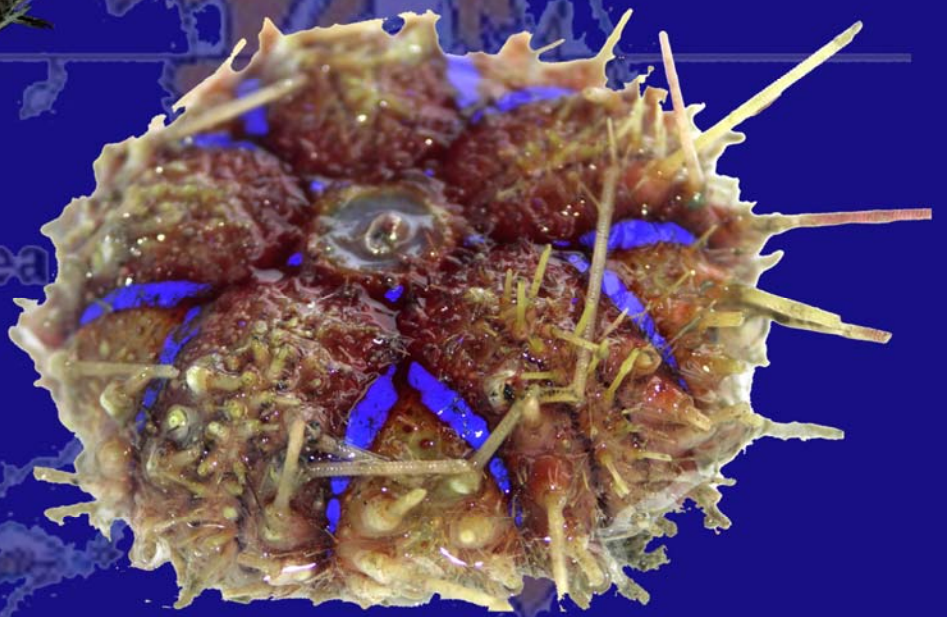
AURORA 2007

cruise report



AURORA 2007
cruise report

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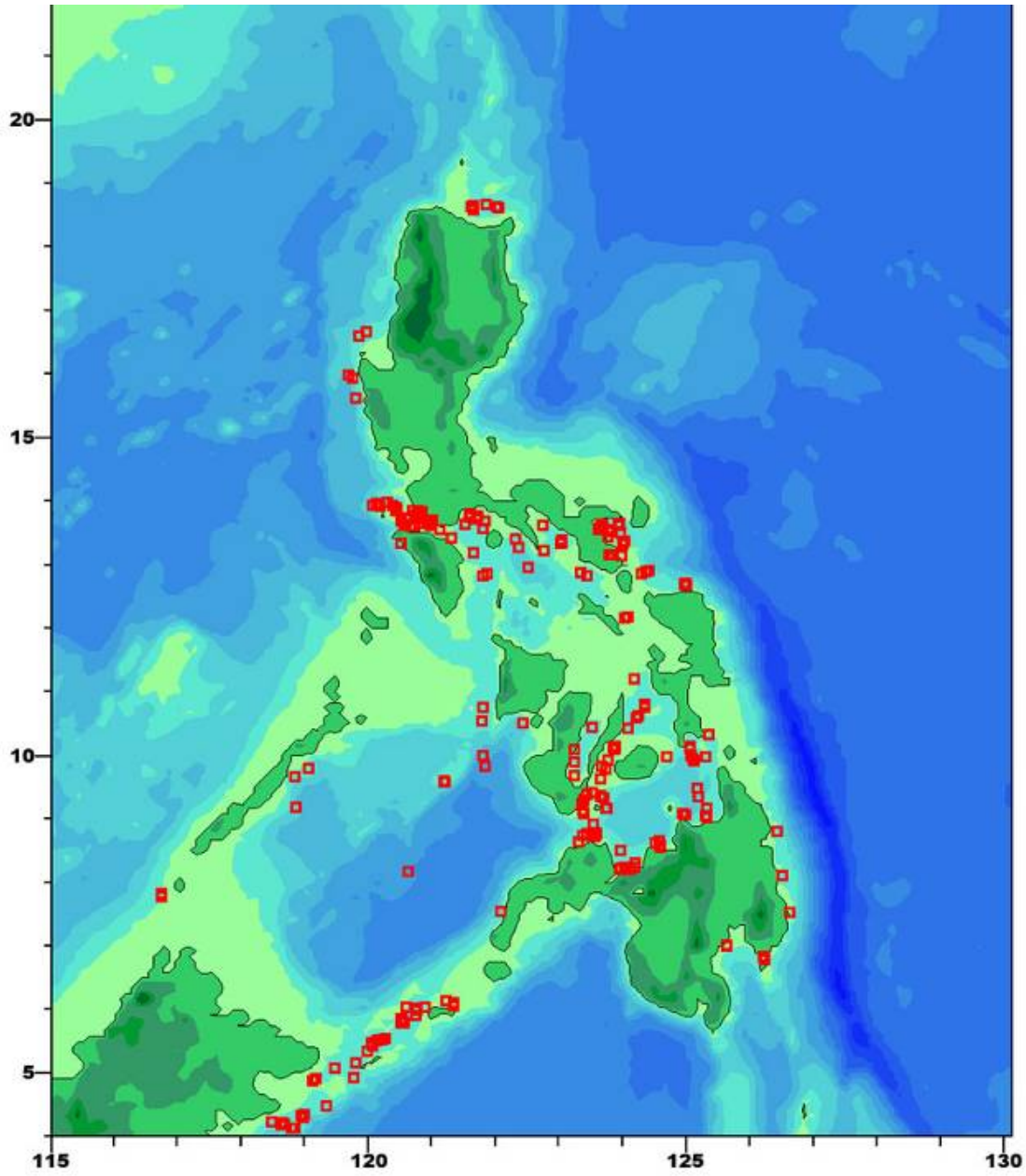
Marivene Manuel Santos (National Museum of the Philippines, Manila)

Contents

History of deep sea biological exploration in the Philippines

by Bertrand Richer de Forges

Other than some occasional deep sea samples realized by earlier expeditions (e.g. “Samarang” 1843-46; “Novara”1857-59; “Challenger” 1874-75; Th. Mortensen, 1914; “Galathea”, 1951), the exploration of the deep sea fauna of the Philippines can be divided in three main phases. At the beginning of the 20th century, following the international movement of sending around the world great expeditions (e.g. “Challenger”, “Siboga”, “Valdivia”), the Americans organised a long series of deep sea sampling in the Pacific, Hawaiian Islands, the Philippines and Indonesia. The research vessel “Albatross” from the US Bureau of Fisheries stayed in the Philippines from February 1908 to January 1910, realising general oceanography and



Localities sampled by the “Albatross” that were deeper than 100 fathoms (ca. 185 m). Each open red sqaure represents one sampling point.

zoological sampling. Five hundred and seventy-seven dredgings and trawlings were done, of which 292 stations were sampled at depths deeper than 100 fathoms (ca. 185 m) (Fig. 2). Most of the marine areas of the Philippines were explored, except the north-eastern coast of Luzon (Anonymus, 1910). Numerous taxonomic works based on the materials brought back to the US by the Albatross Expedition were produced. Many new crustacean species were described by several workers over a period of time (Rathbun, 1916; Griffin, 1976; Tan, 1996).

The second phase is in some ways connected to the first one by discovery of one of the most engimatic glypheid species. On the 17 July 1908, the "Albatross" trawled in the north of Lubang Island hauled up a strange crustacea resembling a burrowing shrimp (station D.5278, 14°00′00″N 120°17′15″E, 187 m, 17 Jul.1908). At that time, no one was able to identify this specimen and it was deposited in the Natural History Museum, Smithsonian Institution, Washington D.C. Sixty-seven years later, it was finally recognize as a living fossil of the glypheid, a group supposed to be extinct at the end of mesozoic period (more than 50 million years ago). Jacques Forest and Michèle de Saint Laurent described this extraordinary specimen in 1975 as *Neoglyphea inopinata* and explored for the possibility to obtain more specimens (Forest, 2006). Alain Crosnier, the Director of the Oceanographic section in ORSTOM at that time, managed to lead the small research vessel "Vauban" to perform trawling operations in this area. This was the beginning of the MUSORSTOM explorations, a collaborative effort between ORSTOM and the Museum national d'Hisotire naturelle, Paris, and heralded a renewed interest in the discovery of the Philippine deep sea fauna. The MUSORSTOM Expeditions were undertaken by the French scientists in 1976, 1981 and 1985, off SW Luzon, near Mindoro, and Marinduque on board the R/V Vauban and R/V Coriolis (Forest, 1981, 1985, 1989). The principal aim of these expeditions was focus on the recapture of *Neoglyphea* specimens and the samplying areas were retricted in range and as well as depth (cf. map Fig. 2). As a result of the MUSORSTOM collection, five volumes of taxonomical description were produced, showing clearly that the inventory of the Philippine deep sea fauna was far from finished (Forest, 1981, 1985, 1989). This lead to a renewed interest in deep sea fauna and started an unprecedent series of deep sea cruises in the Western and Pacific Ocean by the same French team who sampled in the Philippines. The following areas were sampled: New Caledonia, Vanuatu, Wallis & Futuna, Fiji, Tonga, French Polynesia, Solomon, Indonesia and Taiwan (Richer de Forges, 2006).

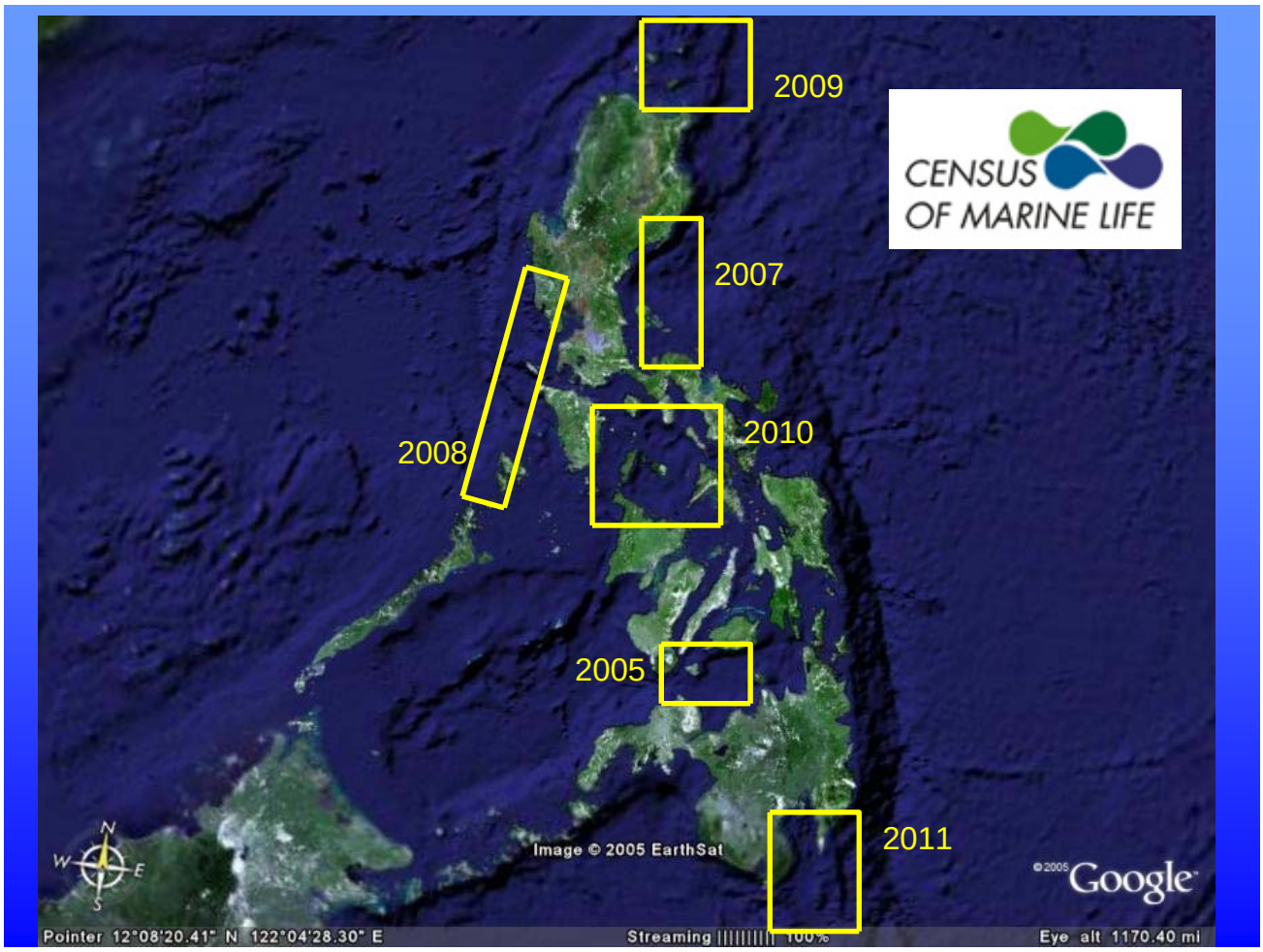
The bathyal fauna appeared as a new frontier of knowledge in the 21st century and stimulate a new series of researchs (Richer de Forges, 1990). The first MUSORSTOM cruise (18–28 March 1976) stayed in the Luzon-Mindoro-Lubang triangle. The new specimens of *Neoglyphea* were caught exactly at the same place where the "Albatross" obtained the first one (stations MUSORSTOM1 No. 6, 12, 26, 33, 34, 35, 36). In total, nine male specimens were obtained, in an area between Luzon and Lubang Island at depth of 180–210 m (Forest & de Saint Laurent, 1976). The depths range sampled were 36 to 1,125 m using essentialy the same gear (a beam trawl) as at the Panglao 2005 and Aurora 2007 cruises.

The MUSORSTOM 2 cruise onboard the R.V. "Coriolis" (22 November–2 December 1980) explored three areas: between Lubang and Luzon; between Mindoro and Luzon; and southeast of Marinduque. The MUSORSTOM 3 cruise onboard the R.V. "Coriolis" (31 May–7 June 1985) explored the following areas: between Luzon and Lubang; south and southeast of Mindoro; North of Panay Island; North of Cebu. The zoological descriptions of the MUSORSTOM collections have shown that the deep sea fauna is rich but poorly known. Many species caught were rare and about 15% were described as new to Science.

The “making of” AURORA 2007

Institutional and programming background

The deep benthos of the tropical seas represents one of the last frontiers of marine biodiversity, and recent deep-sea exploration confirms the Indo-Pacific as a major reservoir of unknown forms of life in all taxonomic groups. However, unlike most other tropical biological communities, the deep-sea benthos of this area has been generally neglected by most zoologists and oceanographers. Only 8.4 % of the 2.2 million sq. km of Philippines territorial waters are shelf waters shallower than 200 meters, i.e. over 2 million sq. km lie within Philippines jurisdiction, but in reality outside the sphere of activity of fishermen, industry and academia.



Following the successful conclusion of the Coral Reefs part of the PANGLAO MARINE BIODIVERSITY PROJECT in 2004, a deep-sea component was added in 2005 at the invitation of BFAR's director Malcolm Sarmiento. The PANGLAO 2005 expedition covered the deep parts of the Bohol Sea and the sill between the Bohol and Sulu seas. It successfully took samples as deep as 2,100 meters (a "first" for M/V DA-BFAR) and demonstrated the feasability of using this vessel for conducting academic exploration research on the deep sea fauna of the Philippines. Based on this success, we established a vision for a *Census of Philippines Deep-Sea Biodiversity*, a series of deep-sea expeditions aimed precisely at filling this gap in knowledge.

Given the extension of Philippines territorial waters, a lifetime would not be enough to sample and document them thoroughly. We thus chose 5 "boxes", representative of the oceanographic conditions of the Philippines seas:
(a) Pacific seaboard,
(b) South China Sea seaboard,
(c) South Mindanao / Philippines - Indonesia transition,
(d) Luzon Strait / Philippines - Taiwan transition,
(e) Interior seas and straits.
The project was presented to the *Census of Margins* (CoMarge) theme of the *Census of Marine Life*, an international network of scientists and institutions established to foster exploration of life in the oceans, and our Philippines project was awarded us a "Census of Marine Life" label.

Where to start?
Senator Edgardo J. Angara, inspired by the success of the Panglao expedition, initiated the idea for an expedition to the unknown Pacific seaboard of Luzon. Following reconnaissance visits to Aurora in 2005, we then decided to target Aurora and Quezon provinces for the expedition to be carried in 2007.

The partnership
The AURORA 2007 expedition operated under an MoA between the Philippines Department of Agriculture (the ministry with authority over BFAR) and the French National Museum of Natural History, that was signed in 2003 at the occasion of the Panglao Marine Biodiversity Project. The 2005 deep-sea expedition had essentially be an offshoot of the 2004 shore-based expedition carried on in partnership between University of San Carlos (Principal Investigator: Dr Danilo Largo) and the French National Museum of Natural History (Principal Investigator and overall Co-ordinator: Dr Philippe Bouchet). However, because the 2007 expedition was going to hit an altogether different region of the Philippines, Dr Largo suggested that University of San Carlos should not be the frontline institution. The National Museum of the Philippines, through Ms Marivene Manuel Santos, had already been involved in the Panglao 2004 and 2005 expeditions, as well as in the Santo 2006 expedition in Vanuatu. The AURORA 2007 expedition was thus carried under a Memorandum of Agreement between the Philippines National Museum (NMP) and the French National Museum of Natural History (MNHN), and the Philippine government authorized the use without charge of M/V DA-BFAR, through an MoA between the National Museum of the Philippines (NMP) and the Bureau of Fisheries and Aquatic Resources (BFAR).

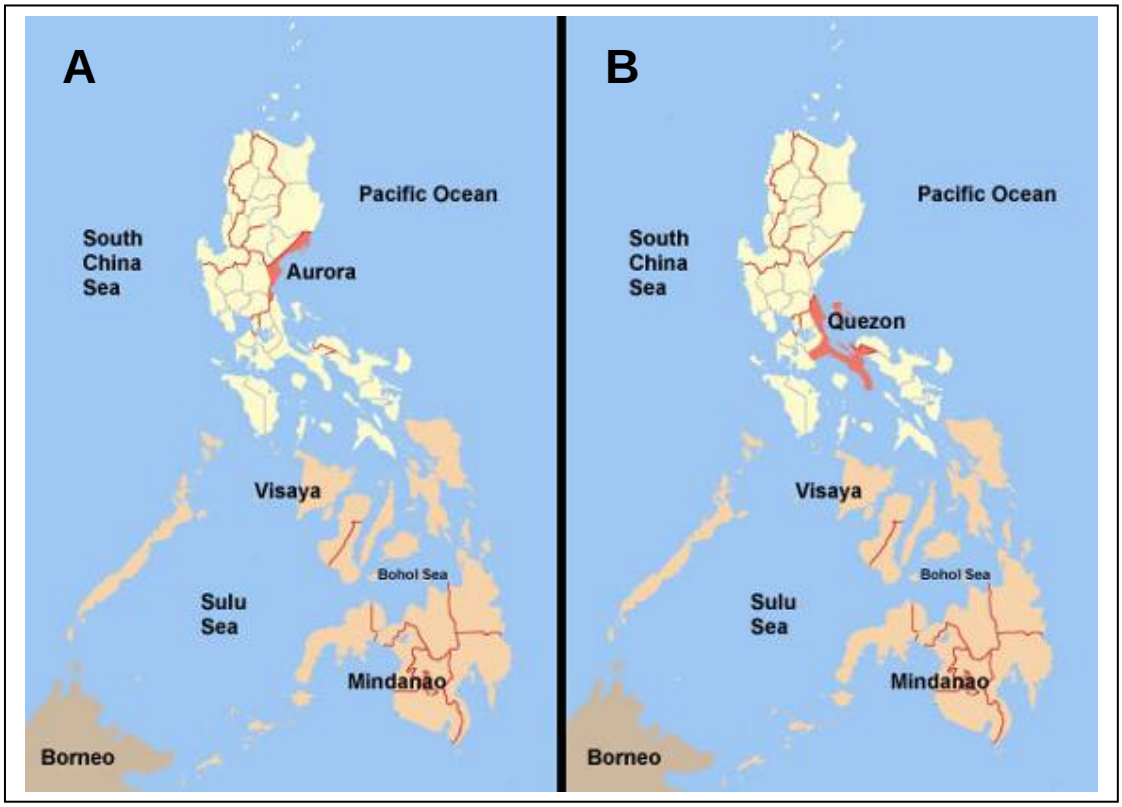
Funding
The idea of a Philippines Deep-Sea Biodiversity expedition was presented to the Lounsbery Foundation. The Foundation liked the idea that the two institutions that had historically conducted inventories of deep-sea fauna in the Philippines (the Smithsonian Institution, with the Albatross, and the French Museum, with the Musorstom expeditions) would resume exploration together, in partnership with Philippines colleagues. This is how the Lounsbery Foundation agreed to fund AURORA 2007 through a grant to MNHN.

Kick off ceremony
The scientific team departed for Baler from Manila on 18 May 2007 and arrived at Aurora State College of Technology (ASCOT) in the evening, and were hosted to a welcome dinner courtesy of the President of ASCOT, Dr. Eusebio Angara. On the morning of the 19th May 2007, a welcome reception for the participants of the Aurora Deep-Sea Cruise 2007 was launched and attended by the Governor of Aurora Province, Ms. Bellaflor Angara-Castillo, Mayor of Baler town Mr. Arthur Angara, BFAR Director Malcolm Sarmiento, DBM Regional Director Elsa Salon, and management head of M/V DA-BFAR Ms. Alma Dickson before boarding the research vessel.

Welcome ceremony hosted by the officials of Aurora Province. From left: Mr. Arthur Angara (Mayor of Baler), Prof. Philippe Bouchet (Principal Investigator of Aurora Project, MNHN), Gov. Bellaflor Angara-Castillo (Governor of Aurora), Mr. Malcolm I. Sarmiento (National Director, BFAR), Ms. Alma Dickson (Head, MFDC), Ms. Marivene Manuel Santos (Co-Principal Investigator of Aurora Project, NMP) and Dr. Eusebio Angara (President, ASCOT)

AURORA 2007 exploratory area

The Province of Aurora is located at the north-eastern side of the Philippine Archipelago, in the Central Luzon region and is divided into eight municipalities (Baler, Casiguran, Dilasag, Dinalungan, Dingalan, Dipaculao, Maria Aurora, San Luis) with Baler serving as the provincial capital. It has 328 km of shoreline, but is generally mountainous of which about 70% are covered by forests. The study area also included Lamon Bay and Polillo Islands in Quezon Province. This is a province located in the eastern Calabarzon region of Luzon. It is located southeast of Metro Manila and is south of Aurora.



Maps depicting the location of the provinces of: A, Aurora and; B, Quezon, on Luzon, Philippines

Sampling via trawling and dredging were performed along and off shore of the provinces of Aurora and Quezon provices. In addition, echo-sounding operations to determine depth of the sampling ground were also undertaken.

This area was not sampled by any other expeditions to the Philippines. Consequently, the substrate of the ocean floor and marine biological communities were essentially unknown. Considering this potential, the survey attempted to:

- Inventory the deep water benthic fauna;
- Continue the transfer of scientific and technological know-how for deep sea exploration to BFAR and NFRDI;
- Evaluate the deep-water organisms for their ecological, scientific, economic and cultural values;
- Provide framework for the conservation and management of deep-water fauna; and
- Evaluate prospective fishing grounds in the study area.

Conducting expeditions in the Philippines: permit issuance
by Noel Saguil

The Philippines is one of the signatories of the Convention on Biodiversity that has been active in the forefront in formulating laws in accordance with the Convention. In concurrence with both the House of Representatives and the Senate of the Philippines which comprise the Legislative branch of the government, it has been successful in passing 3 specific laws that are truly relevant in the conservation of its natural resources, namely: Republic Act 7160 or the Local Government Code of 1991, Republic Act 9147 or the Wildlife Conservation and Protection Act of 2001 and Republic Act 8550 or the Philippine Fisheries Code of 1998. These three laws became the basis or fundamentals of succeeding local either Municipal or Province wide laws in addressing conservation and management of natural resources in their jurisdiction.

