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USAID/UCC FISHERIES AND COASTAL MANAGEMENT CAPACITY BUILDING SUPPORT PROJECT

YEAR FOUR
ANNUAL REPORT

1ST OCTOBER, 2017 – 30TH SEPTEMBER, 2018

DEPARTMENT OF FISHERIES AND AQUATIC SCIENCES
UNIVERSITY OF CAPE COAST

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Cover Photo: Minister for Fisheries and Aquaculture Development, Hon. Elizabeth Afoley Quaye (middle, seated in front row) in a group photograph with members of UCC during the Fifth Year Annual Workplanning Session of the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project

Photo credit: DFAS

LIST OF ABBREVIATIONS

CANS	College of Agriculture and Natural Sciences
CCM	Centre for Coastal Management
CDCS	Country Development Cooperation Strategy
CSLP	Coastal Sustainable Landscape Project
DFAS	Department of Fisheries and Aquatic Sciences
EGO	Economic Growth Office
FfD	Fish for Development Project
FtF	Feed the Future
GC	Gas Chromatographic Unit
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GMMB	Ghana Museums and Monuments Board
JFCoM	Journal of Fisheries and Coastal Management
M&E	Monitoring and Evaluation
MoFAD	Ministry of Fisheries and Aquaculture Development
PMP	Performance Management Plan
RV	Research Vessel
SBS	School of Biological Sciences
SFMP	Sustainable Fisheries Management Project
UCC	University of Cape Coast
UAV	Unmanned Aerial Vehicle
UK	United Kingdom
URI	University of Rhode Island
USAID	United States Agency for International Development
USG	United States Government

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1.0 INTRODUCTION

1.1 Ghana's Marine Fisheries Sector

Ghana's natural resources include minerals such as gold, diamond, bauxite and manganese, forest resources like timber and cocoa, as well as water resources such as fish. Ghana's fishing industry comprises resources from marine waters, inland or freshwater bodies and coastal lagoons. Marine fisheries in Ghana are important for employment, income generation, nutrition, and food security. The marine fisheries sector contributes 3-5% to the country's annual gross domestic product (GDP). In spite of the economic importance of the sector, production from marine capture fisheries has been declining since the mid-1990s, from almost 420,000 tonnes to 202,000 tonnes in 2014, which translates into decrease in revenue generated by the sector. Declines in fish production and subsequent impacts on economic benefits derived from the fisheries sector are partly due to ineffective fisheries management.

Figure 1: Artisanal fishing landing site at Elmina, Central Region, Ghana – UAV image captured by the Centre for Coastal Management

There is a critical need to address the problem of decreasing fish catches, which can only be achieved through improved fisheries management if the Ghana Poverty Reduction Strategy is to be realized. Indeed capacity building is an enabling condition for improved fisheries management across the world. The justification for the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project is grounded on this premise. The primary aim of the project is to promote sustainable marine fisheries management in Ghana through

capacity building actions involving students, professionals and fishing communities, using effective partnerships across public and private institutions, both local and international. The project is sponsored by the United States Agency for International Development (USAID) through the Feed-the-Future (FtF) Initiative of the American Government and also contributes to Government of Ghana's national fisheries policies and coastal development objectives.

1.2 Feed-the-Future (FtF) Initiative of the United States Government

Feed-the-Future (FtF) is a United States Government (USG) Initiative to address global hunger and food insecurity. In 2009, the United States Government committed US$3.5 billion over a 3-year period to this global initiative, which was launched in 2010 with the aim of fighting hunger and poverty. FtF is coordinated primarily by the USAID on the basis that every 1% increase in agricultural income per capita reduces the number of people living in extreme poverty by between 0.6 and 1.8%. No other investment has that return. FtF supports initiatives in fisheries and coastal management with funding because most developing nations lack adequate resource capacity to sustainably exploit and effectively manage their coastal and marine resources.

1.3 The USAID Fisheries and Coastal Management Capacity Building Support Project

The Fisheries and Coastal Management Capacity Building Support Project is a partnership agreement program between the USAID and the University of Cape Coast (UCC) which was signed on 24th October, 2014 and being implemented by the Department of Fisheries and Aquatic Sciences (DFAS) of UCC. The project provides DFAS with administrative, technical and financial assistance. USAID's total contribution to this Project is up to the tune of US$5,500,000, which is sub-obligated on yearly increments to enable DFAS effectively coordinate capacity building at various levels for sustainable marine fisheries management in Ghana over a period of five years (2014-2019). The USAID award represents a strategic investment from the American people for food security in Ghana as part of the USG FtF Initiative, and subject to the terms and conditions of the Agreement signed with the University of Cape Coast (PIL No.: 641-A18-FY14-IL#007).

