

# Sci-Art AquaWeek 2014

28 July - 1 August 2014

SEAFDEC/AQD's 41st Anniversary, AQD Museum's Year 21, FishWorld's Year 14

Page | 1

## Rationale of Sci-Art AquaWeek

The SEAFDEC Aquaculture Department advances responsible aquaculture and supports sustainable development in the Philippines and Southeast Asia. SEAFDEC FishWorld is dedicated to science and environment education of the general public—children, adults, students, teachers, researchers, public officials, tourists, local residents, etc.—particularly about aquatic ecosystems and biodiversity, aquaculture and fisheries, and marine conservation.

Sci-Art AquaWeek seeks to build understanding and appreciation among school children and teachers in Panay of the research and development work of SEAFDEC/AQD and the relations between aquatic biodiversity, aquaculture, fisheries, human nutrition, and economic advancement. Such understanding is then expressed through contests with various outputs. Sci-Art AquaWeek 2014 focuses on (1) aquaculture and its importance to food security, and (2) the Philippines being the center of the center of marine biodiversity and how Filipinos should know more about this natural heritage. Five contests are open to all high schools, and four contests to all elementary schools. There is no registration fee.

## Events during Sci-Art AquaWeek 2014

Date	Day	Time	Events	
28 Jul	Mon	8 am–5 pm	<b>Biodiversity Lab:</b> “ <i>Fish diversity around Panay and Guimaras</i> ”	HS
		8 am–5 pm	<b>Biodiversity Workshop and Quiz:</b> “ <i>The Philippines is the center of mollusk diversity</i> ”	HS
29 Jul	Tue	8 am–5 pm	<b>Painting:</b> “ <i>The Philippines is the center of marine biodiversity</i> ”	HS
		1–5 pm	<b>Powerpoint Seminar:</b> “ <i>Aquaculture versus fisheries</i> ”	HS
30 Jul	Wed	8 am–12 nn	<b>Bring, Show, and Tell (by Teachers):</b> “ <i>Farmed seafood for good health!</i> ”	ES
		2–5 pm	<b>Nutrition and Aquaculture Quiz</b>	ES
31 Jul	Thu	8 am–12 nn	<b>Write and Draw a Booklet:</b> “ <i>Paglaki ko, I want to be a fish farmer</i> ”	ES
		1–5 pm	<b>Aquarium Quiz:</b> “ <i>Lantawa!</i> ”	ES
1 Aug	Fri	8 am–12 nn	<b>Seafood Skills Olympics:</b> “ <i>Preparing and serving sutokil</i> ”	HS
		12 nn	<b>Anniversary Lunch:</b> FishWorld is 14!	
		4–5 pm	<b>Award Ceremony</b> (for winners and coaches)	HS, ES

Descriptions of the contests and Participation Forms are available from FishWorld, phone (33)-315-5665 and 0921-559-0824, and on the website [www.seafdec.org.ph/fishworld/aquaweek2014](http://www.seafdec.org.ph/fishworld/aquaweek2014). Sample quizzes and other information materials are also available to schools that ask for them.

In keeping with 19 years' practice, invitation letters and descriptions of contests are sent to the Principals of about 50 schools in Iloilo and Guimaras when classes start in June. Principals choose contestants and coaches as soon as possible. Students, pupils, teachers, and parents work together and do background research, collect specimens, practice drawing and presenting, and make all related preparations for the competitions in July. Principals fill in the Participation Forms with the contestants' and coaches' correct names and submit the forms to SEAFDEC FishWorld, 5021 Tigbauan, Iloilo, or fax them to (33)-511-

8709 as soon as possible before Friday, 25 July 2014. The FishWorld staff needs lead time to prepare Certificates of Participation, other materials, and logistics.

The Philippines is an archipelagic country with a huge marine territory and 7,107 islands surrounded by various marine habitats with an amazing diversity of species -- fishes, crustaceans, mollusks, corals, echinoderms, other invertebrates, as well as seaweeds, seagrasses, mangroves, sea turtles, dolphins, and whales. The country has 90 million consumers of fish, about 50 million residents of coastal barangays, and probably 10 million workers in fisheries, aquaculture, fish trade, and marine transportation. The oceans and marine biodiversity are essential to daily life in the Philippines. How much do our students know of the importance of the oceans and marine biodiversity, the problems besetting them, and the solutions and interventions implemented by government agencies, by universities and research institutions, by people's organizations, by business, by media? How much love and respect do they have for the oceans and marine biodiversity? FishWorld urges everyone to celebrate the oceans and marine biodiversity in real, concrete, personal ways, **every day**. Page | 2

FishWorld urges students and teachers to visit the AQD library and website ([www.seafdec.org.ph](http://www.seafdec.org.ph)) and find out what the SEAFDEC Aquaculture Department has accomplished in aquaculture research and development over the past 40 years. After all, the key to food security is the responsible harvest and use of wild food species through fisheries and the responsible production of domesticated species through aquaculture (and agriculture). More Filipinos should now take advantage of aquaculture science and current technologies to produce more aquatic products (1) to feed an ever burgeoning national population, (2) to earn foreign exchange, and (3) to conserve and restore aquatic resources.

