of marine organisms. However, if you desire complete anonymity, just indicate this here and your identity will not be included in any way.

You may identify me as a participant.---

I am happy to contribute, but please do not identify me. -----

Name _____

1. I culture marine organisms principally as a:
 - A. hobbyist, answer questions 2 through 10
 - B. commercial enterprise, answer questions 11 through 20
 - C. scientific researcher, answer questions 21 through 30

Hobbyist questions

2. As a hobbyist,
 - A. I do not actively culture marine organisms, but I am interested and support this activity.
 - B. I try to culture marine organisms from time to time, but do not expend much effort.
 - C. I spend too much time with my aquariums and I really work at breeding marine organisms.
3. As a hobbyist, I dispose of the excess organisms I culture by:
 - A. Giving them to other hobbyists
 - B. Selling them to other hobbyists
 - C. I do not produce excess organisms
4. As a hobbyist, I have successfully spawned and reared the following organisms. (Please list those fish, corals, or other invertebrates that you have propagated. List corals only if you routinely cull, sell, or give away excess growth.)
5. As a hobbyist, I have tried and failed to rear the following organisms. (Please list those fish, corals or other invertebrates that you have seriously tried and failed to propagate.)

6. As a hobbyist, the major problems that affect my breeding success are:

- A. disease
- B. lack of time
- C. lack of facilities
- D. lack of knowledge
- E. other (please comment)

7. As a hobbyist, I see the future of my culture efforts as:

- A. a continuing effort to rear marine organisms
- B. something I will probably soon give up
- C. something that is a source of extra income
- D. something that may become a source of extra income

8. As a hobbyist, I would be more successful with culture of marine organisms and enjoy it more if I had the following: (Give me a brief “wish list”.)

9. As a hobbyist, my attitude toward cultured “tank raised” marine organisms is:

- A. I buy the best and most economical animals I can find, doesn't matter where they came from.
- B. I try to buy cultured animals whenever I can.
- C. I ask my sources for cultured animals and encourage them to provide them.
- D. I will only buy cultured animals.

Comments?

10. As a hobbyist, (check all that apply)

- A. I strongly support the efforts of organizations such the Marine Aquarium Council that are working to educate and certify those in the chain of supply of marine organisms.
- B. I support efforts to improve the capture, transport, and maintenance of marine organisms, but I think that little will be accomplished.
- C. I favor increased legislation to control abuses in the marine ornamental industry.
- D. I favor voluntary efforts within the industry to control abuse through education.
- E. I think that cultured marine organisms are absolutely necessary for the near term survival of the hobby.
- F. I think that collection of marine organisms will be the foundation of the hobby for many years to come.

Additional comments?

Commercial breeder questions

11. As commercial breeders of marine organisms, we are:

- A. doing well
- B. hanging in there
- C. checking the want ads comments?

12. As a commercial breeder, we:

- A. work near the sea in open systems or at culture sites located in natural waters
- B. work only with closed systems in areas remote from the sea
- C. work with both open and closed systems, depending on the species under culture

13. As a commercial breeder, the species we are most successful with are:

(Please list the species, up to 10, that provide your greatest financial return)

14. As a commercial breeder, the species that we do not breed commercially, but would most like to breed are: (Please list the species, up to 10, that you would most like to successfully breed.)

15. If, as a commercial breeder, production of cultured stock is only a portion of your business, to what extent does your breeding contribute to your bottom line?

- A. It is a negative factor
 - B. Break even
 - C. 5 to 25%
 - D. 26 to 50%
 - E. 51 to 75%
 - F. 76 to 100%
- comments?

16. As a commercial breeder, our major problems are in the areas of:

- A. biological
- B. financial
- C. personnel
- D. facilities

17. As a commercial breeder, I think that the current status of marine organism culture in the overall marine ornamental industry is:

- A. a small and struggling sector in a large and varied industry
- B. an important and growing sector of the industry
- C. already a significant sector of the industry

18. As a commercial breeder, I see the future of culturing marine organisms as:

- A. a small and restricted part of the total industry
- B. slowly developing into a major sector of the industry
- C. becoming a major part of the industry in the relatively near future

19. As a commercial breeder, the breakthrough development in marine culture that I would most like to see is:

20. As a commercial breeder, our major impediment to great financial success is:
(Please skip this question if you are already successful beyond your wildest dreams.)

Scientific researcher questions

21. My research work in the culture of ornamental marine organisms is as:

- A. a student project
- B. a researcher at a government laboratory
- C. a researcher at a university
- D. a researcher at a commercial company
- E. an aquarist at a public aquarium
- F. an independent non funded research scientist

22. As a scientist doing research on the culture of marine organisms:

- A. I am self funded
- B. I am supported by non profit grants
- C. I am supported by grants or employment from commercial companies
- D. My research is part of my regular job as an aquarist

23. As a scientist doing research on the culture of marine organisms:

- A. it is easy to find financial support for my work
- B. financial support is available but difficult to find
- C. I cannot obtain financial support for my work

24. I am working with the following organisms. (Please list those species that are the subjects of your research.)

25. I have been successful in the controlled culture of the following organisms. (Please list those species that you have successfully spawned and reared into the juvenile stage.)

26. I have tried and failed in the controlled culture of the following organisms. (Please list those species)

27. The major problems I have encountered in working with the culture of marine ornamental organisms are:

- A. lack of funding
- B. lack of facilities
- C. maintaining adults in breeding condition
- D. obtaining viable larvae
- E. feeding early larvae
- F. survival of late larvae
- G. loss at metamorphosis
- H. loss during the early juvenile stage
- I. disease
- J. other (comments?)

28. The object of my work is:

- A. applied research (solve problems in the commercial culture of marine organisms)
- B. basic research (investigate the reproductive biology of interesting marine animals)
- C. aquaristic purposes (maintain endangered species in captivity, and/or develop the technology to maintain captive populations for display purposes)
- D. other (comment?)

29. I plan to publish my work in:

- A. a college thesis or a course report
- B. the hobbyist literature
- C. as a scientific paper
- D. as a confidential company report
- E. I do not publish my work

30. I usually publish my work in the following publications. (Please list the scientific or popular publications where you publish or plan to publish.)

31. As a scientist doing research on the culture of ornamental marine organisms:

- A. I find the hobbyist literature very useful
- B. I read the hobbyist literature but seldom cite it because it is not peer reviewed
- C. I pay no attention to the hobbyist literature

Thank you for your participation.

Martin A. Moe, Jr.