The main purpose of the award is to contribute towards addressing capacity needs in fisheries and coastal management in Ghana. The project was developed to respond to the issues raised in the DFAS SWOT Analysis, which aims at strengthening the institutional capacity of DFAS to train personnel for fisheries and coastal management, and support the Centre for Coastal Management (CCM) at UCC to become fully operational. The award also supports the restructuring of integrated data and information support systems for fisheries and coastal management, which serve as building blocks for evidence-based policy formulation and decision making at various levels. Project activities contribute to USAID's development strategy for Ghana as outlined in its Country Development Cooperation Strategy (CDCS), and also respond to USAID/Ghana Development Objective 2 relating to Sustainable and Broadly Shared Economic Growth. Expected outcomes from the five-year project include the building of significant capacity for sustainable marine fisheries and coastal management in Ghana, and ensuring that management outcomes become more evident.

Local scientific capacities are strengthened in specific areas such as the provision of quality and relevant educational programs, practical research, extension and advisory support services to help the management of Ghana's fisheries and coastal resources, which will enhance the country's social and economic development. Relevant partnerships are built with institutions with shared research and training interests by creating a platform for regular interaction and dialogues with local and foreign universities, particularly with Centres, Institutes and relevant Academic Departments at the University of Rhode Island (URI). This project has also formed important collaborations with relevant government partners including the Ministry of Fisheries and Aquaculture Development (MoFAD), the Fisheries Commission of Ghana, as well as libraries and research institutions with the idea to promote increased use of science and applied research for decision making, law enforcement, climate change adaptation and biodiversity conservation for poverty alleviation.

1.4 The Department of Fisheries and Aquatic Sciences of the University of Cape Coast

The University of Cape Coast (UCC) is located close to the Atlantic Ocean, which provides vast opportunities for the Department of Fisheries and Aquatic Sciences (DFAS) of UCC to become one of the leading institutions in the area of Fisheries and Marine Sciences in Ghana. DFAS has a vision to become an internationally recognized partner in the conservation of healthy aquatic ecosystems for sustained provision of goods and services, in collaboration with public and private institutions. This vision has been facilitated by the initiation of the USAID funding support to DFAS.

Figure 2: Members of DFAS Academic Staff

Through the project, the capacity of DFAS has been strengthened with the provision of adequate logistics and teaching infrastructure, which has made DFAS more attractive to an increasing number of students wanting to undertake studies at the School of Biological Sciences, and also provided enhanced opportunities for institutional collaboration. DFAS now has a state-of-the-art laboratory with relevant modern equipment which supports hands-on practical-based training of students. This presents DFAS students with future academic prospects. DFAS offers undergraduate (BSc) degree in Fisheries and Aquatic Sciences and postgraduate (MPhil and PhD) degrees that expose students to:

- Oceanography, Limnology and Aquatic Ecology
- Integrated Coastal Resource Management including Petroleum Ecology and Climate Change Studies
- Aquaculture, bridging gaps between demand and supply in the fishing industry and aquaculture entrepreneurship
- Fisheries Science including fisheries ecology and organismic interactions

Figure 3: Graduands of DFAS with some academic staff

2.0 PROGRAM COMPONENTS, MANAGEMENT AND ACTIVITIES IN YEAR 4

2.1 Activities Completed in Year 4

Key Activities for the Year:

- ✓ Project Implementation, M&E and Procurement Plans for Year 4 activities were developed to guide Year 4 program activities
- ✓ Ghana Audit Service carried out an audit exercise covering project Year 2 implementation period on behalf of USAID. The exercise also covered financial documentation on project accounts.
- ✓ The Project successfully hosted the USAID/Ghana Mission Director Ms. Sharon Cromer, Economic Growth Office Deputy Director, James Lykos and Project Activity Manager Ms. Susan Bonney
- ✓ An evaluation was carried out to assess the undergraduate research support grant extended to beneficiaries from collaborating universities during the 2016/2017 academic year