#### Schools invited to Sci-Art AquaWeek 2014

The Sci-Art AquaWeek 2014 competitions are open to all school that like to join but FishWorld sends invitations to the regular participants.

Kinaadman Elementary School (ES)	Philippine Science High School WV
Nanga ES	UP High School in Iloilo
Buyuan ES	Ramon Avanceña National High School (NHS)
Eugenio Torrento ES	Parara NHS
Tigbauan Central ES	Tigbauan NHS
Guimbal Central ES	Guimbal NHS
Oton Central ES	Oton NHS
Iloilo City Central ES	Iloilo NHS
Miagao Central ES	St Louise de Marillac School, Miag-ao
Leganes ES	Leganes NHS
Sta Barbara ES	Sta Barbara NHS
Hibao-an ES	Dumangas NHS
Namocon ES	Colegio del Sagrado Corazon de Jesus, ES, HS
Arroyo ES	Colegio de San Jose, ES, HS
Lapaz Central ES	West Visayas State University, Integrated Lab School, ES, HS
Pavia Central ES	Central Philippine University Development HS
Baluarte ES	University of Iloilo, HS
Rizal ES	San Joaquin School of Fisheries
Quezon ES	Botong-Cabanbanan NHS
Molo ES	IloiloCity SPED-Integrated School for Exceptional Children
Jaro Central ES	Kaunlaran Learning Center ES, HS
Santo Nino Sur ES	Pavia NHS
Arevalo ES	Tubungan NHS
Santo Domingo ES	Jordan NHS
	Nueva Valencia NHS

## Sci-Art AquaWeek 2014

### Description of Contests for High Schools

**Biodiversity Lab:** “*Fish diversity around Panay and Guimaras*”  
(28 July, Monday, 8 am–5 pm)

Page | 3

This contest is open to teams (each composed of one teacher and two students) from all interested high schools. The main tasks are: (1) do field work and document fish diversity in coastal habitats around Panay and Guimaras, and (2) process and identify specimens for a reference collection of 25 fish species for the school museum. Teams do the following:

#### *Weeks before AquaWeek:*

1. Choose two or more marine habitats and sampling sites (mangroves, seaweed, seagrass, beach, fishing village, fish landing sites) in Panay and Guimaras, visit them during the day, and take notes and photos.
2. Bring a styrofoam box with plenty of crushed ice. Find 25 species of fish at the selected sites. Collect only 1–2 fresh dead specimens of each species, and choose small specimens <15 cm long so they fit in small jars for later exhibit.
3. Take photos of the fish specimens with all fins extended to show full colors. These photos allow comparison with books and posters for species identification without the wet specimens to handle.
4. Sort specimens by kind or species and pack them straightened out in self-sealing plastic bags (available at Iloilo Plastic Center). Label them by sampling site, locality, date, and time of collection. Use waterproof paper and pencils for wet labels.
5. Transport the collected fish in a styrofoam box with plenty of crushed ice. Once home or at the lab, put specimens in the freezer before they go bad.
6. Identify fishes by means of taxonomic books and posters. Visit [www.fao.org](http://www.fao.org) and [www.seafdec.org.ph/fishworld](http://www.seafdec.org.ph/fishworld) and download the ebooks:
  - Carpenter KE, Niem VH (eds). 1999a. FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific, Volume 3. Batoid Fishes, Chimaeras and Bony Fishes Part 1 (Elopidae to Linophrynidae). Food and Agriculture Organization, Rome, pp 1397–2068.
  - Carpenter KE, Niem VH (eds). 1999b. FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific, Volume 4. Bony Fishes Part 2 (Mugilidae to Carangidae). Food and Agriculture Organization, Rome, pp 2069–2790.
  - Carpenter KE, Niem VH (eds). 2001a. FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific, Volume 5. Bony Fishes Part 3 (Menidae to Pomacentridae). Food and Agriculture Organization, Rome, pp 2791–3380.
  - Carpenter KE, Niem VH (eds). 2001b. FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific, Volume 6. Bony Fishes Part 4 (Labridae to Latimeriidae), Estuarine Crocodiles, Sea Turtles, Sea Snakes and Marine Mammals. Food and Agriculture Organization, Rome, pp 3381–4218.
7. Study first the section on Bony Fishes in Volume 3, from the illustrated morphology and terminology (pp 1541) to Guide to Orders and Families (pp 1548–1618).
8. Examine and sort collected specimens by similarities and differences (or by class, families, genera, and species).
9. Visit FishWorld to use the above books and compare fish specimens with the color posters published by BFAR and other fisheries agencies.
10. Buy 25 plastic jars with red screw caps (available in 3-4 sizes at Commonwealth Store, Iznart St, Iloilo City), the number of jars per size depending on the sizes of the collected specimens.
11. Format, print, and cut 50 museum labels, each 1”x3” bearing the school and museum name with logo. Use waterproof paper if available, or at least thick white board, 220 gsm. Bring these computer-printed labels and fine-tipped pens with permanent ink to FishWorld on contest day. Check out example of museum labels at FishWorld and get an efile.