The passage of Republic Act 7160 was very timely after the 1986 EDSA revolution where this law restructured all the government units from the national level down to the local levels, empowering each component from each barangay to each city or municipality. Each local government unit (LGU) is not only empowered to implement the law but also thru its legislative body to formulate laws that can be specifically applicable in their respective jurisdiction, amend local laws that can be made to be in tune with the times.
R.A. 7160 also created offices that have direct control with project implementation in their respective jurisdictions. For a province to be created, it should have at least PhP 20,000,000 in annual income with at least 2,000 square kilometres in area and a population of no less than 250,000 (Sec 461). For each province, it is subdivided into cities and municipalities depending on the size and delineation of its boundaries. For a city to be created, divided or merged the requisite for this are the following: a minimum of PhP 20,000,000 income for the last 2 consecutive years, a contiguous territory of 100 square kilometres and a population of 150,000 (Sec 450), while for a municipality to be created said LGU should have at least PhP 2,500,000 in income for the past 2 consecutive years, at least 50 square kilometres in area and 25,000 inhabitants (Sec 442). From this major subdivisions of the LGU comes out the barangay which is the basic unit in local governance. Each barangay is composed of at least 2,000 inhabitants except in cities and municipalities within Metro Manila and other metropolitan political subdivision or in highly urbanized areas where such territory shall have a certified population of at least 5,000 inhabitants.
The barangay as a unit of the LGU have different officials that oversee activities in their respective jurisdictions. For the purpose of this paper, discussions will only be focused on project implementations with regard to marine conservation and biodiversity research.

The delineation of municipal waters was formulated along with the passage of R.A 8550, to state: – include not only streams, lakes, inland bodies of water and tidal waters within the municipality which are not included within the protected areas as defined under Republic Act No. 7586 (The NIPAS Law), public forecast, timber lands, forest reserves or fishery reserves, but also marine waters included between two (2) lines drawn perpendicular to the general coastline from points where the boundary lines of the municipality touch the sea at low tide and a third line parallel with the general coastline including offshore islands and fifteen (15) kilometers from such coastline. Where two (2) municipalities are so situated on opposite shores that there is less than thirty (30) kilometers of marine waters between them, the third line shall be equally distant from opposite shore of the respective municipalities. Thus, the LGU's concerned for each activity that will be done within the 15 kilometer exclusive limits are within their jurisdiction and should be done according to their specific local laws.

However, the passage of Republic Act 9147 opened the doors for research. This was after Executive order 247 (the precursor for R.A. 9147) was signed by then President Ramos in 1997. E.O 247 was so limiting in nature to conduct research. It was then that during E.O. 247 that the mere collection of animals was prohibited. Thankfully, R.A 9147 was passed and gave distinction between collection for Commercial purposes and collection for Pure Academic Research.

To state the difference between the nature of the two types of researches and its requirements:

For Commercial Research

Bioprospecting shall be allowed upon execution of an undertaking by any proponent, stipulating therein its compliance with and commitment(s) to reasonable terms and conditions that may be imposed by the Secretary, which are necessary to protect biological diversity. The Secretary or the authorized representative, in consultation with the concerned agencies, before granting the necessary permit, shall require that prior informed consent be obtained by the applicant from the concerned indigenous cultural communities, local communities, management board under Republic Act 7586 or private individual entity. The applicant shall disclose fully the intent and scope of the bioprospecting activity in a language and process understandable to the community. The prior informed consent from the indigenous peoples shall be obtained in accordance with existing laws. The action on the bioprospecting proposal by the concerned bodies shall be made within a reasonable period.Upon submission of the complete requirements, the Secretary shall act on the research proposal within a reasonable period. If the applicant is a foreign entity or individual, a local institution should be actively involved in the research, collection and, whenever applicable and appropriate, in the technological development of the products derived from the biological and genetic resources. Rule 14.1 The DENR, DA and PCSD shall issue joint guidelines specific for biopsospecting.

For Academic Research

Collection and utilization of biological resources for scientific research and not for commercial purposes shall be allowed upon execution of an undertaking/agreement with and issuance of a gratuitous permit by the Secretary or the authorized representative: Provided, That prior clearance from concerned bodies shall be secured before the issuance of a gratuitous permit:

The collection of wildlife for scientific research shall require the prior execution of an Affidavit of Undertaking by the applicant or a Memorandum of Agreement (MOA) between the Secretary or the Council and the proponent, and the issuance of a Gratuitous Permit (GP) by the Secretary or the Council. The MOA and GP shall, as far as practicable, be signed and issued within one month after submission and completion of all requirements.

The proponent shall also submit a letter of application, brief description of the research activity or proposal, and endorsement letter of the Head of Institution where the proponent is affiliated, or in the case of an individual researcher, from a recognized expert at a research institution or conservation organization. The Free and Prior Informed Consent of the IPs, or prior clearance of the concerned LGUs, PAMB, private land owner and/or other relevant agencies/institutions, where the collection shall be made shall also be obtained.

If the applicant is a foreign entity or individual or a Filipino citizen affiliated with a foreign institution, a Memorandum of Agreement shall be executed with the Secretary or Council. In addition to the requirements under the preceding Rule, a local institution must be identified as a research collaborator or counterpart and the corresponding letter of consent of the Head of such local institution should be submitted to the concerned agency.

The Affidavit of Undertaking or Memorandum of Agreement shall contain the following minimum terms and conditions:

a. Spin-off technology shall not be developed out of the results of the scientific study, research, thesis or dissertation;

b. Intellectual property rights over the results shall not be applied for without the prior approval of the concerned agency;

c. The proponent shall submit to the concerned agency at the conclusion of the research, the results and the recommended plan of action, whenever applicable; and,

d. The Animal Welfare Protocol shall be observed as the case may be.

Republic Act 9147 also recommended that a Prior Informed Consent from each LGU is needed before actual implementation of any research activity within each LGU's jurisdiction.

The Prior Informed Consent is a way to ask permission from the local government units to conduct research in their domain or locality. Said LGU can be the Barangay, Municipality, City or Province. In such cases PIC's from the barangay is more personal in approach than the ones from the City, Municipality or from the Province alone.

Generally speaking, the approach in conducting the PIC process from the Barangay level to the provincial levels is as follows: Official communication is sent to the Mayor of each Municipality/ City, Municipal/City

Agricultural Officer, Municipal/ City Environment Officer and the Municipal/City Fisheries and Aquatic Resources Management Council (FARMC). These offices are mandated to review and give recommendations to the Legislative body of the LGU concerned. The proponent is then required to conduct an information campaign with full disclosure of the activity that will be undertaken in every barangay where the project will be held. There are times that it becomes a case to case basis when interests are at stake. A letter of appearance stating that an information campaign or prior informed consent process must be signed by the barangay captain, a signed attendance sheet and if possible pictures of the actual PIC. All stakeholders must be represented, as in the rural communities' non- governmental organizations, peoples organization, fisherfolk organizations are active and considered as representative of the people. After these requirements are satisfied, it is forwarded to the Mayor's office for scrutiny and then approval. If and when the project is approved, a Prior Informed Consent Certificate is issued to the project applicant. If and when a project gets disapproved, the project applicant should repeat the process until such time that the people can understand the significance of the project.

The Prior Informed Consent Certificate is only one of the requirements of an applicant before issuance of a permit to undertake research. An individual still has to undergo and satisfy requirements from the national level, such as:

a. Memorandum of Agreement between the foreign institution and the Department concerned and issuance of gratuitous permit
b. Letter of application, brief description of the research activity or proposal, and endorsement letter of the Head of Institution where the proponent is affiliated, or in the case of an individual researcher, from a recognized expert at a research institution or conservation organization.
c. Memorandum of Undertaking or Letter of Acceptance from a local institution identified in advance.
d. Lastly, the PIC certificates from each City or Municipality, and in some cases endorsement from the Governor of the Province.

Materials and Methods

by Tan Swee Hee and Marivene Manuel Santos

M/V DA-BFAR Research Vessel

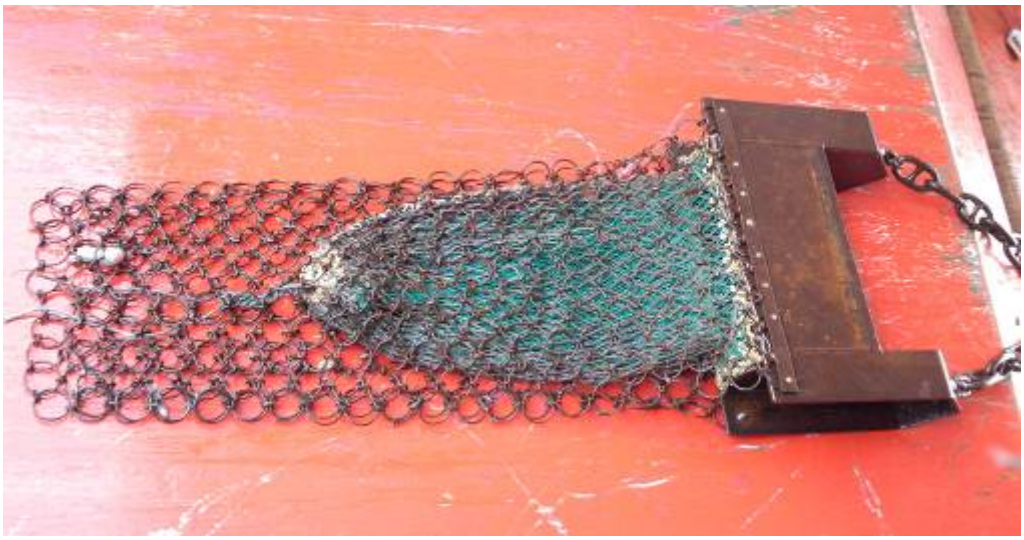
The vessel used was the M/V DA-BFAR, a 60 m, 1,156 gross tonne ship, with a total complement of 90 persons. She was constructed for management, training, research and oceanography. This vessel is equipped with the state of the art scientific and technical equipment on board such as fishing, communications, navigational, hydro-acoustics, oceanography, post harvest and hydraulic machinery for the conduct of offshore fishery researches in the 200 miles Exclusive Economic Zone and high seas. For the purpose of the expedition, the vessel was fitted with an otter trawl, a beam trawl and a waren dredge.

M/V DA-BFAR Research Vessel

The Warén Dredge

The Waren dredge, invented by Dr Anders Warèn from Sweden, is a heavy, metal deployed at the bottom for an average of 15 minutes to take samples of sediments.

This is a dredge of very strong iron with a collecting bag protected by a strong iron net. Weighing about 120 kg, this dredge is used to scrape the upper layer of the sea bottom. It can be used on hard or mixed substrates. Dimensions: horizontal opening: 0.7 m; vertical opening: 0.28 m; total width: 1 m; length: 0. 75 m; length of the chain of the fork: 1 m of 20 mm chain; thickness of the iron frame: 1 cm.



Waren dredge used on board MV DA-BFAR for AURORA 2007 expedition

The Beam Trawl

The beam trawl is a 4.2 meter-wide bottom trawl which is kept open by a wooden beam which glides on iron runners situated at both ends of this bar. A fine-mesh net is attached to this system, the ground rope of the net is strengthened with chain to allow digging into the sediment; a tickler chain is placed before it between the two runners. The beam trawl is towed with one cable only and is used to sample specifically on soft substrate at any depths ranging from shallow water to more than 2000 meters at an average 30 to 60 minutes on the bottom This type of trawl has been used by flatfish fisherman at the north west coast of France, near Honfleur.

For AURORA 2007, the wooden beam is about 4.15 m in length and a cross-section of about 25–30 cm (square section). The beam is fixed to a heavy iron runners or ski on each side and this determines the horizontal opening of the trawl. These runners serve as skis so that the trawl can glide on the ocean floor. The height of the ski determines the vertical opening of the trawl. The heavy weight of the runners at the base of the opening of the net stabilizes the net and keeps it well on the ground. The height of the skis is 0.5 m and the length 0.45 m. The hight of the beam over the bottom was 0.35 m for the model used in the Philippine cruises.

The foot-rope of the trawl is in rubber and ballasted by a chain. The foot-rope serves to scrap the ocean floor and to stir up organisms or substrate on and in the sediment. Behind the foot-rope is the net proper that has a

Beam trawl used on board MV DA-BFAR for AURORA 2007 expedition

conical form, tapering towards its end. This conical shape allows good filtration of the water and guides the organisms caught in the net towards the cod-end of the trawl. The cod-end is double-layered by a net of fine mesh, so that the smallest fauna can be retained in the net. The trawl is connected to the warp (trawling cable) of the ship by two cables of 4.20 m long forming a triangle with beam (patte d'oie), with a swivel and shackles.

The Otter Trawl

An otter trawl used on AURORA 2007 consist of a cone-shaped net and kept open horizontally by two otter boards. The trawl's net mouth is framed by a line of floats to hold up the trawl's net mouth vertically and a ground gear to stir up organisems living close to the substrate, protect the trawl from damage, and to ease movements across uneven substrates. The model used is adapted for a hard substrate deep water trawls.

The dimensions of the otter trawl are: head line of 12.40 m; foot-rope of 16.70 meters made of rockhoppers (rubber bobbins & rondelles); upper wings mesh size 60 mm; lower wings mesh size 60 mm; square belly mesh size 40 mm; top belly mesh size 25 mm; upper part of the trawl mesh of 60 mm, 40 & 25 mm; cod-end mesh size of 25 mm & rigged with a liner 2.50 meters twisted nylon twine 12 mm. Buoyancy is provided by 20 floats on 200 mm diameter made for very deep waters (titanium floats were used for depths of 2,500 m). On each wing two legs of twine rope 16 mm 7 m long (upper & lower wings) and two sweeplines made of steel cable 14 mm diameter. The two doors are made of poly foil (Morgere) of length of width of 1.10 m and 100 kg in weight. The trawl was attached to 30 meters of steel cable of 14 mm diameter fastened on a steel dan leno with inox swivel (making a crow's foot) and fastened on the vessel warp 16 mm diameter.

Otter trawl used on board MV DA-BFAR for AURORA 2007 expedition

Management of samples

All materials collected by these gears were sorted generally into broad taxonomic grouping on deck after washing and retrieval from the gears. Organisms were brought into laboratories for fine sorting recording and photography. Sorted animals were placed in pre-labeled plastic bags, and preserved in either 10% formalin (1 part formaldehyde with 9 parts sea water + Borax) or 80% ethanol. After the initial processing and preservation on board the vessel, the collected samples were sent to the laboratories indicated in the NMP-MNHN Memorandum of Agreement where they were processed and worked on accordingly.

All specimens in the collection were recorded by Geographic Information System (GIS). A database was generated to include; minimum and maximum depth of the area of collection, Global Positioning System reading indicating the longitude and latitude, station number, date of collection and method or the type of implement used of collection.

Expedition Organization

by Tan Swee Hee and Marivene Manuel Santos

Duties and Responsibilities of the Scientific Team

The participants involved in the scientific and investigation aspects of the expedition were grouped according to task. This is to ensure that the collected materials were given the correct treatment.

Group 1: Operation (gear preparation, echo sounding, bottom assessment, supplies)
Group 2: Station description and sample description
Group 3: Sieving and fractioning
Group 4: Sorting
Group 5: Wood and wood-associated animals
Group 6: Fish
Group 7: Echinoderms and associates
Group 8: Cnidaria, Tunicates and Sponges
Group 9: Crustacea and Worms
Group 10: Mollusca and Brachiopoda
Group 11: Laboratory (bar-coding, photography)

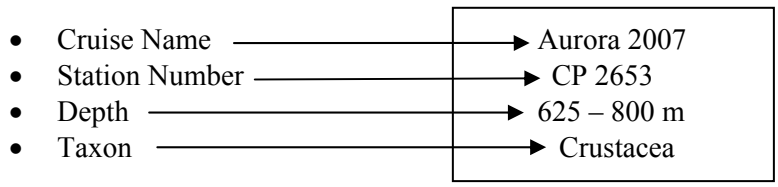
1. Operation (gear preparation, echo sounding, bottom assessment)

This group was assigned to do the fundamental survey of the sea bottom to determine the type of gear to be used in collecting samples, planning of operations, and coordination with the vessel′s fishermen in laying down a specific collecting gear for a particular station, sea water supply, and working space on the deck. Members of this group were Bertrand Richer de Forges, Jean Francois Barazer, Rudo von Cosel, Anders Waren, Raffy Ramiscal, Benigno Magno, Joeren Yleana, and Jo Arbasto.

2. Station description and sample description

This group records the station data such as station code, coordinates, description of the haul, general picture of the bottom assemblage, and other photo documentation of the working area and the participants. For the station code, this expedition followed and continued the coding used by the MUSORSTOM Expeditions. The code includes the type of collecting gear used followed by four numbers. The gear codes were: CP – beam trawl, DW – Waren dredge, and CC – otter trawl. For this expedition the number series started with 2653. This group also consolidated photographs of the expedition such as specimens, people and sceneries as well as database coordinates of each station. Members of this group were Marivene Manuel Santos, Tan Swee Hee, Ludivina Labe, Pierre Easter Velasco, Bastian Bentlage, and Barbara Buge.

Plastic labels and pencils were used for interim labelling of specimens / lots with the following information:



3. Sieving and fractioning

This group cleaned the samples upon recovery of the gears with seawater while ensuring that no sample is lost. The sediment/materials obtained from the trawl or dredge was fractioned by sieving using succesives mesh sizes from 10, 5, 2.5, 1, 0.5 mm, and 10.0-mm. Members of this group were Dave Valles, Jose Javier, Jr., Efren Hilario, Joeren Yleana, Andres Andalis and Jo Arbasto.

4. Sorting

This group sorts out organisms from debris using forceps, whatever necessary. Sorting was done on three white wooden tables on the deck where plastic square trays of assorted sizes were prepared. The organisms sorted are covered with ice to keep them fresh if needed for photography. Group members are tasked to sort the organisms into to phyla or groups, and to ensure that the specimens were taken care of and attended by scientists or specialists. Members of this group include:

Echinoderms – This group handled specimens of holothuria, echinoids, asteroids, ophiuroids as well as noting down associations with molluscs and crustaceans. They also took care of preserving the assigned animals for detail study. Members were Ludivina Labe, Michel Segonzac, Riczyneth Ampoyos, Che-che Salcepuedes, and Waren Anders.

Tunicates, Cnidaria and Sponges – This group handled specimens of ascidicans, sea anemones, sponges, and other cnidarians as well as preserving the assigned animals for detail study. Members were Waren Anders, Roger Fortaliza, Estefania Rodriguez, Bastian Bentlage, Julien Lorion, Rio Gene Alzuelo, and Roger Fortaliza.

Crustacea and Worms – This group took care of specimens of crabs, shrimps, isopods, galatheids, lobsters, hermit crabs, some amphipods and worms such polychaetes, echiurans, and sipunculids. They also photographed representative specimens of each species before preservation. Members were Marivene Manuel Santos, Tin-Yam Chan, Swee Hee Tan, Jose Christopher Mendoza, Chia-Wei Lin and Evelyn Mendoza.

Mollusks and Brachiopods – This group processed specimens of gastropods, bivalves, cephalopods as well as noting down associations with molluscs and crustaceans. Members were Philippe Bouchet, Rudo von Cosel, Evelyn Mendoza, and Nenito Otero.

Fish – This group identified, photographed and preserved fish specimens in formalin. Members were Kwang-Tsao Shao, Yunn-Chih Liao, Raffy Ramiscal, and Rodolfo Reyes.

Fine factions – This group sorted out specimens particularly micro-shells from fine sediment fractions. They also took care of preserving the assigned animals for detail studies. Members were Anders Waren, Evelyn Mendoza and Nenito Otero.

Wood and wood-associated animals - This group is tasked to work out wood hauled from the station and collected boring molluscs and other organisms burrowing in wood. Members of this group were Takuma Haga, Anders Waren, Julien Lorion, and Marlo Demo-os.

5. Bar-coding

This group sampled tissues from different species of gastropods and bivalves by using cold 5–8% magnesium chloride solution to relax specimens before cutting off foot tissue sample. This tissue was immersed in absolute ethanol while the rest of the body and shell were preserved in 80% ethanol. Members of this group were Ellen Strong and Nicolas Puillandre.

6. General photography

This group took photographs of fresh specimens of crustaceans and other animals. Members include Tin-Yam Chan and Chia-Wei Lin

7. Maintenance of supplies, preparation of fixatives and freezing

This group ensured the continuous supply of fixatives such borax-treated formalin, 80% ethanol and absolute ethanol, sorting trays, plastic vials, bags, storage drums and specimen labels. They also coordinated the use of blast freezer for making seawater ice which is used to maintain the freshness of the specimens while sorting. Members were Noel Saguil, Dave Valles, Evelyn Mendoza, and William Bautista

List of participants

M/V DA-BFAR officers and crew

1.	Ernaldo T. CAWALING	Captain
2.	Crisaldo B. PAGLIAWAN	First Mate
3.	Renato BACORDO	Second Mate
4.	Jerome B. RODRIGUEZ	Radio Operator
5.	Cleto B. RAFER, JR.	Elec. Comm. Equipt. Tech II
6.	Adorado C. CAINGLIT	Chief Engineer
7.	Florencio SERANILLO	1st Assistant Engineer
8.	Armilo PAGLIAWAN	2nd Assistant Engineer
9.	Eduardo BUTAC	Boatswain
10.	Mariano ODHOY	Boatswain
11.	Domingo ASUNCION	Masterfisherman - Purse Seine
12.	Remar ASUNCION	Masterfisherman - Tuna Longline
13.	Benigno MAGNO	Masterfisherman (Beam trawl, Warren dredge and Otter trawl)
14.	Sulverio RICO	Quartermaster
15.	Elpidio MENDOZA	Fisherman
16.	Victorino SULLA	Fisherman
17.	Armando LAGUIDAO	Fisherman
18.	Jeremias NELLAS	Fisherman
19.	Domingo MIGUEL	Skiffman
20.	Joseph BANDALA	Seaman
21.	Cesar AMINES	Seaman
22.	Glenn HALLADO	Light boatman

23.	Fel G. MAATA	Marine Engineman I
24.	Marcial CAGUICLA	Cook
25.	Celso IGNACIO	Galleyman
26.	Rafael RAMISCAL	Chief Scientist
27.	Marlo DEMO-OS	Researcher, Chemical Oceanography
28.	Rio Gene ALZUELO	Researcher, Biological Oceanography
29.	Pierre Easter VELASCO	Researcher
30.	Joeren YLEANA	Researcher
31.	Rufino PAGAO	Skilled Laborer, Masterfisherman
32.	Servillano MENDOZA	Skilled Laborer, Masterfisherman
33.	Orly MALIGANG	Skilled Laborer, Marine Engineman
34.	Randy CAWALING	Skilled Laborer, Fisherman
35.	Ronald VILLAFUERTE	Skilled Laborer, Fisherman
36.	Jed DANAO	Skilled Laborer, Fisherman
37.	Eduardo TUZON	Skilled Laborer, Fisherman
38.	Anthony GONZALEZ	Skilled Laborer, Fisherman
39.	Ronaldo CONDINO	Skilled Laborer, Fisherman
40.	Nelor SUALOG, JR.	Encoder/Project Assistant
41.	Riczyneth AMPOYOS	Research Assistant
42.	Sergio MERCADER	Apprentice, Deck
43.	James CAJIMAT	Apprentice, Deck
44.	Clyde BACORDO	Apprentice, Deck
45.	Alfie CASTILLA	Apprentice, Engine
46.	Rafael MOLINAR	Apprentice, Deck
47.	Alfredo CABELLO	Apprentice, Steward
48.	Che-che SALCEPUEDES	Research Assistant
49.	Roger FORTALIZA	Research Assistant
50.	Richard CALUYA	Security Personnel
51.	Edwin MARQUEZ	Security Personnel
52.	Marlowe NIDUARA	Security Personnel
53.	Felix ALANO	Security Personnel
54.	Shirley CAPATI	Caterer