- ✓ The Centre for Coastal Management (CCM) developed a proposal and a Memorandum of Agreement for the University of Cape Coast to go into partnership with the Ghana Museums and Monuments Board (GMMB) for the use of Fort St Jago based in Elmina by CCM as a satellite location for direct community contact towards sustainable management of Ghana's fisheries resources
- ✓ First batch of four (4) PhD students participated in a semester abroad program at URI arrived back home in December 2017, whilst the second batch started their semester study at URI in September 2018
- ✓ J-TERM Students Exchange Program was successfully implemented in July 2018
- ✓ Project management attended the Feed the Future Annual Implementing Partners Meeting and other USAID IPs training workshops including the Communications for Development Workshop, M&E and Gender Point of Contacts meeting, Ghanalinks.org and TraiNet
- ✓ DFAS Fisheries and Coastal Research Laboratory took delivery of a Gas Chromatography laboratory equipment
- ✓ Institutional partnership and collaboration with the MoFAD, DANIDA through Danish Technical University (DTU), was entrenched through sharing of expertise and research projects
- ✓ DFAS undergraduate students who received small grants for their project works and supported by DFAS Fisheries and Coastal Research Laboratory graduated successfully in September 2018.
- ✓ Some DFAS postgraduate scholarship students graduated successfully whilst others advanced to various stages of their research
- ✓ The Project completed and submitted an Annual Report for FY 2017 covering all activities implemented in Year 3
- ✓ Annual workplan for Year 5 of the Project was prepared and submitted to USAID for approval

2.2 Project Management and Finances

USAID/UCC Fisheries and Coastal Management Capacity Building Support Project attended the Feed the Future Implementing Partners Meeting. At the meeting, DFAS was highlighted as one of the FtF successes. Focus was on the number of graduate students receiving support through grants and fully funded scholarships at the Department of Fisheries and Aquatic Sciences at the University of Cape Coast. During a discussion on gender, Project Manager (Prof Denis Aheto) shared light on how the Department is encouraging women in their application process by the introduction of a "catch-phrase" in advertisements, which has led to very brilliant but needy women studying on full scholarships at DFAS.

The Project successfully hosted the Mission Director Ms. Sharon Cromer for a one-day working visit to the three coastal projects, i.e. Fisheries and Coastal Management Capacity Building Support Project, Coastal Sustainable Landscapes Project, and Sustainable Fisheries Management Project. The purpose of this visit was to meet with managers and key stakeholders of three projects funded under the United States Government's Feed the Future

initiative, to have a better understanding of what these projects entail and progress made thus far.

Figure 4: Sharon Cromer visits the Fisheries and Coastal Research Laboratory at DFAS UCC

On a separate visit to the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project, the Deputy Director of the USAID/Ghana Economic Growth Office (EGO) paid a courtesy to the Provost of the College of Agriculture and Natural Sciences (CANS) and the Dean of the School of Biological Sciences (SBS). During his visit, he was introduced to the Department of Fisheries and Aquatic Sciences Project (DFAS) Team and briefed on academic, research, and extension activities ongoing at DFAS. He was also engaged in a discussion on Ghana's fisheries sector and CCM's role after which he took time to meet students/tour laboratory.

Figure 5: Deputy Director of the USAID/Ghana Economic Growth Office interacts with PhD students of DFAS in the laboratory

Figure 6: Deputy Director of the USAID/Ghana Economic Growth Office in group photographs with the PROVOST of CANS (left) and some DFAS postgraduate students (right)

In terms of financing, the project suffered setbacks in view of limited financial remittances from USAID in FY4, which affected some key project activities mainly the extension policy and governance programs and short courses. It is the view of project management to propose a no-cost extension to USAID in the fifth year to enable the university to complete all set activities outlined in the project description.

2.3 Monitoring and Evaluation (M&E)

During the Year under review, the Project was paid a visit by the Activity Manager. Through the period of the working visit, Ms. Susan Bonney held series of meetings with project management and students of DFAS who are funded by the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project. Meeting with students sought to understand activities being undertaken under their various research programmes as well as discussed their challenges and successes chalked so far.

Figure 7: Ms. Susan Bonney with DFAS postgraduate scholarship students

2.4 Project Communications

Project communications materials (Project Brief, DFAS flyers, CCM flyers, manuals for CCM short courses, Postgraduate Research Report, Technical Reports) were produced and exhibited at a parallel session of the FtF IPs Meeting. Discussion was initiated for training on 508 Compliance regarding the upload of reports onto ghanalinks.org. Lesson learnt was the need to produce more materials to communicate especially successes chalked by the project. All project documents were uploaded onto the ghanalinks.org portal. In the third quarter of Year 4, meetings were held with journalists from some media houses to explore opportunities for publicizing Project outcomes and CCM short courses. In addition, a digital marketing approach was used to promote the maiden J-TERM undergraduate students exchange program. Regular updates of DFAS and CCM websites and social media platforms extended the reach of project activities to desired audiences.