#### *On contest day, 28 July, Monday:*

1. Bring to FishWorld the collected fish specimens (frozen or on crushed ice), 25 plastic jars of appropriate sizes, about 50 museum labels, and the **Biodiversity Report** and **Catalogue of Fish Species** (attached) to fill in after the lab.
2. Register at 8 am, and occupy a lab table in the Kids’ Activity Room.
3. Continue, check, and verify the species identification until 25 species have been correctly identified. Put identified specimens in the plastic jars with tentative labels with species name, locality, and date.

4. Each team may present to the FishWorld Curator as many as 5 species of uncertain identification for verification or advice. The FishWorld Curator will verify species and advise between 10 am and 12 noon only.
5. Teams fill out the Biodiversity Report and Catalogue of Fish Species as neatly as possible by hand or by computer.
6. Teams write out the final **museum labels** for the 25 correctly identified species for the school museum. Use fine-tip pens with permanent ink. Specimen numbers in the museum labels must correspond to those in the Catalogue of Fish Species.
7. Teams submit to the FishWorld Curator for scoring the 25 fish species in 25 jars, each with a museum label, together with the Biodiversity Report and Catalogue of Fish Species.

8. Teams will be scored as follows:
  - Biodiversity Report (maximum 10 pts): site and date of sampling, description of aquatic habitats (4 pts); sampling method and processing of specimens (4 pts); identification method, taxonomic references used (2 pts)
  - Collection of specimens of 25 species (1 pt for near-perfect specimen of each species)
  - Catalogue of Fish Species (2 pts per species correctly classified to family and scientific name)
  - Specimen presentation in jars of the appropriate size (1 pt per jar)
  - Labeling with the school or museum name and logo, and scientific names correctly spelled (1 pt per jar)
9. After scoring, teams fill all specimen jars with 10% formalin.
10. After the contest, teams take their fish collections back to their schools for permanent exhibit.
11. Other notes for the Biodiversity Lab contest:
  - Maximum score is 135 pts. Teams must score >95 to qualify for prizes.
  - Top three teams get cash prizes: First (P2,000), Second (P1,700), and Third (P1,500).
  - Non-winners with scores >95 will receive P1,000 to subsidize expenses.
  - Contestants and coaches will receive Certificates of Participation on contest day.
  - Certificates of Merit and cash prizes will be awarded to the winners at 4 pm on Friday, 1 August.

**Sci-Art AquaWeek 2014**  
**Biodiversity Lab: “Fish diversity around Panay and Guimaras”**

**Biodiversity Report**

School \_\_\_\_\_

Page | 5

Team members: \_\_\_\_\_

Localities: \_\_\_\_\_ Date(s) of collection \_\_\_\_\_

**Habitat type, description, with photos of the site**

**Sampling methods and processing of specimens**

**Taxonomic research done, references used**

**Biodiversity Lab: Catalogue of Fish Species Collected around Panay and Guimaras**

Specimen Catalogue #	Species (scientific name)	Common name	Family	Source locality	Date collected
001					
002					
003					
004					
005					
006					
007					
008					
009					
010					
011					
012					
013					
014					
015					
016					
017					
018					
019					
020					
021					
022					
023					
024					
025					

## Sci-Art AquaWeek 2014

### Description of Contests for High Schools

**Biodiversity Workshop and Quiz:** “*The Philippines is the center of mollusk diversity*”  
(28 July, Monday, 8 am–5 pm)

Page | 7

This contest is open to teams (each composed of one teacher and two students) from all interested high schools. The main tasks are: (1) study a collection of shells of 50 mollusk species from coastal habitats around Panay and Guimaras for morphology, similarities, and differences; and (2) learn the taxonomy of mollusks, especially family groupings and scientific names; (3) identify 30 mollusk shells by family or species during the Biodiversity Quiz on 28 July. Teams do the following:

#### *Weeks before AquaWeek:*

1. The Teacher-Coach facilitates the learning sessions and other preparations for the contest.
2. Teams buy the shell pack with 50 labeled species (cost P250) from the FishWorld SeaStore.
3. Examine the 50 species, group them into two Classes (Gastropoda, Bivalvia), then into families within each Class. Discern the similarities of species within families and the differences among species in separate families.
4. Make a **Table of Mollusk Species** by Class, Family, scientific name, and common name (see attached table).
5. Visit the websites [www.fao.org](http://www.fao.org) or [www.seafdec.org.ph](http://www.seafdec.org.ph) and download the pdf file of the following book:  
Carpenter KE, Niem VH (eds). 1998a. *FAO Species Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific, Volume 1. Seaweeds, Corals, Bivalves and Gastropods.* Food and Agriculture Organization, Rome, pp 1–686.
6. Study the chapters on Bivalves (pp 123–362) and Gastropods (pp 363–648) starting with the illustrated morphology and terminology and the keys to families. Study the specimens from the shell pack against the FAO book. Learn to identify shells to families.
7. Use the scientific names in the shell pack to find the species accounts in the FAO book and learn about the biology of the 50 species. Add to the Table of Mollusk Species more columns to indicate shell size, habitat, and feeding habit, as given in the FAO book.