Scientific Team

Philippines

Ms. Marivene MANUEL SANTOS, National Museum of the Philippines (Co-Principal Investigator)
Mr. Noel SAGUIL, Sorting Center, National Museum of the Philippines (Project Manager)
Dr. Eusebio ANGARA, Aurora State College of Technology
Mr Dave VALLES, University San Carlos, Cebu
Ms Ludivina LABE, NFRDI-BFAR, Manila
Mr. Efren HILARIO, fishing gear specialist, BFAR
Mr. Rodolfo REYES, FishBase, Worldfish Center
Ms. Evelyn MENDOZA, Sorting Center, National Museum of the Philippines
Mr Jose JAVIER JR, Sorting Center, National Museum of the Philippines
Mr. Andres ANDALIS, National Museum of the Philippines
Mr. William BAUTISTA, National Museum of the Philippines
Mr Jo ARBASTO, independent fisherman, Panglao Island, Bohol
Mr. Daniel FLORES, Aurora State College of Technology
Mr. Nico Jose LEANDER, Aurora State College of Technology
Mr. Rommel SINDAC, Aurora State College of Technology
Mr. Mark Jhay VALENZUELA, Aurora State College of Technology
Mr. Pedro ROMANTICO, Aurora State College of Technology
Mr. Marlon CALUGTONG, Aurora State College of Technology

France

Dr. Philippe BOUCHET, MNHN, Paris (Principal Investigator)
Dr. Rudo von COSEL, MNHN, Paris
Mr. Nicolas PUILLANDRE, MNHN, Paris
Ms. Barbara BUGE, MNHN, Paris
Mr. Julien LORION, MNHN, Paris
Mr. Michel SEGONZAC, MNHN, Paris

New Caledonia
Dr Bertrand RICHER DE FORGES, IRD, Nouméa, New Caledonia
Mr Jean-François BARAZER, fishing master, Nouméa, New Caledonia

Singapore
Dr. Swee Hee TAN, Raffles Museum of Biodiversity Research, National University, Singapore
Mr. Jose Christopher MENDOZA, National University, Singapore

Sweden
Dr. Anders WAREN, Swedish Museum of Natural History

Taiwan
Dr. Kwang-Tsao SHAO, Academia Sinica, Taipei
Dr. Yunn-Chih LIAO, Academia Sinica, Taipei
Dr. Tin-Yam CHAN, National Taiwan Ocean University, Keelung,
Dr. Chia-Wei LIN, National Taiwan Ocean University, Keelung

Japan
Mr. Takuma HAGA, University of Tokyo

United States of America
Dr. Ellen STRONG, Smithsonian Institution, Washington D.C.
Mr. Bastian BENTLAGE, The University of Kansas
Ms. Estefania RODRIGUEZ, Ohio State University

Operations conducted

Travelogue

Day 00 – 18 May 2007	Gathering of participants from France, Philippines, Singapore, Taiwan, the USA, Sweden, Germany and Spain at the COPA Hotel in Makati where the chartered bus transported the team to Baler, Aurora. Welcome dinner courtesy of Aurora State College of Technology. Spend the night in ASCOT Dormitory.
Day 01 – 19 May 2007	Welcome reception by the Aurora Provincial officials and boarding of participants, loading of provisions, and other supplies and equipment to the vessel. Preparation and organization of supplies and fixatives. Briefing of participants for the cruise and work assignments.
Day 02 – 20 May 2007	Bathymetric survey of Aurora waters; trawl in 83–500 m; 8 hauls.
Day 03 – 21 May 2007	Trawl in 150 – 560 meters; dredge in 487–583 m; 7 hauls (1 haul no catch, dredge may not have touched the bottom).
Day 04 – 22 May 2007	Trawl/dredge in 200–524 meters; 8 hauls (2 hauls no catch; beams and net broken)
Day 05 – 23 May 2007	Trawl/dredge in 505 – 1,207 meters; 5 hauls
Day 06 – 24 May 2007	Trawl in 996 – 1,754 meters; 5 hauls
Day 07 – 25 May 2007	Trawl in 887 – 2,253 meters; 5 hauls
Day 08 – 26 May 2007	Dredge/trawl in 263 – 620 meters; 8 hauls
Day 09 – 27 May 2007	Trawl (otter) in 500 – 2,282 meters; 6 hauls
Day 10 – 28 May 2007	Dredge/trawl in 144 – 484 meters; 8 hauls (1 failed)
Day 11 – 29 May 2007	Dredge/trawl in 155 – 367 meters; 10 hauls
Day 12 – 30 May 2007	Re-watering of vessel at Candagua, Lopez, Quezon. No samples.
Day 13 – 31 May 2007	Dredge/Trawl in 280 – 630 meters; 9 hauls
Day 14 – 01 June 2007	Dredge/Trawl in 90 – 460 meters; 10 hauls
Day 15 – 02 June 2007	Dredge/Trawl in 118 – 631 meters; 8 hauls
Day 16 – 03 June 2007	Dredge/Trawl in 1,252 – 1,873 meters; 6 hauls
Day 17 – 04 June 2007	Trawl in 30 - 197 meters until 1500 hours; stop operation, packed and organized specimens, materials, equipment and other supplies for unloading and transporting to Manila.
Day 18 – 05 June 2007	Participants disembark from M/V DA-BFAR research vesselat 0300 hours. Boarded bus bound for Manila at 0500 hours. Arrive in Manila ca. 1400 hours.

Map indicating the clusters of sampling stations executed during the Aurora 2007 expedition

Station list

Rather than numbering the stations starting from one for each different cruise, the numbering is part of the Tropical Deep-Sea Benthos series. Each number is thus used only once, which avoids ambiguity and potential mistakes. The station code consists of a prefix that determines the kind of gear used (CP = beam trawl, CC = otter trawl, DW = Warén dredge), and the station number.

Station Code	Dragging/Towing				Hauling			
	Time	Lat North	Long East	Depth (m)	Time	Lat North	Long East	Depth (m)
MAY-20-07								
CP 2653	0530H	16° 06. 5	121° 59.7	83	0602H	16° 05. 8	121° 58.8	
CP 2654	0644H	16° 04. 7	121° 57.5	98	0719H	16° 04.3	121° 57	107
CP 2655	0824H	16° 03	121° 54	189	0855H	16° 03	121° 53	189
CP 2656	0943H	16° 02	121° 53	262	1015H	16° 02	121° 54	278
CP 2657	1110H	16° 01	121° 53	358	1207H	16° 01	121° 51	342
CP 2658	1314H	15° 59	121° 51	431	1414H	15° 58	121° 49	422
CP 2659	1515H	15° 57	121° 50	480	1615H	15° 56	121° 49	460
CP 2660	1810H	15° 52	121° 50	506	1838H	15° 52	121° 49	542
MAY-21-07								
CP 2661	0520H	15° 47	121° 44	160	0550H	15° 47	121° 64	167
CP 2662	0655H	15° 47	121° 44	253	0755H	15° 48	121° 45	253
CP 2663	0855H	15° 47	121° 46	562	0955H	15° 45	121° 45	562
CP 2664	1100H	15° 46	121° 46		1158H	15° 48	121° 47	593
CP 2665	1416H	15° 53	121° 42	123	1447H	15° 54	121° 42	125
CP 2666	1529H	15° 57	121° 44	198	1600H	15° 58	121° 45	199
CP 2667	1639H	15° 56	121° 47	307	1709H	15° 55	121° 46	292
DW 2668	1824H	15° 48	121° 46	467	1854H	15° 47	121° 46	576
MAY-22-07								
CP 2669	0550H	14°50	121°48	218	0620H	14°50	121°48	209
DW 2670	0704H	14°52	121°49	180	0724H	14°52	121°49	187
CP 2671	0852H	14°52	121°46	269	0920H	14°53	121°45	277
CP 2672	1014H	14°57	121°44	346	1114H	14°58	121°41	276
CP 2673	1205H	15°00	121°44	431	1305H	15°01	121°45	493
CP 2674	1445H	15°03	121°46	524	1455H	15°03	121°46	476
DW 2675	1600H	15°03	121°43	438	1630H	15°03	121°43	431
DW 2676	1720H	15°04	121°41	323	1740H	15°04	121°40	313
MAY-23-07								
DW 2677	0857H	14°45	123°11	499	0927H	14°46	123°11	499
CP 2678	1026H	14°47	123°10	507	1126H	14°47	123°08	540
CP 2679	1300H	14°49	123°14	713	1400H	14°50	123°12	741
CP 2680	1540H	14°53	123°14	915	1640H	14°53	123°16	924
CP 2681	1830H	15°00	123°14	1160	1930H	14°59	123°15	1184
MAY-24-07								
CP 2682	0535H	15°01	122°50	1624	0635H	15°01	121°52	1544
CP 2683	0850H	15°05	123°02	1743	1000H	15°06	123°04	1754
CP 2684	1155H	15°03	123°06	1413	1315H	15°02	123°05	1449
CP 2685	1515H	14°58	123°05	1155	1615H	15°00	123°06	1302
CP 2686	1730H	14°55	123°08	996	1830H	14°56	123°09	1037
MAY-25-07								
CP 2687	0604H	15°09	122°52	2253	0734H	15°08	122°55	2322
CP 2688	0925H	15°08	122°53	2253	1100H	15°08	122°52	2216

CP 2689	1320H	15°05	123°02	1762	1420H	15°06	123°03	1806
CP 2690	1630H	14°57	123°01	1071	1730H	14°58	123°03	1147
CC 2691	1850H	14°55	123°08	922	2011H	14°53	123°11	909
MAY-26-07								
DW 2692	0611H	14°40	123°40	272	0641H	14°40	123°41	261
DW 2693	0807H	14°42	123°36	363	0840H	14°42	123°37	363
DW 2694	0945H	14°45	123°37	387	1015H	14°45	123°38	389
CP 2695	1100H	14°46	123°39	367	1130H	14°46	123°40	357
CP 2696	1215H	14°47	123°42	367	1315H	14°48	123°43	380
DW 2697	1425H	14°52	123°41	487	1455H	14°51	123°41	470
DW 2698	1630H	14°53	123°34	620	1700H	14°52.	123°34	620
CP 2699	1805H	14°50	123°34	583	1830H	14°50	123°35	541
MAY-27-07								
CC 2700	0540H	14°46	123°11	500	0645H	14°47	123°08	524
CC 2701	0810H	14°49	123°13	709	0910H	14°48	123°16	718
CC 2702	1040H	14°34	123°14	944	1140H	14°55	123°12	1004
CC 2703	1325H	15°00	123°13	1191	1425H	15°02	123°11	1262
CC 2704	1610H	15°04	123°09	1347	1710H	15°03	123°07	1392
CC 2705	1950H	15°08	122°53	2227	2052H	15°09	122°51	2282
MAY-28-07								
DW 2706	0757H	15°04	121°43	478	0815H	15°04	121°43	480
CP 2707	0915H	15°05	121°42	442	0945H	15°04	121°41	368
CP 2708	1040H	15°07	121°38	307	1110H	15°08	121°37	309
CP 2709	1200H	15°11	121°35	296	1305H	15°12	121°34	244
CP 2710	1345H	15°15	121°33	207	1455H	15°17	121°33	216
CP 2711	1525H	15°19	121°32	200	1555H	15°20	121°32	184
CP 2712	1630H	15°21	121°30	140	1705H	15°20	121°30	139
CP 2713	1810H	15°18	121°31	156	1820H	15°17	121°31	156
MAY-29-07								
DW 2714	0575H	14°32	121°42	233	0545H	14°32	121°42	227
CP 2715	0628H	14°32	121°42	233	0658H	14°33	121°42	249
CP 2716	0734H	14°31	121°60.77	335	0824H	14°30	121°41	356
CP 2717	0905H	14°29	121°42	361	0935H	14°29	121°43	311
CP 2718	1035H	14°27	121°47	216	1105H	16°29	121°48	220
CP 2719	1145H	14°27	121°48	160	1215H	14°26	121°48	155
CP 2720	1305H	14°26	121°47	300	1335H	14°27	121°47	301
CP 2721	1430H	14°24	121°47	367	1500H	14°26	121°48	360
CC 2722	1550H	14°25	121°47	313	1620H	14°26	121°46	338
CC 2723	1740H	14°25	121°49	156	1840H	14°23	121°50	147
MAY-31-07								
CP 2724	0545H	15°12	121°35	280	0645H	15°14	121°34	229
CP 2725				620	0755H	15°15	121°36	627
DW 2726	0905H	15°20	121°34	327	0935H	15°20	121°34	339
CP 2727	1015H	15°20	121°34	318	1045H	15°19	121°34	300
DW 2728	1205H	15°19	121°37	587	1235H	15°18	121°37	558
CP 2729	1330H	15°19	121°37	593	1400H	15°20	121°37	600
CP 2730	1550H	15°21	121°34	358	1620H	15°21	121°34	378
CP 2731	1713H	15°22	121°34	376	1813H	15°24	121°34	391
CP 2732					1915H	15°27	121°36	556
JUN-1-07								
CC 2733	0525H	15°55	121°46	278	0625H	15°57	121°47	271
CP 2734	0730H	15°56	121°49	460	0800H	15°57	121°49	453
CP 2735	0855H	15°59	121°50	442	0925H	16°00	121°51	431

CP 2736	1020H	16°01	121°53	344	1050H	16°01	121°54	347
CP 2737	1150H	16°02	121°33	272	1222H	16°02	122°00	269
DW 2738	1309H	16°04	121°55	111	1340H	16°04	121°56	113
DW 2739	1418H	16°05	121°57	96	1450H	16°05	121°58	96
DW 2740	1530H	16°04	122°00	96	1600H	16°04	122°00	100
CP 2741	1645H	16°03	121°55	194	1730H	16°03	121°54	203
CP 2742	1805H	16°03	121°53	182	1835H	16°03	121°52	205
JUN-2-07								
CC 2743	0533H	16°01	121°51	302	0603H	16°01	121°50	309
CC 2744	0712H	15°59	121°50	456	0742H	15°58	121°49	418
CC 2745	0905H	15°58	121°51	469	0935H	15°59	121°49	364
CC 2746	1030H	15°59	121°46	182	1130H	15°57	121°45	220
CP 2747	1235H	15°55	121°42	120	1305H	15°55.53	121°42	124
CP 2748	1400H	15°56	121°45	249	1430H	15°56	121°46	247
CP 2749	1524H	15°56	121°49	473	1555H	15°57	121°50	473
CP 2750	1705H	15°54	121°52	538	1735H	15°53	121°54	518
JUN-3-07								
CP 2751	0545H	15°35	121°55	1471	0615H	15°36	121°56	1456
CP 2752	0740H	15°36	121°56	1436	0837H	15°36	121°57	1378
CP 2753	0930H	15°39	121°59	1262	1000H	15°40	121°59	1360
CP 2754	1120H	15°38	121°59	1273	1150H	15°37	121°59	1333
CP 2755	1340H	15°36	122°04	1850	1412H	15°36	122°85	1873
CC 2756	1645H	15°32	122°55	1719	1725H	15°31	121°54	1788
JUN-4-07								
DW 2757	O517H	15°54	121°50	176	0532H	15°54	121°49.99	169
DW 2758	0620H	15°55	121°50	173	0635H	15°55	121°50.15	151
DW 2759	0745H	15°55	121°49	122	0800H	15°55	121°55.12	139
CP 2760	0910H	15°55.0	121°40.5	100	0940H	15°54.2	121°54.21	100
CP 2761	1021H	15°54.0	121°38.5	79	1050H	15°53.2	121°53.21	79
CP 2762	1130H	15°52.4	121°37.2	66	1200H	15°51.7	121°51.72	66
CP 2763	1245H	15°52.0	121°34.7	42	1315H	15°51.0	121°51.04	44
CP 2764	1345H	15°51.0	121°35.6	47	1415H	15°49.8	121°36.08	45

How to go from station list to museum labels?

The station list contains more detailed information than museum labels usually carry.
Positions are recorded on the bridge of the ship. However, given the distance covered by the ship during towing, and given the fact that the net is towed way behind the ship, we draw attention to the false impression of exact location that the station list may give. We suggest the following guidelines for selecting the minimum information that should accompany specimens on printed labels:
* use position given for dragging/towing
* retain both depths given for dragging/towing and hauling
* for stations in shallow water, a short amount of wire is paid out and the net is towed around 100 meters behind the ship. It then makes sense to retain the first decimal of latitude/longitude (one-tenth of a minute = 180 meters).
* for stations in deep water, a much longer amount of wire is paid out (up to several kilometers) and the net is towed several hundred meters behind the ship. It does not make sense to retain the decimal of latitude/longitude.

Examples

Station shallower than 100 m

Station Code	Dragging/Towing				Hauling			
	Time	Lat North	Long East	Depth	Time	Lat North	Long East	Depth
CP 2764	1345H	15°51.0	121°35.6	47	1415H	15°49.8	121°36.08	45

M/V "DA-BFAR" AURORA2007 Deep-Sea Cruise
Stn CP 2764 45-47 m [use the minimum and maximum depth]
15°51.0'N, 121°35.6'E [use dragging/towing data, retain one decimal]
Date

Station deeper than 100 m

Station Code	Dragging/Towing				Hauling			
	Time	Lat North	Long East	Depth	Time	Lat North	Long East	Depth
CP 2751	0545H	15°35	121°55	1471	0615H	15°36	121°56	1456

M/V "DA-BFAR" AURORA2007 Deep-Sea Cruise
Stn CP 2751 1456-1471 m [use the minimum and maximum depth]
15°35'N, 121°55'E [use dragging/towing data, no decimal]
Date

Station description

Station Code	Station Description
MAY-20-07	
CP 2653	Sediment composed of broken shells and coral rubbles, large coconut stump, 15 species of crustaceans, hydroids, small sand dollars, many big-eye juvenile fish and flatfish, squid, and 30 spp. frogfish
CP 2654	Sandy-shelly bottom, wood chunks, many small crinoids, ophiuroids, sand dollars, sea stars, hydroids, big-eyed fish
CP 2655	Grayish-brown muddy sediment with around 11 species of crustaceans, large frogfish, stingray, globefish, flounders, scleractinians and actinians
CP 2656	Muddy bottoms, cocnut and wood debris, plenty of shrimps, few crabs, globefish, and bivalve (*Lopiamusciidae*), large white sea urchins, sea cucumbers, orange sea stars
CP 2657	Muddy bottom, leaf litters, many big heart urchins, plenty of shrimps, eel, frog fish, and gulper, and a lobster (*Puerulus*)
CP 2658	Muddy bottom consists of coconut husks and shells, wood debris, leaf litters, *Sargassum*, 14 species of crustaceans, angler fish, hatchet fish, flatfish, pencil urchins, sea cucumbers, sea stars, tusk shells, large shells, sea pens, octocorals, and hexacorals
CP 2659	Muddy bottom, wood debris and chunks, leaf litters, lots of brittle stars, sea stars, octocorals, sea pens, Camia shell, nudibranch, anglerfish, and Peristediidae and 8 species of crustaceans
CP 2660	Net broken but with small amount of muddy sediment, wood debris, lantern fish, anglerfish, and other fish, stalked crinoid, sea cucumber jellylike, 2 sea urchins, sea stars, *Vampyistheutis*, tusk shells, at least 3 species of crustaceans, amphipods and galatheids.
MAY-21-07	
CP 2661	Small rocks and coral rubbles, sponges, whip coral, gorgonia, hydroids, soft corals, sea urchins, crinoids, galatheids, *Latreilia*, pilumnid, *Cancellus,* leucosiids,
CP 2662	Big amount of mud with wood debris, frogfish, sea cucumber, sea anemone, about 10 species of crustaceans and small cuttlefish.
CP 2663	Net broken but with small rocks, coconut leaves and debris, jellylike sea cucumber, sea urchins, angler fish, frogfish, 3 species of crabs
CP 2664	Very small catch composed of wood debris, congo eel, lantern fish, few sea stars, sea urchins, few crabs and shrimps (*Platymaia, Acanthephyra*)
CP 2665	Muddy bottom with wood debris, bivalve shells, dead single-polyp corals, sand dollars, hydrozoans, flatfish, few crabs (*Hepthopelta, Charybdis*)
CP 2666	Small amount of mud with wood debris and chunks, logs (2x1 m), spotted sea cucmber, bivalve shells, squids, cuttlefish, octopus
CP 2667	Small catch, with wood debris, large white coral, sea robin fish, frogfish, anglerfish, congo eel, pipefish, about 10 species of crustaceans
DW 2668	No catch. Net probably did not reach the bottom.
MAY-22-07	
CP 2669	Beam broken, net destroyed
DW 2670	Dredge filled to the brim composed of mud, sand and shells (gastropods and bivalves), branchiopods about 13 species, and a crab (*Umalia*)
CP 2671	Small amount of mud, rocks, and numerous stal-building foraminiferans, fish (Ateleopodidae), sea stars, stalked crinoids polychaete (*Aphrodite*), and about 5 species of crustaceans
CP 2672	Big catch of mud with wood debris, coconut husks, tubeworms, foraminiferans, congo eels, sea robin, rattails, batfish, 2 jellyfish, octocorals, sea pens, sea stars, sea urchins, Camia shells, sipunculids, about 8 species of crustaceans
CP 2673	2-m log, wood debris, coconut leaves, 2 crustaceans, squid, crinoids, ophiuroids, small sea urchins, large sea star
CP 2674	10-min tow: lost beam, bent skis, broken net but with large single-polyp sea anemone, stalk of crinoid, disk of ophiuroid
DW 2675	Block of mud with small rocks
DW 2676	Samll amount of mud with 2 polychaetes and a crab (*Chasmocarcinops*)
MAY-23-07	

DW 2677	Very few debris, shells, 1 small transluscent holothurian, and 1 shrimp (*Heterocarpus)*
CP 2678	Very small haul, wood debris, stalked octocoral, sea pen, stalked sponge, large sea urchin, 3 jellylike sea cucumbers, broken sand dollars, heart urchin, 12 species crustaceans, and an amphipod in jellylike sea cucumber
CP 2679	Mud bottom with coconut debris, 10 sea urchin tests, 8 large 3-to-4-inch glass sponges, tusk shells and a crab (*Carcinoplax*)
CP 2680	*Monoflis* glass sponge, numerous ophiuroids, and some crinoids and at least 3 species of crabs
CP 2681	Small catch, about 6 species of crustaceans, sea anemone, zooantharian (*Epizoanthus*), fish (Halosauridae)
MAY-24-07	
CP 2682	Mud bottom with polychaetes in tubes (*Hyalinecia*), amphipod (*Antharthuridae)*, 3 species of decapod crustaceans, pycnogonids, gorgonians, ophiuroids, slickhead (Alepocephalidae)
CP 2683	Mud bottom, with numerous tube-dwelling polychaetes (*Hyalinecia*), jellylike sea cucumbers, 2 spp of *Abyssochrysidae* shells and fish (Oneinodidae)
CP 2684	Small haul, yellowish mud, some coconut debris, polychaete tubes (*Hyalinecia*), large chiton, hydrozoan, 2 species crustaceans
CP 2685	30 x 20-cm wood block, glass sponges, small ophiuroids, worm tubes (*Hyalinecia*), small sea stars, yellow crinoids, 2 pycnogonids, 3 species of decapod crustaceans, tusk shells
CP 2686	1 cu.m. soft mud, with wood debris, coconut fragments, slabs of hard mud, composed of large sea stars, many ophiuroids, jellylike sea cucumbers, glass sponges, and a shrimp (*Hymenopenaeus*)
MAY-25-07	
CP 2687	Net twisted, but with catch of shrimps (*Aristeus, Phaspidea*), sea anemone, and a black gel-like sea cucumber
CP 2688	Wood debris, coconut debris with 4 species of decapod crustaceans, large gel-like sea cucumbers, glass sponge with twisted spicules, hydrozoan, and a large coral with single polyp
CP 2689	Small haul composed of worm tubes (*Hyalinecia*), foraminiferans in orange tube, amphipod, galatheid (*Munidopsis*) and a shrimp (*Nematocarcinus*).
CP 2690	Approx. 2 cu.m liquid mud, with glass sponge, 30-cm hydrozoan, 3 gel-like sea cucumbers, 4 large sea cucumbers, 4 large sea urchins
CC 2691	White gorgonian, glass sponges, numerous ophiuroids,, gel-like sea cucumbers, long-spined sea urchins, 8 species of decapod crustaceans and an amphipod
MAY-26-07	
DW 2692	Very small haul, with small rocks and a goneplacid crab
DW 2693	small rocks and rubbles and shell frgaments, flat sponge, and a galatheid
DW 2694	Small rocks, sea urchin fragments, shell fragments
CP 2695	0.5 cu.m mud with sea urchin tests and fragments, ophiuroids, and large sea urchin
CP 2696	0.5 cu.m harden clay with stalked crinoids, yellow crinoids and small lobster,
DW 2697	Net and chain lost
DW 2698	Handfull of small pebbles and shell fragments with 2 cm2 of sponge,
CP 2699	Very small haul of mud, about 9 spp of fish, foraminiferans, gel-like sea cucumbers, crinoid, sea star, hydroid, about 7 spp of decapod crustaceans, one smooth rock barnacle,
MAY-27-07	
CC 2700	Coconut debris with 2 large goose barnacles, 8 species of decapod crustaceans, jellyfish, glass sponge, 2cm2 sponge, 2 camia shells, bivlaves, Argonaut fragment and 7 sea stars
CC 2701	Coconut debris, long white tube soft ponges, many hydrozoans, sea pen, large soft sea urchin
CC 2702	Liquid mud bottom with numerous ophiroids, long spicules of glass sponges, gel-like sea cucumber, soft-test sea urchins, 10 heart urchins,
CC 2703	Mud bottom with coconut head and debris, large sea anemone, black hydrozoan, large sea stars, soft test urchin, ophiuroids, and 2 decapod crustaceans
CC 2704	0.5 cu.m. mud with coconut frgaments, worm tubes (*Hyalinecia*), whip coral, large, long-armed ophiuroid, 6 species of decapod crustaceans
CC 2705	Net probably did not reach the bottom, tangled in rope of "payao" but with very few debris of plastic trash, one mysid and 3 species of fish.
MAY-28-07	
DW 2706	0.5 cu.m. of hard compressed mud, small pebbles, little shell fragments, a few tusk shells, and small mollusks.