Figure 8: Online banner showing DFAS student activities designed for DFAS Facebook wall

3.0 PROJECT OUTPUT1.1: IMPROVED INFRASTRUCTURE

3.1 Activity 1.1.1: Renovating and Equipping Fisheries and Coastal Research Laboratory

Renovation works at the Fisheries and Coastal Research Laboratory was completed in Year 3. Much of the equipping aspects of the Laboratory with respect to the procurement of equipment and installation as well as procedures for ISO certification were also done but not fully completed. Implications were that procurement of equipment, installation and ISO

certification actions needed to be continued in Year 4. In the first quarter of Year 4, project management continued to work with MES Equipment to procure one major outstanding laboratory equipment, the Gas Chromatographic Unit, a laboratory equipment used to analyze volatile substances in the gaseous state. These efforts resulted in the purchase of the equipment and subsequent transport from abroad into the country. The equipment was eventually delivered to the DFAS Fisheries and Coastal Research Laboratory following several months of hanging at the port, over clearance tax waiver.

Figure 9: The main laboratory and research laboratories with some installed equipment

With respect to research vessel *RV Sardinella*, vessel-use application forms were submitted to the Head Office of Ghana Maritime Authority, Ridge awaiting an inspector from GMA to inspect the boat on campus. Project management, in consultation with the Ghana Maritime Authority, contacted a sailor with the intent to contract him on a short-term basis to assist the project in the registration and manning of the vessel. Given this development, it is expected that the vessel will be registered soon to facilitate research activities of the project and DFAS. As part of laboratory management system, the technical staff in consultation with personnel Ghana Standards Authority is developing Standard Operating Procedures (SOP).

Figure 10: DFAS Research Vessel embossed with the name RV Sardinella

The Fisheries and Coastal Research Laboratory provided academic and technical support for students and staff of both DFAS and other Departments in the School of Biological Sciences and the College of Agriculture and Natural Resources at large. Departments supported include Chemistry, Physics, Biochemistry, Geography, Environmental Science, Laboratory Technology, Molecular Biology and Biotechnology, and Conservation Biology and Entomology.

Table 1: *List of equipment used by other departments*

LIST OF EQUIPMENT USED BY OTHER DEPARTMENTS IN THE FISHERIES AND COASTAL RESEARCH LABORATORY
DR900
Water Quality Checker
Spectrophotometer (UV)
Oven
Furnace
pH Meter
Autoclave
Scale
Turbidimeter
DO Meter
Pocket Calorimeter
Desiccator
Boat
Microscope
Sediment shaker

3.2 Activity 1.1.2: Refurbishing and Equipping office/Lecture/Computer rooms and Library

This activity was largely completed through Year 3. However, minor procurement of office equipment and library books and journals were done in Year 4.

Figure 11: Renovated offices of some DFAS academic staff with computers installed

3.3 Activity 1.1.3: Acquisition of Vehicles to Support Educational, Training, Research and Extension Activities

The project has so far acquired three vehicles (i.e. one Ford pick-up, one Toyota Cross-country, and one Toyota Coaster bus) to facilitate research and project activities and performed routine maintenance of these vehicles. However increasing volume of work and pressure on the vehicles have necessitated the project's request for an additional vehicle. In year 4, the project followed up on USAID for an approval to purchase the additional vehicle.

4.0 PROJECT OUTPUT 1.2 INCREASED TECHNICAL AND SCIENTIFIC KNOWLEDGE

4.1 Activity 1.2.1: Academic and Technical Staff Capacity Strengthening

In Year 4, USAID/Ghana embarked on a journey to develop its staff, implementing partners and key stakeholders including government, civil society and private sector partners to improve effectiveness and efficiency in achieving Ghana's development outcomes, which the Project Manager and Project Support Person benefited from. These efforts were to support Ghana's vision to move beyond aid and USAID's commitment to end foreign assistance. The workshop focused on building principle-centred leadership using tools and methods created by Stephen Covey in his book: "The 7 habits of highly effective people". The 7 Habits represent a proven process of internal and external growth that will have an immediate and lasting impact on an individual's personal and professional life.