#### *On contest day, 28 July, Monday:*

1. Bring to FishWorld the 50 species in the shell pack, the draft **Table of Mollusk Species**, and the printout of the FAO book or the pdf in a laptop.
2. Register at 8 am and get a team number for a lab table and two contestant numbers for the Biodiversity Quiz.
3. Compare the species in the shell pack with the specimens in the FishWorld reference collection (Dry Room) and with books on Philippine mollusks by Springsteen and Leobrera (1986) and by Guido Poppe (2008–2011).
4. Check and verify the entries and then submit the **Table of Mollusk Species** to the FishWorld Curator at 1 pm. The **Table** will be scored as team output, 3 pts for every species with correct entries for shell size, habitat, and feeding habit (maximum 150 pts).
5. The **Biodiversity Quiz** will be held in the ASEAN Hall at 3 pm. Shells of 10 bivalve species and 20 gastropod species are laid out with numbers 1 to 30 corresponding to those in a blank **Table of Mollusk Species** given to the contestants at the start. Contestants enter the round of shells at the station corresponding to their assigned numbers, and move to the next higher-numbered station at one-minute intervals until they finish the round of 30 shells. During the 1 min at every station, contestants fill in the **Table of Mollusk Species**, giving the scientific name and family for the given numbered shell. This Table will be scored 1 pt for each correct entry (maximum 60 pts per contestant).
6. After the contest, teams take their shell pack collections back to their schools for exhibit.
7. Other notes for the contest:
  - Maximum team score is  $150 + 60 + 60 = 270$  pts. Teams must score  $>190$  to qualify for prizes.
  - Top three teams with scores  $>190$  get cash prizes: First (P1,500), Second (P1,200), and Third (P1,000).
  - Non-winners with scores  $>190$  will receive P500 to subsidize expenses.
  - Contestants and coaches will receive Certificates of Participation on contest day.
  - Certificates of Merit and cash prizes will be awarded to the winners at 4 pm on Friday, 1 August.







## Sci-Art AquaWeek 2014 Description of Contests for High Schools

**Painting Contest:** “*The Philippines is the center of marine biodiversity*” (29 July, Tuesday, 8 am – 5 pm)

Page | 10

This contest is open to teams of one student-painter and one teacher-coach from each interested high school. Paintings must depict the amazing marine biodiversity in the Philippines. For this contest, the student-painter must know about marine ecosystems and habitats (mangroves, seagrass beds, seaweed beds, coral reefs, beaches, open water column, soft-bottom sea bed) and the plants and animals that live in them. Painters draw a collection of Philippine species in some artistic or realistic arrangement, or depict a particular marine habitat with its characteristic species composition. In all paintings, the plants and animals must be drawn as accurately as possible to be recognizable as real species.

### *Weeks before AquaWeek:*

1. Teams think up a story concept and plan the painting to include at least **30 different species** in their correct places in the chosen habitat. For example, a painting can show various bony fishes, a shark, a dolphin, a sea turtle in the water column, and many invertebrates at the bottom around the marine plants or on the sediment-- various gastropods (snails); clams and oysters; sea stars, sea urchins, sea cucumbers, feather stars; hard corals, soft corals, sea anemones, jellyfish, sea fans); shrimps, crabs, lobsters, hermits; sponges; tubeworms; etc.
2. Teams then visit FishWorld and examine a print of an amazing biodiversity painting in the Dagat Isda Gallery, a cut-outs collage in the Annex, and several coral reef posters in the Fisheries Hall.
3. To get a good idea of how marine animals look like and behave, student-painters should observe the live animals in the aquaria and tanks at FishWorld.
4. Teams decide on the 30 species to include in the painting, gather photos of these species, and examine books and posters to get the correct shapes, sizes, structures, colors, textures of the selected species.
5. Student-painters practice rendering the 30 species in a meaningful composition on illustration board 20” x 30” with their own preferred coloring material (paint, water color, ink, pastel, etc.).