CP 2707	0.5 cu-m. mud with wood debris, 3 species of shrimps, long spined sea urchin and soft test sea urchin
CP 2708	0.5 cu-m. mud with ophiuroids, sea stars, sea urchins, ball sponges and 9 species of decapod crustaceans
CP 2709	1 cu-m. liquid mud with wood fragments and chunks, sausage-like sea cucumbers, sipunculids, numerous fish, shells, lobster and crab
CP 2710	0.5 cu-m. mud with wood debris, some shells, and 3 species of crabs, polychaetes, fish, cnidarians
CP 2711	Mud bottom, with chambered nautilus shell, worm tubes, soft-test sea urchins and 10 big sea anemones
CP 2712	Broken net but with corals and coral rubbles with 5 crabs
CP 2713	Failed, No catch
MAY-29-07	
DW 2714	Small amount of grayish mud with few fish, few mollusks, a crab and a galatheid
CP 2715	Small haul with wood debris, gooseneck barnacles, 5 decapod crustaceans
CP 2716	1-m log, wood debris, coconut debris and plant debris, 6 species of decapod crustaceans
CP 2717	1 cu-m. logs and plant debris, soft-test sea urchins, sausage-like sea cucumbers, sea anmeone, medusae, bivlave mollusks, 3 decapod crustaceans and a stomatopod
CP 2718	Small haul of mud with wood debris, hydrozoan, 4 species of decapod crustaceans
CP 2719	Small haul of mud with 1.5-m log, good assortment of gastropods (*Murex* and *Tibia* and others) and bivalves (*Adra*)
CP 2720	Small haul of mud with large piece of wood and soft-test sea urchin
CP 2721	Mud bottom with chunks of wood, soft-test sea urchin and 5 decapod crustaceans
CC 2722	Mud bottom with soft-test sea urchin, sea stars, sausage-like sea cucumbers, 7 decapod and 1 stomatopod crustaceans
CC 2723	Mud with big sea star, 2 jecllyfish and *Murex* shell
MAY-30-07	**RE-WATERING, NO TRAWL OPERATION**
MAY-31-07	
CC 2724	Log, wood debris and coconut debris with *Linuparus* lobster, 4 crabs and 2 shrimps
CP 2725	Mud pellets with bivalves (*Tellina*), jellyfish, sipunculid, and 2 decapod crustaceans
DW 2726	Muddy bottom with pebbles and bivalves
CP 2727	Mud with some wood debris, large stalked barnacles, sea stars, 8 decapod crustaceans and fish.
DW 2728	Mud with nothing in it
CP 2729	Big haul of mud with 4 decapod crustaceans
CP 2730	Pellets of mud with logs and wood debris, white stalked crinoids, sea urchins, sea stars, ophiuroids and 6 decapod crustaceans and a stalked barnacle, and moray eel
CP 2731	Big log and chunks of wood, coconut husks, with gel-like sea cucumbers, soft-test sea urchins, stalked crinoids, ophiuroids, sipunculids, isopods, 6 decapod and a stomatopod crustaceans, eel, angler fish and other fishes.
CC 2732	Net got tangled in a rope of "Payao"; No catch
JUN-01-07	
CC 2733	Net badly torn but with few catch of 4 decapod crustaceans, stony coral, sea anemone, sea pen, sponges, 9 species of fish and *Sargassum*
CP 2734	Mud with wood debris, coconut, bamboo, and plant debris, fish and 5 species of decapod crustaceans, plenty of shrimps, ascidians, tube worms
CP 2735	Mud with wood debris, coconut heads and debris, sea anemones, long-spined sea urchin, various sea stars, reef lobster, galatheid and 2 slit shells (*Pleurotomaria*), limpets, several fishes
CP 2736	Mud with wood debris, large heart urchin, 3 decapod crustaceans, baby shark and other fishes, and several gastropod and bivalve shells
CP 2737	Mud with coral rubbles, shell fragments and granules, whip coral, hydroids, sea stars and 3 species of crabs
DW 2738	Mud with some rocks, shell frgamnets, reef-building foraminiferans and chela of *Charybdis*
DW 2739	Mud, sand, dead shells, *Conus*
DW 2740	Sand-mud with polychaete tubes
CP 2741	Rocks and rubbles, coconuts, with 12 decapod crustaceans, soft-test sea urchin, dotted sea cucumber and ophiuroids

CP 2742	Net got tangled but with few haul of rocks and shells, whip corals, black coral, shrimps, 3 crabs and fish
JUN-02-07	
CC 2743	Mud with wood debris, crinoids, large sea anmeone, and 4 decapod crustaceans and a stomatopod
CC 2744	Rocks, wood debris, with chambered nautilus, Camia shell, small slit shell (*Pleurotomaria*), barnacles,5 decapod crustacean species
CC 2745	Soft-test sea urchin, ophiuroids, hydrozoans, barnacles, 6 species of decapod crustaceans
CC 2746	Coconuts, wood debris, glass bottle, stomatopod crustaceans and *Pylopagurus* hermit
CP 2747	Mud with broken shells, small crinoids, 7 species of decapod crustaceans
CP 2748	Mud with 2 decapod crustaceans
CP 2749	Mud with wood debris, foraminiferans, 10 species of decapod crustaceans
CP 2750	Mud with *Halimeda* fronds, 3 species of decapod crustaceans
JUN-03-07	
CP 2751	Mud with coconut and wood debris, worm tubes, bivalve shells, ophiuroids, gel-like sea cucumbers, white sea cucumbers with long tubercles, galatheids and hermit crabs
CP 2752	Wood debris with worm tubes, gel-like sea cucumbers, ophiuroids, small sea nemones, 4 decapod species of crustaceans
CP 2753	Mud with big rocks, wood debris, hydrozoans, long-armed ophiuroids, gel-like sea cucumber, sea stars, cirripedes, 5 species decapod crustaceans.
CP 2754	Compressed sand-mud with stalked crinoid, soft-test sea urchin, hydrozoans, deep-sea coral polyp, sea anemone, 3 decapod crustaceans
CP 2755	Mud with wood debris, short stubby chunk of wood, round smooth rocks, ophiuroids, and 3 species of decapod crustaceans
CC 2756	Wood debris and coconuts, soft-test sea urchin, gel-like sea cucumber and I shrimp (*Plesiopenaeus*)
JUN-04-07	
DW 2757	Chain-links of net trawl broken but with few haul of coral rubbles, broken shells, *Halimeda* fronds, small ophiuroids, 5 decapod crustaceans
DW 2758	*Halimeda* fronds, corals, fish, encrusting sponges, hydrozoans, fish and Chirostylids
DW 2759	Sandy-mud with foraminiferans, 4 species of decapod crustaceans
CP 2760	Wood debris and shell fragments, shells, long-armed ophiuroids, sand dollars, and a crangonid
CP 2761	Mud with hydroids, sipunculids, polychaetes, attached bivalves, and 7 species of decapod crustaceans
CP 2762	0.5-m mud with wood debris
CP 2763	0.5 cu-m mud with wood debris, hydrozoan with feathery arms
CP 2764	1 cu-m. mud with wood debris, 2 decapod crustaceans and a stomatopod

Altogether a total of 112 collecting operations, including 75 beam trawls (CP), 17 otter trawls (CC) and 20 dredges (DW) ranging from 30 m to 2,253 m were employed. Table 1 presents the station list details for all stations.

The deep water benthic fauna revealed about 230 species of decapod crustaceans [see crustacean report], 12 species of stomatopods, 300 of fish [see fish report], 60 species of echinoderms (19 holothuroids, 8 asteroids, 14 ophiuroids, 8 crinoids, and 11 echinoids) and several hundred species of mollusks [see mollusks report]. The most abundant holothurian obtained from this cruise was *Molpadida* sp. Three species of echinoderms were hosts to eulimids and one six-armed sea star was host to crustacean.
Around 800 lots of cnidarians and sponges were collected, with associated DNA samples. The sponges were mainly calcarean although we also collected several hexactinellid species. Regarding cnidarians the hydroids we collected were mostly from shallow waters. Scleractinians (although not many different species) were very abundant. Within octocorals, pennatulaceans were the most remarkable group. We found very interesting sea anemone species, mostly of the family Hormathiidae (*Calliactis*, *Allanthactis*, *Adamsia*, *Amphianthus*) but also a couple species of the suborder Endocoelantheae; we expect several new species of sea anemones from the cruise.

In terms of fishery resource: 36 crustacean species have a sufficient size to be considered as edible. However, none were observed in large enough numbers via the sampling method used. Although these species have potential as a fishery resource, a thorough assessment should be conducted by the Bureau of Fisheries and Aquatic Resources. The Project left the beam trawl for a while on board the vessel so that the fishing gear specialists can study its catching effort and an adjustment of the net mesh size can be done to catch these species effectively. In this manner, transfer of technology to the BFAR people is continued.

Preliminary results

Sunken drift-wood in the deep-sea – a dining table for opportunists

by Anders Warén, Takuma Haga & Julien Lorion

Background

Rivers and streams have been carrying out vegetation from land, as long as plants have existed. Wood and cellulose contain energy that is only slowly being degraded, usually with the aid of bacteria or fungi. Most kinds of wood and plant matter floats, especially in sea-water and can therefore be carried out, far off the coasts, until it becomes too water-logged and eventually sinks. Before that it has usually served as a substrate for animals that may be totally (before the age of ships and plastics) dependent on old logs and branches as a substrate to live attached to.

A drifting coconut (A) may end up as a microcosm on the sea-floor (B)

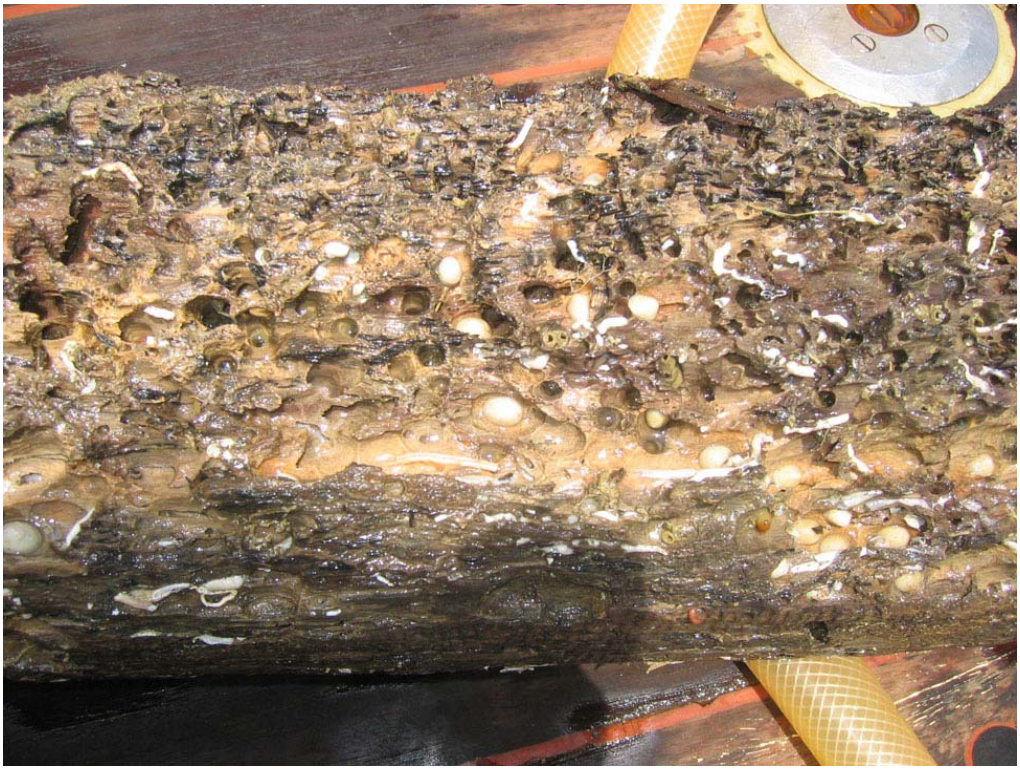
Only few animals are at this stage directly using the wood as a source of energy: Shipworms of the family Teredinidae and some Isopods (relatives of pill bugs) make tunnels in the wood and digest the excavated cellulose with the aid of symbiotic bacteria.

Research, started during the Danish Galathea Expedition 1950-51, has shown that it is when the vegetation finally ends up on the sea-floor, that it becomes really important. Here the availability of energy is extremely low and the occasional addition of a *Casuarina* cone or a 10 m log means food and survival for generations of animals.

Research on the organisms living on and in sunken wood that started soon 60 years ago, was maintained on molluscs in New Zealand, but it was only a few years ago, after some eye-catching reports on sunken whale carcasses that the biogenic substrates in the deep sea started to raise the interest of funding agencies.

Thirty litres of plant debris from a trawl in 100 m depth

Now, a few years later, there are several projects going on in research laboratories in half a dozen countries. The interest has been further fuelled by the evolutionary connections between this fauna and the vent and seep faunas which were early recognised for molluscs, more reluctantly for other animal groups whose scientists were burdened by the primordial ideas about seeps being refugia for a meso- to palaeozoic fauna.

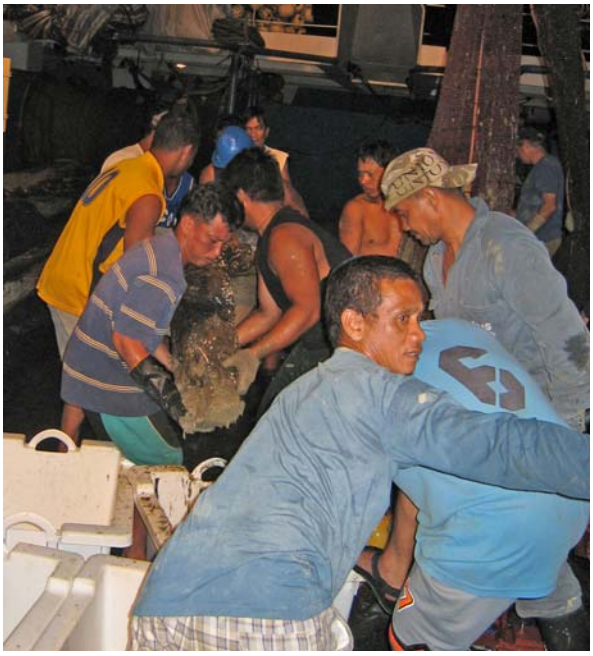


A section of a 15 cm thick log from 500 m depth, partly destroyed by shipworms and limpets

Early exploration of the mollusc fauna of biogenic substrates was carried out during cruises on R/V *Alis* in the South Pacific and had revealed it to be very rich; this is why it was decided that special care should be given to sunken wood during the Aurora 2007 expedition.

Wood work on M/V DA-BFAR during Aurora 2007

The aims for the wood-work during Aurora 2007 were to explore the marine life on the pieces of wood that were recovered during trawling and dredging. The results that were obtained were intended for: A) the barcoding project, B) taxonomic, phylogenetic and ecological investigations of this fauna, especially molluscs. The collecting requires methods quite different from the normal treatment of the trawled bottom sediment and was therefore carried out in parallel to the rest of the sample processing.



A large log being extracted from the trawl

Working methods

Like with most other sampling of organisms, the treatment of the samples differs widely for the different types of organisms, and no "universal method" can be used for everything. Each problem and each kind of organism requires its own methods and its own piece of wood, but generally most macrofauna can be taken from a single piece of wood. Shipworms, however, require special care since they are fragile and need to be chiselled out individually, which often destroys other medium size animals.

During Aurora 2007 we experienced that it is an advantage if the pieces of wood are separated as soon as they are seen, and before they are washed with the remaining sediment since much of the wood fauna is easily washed off and never recovered, or its wood dependency or wood-species specificity is not recognised. The pieces of wood shall, if they are muddy, be gently washed and brushed in a suitable container, preferably with cold seawater. The residue in the container can be sieved to get rid of unnecessary fine mud. A large-mesh sieve is used to separate material that can be sorted directly on deck; a finer-meshed sieve retains the size of animals and particles to be saved for later examination, either at home (immediate preservation) or alive on the ship (kept in a mixture of sea-water and ice). After that the piece is ready for more detailed inspection for large organisms which are handpicked.

Examination of small pieces of wood debris

The continuation depends totally on the quality of the wood and the purpose of the examination. Wood that has been submerged for a short time only is usually attacked only by superficial inhabitants and fungi and, unless one wants the fungi, superficial examination may be enough. The pieces can be split with a wedge or cross-sectioned with a saw (e.g. a stainless garden saw or a teflon coated carpenter's saw) for search for boring organisms which have small entrance holes which may be difficult to find, e.g. the boring bivalves. If electric saws are used, cordless ones reduce the risk of electrocution, and stainless blades are better suited in a marine environment. A pair of garden loppers can be used both for splitting and cutting wood but their use

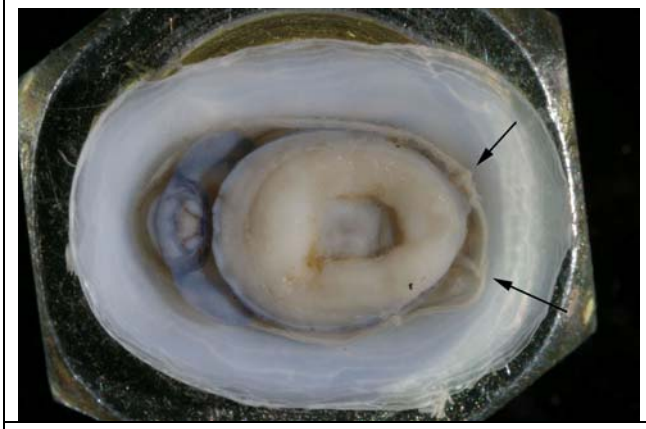
is more violent than a saw or wedge. A knife is good for removing limpets clinging to wood by shaving off a thin flake of wood; a carpenter's chisel can also be used, especially if larger pieces of wood shall be removed, but a knife has the advantage that they are available in stainless steel, while chisels are made in rust- prone steel. Therefore when buying chisels choose the cheapest quality, as rust will degrade the edge quickly.

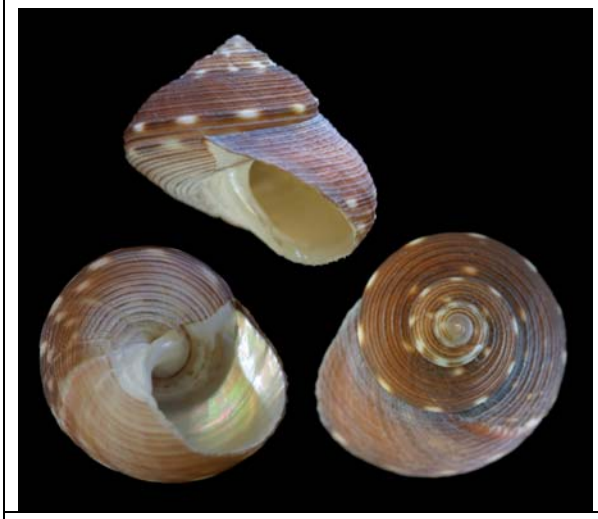
Log approaching the end of its life. Very little actual wood remains: almost all has been consumed by shipworms. The red gastropods belong to the family Turbinidae, size ca 6 mm

Wood that has been submerged for a very long time may be totally drilled by bivalves, so only a little of the wood remains. This kind of wood usually has the richest animal life, but the boring bivalves are now often few in number and have been replaced by gastropods, sipunculoids, echinoids, brittle stars, polychaetes and crustaceans, which use the wood as shelter or hunting ground. Several gastropods, especially limpets, continue the breakdown of the wood, while other gastropods mainly eat the bacterial film that now plays an important role for the degradation. Large animals can here be handpicked and the piece of wood broken up and washed in sea-water for obtaining a residue to be treated as above. Various kind of pliers are also suitable for several tasks, especially wire cutters, which occasionally can be obtained in stainless steel. A small axe may come in handy for shaving off larger quantities of superficial wood over a container, for later washing.

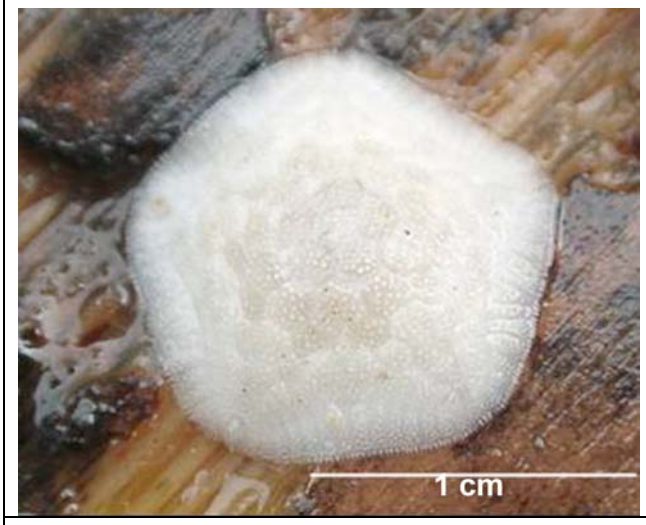
Presentation of the fauna

Almost all groups of marine organisms can be found on wood falls but only a smaller part can be considered specialised "wood fauna" or "wood organisms". It is therefore important to keep track of the species and consider their life histories. For example bivalves of the families Teredinidae and Xylophagaidae drill the wood and are permanently living inside it. They are typical wood fall organisms. Bivalves of the genus *Idas* live attached to pieces of wood and are never found free in the sediment or on rocks, and are also members of the wood fauna. Bivalves of the family Lucinidae, e.g. some species of *Myrtea*, are regularly found in sediment that is discoloured by sulphides close to, or in pieces of wood that have been buried in the sediment. They have symbiotic bacteria in the gill and derive their nourishment from sulphides produced by bacteria during the decay of the wood, but may also be found in other sulphide-rich environments; such species are better termed "sulphide dependent species".
Below follows a few examples of important and common organisms which are dependent on wood-falls.

	Polyplacophora or chitons. Species of ***Leptochiton*** are particularly common on deep sea wood.
	Patellogastropods of the genus ***Pectinodonta*** reach a size of 25 mm and scrape off wood with a strong radula. Contrary to the cocculiniform limpets, they have a sturdy shell and lack the two small tentacles at the end of the foot.
	Cocculiniform limpets are characterised by having a pair of small tentacles at the end of the foot (arrows, above) and occur mainly on wood falls. This specimen is 6 mm long. They feed mainly on bacterial film on the wood.
	True shipworms of the family Teredinidae coat their burrows in the wood with a layer of calcium carbonate and have a small shell in the front of the body. This specimen has been extracted from its burrow.