4.2 Activity 1.2.2: Operationalization of the Centre for Coastal Management

Search for community center for outreach and sensitization (Fort St. Jago)

A major activity of the Centre is the search for a location in the coastal communities from where the Centre could operate. CCM has been in discussions with officials of the Ghana Museums and Monuments Board (GMMB), on the possibility of using the Fort St. Jago as the Centre for Coastal Management. In pursuit of this, Director for the Centre presented the intent to the GMMB in an earlier meeting in Accra, after which the Acting Director for GMMB made a follow-up visit to the University to finalize a MoU with the Centre.

Figure 12: Ag. Dir. of GMMB (bottom right) in a group photograph with the VC of UCC (bottom left) and other project personnel

Figure 13: Ag. Dir. of GMMB meets with members of DFAS and Project Management to peruse memorandum of agreement

Figure 14: Ag. Dir. of GMMB meets PROVOST of College of Agriculture and Natural Sciences, UCC (left) and the Dean of School of Biological Sciences (right)

During her working visit to the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project, Ms. Susan Bonney, in the company of the Project Manager and other persons including the M&E Support and College Accountant (CANS), visited Fort St. Jago in Elmina to familiarize with the fort and have a fore sight of the facility intended for CCM's community/satellite office.

Figure 15: Ms. Susan Bonney and the Project team at the forecourt of Fort St Jago, Elmina

In relation to Fort St. Jago, one Project Staff who has taken keen interest in culture and heritage was invited as one of thirty delegates to the UNESCO World Heritage Young Professionals Forum, 2018, held at Manama, Kingdom of Bahrain. He presented the case of harnessing the potential of World Heritage Sites, for the sustainable development i.e. conservation and protection of natural heritage such as fisheries and coastal resources (See poster in Appendix 1). By this, he sought to advocate and put CCM's quest on the spotlight on a global stage.

Figure 16: Ernest Chuku makes a presentation (left) to participants (right) at the UNESCO World Heritage Young Professionals Forum

Staffing

As part of the University's commitment to the operationalization of the Centre, two Research Fellows in the persons of Dr. Donatus Angnuureng and Dr. Precious Agbeko D. Mattah were officially appointed by to CCM. This brings total staff strength to three (3), thereby bolstering efforts to strengthen staff capacity of CCM.

Figure 17: Profile of Dr. Donatus Angnuureng as presented on the CCM website

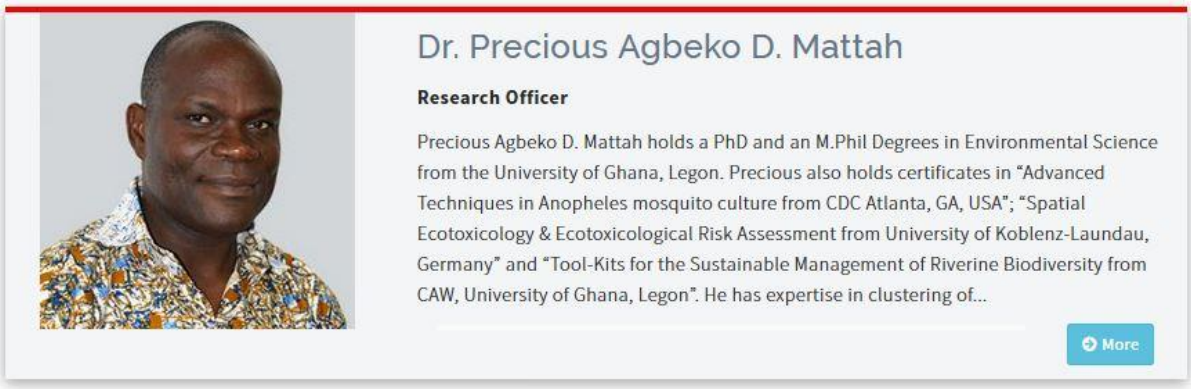

Figure 18: *Brief profile of Dr. Precious Mattah as it appears on the CCM website*

Strategic and business plan

The drafting of a new Strategic Plan to guide the Centre's operations for 2017 – 2022 was also initiated and a draft completed. This is expected to facilitate processes involved in the operationalization of the Centre such as staffing, funding and long-term sustainability. As part of the Centre's operationalization, a business and sustainability plan was developed for the Centre's Unmanned Aerial Vehicle (UAV).