### *On contest day, 19 July:*

1. Teams bring their preferred coloring materials, and register at FishWorld at 8 am to get a team number.
2. Illustration boards will be provided by FishWorld.
3. Contestants are allowed 8 hours to paint their entries, then they submit the paintings with a title and a two-sentence explanation written on a sheet of paper. Contestants may **not write** anything on the painting.
4. Notes:
  - Judges: AQD researchers, artists, and the FishWorld Curator
  - Criteria: number of species depicted in the drawing (1–30 pts) ; species details and accuracy (1–30 pts); context and message or story value of the artwork (20 pts); composition, style, color, and visual impact (20 pts)
  - Minimum score to be considered for a prize is 70 pts.
  - Top three scorers >70 get cash prizes: First (P1,500), Second (P1,200), and Third (P1,000).
  - Non-winners with scores >70 will get P500 to subsidize expenses.
  - Contestants and coaches will receive Certificates of Participation on contest day.
  - Certificates of Merit and cash prizes will be awarded to the winners at 4 pm on Friday, 1 August.

## Sci-Art AquaWeek 2014

### Description of Contests for High Schools

**Powerpoint Seminar: “Aquaculture versus capture fisheries”**  
(29 July, Tuesday, 2–5 pm)

Page | 11

This contest is open to teams (each composed of a student-presenter and a teacher-coach) from all interested high schools. The main tasks are: (1) to find out and understand the characteristics, similarities, and differences between aquaculture (growing aquatic species in controlled environments) and capture fisheries (hunting wild species); and (2) to document aquaculture operations and capture fisheries in the field. Teams have to do the following:

*Weeks before AquaWeek:*

1. Read the attached *Fundamentals of Aquaculture* to understand aquaculture as a food production sector.
2. Search the internet or visit some websites ([www.seafdec.org](http://www.seafdec.org), [www.fao.org](http://www.fao.org), etc.) to find a similar concise *Fundamentals of Capture Fisheries* to understand the characteristics of capture fisheries.
3. Download the *FAO Code of Conduct for Responsible Fisheries* and the *Regional Guidelines for Responsible Fisheries in Southeast Asia – Responsible Aquaculture*. Understand the difficult issues in fisheries and aquaculture, and what interventions have been put in place to address these issues.
4. Visit FishWorld and study the posters on small-scale and commercial fishing, and particularly the *tangab* fishery.
5. Find and visit local aquaculture enterprises (hatchery, nursery, growout farm for any species) but NOT the SEAFDEC/AQD stations in Tigbauan, Dumangas, and Igang. Talk to the operators and technicians, and document and photograph the farm operations and the farmed species.
6. Visit nearby fishing villages, talk to fishers, and note the various fishing operations (fish corrals *punot*, gill nets *pukot*, filter nets *tangab*, longline, purse seine, lift nets, etc.). Document and photograph the fishing gears and catch composition.
7. Write the text of a 20-minute seminar that compares and contrasts aquaculture and capture fisheries and argues for one or the other. Choose the 10–15 best photographs from the field work to illustrate the main arguments.
8. Prepare a very visual (NOT text-heavy) MS Powerpoint seminar with maximum 20 slides to include:
  - title and team members (1 slide); rationale and objectives (1 slide); methods of study (1 slide);
  - characteristics, similarities, differences between aquaculture and capture fisheries (4 slides);
  - photographs of aquaculture operations and species from field work (4 slides);
  - photographs of fishing operations and catch composition from field work (4 slides);
  - arguments for and against aquaculture and capture fisheries (4 slides)
9. The student-presenter practices the 20-minute delivery of the seminar; the teacher critiques.

*On 29 July, Tuesday afternoon:*

1. Register at 1 pm, submit the Powerpoint file on a USB disk to the FishWorld staff, and get a team number indicating the order of presentations.
2. The student-presenter must speak like a knowledgeable researcher or journalist, and answer questions.
3. The seminar will be judged according to the following criteria:
  - Informative title and clear rationale, objectives, methods of the study, and synopsis (10 pts);
  - Clear depiction of aquaculture enterprises and farmed species (20 pts);
  - Clear depiction of capture fisheries and catch composition (20 pts);
  - Arguments for and against aquaculture and capture fisheries (20 pts);
  - Quality of slides, photographs, and graphics (10 pts);
  - Speaking and teaching ability of student-presenter, response to questions (20 pts)
4. Other notes for the contest:
  - Judges: AQD Scientists and Information Specialists
  - Maximum score is 100 points. Seminars must score >70 points to qualify for prizes.
  - The top three seminars with scores >70 win cash prizes: First (P1,500), Second (P1,200), Third (P1,000).
  - Non-winners with scores >70 will receive P500 to subsidize expenses for research.
  - Contestants and coaches will receive Certificates of Participation on contest day.
  - Certificates of Merit and cash prizes will be awarded to the winners at 4 pm on Friday, 1 August.

## Fundamentals of Aquaculture

WG Yap

### Aquaculture

Farming of aquatic organisms including fish, mollusks, crustaceans, other invertebrates and aquatic plants.