	***Pseudothalotia* cf *sakurai*** is not rare on drift wood in the Tropical Pacific, in 200-600 m depth. It feeds on a mixture of wood and bacterial film (Below).
	SEM photo of the gut content of ***Pseudothalotia* cf *sakurai***
	The bivalve ***Idas*** lives on various types of biogenic substrates, wood, bone, coconuts among others. They have symbiotic bacteria in their gill.
	Xylophaginid shipworms have proportionally smaller body and do not coat their burrow with calcareous material

	An echiuroid worm embedded in wood shavings, probably a result of its activity, but details about this are not known
	An echiuroid worm embedded in wood shavings, probably a result of its activity, but details about this are not known. Burrowing shrimps are not rare in the burrows of shipworms but their dependence on wood is not known.
	Hermit crabs of the genus ***Xylopagurus*** live in pieces of sunken wood with hollow centre, which they continuously excavate for more space as they grow. They use the wood for shelter only
	Squat lobsters of the genus ***Munidopsis*** are common on wood in slightly deeper water; it is not known if they are totally dependent on wood.

	Sea-stars of the family ***Caymanostellidae*** are frequent on wood falls deeper than 200 m.
	This unidentified sea-urchin grows to a size of ca 10 mm and is regularly found on pieces of wood
	Fungi are more common in marine environment than what is taught in elementary courses and wood is not an exception.

Results from Aurora 2007

During AURORA 2007, sunken drift wood was plentiful in many places, especially in what seems to be depressions in the seafloor that are protected from currents. A wood-dependent fauna occurred in almost all the collecting efforts with the beam-trawl, also very shallow at ca 100 m depth. Sometimes very large pieces of wood, up to a few meters length were recovered .

The fauna is quite rich, some estimates for the common taxa are: Cocculiniform gastropods 15 species (mostly undescribed); Other gastropods 30 species (mostly undescribed); Bivalves (Mytilidae) at least seven species; Shipworms (Teredinidae) at least five species; Shipworms (Xylophagaidae) at least 15 species
Another result of importance for future wood exploration was the use of sea-water ice for keeping the samples and the washing at temperatures more similar to what the organisms are used to. This has considerably improved the quality of the morphology as well of the DNA of the specimens. Only a short time in temperatures of 25-30°C is enough to destroy DNA.

Abyssochrysos – A living fossil?

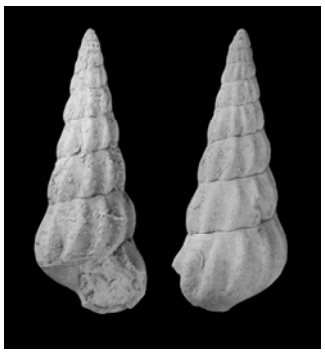
by Ellen Strong

The gastropod family Abyssochrysidae includes a single genus – *Abyssochrysos* – and only 6 species have been described worldwide. All known species are characterized by a rather large, turreted shell (adult size greater than 2 cm), with dominating axial (vertical) sculpture particularly on the early whorls.

Shells of ***Abyssochrysos melvilli*** *(left) and* ***Abyssochrysos melanioides*** *(right)*

The waxy, olive green appearance of the shell is also characteristic of the family (Fig. 1). Four species are found in the Indo-West Pacific and Indian Oceans, with one species from the eastern Atlantic off the coast of southern Morocco and another from the western Atlantic off the coast of Brazil. All species live in bathyal and abyssal depths, typically between 1000-2000 meters, but are known from waters as shallow as ~500 meters and as deep as 3150 meters. Due to their deep water distribution, they are poorly represented in research collections, with the majority of this material representing empty shells. The only paper written documenting what little is known of the anatomy was written over 20 years ago, is based on rehydrated tissues from a dry shell and is woefully incomplete; nothing is known of the ecology of these species.

Since that time, a handful of specimens of *Abyssochrysos melvilli* had been collected in the Solomon Islands, but because the animals retract deeply in the many-whorled shells they do not preserve well, and these Solomon specimens proved to be of limited utility for comprehensive anatomical comparisons and challenging for obtaining DNA. Consequently, this family of gastropods remains very poorly known and their position among the branches of the gastropod family tree is uncertain. Rendering them all the more intriguing is their striking resemblance to an extinct group of families now referred to as the Zygopleuroidea (Fig. 2). Zygopleuroids roamed shallow water seas during the Paleozoic and Mesozoic and were thought to be extinct since the upper Jurassic, over 150 million years ago. Ever since the pioneering expeditions of the 19th century, a number of lineages long thought extinct have been found inhabiting the deep ocean. *Abyssochrysos* potentially represents one of these relictual lineages and is of significant scientific interest.

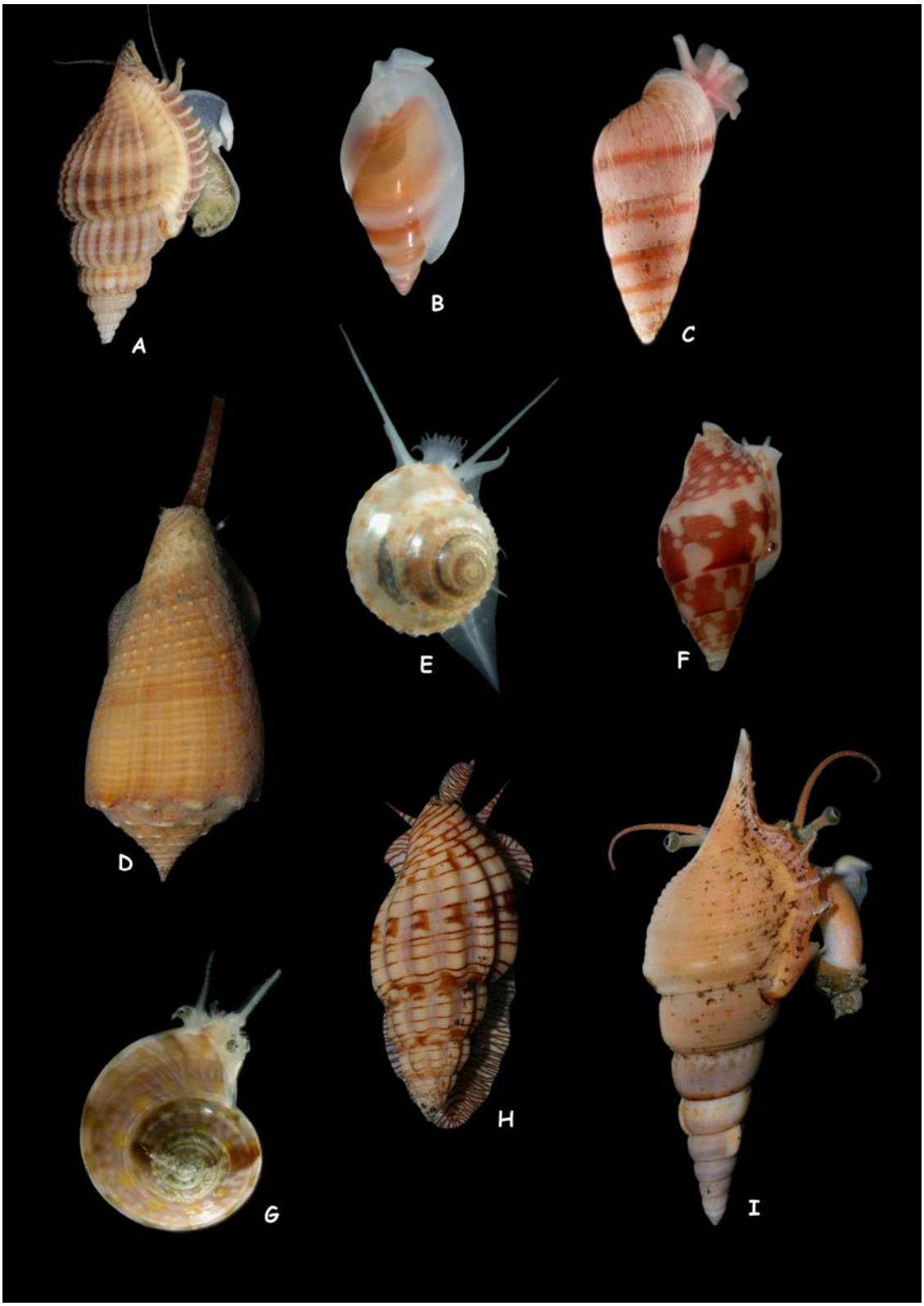


Shells of the Paleozoic fossil ***Pseudozygopleura (Stephanozyga) subnodosus***

During Aurora 2007, 35 living specimens of *Abyssochrysos*, representing two species [*A. melvilli* (24), *A. melanioides* (10)] were dredged from depths between 1200-2200 meters (Fig. 3). This sampling more than doubles the number of specimens available for research with preserved soft parts. To avoid repeating the poor preservation of the Solomon specimens, a number of specimens were drilled or cracked to ensure proper penetration of the ethanol. DNA sequencing and dissections of both species will be completed by Ellen Strong at the Smithsonian Institution in Washington.

Interesting and remarkable molluscs

by Barbara Buge



A. Strombidae, Stn CP 2763, 42-44 m; **B**. Olividae, Stn CP 2730, 358-378 m; **C**. Pyramidellidae, Stn CP 2732, 556 m; **D**. Conidae, Stn CP 2665, 123-125 m; **E**. Chilodontidae, Stn CP 2712, 139-140 m; **F**. Columbellidae, Stn CP 2720, 300-301 m; **G**.Trochidae, Stn CP 2741, 194-203 m; **H**. Volutidae, Stn CP 2741, 194-203 m; **I.** Strombidae, Stn CP 2715, 233-249 m.

J. Naticidae, Stn CP 2733, 271-278 m; **K**. Turbinidae, Stn CP 2720, 300-301 m; **L**. Tonnidae, Stn CP 2658, 422-431 m; **M**. Mitridae, Stn CP 2741, 194-203 m; **N**. Costellariidae, Stn CC 2746, 182-220 m; **O**. Nassariidae, Stn CP 2665, 123-125; **P**. Terebridae, Stn CP 2665, 123-125 m; **Q**. Ovulidae, Stn CP 2653, 83 m; **R**. Nassariidae, Stn CP 2710, 207-216 m; **S**. Sepiolidae, Stn CP 2661, 160-167 m.

T. Arminidae, Stn CP 2742, 182-205 m; **U**. Galeommatoidea attached to callianassid ghost shrimp, Stn CC 2746, 182-220 m; **V**. Bullomorpha, Stn CP 2736, 344-347 m; **W**. Unknown gastropod (Naticidae or Cephalaspidea?), CP 2719, 155-160 m; **X**. Philinidae, Stn CP 2678, 507-540 m; **Y**. Galeommatoidea?, Stn CP 2747, 120-124 m; **Z**. Galeommatoidea on sipunculid, CP 2747, 120-124 m.

Focus: Barcoding in the gastropod family Turridae

by Nicolas Puillandre

The family Turridae is a group of predatory marine molluscs that occupy all marine habitats from the tropics to the poles and from shallow to deep water. This is one of the most speciose groups of marine molluscs, with estimates of about 340 Recent valid genera and subgenera, and 4,000 named living species. A large amount of diversity remains unknown, especially in deep environments where sampling is difficult. Furthermore, the systematic of this group is problematic because taxonomists traditionally use morphological characters that are particularly difficult to evaluate in this group: typically, what one specialist interprets as geographical or bathymetrical variation can be interpreted by another as specific differences.

In this context, molecular characters can be used to propose species delimitations in the Turridae, but also to study phylogenetic relationships within this group. DNA characters possess the advantage to be genetically determined, and thus not susceptible to vary with the environment, contrary to the morphological characters. Furthermore, thanks to the sequencing facilities available in scientific institutions such as the Muséum National d'Histoire Naturelle, DNA can be extracted from the tissue and sequenced very quickly.
In this perspective, I was invited to participate to the Aurora 2007 cruise to specifically prepare specimens for molecular analyses. Actually, specimens have to be preserved in a way that DNA will not be damaged after the death of the animal. Right after specimens arrive on board, they were placed in a magnesium solution in order to anaesthetize them. The goal was here to prevent the withdrawal of the animal in the shell, often closed by an operculum, so the tissues could be correctly fixed in alcohol and the DNA preserved. When possible, a piece of tissue was cut and placed in a tube of alcohol. If the anesthesia was not successful, shells was drilled in order to facilitate the penetration of the alcohol in the tissue. Each specimen was also given a unique number, and relative data for each specimen were entered in an electronic database.

Back in the laboratory in Paris, DNA was extracted from the tissue collected during the cruise, and DNA was sequenced for the COI gene (Cytochorme Oxidae I). This gene is used in the international DNA Barcode project as the universal marker. This gene has the advantage to be very similar between specimens of the same species, but very different between specimens from different species. It can thus be considered as a real barcode, as it allows the recognition of specimens, but also the delimitation of species within a taxonomically difficult group such as the Turridae.

Over the 700 specimens of Turridae collected during the Aurora 2007 cruise, 250 are already sequenced. They correspond to one genus, *Bathytoma*, and one subfamily, the Turrinae. Within the genus *Bathytoma*, five species are recognized based on the COI gene, most of them new to science. Within the subfamily Turrinae, 20 species are recognized: for the moment, an existing name was attributed to only five of them. The specimens collected during the Aurora 2007 cruise are then associated to specimens collected during other cruises. For example, in the subfamily Turrinae, some species found during this cruise were also collected during the Santo 2006 or the Panglao 2005 cruises (Figure).

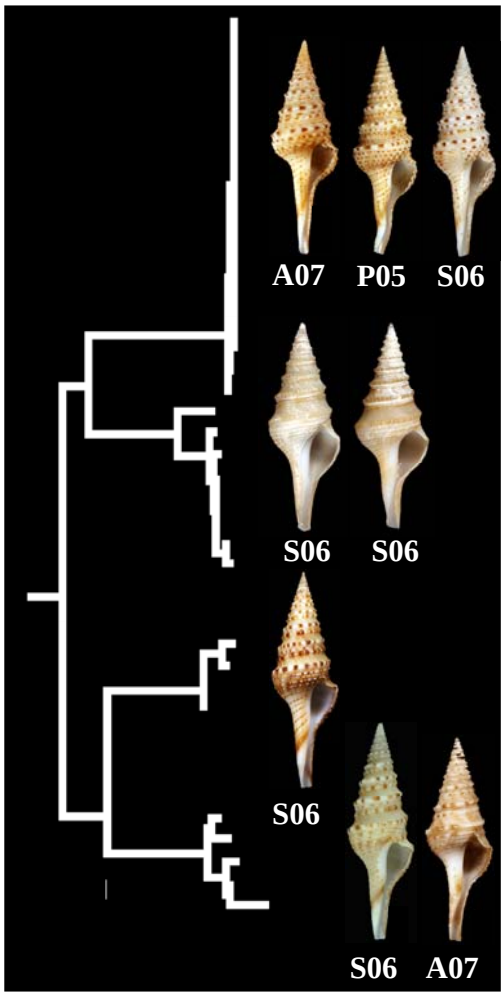


Figure: phylogenetic tree obtained with the COI gene, using specimens collected during Aurora 2007 (A07), Santo 2006 (S06) and Panglao 2005 (P05) cruises. Four species are recognized, characterized by short branches within species and long branches between species. Some specimens are illustrated for each species.

Decapod Crustaceans

by Tin Yam Chan, Tan Swee Hee, and Jose Christopher E. Mendoza

The decapod crustaceans collected from the AURORA 2007 are about 320 species, with half of them crabs and half of them being shrimps and anomurans In PANGLAO, generally the crabs collected were two times the number of shrimps and anomurans together.

Shrimps

The commonest decapod crustacean group collected in AURORA is Penaeoidea, particularly of the genera *Penaeopsis*, *Parapenaeus*, *Aristeus* and *Hymenopenaeus*. Other than penaeoids, only the caridean shrimp genus *Heterocarpus* was of similar abundance as in PANGLAO 2005 but still in slightly less diversity. For lobsters, the AURORA was much lower in diversity and less in quantity. For example, only two species of *Metanephrops* were collected in AURORA (vs 5 species in PANGLAO 2005) and they were never many. The AURORA 2007 was also particular in having very few stenopodids (only one specimen collected, vs more than 100 specimens of about 7 species in PANGLAO 2005) and poor in numbers of galatheids (generally each trawl in AURORA collected less than 10 galatheid specimens), though the total diversity of galatheid collected was only slightly lower than PANGALO 2005. Only the caridean family Glyphocrangonidae had a higher diversity (about 11 species as compared to 5 species from PANGALO 2005) and more numerous in AURORA. Although the AURORA expedition generally had less diversity and abundance than PANGLAO 2005, some rare thalassinideans were collected, such as the family Ctenochelidae and those callianassids from sunken wood burrows. At least two thalassinidaens have already be determined as new to science. Furthermore, a specimen of the rare lobster genus *Thaumastochelopsis* was collected and it also represents a new species. At least one penaeid, two carideans, two thalassinideans, one lobster and one galatheid have already been determined to be new from the AURORA expedition. It is believed that more new taxa will be found from the AURORA expedition when the material collected is fully studied.

Metapenaeopsis lata (Penaeidae), stn CP2677.

Hymenopenaeus equalis (Solenoceridae), stn CP2678.

Acanthephyra armata (Oplophoridae), stn CP2664.

Pylocheles sp. (Pylochelidae), stn CP 2656.

Common species but small or without commercial value

Crabs

There were approximately 161 species of Brachyura collected during the Aurora 2007 deep-sea cruise. The abuandance and diversity of crabs was considerably less than what was collected in a similar cruise in the Bohol Sea in 2005 (Panglao 2005). However, the Aurora 2007 cruise also had its fair share of unique and new crab species, in addition to some rare species which were also collected in the earlier cruise.

Most of the crabs sampled were collected by beam trawl, with the remainder collected by otter trawl or Waren dredge. It goes without saying that the beam trawl was most often used than the other two collecting methods due to the greater success in collecting animals, hence, the higher capture incidence.

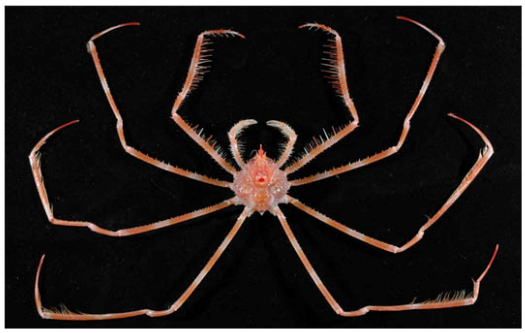
The crab families represented, in order of decreasing species diversity, were: Majidae (32), Leucosiidae (21), Pilumnidae (17), Goneplacidae (16), Portunidae (14), Ethusidae (9), Xanthidae (8), Calappidae (6), Chasmocarcinidae (6), Palicidae (6), Homolidae (5), Raninidae (5), Cyclodorippidae (3), Dromiidae (2), Retroplumidae (2), Parthenopidae (2), Atelecyclidae (1), Corystidae (1), Dorippidae (1), Dynomenidae (1), Latreillidae (1), Homolodromiidae (1), Hexapodidae (1), and Trapeziidae (1). It is important to note that there is a high probability that the number of species reported here is substantially underestimated. The most commonly collected species belong to the genera *Platymaia, Cyrtomaia, Oxypleurodon, Charybdis, Hephthopelta, Tymolus, Ethusa, Carcinoplax, and Randallia.* Comparisons with data from the Panglao 2005 cruise show that there is markedly less abundance and diversity seen in Luzon's eastern Pacific seaboard for the following groups: Retroplumidae, Hexapodidae, Goneplacidae, and Pinnotheridae. However, although the general diversity of the other groups remained more or less the same between the two cruises, there were some species that were exclusively seen from only one cruise or the other. Some examples of crabs seen solely in Aurora are *Neoxanthias michelae*, *Cryptopodia* sp., *Benthochascon hemingi*, *Hexaplax* sp., and *Trachycarcinus* sp.

New Species:

At present, there are at least four new species being described, but it is expected that the number of new species will increase as the specimens sampled are studied in greater detail.

Cyclodorippidae: *Cymonomus* sp. nov.1 (Station CC2700); *Cymonomus* sp. nov.2 (Station CP2681); *Krangalangia* sp. nov. (Station CP2678)
Homolodromiidae: *Homolodromia* sp. nov. (Station CC2961)

Rare/Interesting Species:
Homolidae: *Lamoha longirostris* (Station CP2754)
Atelecyclidae: *Trachycarcinus* sp. (Station CP2664)
Majidae: *Oxypleurodon* cf. *auritus* (Station CP2678); *Pleistacantha terribilis* (Station CP2656); *Pugettia sagamiensis* (Station CP2673)
Portunidae: *Benthochascon hemingi* (Station CC2700)
Retroplumidae: Retroplumidae sp. (Station CP2678)
Xanthidae: *Crosnierius carinatus* (Station CP2737); *Euryxanthops dorsoconvexus* (Station CP2716, etc.)



Platymaia fimbriata CP2659

Cyrtomaia cf. *owstoni* CP2658

Charybdis bimaculata CP2710

Carcinoplax sp. CP2709

Tymolus sp. CP2658

Ethusa cf. *indica* CP2684

Common Crabs

Cymonomus sp. nov. 1 CC2700

Cymonomus sp. nov. 2 CP2681

Krangalangia sp. nov. CP2678

Homolodromia sp. nov. CC2691

New Species

Trachycarcinus sp. CP2664

Oxypleurodon cf. *auritus* CP2678

Pleistacantha terribilis CP2656

Benthochascon hemingi CC2700

Euryxanthops dorsiconvexus CP2720

Retropluma sp. CP2678

Rare or Interesting Crabs

Interesting and remarkable fish

by Kwang-Tsao Shao, Yun-Chih Liao, Rodolfo Reyes, and Raffy Ramiscal

General description for fish specimen treatment
Methods:

1. Identification: species were identified to species level, if possible, based on available literatures brought on board.
2. Photographs: photographs of fish specimens were taken in water-filled aquarium tank while they were fresh, with high quality digital camera (Nikon D200 with 60 mm micro lens). Images were stored in NEF file format with about 15Mb in size per image and in jpg file format.
3. Tissue samples for bar-cording: muscle tissue samples were taken from the body or near caudal peduncle region. Some small fishes were preserved whole.. Tissue samples were preserved in absolute alcohol for barcording. After we receive these tissue samples from Philippines, we will subdivide them into 2-3 shares. One part will be sent to Museum in Paris or Smithsonian Institute in U.S. for their collections and barcoding.
4. Voucher specimens and other fish specimens were fixed and preserved in 10% formalin.
5. The fish collections were divided among three museums, the National Museum of Natural History, Washington D.C., U.S.A (USNM), Biodiversity Research Museum, Research Center for Biodiversity, Academia Sinica, Taiwan (ASIZ), and Philippine National Museum (PNM), for further identification. Among these collections, flatfishes will be shipped to USNM, unidentified and voucher specimens for barcoding will go to ASIZ, the others or extra specimens will be deposited in the PNM or WorldFish Center.
6. Some literatures, databases and one otter trawl were left in Philippines for the expedition next year.

Preliminary results:

1. There were a total of 112 samplings during the expedition. Among them, 88 had fish specimens - 3 dredge, 70 beam trawl, and 15 otter trawl samplings. There were 359 species from 96 families and 3,581 individuals of fish specimens were collected. Among them, 569 individuals of barcode samples will be treated as voucher specimens for barcoding work in the future.
2. Specimen photos were taken for nearly 200 species during the cruise.
3. Among these collections, there could be about 10 species treated as new species. They are 2-3 in Gobiidae, *Owstonia* in Cepolidae, species in Apogonidae, Tetraodontidae, Penguipedidae, and Moringuidae collected in shallow water. There could be some new species in Ophiidae, Macouridae, Ogcocephalidae, and Cynoglossidae in deeper water.
4. Several rare or bizarre specimen photos and equivalent figure legends.
   4-1. CC2702-002-Ipnopidae-*Bathypterois marionae*: rare, probably first recorded from Western Pacific. Eyes are very small, almost blind.
   4-2. CP2752-002-Ipnopidae-*Ipnops agassizii*: rare, only a few specimens have been collected from Pacific. Almost blind, their eyes were degenerated and were covered with skin.
   4-3. CC2703-001-the Aphyonidae is a family of fish that live below 700 meters; all species are very rare. This gelatinous specimen of the genus *Barathronus* is probably an undescribed species.