UAV program

The Centre also conducted a one-week mapping training for Military Officers of the Ghana Armed Forces Second Battalions Infantry in Takoradi in the Western Region. Military personnel were equipped with fundamental knowledge and skills in Geographic Information Systems (GIS) and Remote Sensing. They were exposed to the practical skills of piloting the Unmanned Aerial Vehicle (UAV) for mapping their base camps and territories. The Centre's website was also upgraded to improve communication of the Centre's activities and increase visibility. New contents were developed and existing contents reviewed to accurately tell the Centre's story. Also, features of the website were optimized to ensure appealing user-interface.

Figure 19: *CCM trains personnel of the Ghana Armed Forces, Western Regional Command on the use of UAVs*

Research and collaboration

The Centre for Coastal Management (CCM) successfully collaborated with the Technical University of Denmark (DTU) to embark on a joint project aimed at generating knowledge to support research-based management of marine and coastal resources; and the environment. The project dubbed "HOTSPOT" is aimed at strengthening research capacity in Ghana and Denmark through the integration of two research cultures that would provide ideal setting for scientific innovation using current scientific knowledge to address maritime sustainability challenges. HOTSPOT is being funded by the Ministry of Foreign Affairs, Denmark through the Danish Development Cooperation (DANIDA) with a grant of DDK 5 million which is equivalent to US $ 800,000 for a period of three years thus, 2018-2020. Project implementers include DTU Aqua, UCC-CCM, COWI, LITEHAUZ and Zeal Environmental Technologies.

Figure 20: *Launch of HOTSPOT Project being implemented by CCM and DTU-Aqua and Zeal Environmental with funding from DANIDA*

4.3 Activity 1.2.3: Support for Postgraduate (MPhil & PhD) Training Program

The Project set out to train thirty postgraduate students comprising twenty (20) MPhil and sixteen (10) PhD students. To date, all 30 including an additional six (6) (partially funded) PhD students have been supported by the Project in the areas of tuition and research, adding up to a total of 36, out of which five (5-MPhils) have successfully graduated. Of the remaining thirty-one (31), twenty-six (26) comprising 10 MPhils and 16 PhDs received support to complete various stages of their research. The other five (5) are just about beginning their MPhil research.

Figure 21: *DFAS Scholarship student graduates with Master of Philosophy (Fisheries Science)*

In addition, one (1) PhD student who was supported to travel to URI on a semester abroad to study returned to the country. As part of activities undertaken while URI, she studied the principles and policy process in coastal governance by taking courses such as Coastal Ecosystem Governance and Marine Pollution Policy. She also explored appropriate software/tools for data analyses and thus improved her skills in sample handling and treatment for laboratory testing. The student is expected to apply knowledge gleaned from the experience in completing her thesis and supporting coastal management initiatives in Ghana. A list of all students supported by the project is presented in Table 1. The table provides an overview to include those who have successfully completed and current students. The second batch of PhD students are currently in the US studying at the URI for a semester.

UCC and URI pushed processes aimed at facilitating and institutionalizing the proposed dual degree program for both UCC and URI students. The dual degree program document was finalized and approved by the academic board of UCC in Year 4 which will see the next batch of students undertaking research that will lead to the award of dual degrees, making graduates with dual degrees more competitive and marketable. This development will further strengthen the existing partnership between UCC and URI.

Bright Asare, an alumnus of the Department of Fisheries and Aquatic Sciences, received the prestigious Dean's Award of Excellence. Bright is one of the students who benefited from the full scholarships through the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project at DFAS.