Farming implies:

- interventions to enhance production such as:
  - regular stocking
  - feeding
  - protection from predators
- ownership over the stock being cultivated, whether individual or corporate, so that the resulting product is not exploited by the public as a common property resource

### Aquaculture by environment

- Freshwater – lakes, reservoirs, rivers
- Brackishwater – river mouths, estuaries, mangrove areas
- Marine (Mariculture) – bays, coral coves, offshore

### Production phases

- Hatchery – from broodstocks to eggs to postlarvae or small juveniles (often called ‘fry’ or ‘seed’)
- Nursery – from ‘fry’ to larger juveniles (often called ‘fingerlings’)
- Grow-out – from juveniles to preferred market sizes

### Aquaculture by farming system

- Land-based tanks (concrete, fiberglass, canvass, plastic, etc.), for tilapia, freshwater prawn, etc.
- Earthen ponds for milkfish, tiger shrimp, grouper, etc.
- Cages (fixed or floating) for tilapia, milkfish, grouper, snapper, seabass, etc.
- Pens for milkfish, mud crabs, etc.
- Racks, stakes, hanging lines for mussels, oysters, etc.
- Longlines for seaweeds

### Aquaculture by level of inputs and management

- Extensive: low stocking density, natural food only, may use fertilizers
- Semi-intensive: moderate stocking density, natural food plus supplemental feeds, greater water change rate, may use pumps
- Intensive: high stocking density, regular feeding, pumps and aeration

### Species selection depends on

- Marketability
- Type of water in area where farm is to be located
- Availability of spawning stock (for hatcheries)
- Availability of seedstock (for grow-out)
- Availability of feed and other inputs
- Availability of technology
- Availability of capital

### Trophic level considerations

- Herbivores or omnivores (carps, tilapia, milkfish) are generally easier to rear and may subsist on natural food. Even when fed, feed will not require high quantity of animal protein and is therefore cheap. Production cost is low, but market price is also low.
- Carnivores (shrimps, grouper, snapper) require high amount of animal protein and is therefore more expensive to produce. Market price is much higher (more than 10x) than for herbivores. Unit profit margin is generally much higher.

### Aquatic species farmed in Southeast Asia

	Freshwater	Marine/Brackishwater
Fishes	Nile tilapia, common carp, <i>Pangasius</i> catfish, <i>Clarias</i> catfish, gourami, silver barb, Java barb, Mozambique tilapia, milkfish, snakehead, bighead carp, silver carp, grass carp	Milkfish, Mozambique tilapia, seabass, mullets, groupers, rabbitfishes, snappers, Nile tilapia
Crustaceans	Giant river prawn	Tiger shrimp, Pacific white shrimp, Banana shrimp, Indian white shrimp, <i>Metapenaeus</i> shrimps, mud crabs
Mollusks		Blood cockle, green mussel, oysters
Seaweeds		<i>Kappaphycus alvarezii</i> , <i>Eucheuma</i> spp., <i>Gracilaria</i> spp.

**Site selection depends on:**

- Target environment
- Desired production system and farming system
- Species

**Basic requirements**

- Sufficient water supply of good quality
- Free from harmful pollution
- Accessibility
- Free from flooding, erosion, strong winds, strong wave action
- Availability of electrical power
- Proximity to source of inputs
- Proximity to market (depending on species and potential market)
- Soil quality (for ponds)
  - can hold water
  - can form stable dikes
  - not acidic

**Examples of good aquaculture sites**

- Saltwater hatchery for shrimps, crabs or fish:  
Area far from river, with sandy sea bottom that does not get turbid even with strong wave action; but with good supply of fresh water
- Freshwater hatchery or freshwater fishponds for tilapia, carp, freshwater prawn, catfish, etc.:  
Relatively flat area with sandy-clay-loam or sandy-clay soil, with abundant supply of clean water not contaminated by pesticides from agriculture
- Brackishwater ponds for shrimp or fish:  
Coastal area with elevation above high tide level, with sandy-clay soil, and ready access to clean brackish water (from river or shallow well)
- Freshwater pens and cages for fish  
Shallow areas (3 to 10 m deep) of lakes, with high primary productivity and no industrial pollution
- Marine pens and cages for fish  
Sheltered bays and coves
- Rafts and lines for mussels and oysters  
Shallow bays and coves with high primary productivity and low density of people
- Longlines for seaweeds  
Clean marine waters with no massive freshwater inflow or runoff during the rainy season

**Aquaculture in public waters**

Farm structures should not impede navigation (boat traffic) nor the fishing activity of the local fishers.

**Use of mangrove swamps for aquaculture****Background**

- Has long history in Indonesia and the Philippines
- Used primarily for milkfish culture
- Only in recent years (1980s) with strong Japanese market for shrimps that milkfish farms were converted to shrimp farms or mangroves converted to shrimp farms

Why mangrove swamps were used for traditional fish ponds

- Swamps cannot be used for agriculture or for habitation.
- Nobody owns them.
- Regularly watered during high tide
- Can be developed by simply clearing the trees and putting a dike around an area with very little excavation

Why mangroves are not the best site for modern aquaculture

- New technologies require deeper ponds and more excavation.
- Once excavated, soil with high iron sulfide content is exposed and becomes highly acidic
- At high stocking density, regular feeding is required, and higher water exchange rate, which can no longer be provided by tidal action.