Expected results:

1. FishBase group (WorldFish Center) already agreed to let fish taxonomists from Academia Sinica examine and identify those fish specimens collected from the expeditions three years ago (Panglao 2005), currently deposited at WorldFish Center. Eventually, it is hoped that the fish checklist of Philippines can be updated and published.
2. Publish some new species or new records papers or a checklist of AURORA2007 in scientific journal. All holotype specimens will be returned to PNM.
3. Submit and increase the COI sequences and voucher specimens information to BOLD at least 250 species and 400 individuals.

Ipnopidae: ***Bathypterois marionae***

Aphyonidae: ***Barathronus sp.***

Ipnopidae: ***Ipnos agassizii***

Species list for fishes collected during AURORA 2007 expedition

Family	Species name	Station	sp ms
Acropomatidae	Acropoma sp.	CP2718-006	1
	Malakichthys elegans	CC2722-005	4
		CC2743-012	3
		CP2727-007	2
		CP2731-002	1
	Malakicthys sp.	CC2723-002	2
		CP2656-001	8
		CP2657-009	3
		CP2667-010	1
		CP2711-005	1
		CP2717-002	3
	Synagrops japonicus	CC2722-003	5
		CC2733-003	1
		CC2744-024	1
		CC2745-005	1
		CP2730-006	1
		CP2748-020	6
	Synagrops philippinensis	CC2700-013	4
		CC2733-013	16
		CC2743-005	10
		CC2746-020	20
		CP2657-022	1
		CP2666-013	13
		CP2667-004	6
		CP2695-013	1
		CP2709-017	6
		CP2711-015	
		CP2715-011	1
		CP2718-004	7
		CP2720-006	1
		CP2727-012	5
		CP2736-011	1
		CP2737-002	1
		CP2741-015	8
		CP2742-001	1
		CP2748-014	45
	Synagrops sp.	CP2658-017	1
Alepocephalidae	Alepocephalus sp.	CC2701-003	1
		CP2682-001	1
	Leptoderma sp.	CP2689-003	1
	Rouleina guentheri	CC2704-006	1
Antennariidae	Antennarius sp. (spot on dorsal)	CP2653-021	2
	Antennarius stiatus	CP2654-004	1
Aphyonidae	Barathronus sp.	CC2703-001	1
Aploactinidae	Erisphex pottii	CP2666-001	5
		CP2741-003	1
Apogonidae	Apogon carianus	CC2723-009	1
	Apogon ellioti	CP2653-027	16
		CP2761-005	1
		CP2762-009	2
		CP2763-011	1
	Apogon kiensis	CP2763-008	1
		CP2763-012	7
	Apogon lineatus	CP2653-028	4
	Apogon sp.1 (pink)	CP2653-025	20
	Apogon sp.2 (kiensis)	CP2653-026	5
	Siphamia sp. (organe)	CP2661-005	1
Argentinidae	Argentina kagoshimae	CP2711-016	1
	Glossanodon lineatus	CP2662-003	3
Ateleopodidae	Ateleopus purpureus	CP2671-001	1
	Ateleopus sp.	CP2748-019	2
Balistidae	Abalistes stellaris	CP2653-032	1
		CP2654-016	1
	Balistidae sp.	CP2684-004	1
	Xanthichthys sp.	CP2683-003	1
Bathysauroididae	Bathysauroides sp.	CC2743-001	6
		CP2672-011	1
Bembridae	Bembradium sp.	CP2695-011	1
		CP2696-001	1
		CP2696-002	1
Bothidae	Arnoglossus sp.	CP2653-024	31
		CP2761-001	2
		CP2762-011	2
	Bothidae sp.	CP2655-014	5
		CP2661-008	1
		CP2665-013	1
		CP2666-014	1
		CP2720-010	1
		CP2741-010	6
		CP2741-011	1
	Chascanopsetta prognathus	CC2700-007	1
		CC2745-006	1
		CP2658-003	2
		CP2708-007	1
		CP2709-005	1
	Chascanopsetta sp.	CP2695-007	1
	Laeios kitaharae	CP2710-009	1
		CP2712-025	3
	Neolaeops microphthalmus	CP2711-004	1
	Parabothus sp.	CP2712-001	1
		CP2712-022	9
	Psettina gigantea	CP2763-006	1
	Taeniopsetta ocellata	CP2654-011	10
Bramidae	Brama sp.	CC2702-019	1
Bregmacerotidae	Bregmaceros japonicus	CC2700-004	1
		CC2744-028	1
		CC2746-017	2
		CP2699-007	1
		CP2707-001	4
		CP2708-004	1
		CP2710-002	1
		CP2715-012	5
		CP2716-007	2
		CP2717-011	1
		CP2718-002	11
		CP2720-007	3
		CP2721-005	3
		CP2734-007	4
		CP2735-007	1
		CP2748-006	1
		CP2749-002	4
	Bregmaceros nectabanus	CP2695-003	4
		CP2719-013	1
	Bregmaceros sp.	CP2661-018	1
		CP2665-015	1
		CP2672-010	1

		CP2673-001	4
		CP2709-020	1
		CP2716-008	1
		CP2721-006	2
Callanthiidae	Grammatonotus surugaensis	CP2661-002	1
Callionymidae	Bathycallionymus formosannus	CP2665-014	1
		CP2747-019	25
		CP2748-012	2
	Bathycallionymus sokonumeri	CP2665-002	1
	Callionymidae	CP2654-021	2
	Calliurichthys sp.	CP2655-016	1
	Foetorepus masudai	CP2662-002	1
	Repomucenus sp.	CP2653-008	2
Callyonymidae	Callyonymidae	CP2666-009	1
Caproidae	Antogonia capros	CC2733-002	1
	Antogonia rubesceus	CP2727-002	1
Carangidae	Carangidae sp.	CC2701-008	
		CP2742-007	1
Carapidae	Carangidae sp.	CP2666-016	1
	Pyramodon ventralis	CC2733-011	2
		CC2743-018	1
		CP2656-019	1
		CP2661-012	1
		CP2710-008	1
		CP2748-005	1
Cepolidae	Acanthocepola sp. (Cepolidae)	CP2656-004	4
	Owstonia sp. (Cepolidae)	CP2657-018	1
	Owstonia sp. (Cepolidae) (CF white margin)	CC2743-020	1
		CP2667-003	1
	Owstonia sp.2	CP2719-011	1
	Owstonia sp.3	CP2736-001	2
	Owstonia tosaensis	CC2723-007	1
Chaetodontidae	Chaetodon modestus	CP2712-014	1
Challionymidae	Bathycallionymus formosannus	CP2741-006	1
		CP2760-002	2
		CP2762-012	1
Champsodontidae	Champsodon guentheri	CC2746-009	2
		CP2672-015	1
		CP2695-015	9
		CP2741-018	3
		CP2747-027	5
		CP2747-030	1
		CP2748-011	1
		CP2760-012	4
		CP2762-007	5
	Champsodon longipennis	CP2696-004	1
	Champsodon longipinnis	CC2722-002	3
		CC2733-001	1
		CC2744-011	1
		CP2655-013	33
		CP2662-011	1
		CP2666-012	10
		CP2667-015	1
		CP2711-013	6
		CP2715-008	2
		CP2727-010	1
		CP2736-003	3
		CP2737-004	7
		CP2737-009	3
		CP2741-017	6
		CP2742-002	3
	Champsodon snyderi	CP2661-003	4
		CP2672-016	1
		CP2710-007	8
		CP2711-003	10
		CP2712-020	16
	Champsodon sp.	CP2656-014	24
	Champsodon sp.2	CC2723-003	6
		CC2743-023	10
		CP2653-033	70
		CP2654-006	200
		CP2709-014	5
		CP2719-010	8
		CP2727-009	1
		CP2736-004	4
		CP2741-004	9
		CP2748-016	3
	Champsodontidae	CP2659-005	5
		CP2665-011	23
Champtodontidae	Champsodon snyderi	CC2723-004	8
	Champsodon sp.2	CP2720-001	4
Chaunacidae	Chaunax abei	CP2658-001	1
	Chaunax sp.	CC2744-027	1
		CP2657-007	3
		CP2734-005	1
		CP2734-008	2
		CP2735-013	1
	Chaunex sp.2 (black spots)	CP2658-021	1
Chimaeridae	Hydrolagus barbouri	CC2700-008	1
	Hydrolagus mitsuhurii	CC2691-002	1
Chlorophthalmidae	Chlorophthalmus sp.	CC2725-001	1
		CC2733-009	5
		CC2743-002	1
		CC2746-010	1
		CP2695-008	2
		CP2709-002	2
		CP2711-001	35
		CP2727-003	3
		CP2730-004	1
		CP2735-009	3
		CP2749-001	1
	Chlorophthalmus sp.	CP2658-022	1
	Chlorophthalmus sp. (CF black band)	CP2662-001	3
Citharidae	Citharoides macrolepidotus	CC2746-018	2
		CP2666-015	1
		CP2741-014	1
	Lepidoblepharon sp. (left flounder)	CP2665-001	1
Congridae	Bathycongrus retrotincta	CP2709-013	2
		CP2716-005	1
	Congridae sp.	CP2695-012	1
		CP2721-001	1
	Congriscus megastomus	CP2709-010	1
	Gnathophis nystromi	CP2658-008	1
		CP2664-001	1
		CP2667-007	1

		CP2672-002	1
		CP2707-006	
		CP2712-024	1
		CP2720-004	2
		CP2737-003	1
	Gnathophis nystromi (short)	CP2715-001	1
	Gnathophis nystromi nystromi	CC2733-016	1
	Gnathophis xenica	CC2700-016	2
		CC2723-010	1
		CP2663-005	1
		CP2699-003	3
		CP2715-003	1
	Parabathymyrus macrophthalmus	CC2722-006	1
		CP2715-002	1
		CP2716-004	1
		CP2727-013	1
		CP2730-001	1
		CP2731-003	1
	Urogonger lepturus	CP2686-002	1
		CP2686-003	1
Cynoglossidae	Cynoglossidae (black and white bands)	CP2695-010	4
	Cynoglossidae (white, one eye)	CP2660-003	1
	Cynoglossus sp.	CP2653-011	2
		CP2654-012	16
		CP2655-009	1
		CP2671-003	1
		CP2712-002	2
	Cynoglossus sp.	CC2744-014	2
		CP2734-006	1
		CP2735-005	2
		CP2742-005	1
		CP2747-004	8
		CP2760-003	2
	Symphurus orientalis (bands on fin)	CP2661-017	1
	Symphurus sp.	CP2658-002	4
Dactyloperidae	Dactylopera sp.	CP2747-003	1
Dactylopteridae	Dactylopera sp.	CP2654-022	1
		CP2655-017	1
		CP2712-017	4
	Dactyloptena gilberti	CP2653-003	12
Dasyatidae	Dasyatis sp.	CP2655-002	1
Etmopteridae	Etmopterus lucifer	CC2744-026	3
		CC2745-011	4
Eurypharyngidae	Eurypharynx sp.	CC2703-007	1
		CP2690-002	1
		CP2756-007	1
Evermannellidae	Odontostomops normalops	CP2753-001	1
		CP2756-006	1
Fistularidae	Fistularia petimba	CP2653-023	2
		CP2654-025	1
Fistulariidae	Fistularia sp.	CP2764-011	1
Gempylidae	Rexea nakamurai	CP2657-001	1
	Rexea prometheoides	CC2743-019	1
		CC2744-018	1
Gobiidae	bogy sp.	CP2737-013	1
	Centrodraco acanthopoma	CP2695-009	3
	Ctenotrypauchen microcephalus	CC2722-008	1
		CC2722-010	1
		CP2716-003	1
		CP2717-003	1
		CP2762-006	2
		CP2764-005	1
	Gobiidae sp.	CP2719-008	1
	Gobiidae sp.2	CP2712-008	6
	Gobiidae sp.4	CC2723-005	5
	Goby (Gobiodon like)	CP2653-009	1
	goby (Oligolepis)	CP2653-014	1
	goby sp.1 (yellow strips on body and tail)	CP2661-013	3
	goby sp.2 (yellow strips on body and spots on tail)	CC2746-015	1
		CP2656-016	1
		CP2661-016	1
		CP2665-012	1
		CP2667-008	1
		CP2737-008	1
		CP2748-017	4
	goby sp.3	CP2661-014	2
	Oxyurichthys saru	CP2763-015	1
	Oxyurichthys sp. (goby, long tail, yellow spot)	CP2654-014	2
		CP2665-004	1
Gonostomatidae	Cyclothone atraria	CP2679-007	1
		CP2689-005	1
	Cyclothone sp.	CP2708-013	1
	Gonostoma elongatum	CC2704-001	1
	Sigmops gracile	CC2691-005	1
		CC2702-005	
		CP2679-008	1
		CP2680-001	1
		CP2684-002	1
		CP2756-003	3
Halosauridae	Aldrovandia affinis	CC2702-008	2
		CP2681-001	
		CP2684-001	1
		CP2752-003	1
		CP2754-002	2
	Aldrovandia sp.	CP2663-001	1
	Aldrovandis affinis	CP2689-001	1
		CP2690-005	1
	Halosaurupsis macrochir	CP2688-001	1
		CP2754-001	1
		CP2755-003	1
		CP2756-009	1
Hoplichthyidae	Hoplichthys gilberti	CC2743-006	2
		CP2695-001	1
	Hoplichthys langsdorfii	CP2656-003	2
		CP2711-007	1
	Hoplichthys regani	CP2656-002	1
	Hoplichthys sp.	CP2656-018	1
		CP2719-006	3
	Hoplichthys sp. (CF pink)	CP2655-004	6

		CP2666-007	3
Ipnopidae	Bathypterois guentheri	CC2691-001	2
		CP2679-005	1
		CP2755-001	1
		CP2756-001	1
	Bathypterois maronae	CC2702-002	2
		CP2690-001	1
	Ipnops agassizii	CP2752-002	1
Leiognathidae	Leiognathus rivulatus	CP2761-009	1
		CP2763-002	1
Lophiidae	Antennarius sp.	CP2747-012	1
	Chaunax sp.	CC2733-006	1
	Lophiodes miacanthus	CP2656-008	1
		CP2658-018	4
		CP2660-007	1
		CP2663-009	1
		CP2720-003	1
	Lophiodes sp.	CC2743-015	1
		CC2745-014	1
		CC2746-003	2
		CC2746-019	
		CP2657-016	2
		CP2659-004	1
		CP2666-011	1
		CP2667-016	1
		CP2711-002	2
		CP2727-006	1
		CP2731-001	2
		CP2735-010	1
		CP2736-009	2
		CP2741-009	1
		CP2742-004	1
		CP2747-017	1
		CP2750-001	1
	Lophiomus setigerus	CC2723-012	2
		CP2653-013	1
		CP2654-013	7
		CP2661-015	1
		CP2712-003	1
		CP2718-007	1
Lutjanidae	Pristipomoides zonatus	CP2709-009	1
Macrouridae	Bathygadus antrodes	CC2702-011	2
		CC2703-004	2
	Caelorinchus anatirostris	CC2700-010	1
	Caelorinchus asteroides	CC2691-007	1
		CC2700-009	1
		CC2702-001	5
	Caelorinchus cingulatus	CC2744-021	1
		CC2745-007	1
		CP2658-007	8
		CP2673-004	1
		CP2695-002	5
		CP2735-003	3
		CP2750-002	1
	Caelorinchus longissimus	CP2709-011	1
	Caelorinchus sp.	CP2671-002	2
		CP2711-017	11
	Cetonurus robustus	CC2703-003	1
	Coryphaenoides marginatus	CC2701-001	1
	Coryphaenoides nasutus	CC2691-006	1
	Dicrolene quinquarius	CC2702-010	4
	Gadomus colletti	CC2702-021	1
		CP2735-017	1
	Hymenocephalus hachijoensis	CC2700-017	3
		CC2700-019	9
		CC2745-009	3
		CP2657-008	30
		CP2658-010	13
		CP2660-009	1
		CP2663-008	10
		CP2671-004	1
		CP2678-005	9
		CP2707-007	5
		CP2727-004	1
		CP2735-015	5
	Hymenocephalus lethonemus	CC2700-015	12
		CC2701-006	2
		CP2664-004	13
		CP2695-014	2
		CP2699-006	4
		CP2731-009	1
		CP2750-004	2
	Hymenocephalus sp.	CC2744-005	1
	Hymenocephalus sp. (head and P1 base with dark spot)	CP2673-005	7
	Hymenocephalus striatissimus	CP2735-016	1
	Macrouridae sp.2 (red mouth)	CP2659-002	1
	Pseudonezumia cetonuropsis	CC2702-004	5
	Ventrifossa fusca	CC2700-011	1
		CC2701-011	2
	Ventrifossa japonicus	CC2744-020	2
		CC2744-022	1
		CC2745-008	1
		CP2678-006	1
		CP2678-008	7
		CP2679-004	1
		CP2699-002	2
		CP2707-004	2
		CP2708-010	1
		CP2709-019	1
		CP2715-006	1
		CP2736-005	1
		CP2749-005	1
		CP2749-008	1
		CP2750-003	3
	Ventrifossa sp.	CC2700-018	2
		CP2735-004	6
	Ventrifossa sp. (P1 base black)	CP2678-007	1
Microstomatidae	Nansenia ardesiaca	CP2658-004	1
Monacanthidae	Cantherhines fronticinctus	CP2712-009	1
	Monacanthidae	CP2655-020	1
	Paramonacanthus sp.	CP2653-012	7
		CP2654-015	3
		CP2655-011	2
Mullidae	Upeneus sp.	CP2653-019	1
		CP2747-013	2
Muraenidae	Muraenidae sp.	CC2723-013	1
Myctophidae	Diaphus fragilis	CP2672-007	1

	Diaphus sp.	CC2744-008	11
		CC2744-010	1
		CC2745-010	3
		CP2678-009	1
		CP2709-007	1
		CP2749-003	1
	Electrona sp.	CP2685-002	2
		CP2690-003	1
	Myctophum asperum	CC2701-009	1
	Notoscopelus caudispinosus	CP2699-001	1
	Symbolophorus evermanni	CC2702-009	2
	Taaningichthys minimus	CP2658-020	1
	Tanninggichthys sp.	CC2703-005	1
Myxinidae	Eptatretus sp.	CC2702-017	2
Nemipteridae	Nemipteridae	CP2653-022	1
	Nemipterus marginatus (CF yellow mark)	CP2665-005	1
	Nemipterus sp.	CP2760-005	1
		CP2762-014	1
		CP2763-013	3
		CP2764-013	2
	Parascolopsis inermis	CP2747-009	1
	Parascolopsis sp.	CP2712-007	1
Neoscopelidae	Neoscopelus macrolepidotus	CC2701-010	2
		CC2702-007	2
		CP2660-011	1
		CP2663-004	1
		CP2664-002	2
		CP2679-002	2
		CP2679-003	1
	Neoscopelus microchir	CC2691-009	1
		CC2700-002	9
		CC2744-006	3
		CC2745-004	1
		CP2657-010	16
		CP2658-012	1
		CP2672-004	3
		CP2699-004	1
		CP2708-005	3
		CP2717-005	1
		CP2727-008	1
		CP2729-003	2
		CP2731-006	2
		CP2735-002	8
		CP2736-007	1
Nettastomatidae	Nettastoma solitarium	CP2710-006	1
	Nettastoma sp.	CC2701-005	1
	Saurenchelys sp.	CP2709-018	1
	Venefica tentaculata	CC2691-008	1
Nomeidae	Psenes cyanophrys	CC2743-021	2
	Psenes maculatus	CC2745-002	2
		CP2660-001	1
Ogcocephalidae	Halicmetus ruber	CP2663-006	1
		CP2673-006	1
		CP2678-003	1
	Halicmetus sp. (black body)	CP2680-002	2
	Halieutaea indica	CP2653-031	1
	Halieutaea sp. (Grey color)	CP2654-023	1
		CP2679-006	1
		CP2711-009	1

		CP2717-015	2
		CP2720-005	1
		CP2721-002	2
	Halieutaea sp.?	CP2695-004	1
	Halieutaea sp.2 (PF black band)	CC2702-003	
		CC2722-007	2
		CP2661-009	2
		CP2663-012	1
		CP2665-006	1
		CP2672-012	1
		CP2712-016	
		CP2715-009	1
	Halieutaea stellata	CC2743-016	1
		CC2746-001	4
		CP2654-005	5
		CP2655-003	2
		CP2657-012	1
		CP2658-013	1
		CP2662-009	1
		CP2712-004	
		CP2716-002	4
		CP2716-009	1
		CP2719-009	1
		CP2731-005	1
		CP2742-006	1
		CP2747-018	10
		CP2748-001	1
		CP2748-010	1
		CP2760-011	1
	Halieutopsis stellifer (transparent body)	CP2661-010	2
	Malthopsis annulifera	CC2733-012	2
		CC2743-017	1
		CP2657-023	1
		CP2662-006	1
		CP2667-014	1
		CP2708-012	1
		CP2709-016	3
		CP2717-014	1
		CP2748-004	1
	Malthopsis mitrigera	CC2733-017	1
		CC2743-014	1
		CP2657-019	9
		CP2660-006	1
		CP2708-001	1
		CP2710-004	1
		CP2736-006	2
		CP2737-007	3
	Malthopsis mitrigera (hybrid)	CC2733-015	1
	Malthopsis sp. (turbcles)	CP2663-007	1
	Malthopsis tutea	CP2656-005	8
		CP2656-017	7
		CP2658-014	2
		CP2662-005	10
		CP2667-013	1
		CP2720-011	1
Oneirodidae	Oneirodes sp.	CP2683-001	1
Ophichthidae	Ophichthus megalops	CP2727-001	1
	Ophichthus tsuchidae	CP2657-014	1
	Ophichthus urolophus	CP2672-009	1

Ophidiidae	Beobythites nigromaculatus	CP2717-009	3
	Dicrolene quinquarius	CP2679-001	1
	Glyptophidium japonicum	CP2657-020	3
		CP2663-002	3
		CP2699-008	4
		CP2708-008	1
	Homostolus acer	CP2707-005	1
	Monomitopus kumae	CC2691-003	3
		CC2691-012	1
		CC2704-002	1
		CP2680-003	1
		CP2686-004	1
		CP2688-003	1
		CP2729-004	2
	Monomitopus pallidus	CC2691-014	1
		CC2702-013	1
		CP2663-010	1
		CP2663-011	1
		CP2680-004	1
		CP2685-001	1
		CP2715-007	1
	Monomitopus sp.	CP2717-006	1
		CP2721-004	1
	Neobythites nigromaculatus	CP2655-012	1
		CP2659-003	1
		CP2709-004	1
	Neobythites sivicolus	CC2722-004	1
		CP2663-003	3
		CP2709-008	2
		CP2716-001	1
		CP2717-013	1
		CP2720-008	1
	Neobythites stigmosus	CC2700-012	2
		CC2725-003	1
		CC2743-011	2
		CC2745-018	1
		CP2656-011	7
		CP2657-015	3
		CP2658-011	7
		CP2660-005	1
		CP2667-009	4
		CP2672-006	2
		CP2672-008	1
		CP2678-001	2
		CP2707-002	2
		CP2708-009	1
		CP2709-006	2
		CP2727-005	3
		CP2730-005	1
		CP2731-004	2
		CP2734-002	1
		CP2735-014	1
		CP2737-001	2
	Ophidiidae (long p1, CF margin black)	CP2664-003	2
	Porogadus guentheri	CC2704-005	1
		CP2688-004	1
	Porogadus sp.	CP2752-006	1
	Sirembo imberbis	CP2654-003	2
	Xyelacyba myersi	CC2702-018	1
		CP2752-001	1
		CP2756-005	1
Ophiidae	Neobythites nigromaculatus	CP2748-009	1
	Neobythites stigmosus	CC2744-001	2
		CP2736-012	3
Parabembridae	Hoplichthys langsdorfii	CC2746-005	1
	Parabembras sp.	CC2744-009	3
		CP2735-011	2
Paralepididae	Lestrolepis japonica	CC2700-006	1
	Stemonosudis rothschildi	CC2744-004	1
		CC2745-017	1
Paralichthyidae	Pseudorhombus pentophthalmus	CP2654-001	4
Percichthyidae	Howella parini	CC2702-006	1
	Howella zina	CC2701-007	2
		CP2689-004	1
Percophidae	Acanthaphritis uroorum	CP2695-005	0
	Bembrops caudimacula	CC2744-019	2
		CP2656-010	1
		CP2657-013	9
		CP2658-019	4
		CP2667-001	1
		CP2667-002	1
		CP2727-014	1
		CP2731-008	1
	Bembrops caudimacura	CC2743-004	4
		CC2745-001	
	Bembrops curcatura	CC2743-007	4
	Bembrops curvatura	CC2723-011	6
		CC2743-024	1
		CC2746-011	5
		CP2655-010	5
		CP2661-006	2
		CP2662-010	1
		CP2709-001	3
		CP2711-020	1
		CP2715-004	1
		CP2719-005	5
		CP2736-008	1
		CP2737-005	1
		CP2741-001	3
	Bembrops filifera	CC2733-005	1
		CP2660-010	1
		CP2695-006	1
		CP2696-003	1
		CP2735-008	1
		CP2736-013	1
	Bembrops sp.	CP2666-006	2
		CP2717-007	1
		CP2718-003	9
	Percophidae sp.1 (yellow spots)	CC2723-008	5
	Percophidae sp.2 (bands)	CC2723-015	1
Peristediidae	Gargariscus prionocephalus	CC2733-007	2
		CP2655-001	1
		CP2666-004	1
	Gargariscus sp.	CP2655-006	1
	Peristedion nierstraszi	CP2709-012	4
	Peristedion orientale	CP2657-024	1
		CP2672-001	1
	Peristedion orientale ?	CP2659-001	1