**Why or when to go into hatchery/nursery business?**

- Seed supply is needed for aquaculture development
- Limited land area available
- Skilled hatchery workers are available

Shorter production time (weeks) means less leeway for mistakes. Fast turnover (weeks) means more frequent cash inflow even on a monthly or weekly basis.

**Why or when go into the growout business?**

- There is constant demand for fish products
- Land or water area is available
- Technology and inputs are available
- Skills available for selected farming intensity

Slower turnover (months) means cash inflow may come only once or twice a year.

## Sci-Art AquaWeek 2014

### Description of Contests for High Schools

**Seafood Skills Olympics:** “Preparing and serving sutokil”  
(1 August, Friday, 8 am –2 pm)

Page | 14

This contest is open to teams (each made of three student-cooks and a teacher-coach) from all interested high schools. The purpose is to teach students about food from aquaculture and enable them to prepare clean and inexpensive traditional seafood dishes for family and friends. Each team prepares three simple seafood dishes—sugba, tola, kilaw, or sutokil in Cebuano, or sinugba, tinola, and kinilaw in Ilonggo—made with **farmed** species.

Student-Cook **Su** prepares *sinugbang* boneless *bangus*

Student-Cook **To** prepares *tinolang samaral*

Student-Cook **Kil** prepares *kinilaw na gulaman* and *kinilaw na talaba*

Teacher-Coach prepares the team for the contest and sets up the table presentation

FishWorld will provide the *bangus*, *samaral*, *talaba*, and *gulaman* to be cooked during the contest on 1 August. FishWorld will set up a long charcoal grill where *bangus* can be grilled and charcoal stoves where *tinolang isda* and *gulaman* and *talaba* can be cooked. Trays, cutting boards, tongs, some kettles, aluminum foil, raddish, eggplant, kamote tops, salt, onions, tomatoes, garlic, ginger, chili, batwan, vinegar, soy sauce, fish sauce, sugar will be available. The use of herbs, spices, or vegetables is encouraged instead of monosodium glutamate in all its commercial guises (Knorr, Magic Sarap, etc.).

Teams must bring their own sharp knives and tweezers to debone *bangus*, kettles to contain the *tinola*, some cooked rice to serve with the seafood, serving plates and bowls, a nice table cloth, and other tools and materials. Teams bring only what is necessary.

The student-cooks must do the following:

#### ***Weeks before 1 August:***

1. Observe and help parents, siblings, or helpers prepare seafood at home.
2. Visit nearby markets and observe the ways of handling and processing seafood cleanly and safely.
3. Learn milkfish deboning or *pagsikag sang bangus* from a deboning expert, then practice, practice, practice.
4. Learn and practice handling *samaral/danggit* to avoid getting pierced by the poisonous spines.
5. Learn and practice the following skills: icing and keeping fish fresh and clean, *paghimbis sang isda*, *paghukas sang kasudlan*, *paghiwa*, *pagpakas sang isda*.
6. Learn and practice *pagtimpla* and *pagsugba sang* boneless *bangus*.
7. Learn and practice *pagtimpla* and *pagtola sang samaral* with vegetables and spices.
8. Learn and practice handling red seaweed *gulaman* and fresh *talaba* oysters in a sanitary way, and preparing and seasoning *kinilaw na talaba*, and *kinilaw na gulaman*.
9. Learn and practice plating and presenting seafood, etc.
10. Prepare kettles, sharp knives, tweezers, plates, and other materials to bring to FishWorld on 1 August.

#### ***On 1 August, contest day***

1. Bring to FishWorld needed kettles, sharp knives, tweezers, big plates, bowls, platters, spoons, forks, table cloth, some cooked rice, and other materials.
2. Register at 8 am and get from the FishWorld staff the contestant badges and a team number corresponding to an outdoor table where the preparation skills will be demonstrated, and an indoor table where the cooked dishes will be presented and tasted.
3. Find and gather the fish, spices, vegetables, condiments needed by the team.
4. Find the team’s work table and start work as soon as possible.
5. Find the Skills Judges assigned to score the different skills for the different dishes and report to them for scoring.
6. Teams demonstrate the following skills in front of the judges:

## SKILLS TO BE DEMONSTRATED BY THE TEAM

### Student-Cook Su (Sinugbang bangus)

- Keeping seafood fresh and clean Keep 1 bangus on ice and work on clean table and cutting board.
- Pagpakas sang bangus Cut 1 bangus in half lengthwise along vertebral column.
- Paghukas sang kasudlan sang bangus Remove gills, blood, all internal organs from 1 bangus.
- Pagsikag sang bangus Debone 1 bangus thoroughly.
- Pagtimpla sang bangus Season 1 bangus with salt and spices.
- Pagsugba sang bangus Cook 1 bangus over a charcoal grill.
- Plating grilled bangus Arrange 1 grilled bangus and condiments on a plate to look appetizing.
- Serving grilled bangus Serve a piece of grilled bangus on a platter to the Skills Judge.