	Satyrichthys hians	CC2744-015	2
		CP2658-005	2
		CP2737-010	1
	Satyrichthys murrayi	CC2744-023	1
		CP2658-006	1
	Satyrichthys rieffeli	CP2710-010	1
	Satyrichthys sp.1	CP2657-005	1
	Satyrichthys sp.2	CP2657-006	2
		CP2737-012	1
	Satyrichthys sp.3	CP2672-013	1
	Satyrichthys sp.4	CC2746-013	1
		CP2656-006	5
		CP2710-011	5
	Satyrichthys sp.5	CP2672-014	1
		CP2711-019	1
	Satyrichthys welchi ?	CP2667-005	1
Phosichthyidae	Polymetme corythaeola	CC2700-003	3
		CP2660-004	1
	Polymetme sp.	CC2744-002	1
		CP2749-007	1
Pinguipedidae	Parapercis sp. (2 spots on CF)	CP2661-004	2
		CP2712-018	1
		CP2741-016	1
		CP2747-014	8
		CP2748-003	1
	Parapercis sp.2	CP2653-005	1
		CP2747-007	2
	Parapercis sp.3	CP2653-006	1
Platycephalidae	Pristigenys niphomia	CP2654-018	1
	Rogadius patriciae	CP2653-017	1
		CP2761-007	1
		CP2762-004	3
		CP2764-001	1
Poecilopsettidae	Poecilopsetta plinthus	CP2711-010	1
	Poecilopsetta plinthus ?(CF 2 and P1 black spots)	CP2656-007	3
	Poecilopsetta plinthus ?(CF 2 spots)	CP2655-005	6
	Poecilopsetta plinthus?	CP2708-011	110
Polymixiidae	Polymixia longispina	CC2743-003	1
Priacanthidae	Priacanthidae sp.1 (red)	CP2653-029	180
		CP2654-010	40
		CP2665-003	5
	Priacanthidae sp.2 (grey)	CC2746-016	1
		CP2653-030	450
		CP2654-009	20
	Priacanthus blochii	CP2747-002	2
	Priacanthus macracanthus	CP2655-007	4
		CP2709-015	9
		CP2712-010	1
		CP2747-015	8
		CP2748-002	1
		CP2748-018	1
		CP2760-004	4
		CP2761-008	1
		CP2762-010	3
		CP2763-010	3
		CP2764-009	7
	Pristegenys niphonia	CP2653-018	3
	Pristigenys meyeri	CP2661-011	1
	Pristigenys niphomia	CP2654-020	1
	Pristigenys niphonia	CC2746-006	1
		CP2747-006	5
		CP2747-028	3
	Pristigenys sp. (CF with black spots)	CP2665-010	1
Samaridae	Poecilopsetta plinthus ?(CF 2 and P2 black spots)	CP2657-017	1
	Samariscus latus	CP2761-003	1
Scorpaenidae	Dendrochirus sp.	CP2747-024	4
	Ebosia bleekeri	CC2746-007	2
	Erisphex pottii	CC2746-008	1
	Halicolenus sp. ? (Scorpaenidae)	CP2665-009	1
	Inimicus didactylus	CP2653-010	2
	Inimicus sp.	CP2654-019	3
		CP2712-012	1
	Minous sp.	CP2762-013	1
	Pontinus macrocephalus	CC2733-004	5
	Pterois sp.	CP2665-008	1
		CP2712-006	
		CP2760-010	1
		CP2762-003	1
		CP2763-004	1
	Satarchis lingimanus	CP2734-003	5
	Satarchis lingimanus	CP2735-001	4
	Scorpaena miostoma	CP2653-002	3
	Scorpaena neglecta	CP2653-034	1
		CP2661-007	5
		CP2711-011	2
		CP2712-013	1
		CP2717-010	11
		CP2741-005	2
		CP2747-001	16
		CP2760-008	1
	Scorpaenidae (red-black)	CP2659-006	1
	Scorpaenopsis sp.	CP2653-001	2
		CP2655-008	1
	Setarches guentheri	CC2744-016	2
		CP2656-012	17
		CP2657-011	25
		CP2658-015	5
	Setarches longimanus	CC2733-010	1
		CC2743-009	21
		CC2744-017	1
		CC2745-016	1
		CP2657-004	1
		CP2658-016	2
		CP2666-008	1
		CP2667-011	1
		CP2667-012	1
		CP2708-003	1
		CP2711-014	3
		CP2736-002	6
		CP2748-015	3
		CP2749-006	1
Scyliorhinidae	Galeus sauteri	CP2657-003	2
	Galeus sp.	CC2745-012	3
		CP2731-010	1
		CP2735-012	1
		CP2736-010	1

		CP2750-005	1
Serranidae	Chelidoperca sp.	CC2746-021	1
		CP2655-018	1
		CP2656-013	1
		CP2657-021	1
		CP2662-004	1
		CP2666-002	4
		CP2712-015	6
	Epinephelus sp.	CP2763-014	2
	Plectranthias sp.	CC2746-025	1
		CP2747-011	1
	Plectranthias sp.1	CC2746-023	1
		CP2653-004	1
		CP2653-007	3
		CP2654-008	10
		CP2712-019	4
		CP2719-014	1
	Plectranthias sp.2 (lingutudinal line)	CP2665-007	6
		CP2747-026	6
	Pseudanthias sp.	CP2661-001	1
		CP2741-007	1
	sp.1	DW2758-001	2
	sp.2	DW2758-002	1
	sp.3	DW2758-003	1
		DW2758-004	1
	Tosana niwae	CP2653-020	5
Serrivomeridae	Serrivomer sector	CC2691-013	1
Soleidae	Heteromycteris sp.	CP2709-003	2
		CP2711-018	2
		CP2748-008	1
Squalidae	Squalus brevirostris	CC2691-004	1
	Squalus sp.	CC2702-014	1
Sternoptychidae	Polyipnus spinifer	CP2730-003	3
	Polyipnus sp.	CC2733-008	1
	Polyipnus spinifer	CC2725-002	1
		CC2743-008	1
		CC2744-013	17
		CC2745-015	11
		CP2660-008	35
		CP2708-006	1
		CP2727-011	1
		CP2731-007	1
		CP2734-001	4
		CP2735-006	14
	Polyipnus stereope	CC2700-014	2
		CP2657-002	4
		CP2658-009	9
		CP2678-004	3
		CP2699-005	3
	Sternoptyx obscura	CC2704-003	1
Stomiidae	Astronesthes lucifer	CC2733-014	1
		CC2744-003	2
		CC2745-003	3
	Astronesthes sp.	CC2722-009	1
		CC2746-022	1
	Borostomias elucens	CP2689-002	1
	Chauliodus sloani	CC2701-004	1
		CC2703-006	1
		CP2678-002	1
		CP2690-004	1
	Eustomias bifilis	CP2684-003	1
	Idiacanthus fasciola	CC2701-013	
		CP2678-010	1
	Stomias nebulosus	CC2701-012	
		CC2725-005	1
Synaphobranchidae	Ilyophis brunneus	CC2691-010	2
		CC2702-016	1
	Synaphobranchus affinis	CC2702-012	4
	Synaphobranchus bathybius	CP2688-002	1
	Synaphobranchus brevidorsalis	CP2683-002	1
	Synaphobranchus kaupii	CC2691-011	2
		CP2686-001	1
	Synaphobranchus sp. (body white)	CC2702-015	1
	Synaphobranchus sp. (P1 black)	CC2702-020	1
		CC2703-002	1
		CC2704-004	1
Syngnathidae	pipefish	CP2667-006	1
Synodontidae	Harpadon microchir	CP2673-003	1
	Saurida sp.1	CP2654-007	15
	Saurida sp.2	CC2723-001	1
		CC2746-002	1
		CP2712-021	6
		CP2712-023	4
		CP2747-016	3
		CP2760-001	2
		CP2761-004	4
		CP2762-008	7
		CP2764-008	2
	Saurida wanieso	CP2719-003	1
	Synodus sp.	CP2653-016	4
		CP2747-025	4
	Synodus sp. (pink)	CP2654-024	1
Tetraodontidae	Arothron sp.	CC2723-014	1
		DW2670-001	1
	Takifugus sp.	CP2654-017	3
	Torquigener sp.	CP2653-015	1
Trachichthyidae	Aulotrachichthys sajademalensis	CC2722-001	1
		CP2715-010	1
		CP2716-006	1
		CP2717-004	2
		CP2720-002	3
		CP2721-003	1
	Hoplostethus melanopus	CC2701-002	1
Triacanthidae	Triacanthodes anomalus	CC2746-024	2
		CP2710-012	1
Triacanthodidae	Halimochirurgus alcocki	CC2744-025	1
	Triacanthodes anomalus	CP2662-007	1
		CP2666-010	1
	Tydemania navigatoris	CC2700-001	1
Trichiuridae	Benthodesmus elongatus	CC2700-005	2
	Bethodesmus tenuis	CC2743-010	1
		CC2744-007	4
		CC2745-013	2
		CP2660-002	1
		CP2672-005	1
		CP2734-004	2

		CP2749-004	1
Trigliae	Cheridonichthys ischyrus	CC2746-004	4
Triglidae	Lepidotrigla sp.	CP2711-008	6
		CP2712-005	2
		CP2712-011	1
		CP2741-008	2
	Pterygotrigla hemisticta	CP2662-008	2
	Pterygotrigla macrolepidota	CP2655-015	6
		CP2666-005	3
		CP2718-005	4
		CP2719-002	
	Pterygotrigla sp.	CC2723-006	1
		CC2746-026	1
		CP2708-002	2
		CP2741-002	1
	Triglidae sp. (long sine on uper neck)	CP2666-003	1
Uranoscopidae	Uranoscopus tosae	CP2654-002	1
		CP2655-019	1
		CP2656-009	2
		CP2662-012	1
		CP2710-001	1
		CP2715-005	2
		CP2719-004	5
		CP2760-006	1
		CP2761-006	3
		CP2762-001	7
		CP2763-001	3
		CP2764-003	3
	Xenocephalus elongatus	CP2656-015	1
96	359	954	3581

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Dr Tan Swee Hee assembled an early version of this report, and Joeren Yleaña, Jed Danao, and Marlo Demo-os prepared station maps. Philippe Maestrati (MNHN) put together the final lay-out and organized the production of the paper copies of the report.

Paris and Manila, 16 March 2008.
Philippe Bouchet
Marivene Manuel Santos.

Appendices: Background of Collaborating Institutions

Bureau of Fisheries and Aquatic Resources (BFAR)

The Bureau of Fisheries and Aquatic Resources (BFAR) is the government agency responsible for the development, improvement, management and conservation of the country's fisheries and aquatic resources. It was reconstituted as a line bureau by virtue of Republic Act No. 8550 (Philippine Fisheries Code of 1998). The bureau is under the Department of Agriculture.

As a line bureau, BFAR has the following functions:
Prepare and implement a comprehensive National Fisheries Industry Development Plan;

- Issue licenses for the operation of commercial fishing vessels;
- Issue identification cards free of charge to fishworkers engaged in commercial fishing;
- Monitor and review joint fishing agreements between Filipino citizens and foreigners who conduct fishing activities in international waters and ensure that such agreements are not contrary to Philippine commitment under international treaties and convention on fishing in the high seas;
- Formulate and implement a Comprehensive Fishery Research and Development Program, such as, but not limited to, sea farming, sea ranching, tropical / ornamental fish and seaweed culture, aimed at increasing resource productivity improving resource use efficiency, and ensuring the long term sustainability of the county's fishery and aquatic resources
- Establish and maintain a comprehensive Fishery Information System;
- Provide extensive development support services in all aspects of fisheries production, processing and marketing;
- Provide advisory services and technical assistance on the improvement of quality of fish from the time it is caught (i.e., on board fishing vessels, at landing areas, fish markets, to the processing plants and to the distribution and marketing chain);
- Coordinate efforts relating to fishery production undertaken by the primary fishery producers, LGUs, FARMCs, fishery and organization / cooperatives;
- Advise and coordinate with LGUs on the maintenance of proper sanitation and hygienic practices in fish markets and fish landing areas;
- Establish a corps of specialists in collaboration with the Department of National Defense, Department of the Interior and Local Government and Department of Foreign Affairs for the efficient monitoring, control and surveillance of fishing activities within Philippine territorial waters and provide the necessary facilities, equipment and training thereof;
- Implement and inspection system for import and export of fishery / aquatic products and fish processing establishments consistent with international standards to ensure product quality and safety;
- Coordinate with LGUs and other concerned agencies for the establishment of productivity-enhancing and market development programs in fishing communities to enable women to engage in other fisheries / economic activities and contribute significantly to development efforts;
- Enforce all laws, formulate and enforce all rules and regulations governing the conservation and management of fishery resources, except in municipal waters and to settle conflicts of resource use and

allocation in consultation with the NFARMC, LGUs and local FARMCs;
- Develop value-added fishery products for domestic consumption and export;
- Recommend measures for the protection / enhancement of the fishery industries;
- Assist the LGUs in developing their technical capability in the development, management, regulation conservation and protection of the fishery resources;
- Formulate rules and regulations for the conservation and management of straddling fish stocks and highly migratory fish stocks; and
- Perform such other related functions which shall promote the development, conservation, management protection and utilization of fisheries and aquatic resources.

Brief History

When the Civil Government was established on July 4, 1901, the Philippine Commission proposed the creation of an Office under the Department of the Interior to take charge of the conservation, promotion and development of the country's fishery resources. This was not carried out, due to limited funds. The Secretary of the Interior continued to stir interest in the development of fisheries. Finally, in 1907, studies in fisheries began following the arrangements made by the Secretary of the Interior for the services of the U.S. Fish Commission research fishing vessel "Albatross" to work in Philippine waters for eighteen months; and the employment of an American specialist in fisheries in the Bureau of Science to take charge of all work pertaining to fisheries. This Division remained under the Bureau of Science until the end of 1932.

On January 1, 1933, by virtue of General Memorandum Order No. 4, dated December 5, 1932, of the Secretary of Agriculture and Commerce, the Division of Fisheries and the Division of Zoology of the Bureau of Science, together with the Division of Forest Fauna and Grazing of the Bureau of Forestry, were fused into one special division known as the Fish and Game Administration, which was placed under the direct administrative jurisdiction of the Department of Agriculture and Commerce. Under this arrangement, the Fish and Game Administration operated under the provisions of the Fisheries Act (Act No. 4003) and Act No. 2590, entitled "An Act for the Protection of Game and Fish." By subsequent reorganization effected on September 27, 1934, the Fish and Game Administration was returned to the Bureau of Science. The reason for its return was to strengthen the office through the use of equipment, personnel, and appropriation of the said Bureau.

On July 1, 1939, under the provisions of General Administrative Order No. 15, the Fish and Game Administration was reorganized as an independent unit under the Department of Agriculture and Commerce and renamed *Division of Fisheries*. The functions pertaining to forest fauna and grazing were returned to the Bureau of Forestry and those of the Division of Zoology to the Bureau of Science.

The Division of Fisheries, as a special division under the Department of Agriculture and Commerce, functioned until the outbreak of the war in 1941. During the early days of World War II, the Division of Fisheries was fused with the Bureau of Forestry and then known as the Bureau of Forestry and Fishery. In the latter part of the enemy occupation, however, the Division of Fisheries was converted into an independent office known as the *Bureau of Fisheries.*

Taking cognizance of the increasing importance of effectively administering and conserving our fishery and other aquatic resources in our efforts to rehabilitate our prostrate economy, the Congress of the Philippines enacted Republic Act No. 177 creating the present Bureau of Fisheries which took effect on July 1, 1947. The Division of Fisheries and all sections, field districts, experimental stations and all activities and agencies of the National Government connected with fishery work have been incorporated in the Bureau of Fisheries.

As organized on July 1, 1947, the Bureau of Fisheries had seven functional divisions, namely, (1) Administrative Division, (2) Division of Fish Culture and Fisheries Biology, (3) Division of Commercial Fisheries, (4) Division of Fisheries Technology, (5) Division of Licenses and Regulations, (6) Division of Investigation and Inspection, and (7) Philippine Institute of Fisheries Technology offering a 2 1/2-year course in fisheries on the collegiate level. Subsequently, branches of this Institute offering a 4-year secondary course in fisheries were established in Samar, Cebu, Albay, Iloilo, Zamboanga City, Antique, and Batangas.

The entire Philippines was divided into ten fishery districts, each with a District Fishery Officer as head. The headquarters of the ten fishery districts were located in strategic places in the different fishing regions: Fishery District No. 1-Aparri, Cagayan; 2-Dagupan City; 3-Manila; 4-Naga City; 5-Catbalogan, Samar; 6-Iloilo City; 7-Coron, Palawan; 8-Cebu City; 9-Davao City; and 10-Zamboanga City.

Under the Reorganization Plan No. 30-A, reorganizing the Department of Agriculture and Natural Resources as implemented by Executive Order No. 216, dated November 17, 1956, the Bureau of Fisheries was reorganized again, effective January 16, 1957, such that functional divisions of the Bureau were reduced from seven to five, namely, (1) Licenses and Regulations Divisions; (2) Marine Fisheries Division; (3) Fisheries Research Division; (4) Inland Fisheries Division; and (5) Administrative Services Division.

The Philippine Institute of Fisheries Technology was transferred to the University of the Philippines. The seven secondary schools of fisheries in the provinces previously mentioned were transferred to the Department of Education, under the administration of the Bureau of Public Schools.

On March 20, 1963, Republic Act 3512 reorganized the Bureau of Fisheries into the *Philippine Fisheries Commission*. On September 30, 1972, under the Integrated Reorganization Plan, the Philippine Fisheries Commission was reverted to the Bureau of Fisheries. By virtue of Presidential Decree No. 461, signed on May 17, 1974, which reorganized the Department of Agriculture and the Department of Natural Resources, the Philippine Fisheries Commission was renamed *Bureau of Fisheries and Aquatic Resources* (BFAR) and placed under the Ministry of Natural Resources.

On June 30, 1984, BFAR was transferred from the Ministry of Natural Resources to the Ministry of Agriculture and Food, in compliance with Executive Order 967, mandating the conversion of BFAR as a staff Bureau and integrating its Regional Offices with the Regional Offices of the Department of Agriculture. The staff functions of the Central Office and the integration of BFAR's Regional Offices into Regional Offices of the Department of Agriculture was fully implemented with the issuance of Executive Order 116, signed by President Corazon Aquino on January 30, 1987.

After undergoing a series of reorganizations, BFAR today has nine (9) functional divisions: the Fisheries Policy Research and Economics Division, Fishery Resources Administration Division, Fisheries Development and Support Services Divisions, Aquaculture Division, Fisheries Resources Research Division, Exclusive Economic Zone Fisheries and Allied Services Division, Fishing Technology Division, Fisheries Regulation and Quarantine Division, and Post Harvest Technology Division. It also has eight (8) Fisheries Technology Centers under its wing: National Marine Fisheries Development Center, National Brackishwater Aquaculture Technology Research Center, National Freshwater Fisheries Technology Research Center, Tanay Freshwater Experimental Station, Fisheries Biological Station Complex, National Fisheries Research and Development Center, National Seaweeds Technology and Development Center, and the Mindanao Freshwater Fisheries Technology Center.

On February 25, 1998, President Fidel V. Ramos signed into law Republic Act. No. 8550, entitled, "An Act providing for the Development, Management and Conservation of the Fisheries and Aquatic Resources, Integrating All Laws pertinent thereto and for Other Purposes", otherwise known as the *Philippine Fisheries Code of 1998*. This law took effect on March 23, 1998.

This Code is very significant as it provided for the reconstitution of BFAR as a line bureau under the Department of Agriculture, and created the position of Undersecretary for Fisheries solely for the purpose of attending to the needs of the fishing industry. As a line bureau, BFAR shall be headed by a Director, assisted by two Assistant Directors, who shall supervise the administrative and technical services of the bureau respectively. It shall establish regional, provincial, and municipal offices, as may be appropriate and necessary to carry out efficiently and effectively the provisions of this Code. As proposed, BFAR will have eleven (11) divisions and (8) fisheries technology centers.

The National Fisheries Research and Development Institute (NFRDI) was created to serve as the research arm of BFAR, attached to the Department of Agriculture. The governance of NFRDI shall be vested in the Governing Board,

composed of nine (9) members. It shall have a separate budget specific to its manpower requirements and operations to ensure the independent and objective implementation of its research activities. The Code, likewise, provided for the creation of the National Fisheries and Aquatic Resources Management Council (NFARMC) as an advisory and recommendatory body to the Department of Agriculture, composed of fifteen (15) members. The members of NFARMC, except for the Undersecretary of Agriculture and the DILG Secretary, shall be appointed by the President upon the nomination of their respective organizations.

The National Museum, Manila (NMP)

The National Museum has a tri-dimensional goal covering diverse fields of knowledge through various educational, scientific and cultural activities.

As an educational institution, the National Museum disseminates scientific and technical knowledge in more understandable and practical forms through lectures, exhibitions, interviews, and publications for students and the general public.

As scientific institution, the National Museum conducts basic research programs combining integrated laboratory and field work in anthropology and archaeology, geology and paleontology, botany and zoology. It maintains reference collections on these disciplines and promotes scientific development in the Philippines.

As a cultural center, the National Museum has taken the lead in the study and preservation of the nation's rich artistic, historic and cultural heritage in the reconstruction and rebuilding of our nation's past and venerating the great individuals who helped in the building of our nation.

Brief History

The National Museum started in 1901 as the Insular Museum of Ethnology, Natural History and Commerce under the Department o f Public Instruction by virtue of Act No. 284 passed by the Philippine Commission. The name was changed in 1903 to Bureau of Ethnological Survey under the Department of Interior. After the St. Louis Exposition in 1904 the Office was renamed the Philippine Museum. The Bureau of Ethnological Survey which had a division called the Philippine Museum was abolished as a separate bureau and was made merely a Division of Ethnology under the Bureau of Education by virtue of Act No. 1407. In 1906, the Philippine Commission transferred the Division of Ethnology of the Bureau of Education to the Bureau of Science which had other branches of Natural Science such as botany, geology and paleontology, entomology, ichthyology, herpetology and mammalogy.