### Student-Cook To (Tinolang samaral)

- Keeping seafood clean Keep 2 samaral on ice and work on clean table and cutting board.
- Paghimbis sang samaral Remove scales from 2 samaral.
- Paghukas sang kasudlan sang samaral Remove gills, blood, all internal organs from 2 samaral.
- Paghiwa sang samaral Cut 2 samaral into three parts-- head, body, tail.
- Pagtola sang samaral Cook tinolang samaral with vegetables and spices.
- Plating tinolang samaral Present tinolang samaral in a nice big bowl to look appetizing.
- Serving tinolang samaral Serve a slice of tinolang samaral in a bowl to the Skills Judge.

### Student-Cook Kil (Kinilaw na gulaman, kinilaw na talaba)

- Icing and keeping talaba clean Keep talaba on ice and work on clean table and cutting board.
- Cleaning, washing fresh gulaman Remove suso, lumut, other debris from gulaman
- Blanching talaba Blanch or half-cook 10 pieces big talaba
- Seasoning and plating talaba Loosen the shells of the talaba and arrange on a nice plate with condiments
- Blanching gulaman Blanch or half-cook about 100 grams gulaman.
- Seasoning and plating gulaman Season blanched gulaman and arrange in a nice bowl
- Serving kinilaw na talaba and gulaman Serve one talaba and some gulaman on a platter to the Skills Judge.

### Teacher-Coach

- Teaching and preparing student-cooks Set up cooking lessons and adequate practice for the student cooks
- Coordinating teamwork Make sure all student-cooks know what they have to do during the contest.
- Table presentation Use nice table cloth and decorate the team table.
- Taste-checking the sutokil dishes Make sure the 4 sutokil dishes taste good without monosodium glutamate.
- Presentation of sutokil dishes Prepare appropriate containers for four sutokil dishes on the team table, small serving plates for the Skills Judges, and big serving plates for the two Taster Judges.
- Cueing the food service Prompt the student-cooks to serve pieces of the individual dishes to the Skills Judges and a complete sutokil set on two big plates to two Taster Judges.

**SCORING OF SKILLS AND DISHES (Scores: 1 poor; 2 good; 3 very good)**

**By Skills Judge for Sinugbang Bangus**

<b>Score for Student-Cook Su</b>	(total score 9–27)
• Keeping bangus fresh and clean	1–3
• Pagpakas sang bangus	1–3
• Paghukas sang kasudlan	1–3
• Pagsikag sang bangus	1–3
• Pag timpla sang bangus	1–3
• Pagsugba sang bangus	1–3
• Plating grilled bangus on the team table	1–3
• Serving grilled bangus to judge	1–3
• Taste of the sinugbang bangus	1–3

**By Skills Judge for Tinolang Samaral**

<b>Score for Student-Cook To</b>	(total score 8–24)
• Keeping seafood clean	1–3
• Paghimbis sang samaral	1–3
• Paghukas sang kasudlan sang samaral	1–3
• Paghiwa sang samaral	1–3
• Pagtola sang samaral	1–3
• Plating tinolang samaral on team table	1–3
• Serving tinolang samaral to judge	1–3
• Taste of the tinolang samara	1–3

**By Skills Judge for Kinilaw na Talaba and Gulaman**

<b>Score for Student-Cook Kil</b>	(total score 9–27)
• Icing and keeping talaba clean	1–3
• Cleaning fresh gulaman	1–3
• Blanching talaba	1–3
• Seasoning and plating talaba	1–3
• Blanching gulaman	1–3
• Seasoning and plating gulaman	1–3
• Serving kinilaw na talaba and gulaman	1–3
• Taste of the kinilaw na talaba	1–3
• Taste of the kinilaw na gulaman	1–3

**By Taster Judge for Team Table and Sutokil Taste**

<b>Score for Teacher-Coach and Team</b>	(total score 7–21)
• Arrangement, appearance of team table	1–3
• Containers of four sutokil dishes on the table	1–3
• Plate service of sutokil dishes as a complete set	1–3
• Taste of Sinugbang bangus	1–3
• Taste of Tinolang samaral	1–3
• Taste of Kinilaw na talaba	1–3
• Taste of Kinilaw na gulaman	1–3

**Other notes for the contest:**

- Maximum team score is 99 points. Teams must score 70 points to be considered for a prize.
- The three top-scoring teams win cash prizes: First (P2,000), Second (P1,700), and Third (P1,500).
- Non-winners with scores >70 will receive P1,000 to subsidize the cost of preparations.
- Contestants and coaches will receive Certificates of Participation on contest day.
- Certificates of Merit and cash prizes will be awarded to the winners at 4 pm on Friday, 1 August.