In 1916, the Philippine Legislature passed Act No. 2572 organizing the Philippine Library and Museum from the former division of archives, patents, copyright, trademarks and corporation of the executive bureaus; the former law library of the Philippine Assembly and the former Philipine Library. The Division of Ethnology continued to function under the Bureau of Science. In 1926, Act No. 3437 passed by the Philippine Legislature recreated the National Museum of the Philippines as part of the Department of Agriculture and National Resources and these consisted of the Ethnology Division and the Division of History and Fine Arts. The Division of Natural Science was not included in the organization.

Again in 1933, the Philippine Legislature passed Act No. 4007 abolishing the National Museum and distributing its activities, functions and materials to the following:

1. The Division of Fine Arts and History to the National Library;
2. The Ethnology Division to remain with the Bureau of Science;
3. The Division of Anthropology which included archaeology, ethnography and physical anthropology and the other sections of natural history of the Bureau of Science were organized into a National Museum Division with Dr. Leopoldo B. Faustino as its first chief.

In 1939, an administrative order renamed the division as the Natural History Museum Division, but after the Commonwealth Act No. 453 made the Division an independent unit directly under the office of the Secretary of Agriculture and Commerce.

The Japanese occupation saw the abolition of the Natural History Museum Division, but after the liberation of the Philippines in 1945, it was reestablished under the Department of Agriculture and Commerce and placed it under the Office of the Executive Secretary. In 1951, Executive Order

No. 392 transferred the National Museum to the Department of Education.

The reorganization of the Department was implemented in 1988. The National Museum's organizational structure together with its functions were improved and expanded. The Archaeology Division was created from a section of the Anthropology Division. It's function is to conduct researches on the prehistory of the Philippines in order to define the foundation of the culture of the people through systematic archaelogical excavations of land and underwater sites. Two existing divisions were renamed and their functions were expanded: the Restoration and Engineering Division takes charge of the implementation of Presidential Decree Nos. 260 and 756. It conducts nationwide surveys and documentation of important immovable cultural properties of the Philippines and has general supervision over the restoration, preservation,, reconstruction and remodelling of immovable cultural properties. The Archaeological Sites and Branch Museum Divisions that administers. maintains, preserves artifacts in situ in the archaeological sites, is also authorized to establish branch museums in the different regions of the country, concomittant with its goal of bringing the museum closer to the majority of the people in the countryside.

In the same year, two Presidential Proclamations on culture were issued by the President of the Philippines, pursuant to the 1987 Constitution, giving priority programs to the arts and culture. These were Presidential Proclamation No. 269, proclaiming the period from 1988 to 1998 as "The Decade of Centennials of the Filipino Nationalism, Nationhood and the Philippine Revolutionary Movement" and Presidential Proclamation No. 270 authorizing the National Museum to conduct a National Educational and Fund Campaign for the period June 12, 1988 to June 12, 1989.

On 26 January 1996, President Fidel V. Ramos signed Administrative Order No. 246 that created a Presidential Committee to oversee the rehabilitation of the National Museum complex. Earlier in October 1994, the President instructed the Secretaries of Finance and Tourism to prepare for the eventual turnover of the Finance and Tourism buildings to the National Museum.

In December 1995, the Department of Finance transferred to Bangko Sentral Complex and turned over the Finance building to the National Museum. The Department of Tourism was scheduled to turn over the Tourism building by the end of 1997.

In mid-1996, the Philippine Senate, in a historic move, vacated the Senate Chambers of the Executive House paving the way for its turn over to the National Museum thus providing the institution with the three buildings within the Agrifina Circle that would now form the National Museum precinct, the heart and soul of the National Museum system.

On February 12, 1998, President Fidel V. Ramos approved and signed Republic Act No. 8492, also known as the 'National Museum Act of 1998' that established a National Museum System and provided for its permanent home, among others.

In June 1998, the new National Museum located at the former Finance Building precinct was opened with the formal inauguration of the National Museum of the Filipino People and the exhibition of the permanent exhibit, ***The Story of the Filipino People***, and the world-class travelling exhibit, ***The Treasures of the San Diego***, which was returned to the Philippines after its world tour of Paris, Madrid, New York and Berlin. The formal inauguration formed a key part of the grand celebration of the Philippine centennial.

Muséum National d'Histoire Naturelle (MNHN)

Mission

Both a scientific establishment and a public service, applying itself to research and the dissemination of knowledge, the Museum has five main founding objectives which govern and nourish all of its activities.

Fundamental and Applied Research

To further knowledge about living beings.

The Museum's research activity consists of making inventories, organising and understanding biological and ecological diversity, its origin, role and dynamics in order to be able to contribute to the sustainable management of this diversity. Drawing from the Life sciences, the research calls upon two principal fields of knowledge: the Earth sciences, and human and social sciences.

The collections, archives of the planet

A fantastic memory of living beings and minerals; The management and conservation of the collections is one the central pillars in the Museum's statutory activities.

The museum exercises a major patrimonial function - to acquire, conserve, restore, manage and exhibit very important national collections of documents and natural history: collections of living organisms, inert collections and databases. The Museum is therefore, along with its counterparts in London and Washington, the richest source of collections in the world.

The inert object collections of palaeontology, geology, mineralogy, meteorites, botany, zoology, prehistory, anthropology, ethnobiology and chemistry are estimated to total over 60 million specimens.

The vocation of the collections

The Museum's collections are used for the purposes of scientific, cultural and educational research in the areas of the sciences of Life, Man, the Earth and the Universe. They are used by researchers to support their scientific studies or as examples of biodiversity within the framework of ecological or environmental studies. They are also made available to museologists for exhibitions and other scientific popularisation events, as well as to teachers for their training programmes.

Constitution and enhancement of the collections

The collections that the Museum manages come from erudite collectors or institutions such as the large research facilities, universities of educational establishments. They also come from donations, bequests, purchases or are attributed by the State. Their enhancement currently continues as part of the programmes of public and private research institutes, universities or from scientific expeditions. Initially study collections, they naturally have the vocation of becoming patrimonial collections for reasons that are clearly defined: scientific reference, biological or ecological relevance, extinct species, historical memory, etc. However, the national collections cannot be content with simply being the "collation" of researchers' individual collections, each one a reflection of a specific study. They must be put together and managed within the framework of a coherent, prospective policy that anticipates the needs of future generations. Their enhancement must be a response to priorities defined as part of a plan spanning a number of years that takes the interests of the community that is financing them into account. This policy, which must take the interests of all the national research organisms: universities, CNRS, IRD, INRA, IFREMER, etc. into consideration, is the reason for the transversal structure of the management of the Museum's collections.

Education and Pedagogy

To train in the sciences of nature and Man.

The first objective stated in the founding decree of 1793 and repeated in the succeeding statutes concerns education. This education is open to all, relying upon teachers who themselves carry out research and contribute directly to the development of the knowledge taught. Over 200 teacher-researchers, lecturers and professors are responsible for this objective.

A large palette of disciplines for very different audiences.

In the large range of disciplines covered, which range, for example, from the cellular and molecular mechanisms of evolution to the adaptation for analysis of the relationship between human societies and nature, the Museum addresses a wide variety of audiences:
- post-graduate students and doctorands, through the Master's course "Evolution, natural patrimony and societies", the research school 227 "Sciences of nature and Man", and the 12 diplomas of advanced studies (DEA) organised by the establishment or those where they are studying;
- secondary school teachers, through academic teacher training plans offered by the rectorates of different academies;
- secondary and primary school pupils, through reception by the departments for educational and cultural action, temporary exhibitions, the "Museum lessons", and various national operations of the guided personal work type (TPE);
- the general public, through public courses, conferences, visits to the departments and online training;
- continuous training for professionals, through training courses offered to various groups constituted on the bases of disciplines;
- individual visits by trainees of all levels in the area of natural history, etc.

Raising awareness, notions of responsibility and assisting teachers in their work.
One of the modern objectives of such a campaign vis-à-vis the general public is to offer the citizens the tools for thinking responsibly with regard to nature and the environment, between the optimistic and permissive vision of a robust and resistant world, and a restrictive vision considering, for example, each extinction of a species, or even a population, as a major ecological catastrophe.
Raising awareness at school level of the importance of biodiversity, the dialectics of uniqueness and the diversity in the living world, and the stakes and difficulties of its sustainable management should and must be done as early as possible during schooling: only a few prerequisites are necessary to be able to understand these questions, and a solid pedagogy, tested notably in the "Museum classes" would appear to be particularly suitable. The major stake is the action of the establishment intended to provide the teachers concerned with the necessary support for them to be able to accomplish this crucial objective of raising awareness themselves. It could also involve training in concepts for the supply of pedagogical material that are new or in rapid evolution, just as well as specific sessions as part of a global pedagogical project.

Dissemination

Making knowledge available to everyone
Through its actions of knowledge dissemination in all areas of natural history aimed at larger audiences, the Museum paves the way for visitors to have access to the scientific culture and to further their knowledge, providing a basis for their choices and decisions as citizens.

Right from the beginning, the vocation of the Museum has been to transmit its knowledge at all levels to all audiences. For generations, it has received ever-increasing numbers of visitors who are increasingly aware of what is at stake for nature and the sciences of Man. Its exhibition galleries, events, botanical gardens and zoos, wide choice of activities from a simple stroll to courses and conferences, workshops or film screenings offer a unique and original range of pedagogical spaces and relaxation. The range on offer makes the Museum the most important centre for the transmission of scientific knowledge in France.

Assessments

The knowledge acquired at the Museum about nature serves as an essential base for assessments in the area of natural patrimony. These assessments draw from all of the sectors of activity of the establishment and, in particular, upon research activities. As an independent scientific institution, the Museum appears as a real reference in this particularly sensitive area.

Assessments at the Museum concern two main fields of activity.
1. Inventories, monitoring biodiversity, management of species and spaces.
In this area, the assessment is carried out using acquired knowledge of the natural patrimony whether alive or historical.
2. Management of Conventions

The State has delegated the management of the procedures of response to national or international engagements which are the subject of conventions to the Museum. These engagements require the opinions of experts. The Museum's role, at this

level, is to ensure the coordination of the replies, synthesise them and transmit them.

By looking at the levels and the origins of the requests, three main types of assessments can be distinguisehed:

- technical support for policies at State, regional and public establishment level which consists of making available information, reports of evaluations with a view to decisions to be taken that concern the natural patrimony (for example, the Natura 2000 programme for which the Museum is the institution of reference of the Ministry of Ecology and Sustainable Development),
- ad-hoc assessments, sometimes dealing with "burning" subjects, such as the consequences of an oil slick for the survival of fauna or flora, the impact of the installation of wind turbines on the natural patrimony, etc.,
- individual, non-institutional requests which may concern an assessment of seeds delivered to a perfume manufacturer, the identification of a skull found in a burial ground located on a road alignment, etc.

Smithsonian Institution, National Museum of Natural History (SI)

About The Museum
Introduction to the National Museum of Natural History

The National Museum of Natural History (NMNH) is part of the Smithsonian Institution, the world's preeminent museum and research complex. The Museum is dedicated to inspiring curiosity, discovery, and learning about the natural world through its unparalleled research, collections, exhibitions, and education outreach programs. Opened in 1910, the green-domed museum on the National Mall was among the first Smithsonian building constructed exclusively to house the national collections and research facilities.

Whether looking at the history and cultures of Africa, describing our earliest Mammalian ancestor or primate diversity around the world, examining ancient life forms including the ever popular dinosaurs, or exploring the beauty of rare gemstones such as uniquely colored diamonds, the Museum's temporary and permanent exhibitions serve to educate, enlighten and entertain millions of visitors each year. The main building on the National Mall contains 1.5 million square feet of space overall and 325,000 square feet of exhibition and public space; altogether the Museum is the size of 18 football fields, and houses over 1000 employees. With a growing network of interactive websites, the Museum is transforming itself into a hub for national and international electronic education, accessible to anyone with access to the internet.

At the center of the Museum's exhibition and research programs are its expertly documented collections: more than 125 million natural science specimens and cultural artifacts. Just to name a few of our museum holdings, the collections include 30 million insects carefully pinned into tiny boxes; 4½ million plants pressed onto sheets of paper in the Museum's herbarium; 7 million fish in liquid-filled jars; and 2 million cultural artifacts, including 400,000 photographs housed in the National Anthropological Archives. Over 3½ million specimens are out on loan each year; over 15,000 visitor days are spent in the collections; and there are almost 600,000 additional visits to collection data bases available on the Web.

The Museum includes a state-of-the-art collections storage facility in Suitland, Maryland; a marine science research facility in Ft. Pierce, Florida; and field stations as far away as Belize, Alaska, and Kenya. Research activities are organized into seven departments, and a number of affiliated U.S. government agencies on-site contribute to the Museum's strength, including the Department of the Interior (U.S. Geological Survey Biological Resources Division), the Department of Agriculture (Systematic Entomology Laboratory), the Department of Commerce (National Marine Fisheries Service Systematics Laboratory), and the Department of Defense (Walter Reed Biosystematics Unit).

Through its research, collections, education and exhibition programs, NMNH serves as one of the world's great repositories of scientific and cultural heritage as well as a source of tremendous pride for all Americans.

Behind the Scenes:
NMNH Research and Collections

Beyond the Museum's exhibitions lies a labyrinth of hallways, vast storage rooms and busy offices, all filled with the sights and sounds of discovery.

Eminent scientists, specimens, books and papers microscopes, and sophisticated computer systems: Welcome to the realm of NMNH Research and Collections. In this university-like atmosphere, scientists delve deep into the history of our planet and the processes and peoples that shape it today.

Their enduring curiosity has led these Museum explorers to the four corners of the earth. They travel to ocean depths, the peaks of the Andes, Africa's Rift Valley, the rainforests of South America, and the deserts of Central Asia. Perhaps even to a field site or research institution in your own state, territory or country.

In each area, researchers collect specimens: fossils, minerals, and rocks, plants and animals, tools and artworks. Collections care professionals have meticulously preserved, labeled, catalogued, and organized items of this kind for more than 150 years.

Taken together, the NMNH collections form the largest, most comprehensive natural history collection in the world. By comparing items gathered in different eras and regions, scientists learn how our world has varied across time and space.

Such collections-based research then provides the essential building blocks for answering broader questions about our future. NMNH scientists and their colleagues worldwide seek the puzzle pieces that will form detailed pictures of vital topics such as evolutionary relationships of organisms, biodiversity loss and global climate change.

The Museum's location in the heart of the nation's capital promotes sharing these research findings with key decisionmakers from around the world.

There are now over 126 million items in the ever-growing NMNH collections, ranging from fossilized pollen to bones of Tyrannosaurus rex, algal samples to a slab of a giant sequoia tree, tiny crustaceans to giant squid, DNA samples to whale skulls, ancient spear points to Chinese shoes, and the Hope Diamond to Moon rocks.

Museum visitors sometimes wonder aloud whether we need to keep adding "stuff" to the NMNH collections. In fact, we have literally only skimmed the surface when it comes to understanding the natural world and humanity's place in it.

We could no more finish adding specimens to the National Collections of the Smithsonian Institution than we could stop adding books to the Library of Congress or historic documents to the National Archives! Together, these are among our nation's greatest treasures.

Census of Marine Life (CoML)

The Census of Marine Life is a global network of researchers in more than 80 nations engaged in a 10-year scientific initiative to assess and explain the diversity, distribution, and abundance of life in the oceans. The world's first comprehensive Census of Marine Life-past, present, and future-will be released in 2010.

The stated purpose of the Census of Marine Life is to assess and explain the diversity, distribution, and abundance of marine life. Each plays an important role in what is to known, unknown, and may never be known about what lives in the global ocean.

First, diversity. The Census aims to make for the first time a comprehensive global list of all forms of life in the sea. No such unified list yet exists. Census scientists estimate that about 215,000 species of marine animals have been described and reside in jars in collections in museums of natural history and other repositories. Since the Census began in 2000, researchers have added more than 5600 species to the lists. They aim to add many thousands more by 2010. The database of the Census already includes records for more than 14 million species, old and new. By 2010, the goal is to have all the old and the new species in an on-line encyclopedia with a webpage for every species. In addition, we will estimate how many species remain unknown, that is, remain to be discovered. The number could be astonishingly large, perhaps a million or more, if all small animals and protests are included. For comparison, biologists have described about 1.5 million terrestrial plants and animals.

Second, distribution. The Census aims to produce maps where the animals have been observed or where they could live, that is, the territory or range of the species. Knowing the range matters a lot for people concerned about, for example, possible consequences of global climate change.

Third, abundance. No Census is complete without measures of abundance. We want to know not only that there is such a thing as a Madagascar crab but how many there are. For marine life, populations are being estimated either in numbers or in total kilos, called biomass.

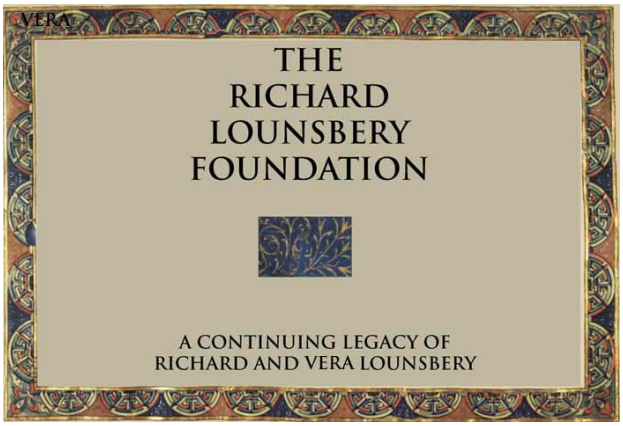
To complete the context, it is important to understand the top motivations for the Census of Marine Life. First, much of the ocean is unexplored. Most of the records in its database are for observations near the surface, and down to 1000 meters. No observations have been made in most of the deep ocean, while most of the ocean is deep.

Second, diversity varies in space. For large fish, marine hot spots, like the rain forests of the land, exist off Brazil and Australia. The goal is would like to know much more about marine hot spots, to help conserve these large fish. Their abundance and thus their diversity is changing, especially for commercially important species. Between 1952 and 1976, for example, fishermen and their customers emptied many areas of the ocean of tuna.

The Census has evolved a strategy of 14 field projects to touch the major habitats and groups of species in the global ocean. Eleven field projects address habitats, such as seamounts or the Arctic Ocean. Three field projects look globally at animals that either traverse the seas or appear globally distributed: the top predators such as tuna and the plankton and the microbes. The projects employ a mix of technologies. These include acoustics or sound, optics or cameras, tags placed on individual animals that store or report data, and genetics, as well as some actual capture of animals. The technologies complement one another. Sound can survey large areas in the ocean, while light cannot. Light can capture detail and characters that sound cannot. And genetics can make identifications from fragments of specimens or larvae where pictures tell little.

This mix of curiosity, need to know, technology, and scientists willing to investigate the unexplored and undiscovered will result in a Census of Marine Life in 2010 that provides a much clearer picture of what lives below the surface around the globe. Several reasons make such a report timely, indeed urgent. Crises in the

sea are reported regularly. One recent study predicted the end of commercial fishery globally by 2050, if current trends persist. Better information is needed to fashion the management that will sustain fisheries, conserve diversity, reverse losses of habitat, reduce impacts of pollution, and respond to global climate change. Hence, there are biological, economic, philosophical and political reasons to push for greater exploration and understanding of the ocean and its inhabitants. Indeed, the United Nations Convention on Biological Diversity requires signatories to collect information on living resources, but, as yet, no nation has a complete baseline of such information. The Census of Marine Life will help to fill this knowledge gap, providing critical information to help guide decisions on how to manage global marine resources for the future.



The Richard Lounsbery Foundation

Mission

The Richard Lounsbery Foundation aims to enhance national strengths in science and technology through support of programs in the following areas: science and technology components of key US policy issues; elementary and secondary science and math education; historical studies and contemporary assessments of key trends in the physical and biomedical sciences; and start-up assistance for establishing the infrastructure of research projects. Among international initiatives, the Foundation has a long-standing priority in Franco-American scientific cooperation.

The Foundation generally provides seed money or partial support, rarely renews grants for continuing activities, does not normally fund endowments or laboratory research, and aims to achieve high impact by funding novel projects and forward-looking leaders.

Brief History

Richard Lounsbery was born in New York City in 1882 to affluent parents, Richard P. Lounsbery and Edith Hunter Haggin Lounsbery. The family's antecedents were generally of English origin, with most having come to America during colonial times. One exception was Richard's great-great-grandfather, Ibrahim Ben Ali, whose life was marked by tragedy. Born in Turkey in 1756, Ben Ali was trained as a doctor and became a captain in the Turkish army. He lost his entire family when mob violence erupted in Istanbul, and was later imprisoned by the Russians during a conflict between Russia and Turkey. Eventually freed thanks to the intervention of a British general in whose charge he had been placed, Ben Ali traveled extensively through Europe, became a Christian, and later migrated to the United States. He settled in Philadelphia, where he married an Englishwoman and set up practice as a physician. Sadly, Ben Ali contracted yellow fever while ministering to patients during an epidemic that struck Philadelphia and Baltimore, and he died in 1800. He was survived by his wife and infant daughter, Adeline Sally. The middle name, "Ben Ali" appears several times among his descendants.

The Lounsbery family's wealth was derived from the extensive business activities of James Ben Ali Haggin, grandson of Ibrahim Ben Ali and the grandfather of Richard Lounsbery. Born in Kentucky in 1822, Haggin opened a law office in Sacramento, California in 1850 to take advantage of opportunities provided by the Gold Rush. He and his partner were instrumental in forming several highly successful mining operations in the American West and later abroad. They helped to solidify the United States position in the copper industry and also played a role in developing California farmland and implementing legislation controlling the state's water rights. Through these initiatives, Haggin formed a close friendship with Senator George Hearst.

Haggin married Eliza Jane Sanders in 1852, and the couple had five children. Their daughter Edith married Richard P. Lounsbery in 1878. Richard P. Lounsbery was a descendant of a distinguished pre-Revolution family noted in the Harvard archives for the bequest of a scholarship in 1670. He assumed an active role in the Haggin family business, which moved its headquarters to New York City. Richard Lounsbery-creator of the Lounsbery Foundation-was the couple's only child. He was born in 1882

RICHARD AND VERA LOUNSBERY

Richard attended St. Paul's School in Concord, New Hampshire, and graduated from Harvard College in 1906. After college, Richard joined the family business, traveling extensively to gain familiarity with its widespread enterprises. He extended the business' activities into new areas such as importing silk from Japan. When his father died in 1912, Richard considered taking over the family firm. However, as a result of a bout of illness, he decided to change fields and joined the investment firm of J. B. Harris and Company, soon becoming a familiar figure in the New York banking community.

After serving in France as an Army lieutenant in World War I, Richard stayed in that country to study art. Thus began his love affair with France, which was to last all his life. He split his time between Paris and New York and became a prominent member of the business and social life

of both cities. He was also an excellent amateur painter and enthusiastic golfer on both continents.

Richard married Vera Victoroff, a Russian refugee living in Paris, in 1928. During nearly forty happy years together, they shared many interests and continued to divide their time between Paris and New York.

THE FOUNDATION'S FORMATIVE YEARS

After Richard's death in 1967, Vera Victoroff Lounsbery worked with the attorney Alan F. McHenry to develop a clear-cut set of goals for the Foundation. McHenry went on to serve as the first president of the Foundation, retaining that position until his death in 1993. His interest in American and French cultural and scientific affairs closely matched that of both Lounsberys, and he created programs and awards of which they would undoubtedly have approved. Over the years, the Board has continued to implement programs focused along the guidelines established by Vera and McHenry, while adapting to changing times and opportunities.

Other advisers to the Lounsberys included Benjamin F. Borden, Edward R. Finch, and Leon Schaefler. Borden served as secretary-treasurer until 1996. Schaefler, along with Alan McHenry, was trustee and advisor to the original trust fund created in Richard Lounsbery's will, which contained a major portion of the Foundation's endowment. His son-in-law, Richard H. Pershan, holds that position today.

In 1978, Vera established the Lounsbery Award in honor of her husband. This award is presented annually to a distinguished investigator in biology or medicine who has been selected by a jury of seven members representing the National Academy of Sciences of the United States and the Academie des Sciences of France**.**

Research Institutions

Smithsonian
National Museum of Natural History

National Museum, Manila

Muséum national d'Histoire Naturelle, Paris

AURORA 2007 part of CoMARGES component of

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