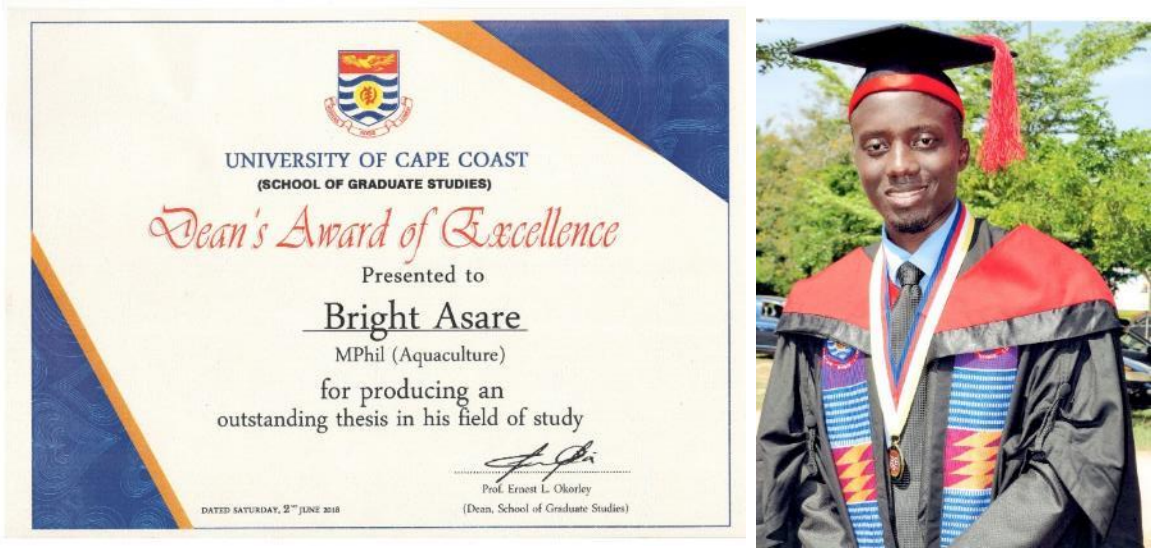

Figure 22: *Bright Asare receives prestigious Dean's Award of Excellence*

Postgraduate students have conducted several studies under the research themes of the project. These span areas in fisheries, aquaculture and coastal management.

Figure 23: *DFAS MPhil (Aquaculture) research student investigating the effect of some ingredients in fish diets on the growth of Sarotherodon melanothron*

Figure 24: *Postgraduate (PhD) research; Michelle analyses fish eggs (L) and Etornam studies fish otoliths (R) under a microscope*

Table 2: List of Current USAID funded Postgraduate Students at the Department of Fisheries and Aquatic Sciences of the University of Cape Coast

NB	Postgraduate study completed (graduated)		Completed 4 months study at URI in December 2017		Starting 4 months study at URI in September 2018	

No.	**Name of Student**	**Programme of Study**	**Level**	**Status**	**Start Date**	**Completion Date**	**Funding**	**Principal Supervisor**	**Co-Supervisor(s)**
1	Pearl Sakyi-Djan	Fisheries Science	MPhil	Compl	2014/15	Nov. 2017	Full	Prof. Joseph Aggrey-Fynn	Dr. Najhi Lazar
2	Elsie Akusika Debrah	ICZM	MPhil	Compl	2014/15	Jun. 2017	Full	Prof. Denis. W. Aheto	Prof. George Wiafe
3	Prince Dela Tseku	Aquaculture	MPhil	Compl	2014/15	Dec. 2016	Full	Prof. Kobina Yankson	Dr. Emmanuel Acheampong Mr. Jacob Ainoo-Ansah
4	Bright Asare	Aquaculture	MPhil	Compl	2014/15	Jun. 2017	Full	Prof. Edward A. Obodai	Dr. Emmanuel Acheampong
5	Daniel Agyei	ICZM	MPhil	Compl	2014/15	Jun. 2017	Full	Prof. Denis. W. Aheto	Prof. George Wiafe
6	Divine Worlanyo Hotor	Fisheries Science	MPhil	Due	2015/2016	Sep 2017	Full	Prof. Joseph Aggrey-Fynn	Prof. John Blay
7	Jennifer Eshilley	ICZM	MPhil	Due	2015/2016	Sep 2017	Full	Prof. Denis. W. Aheto	Dr. Noble K. Asare

8	Kezia Baidoo	Fisheries Science	MPhil	Due	2015/2016	Sep 2017	Full	Prof. John Blay	Dr. Noble K. Asare
9	Mercy Johnson-Eshun	Aquaculture	MPhil	Due	2015/2016	Sep 2017	Full	Prof. Kobina Yankson	Dr. Emmanuel Acheampong
10	Simon Kyei Gyimah	Aquaculture	MPhil	Due	2015/2016	Sep 2017	Full	Prof. Edward A. Obodai	Dr. Emmanuel Acheampong
11	Lawrence Armah Ahiah	Aquaculture	PhD	Due	2015/2016	Sep 2018	Full	Prof. John Blay	Prof. Kobina Yankson
12	Michelle N. Kordei Clottey	Fisheries Science	PhD	Due	2015/2016	Sep 2018	Full	Prof. Joseph Aggrey-Fynn	Prof. John Blay
13	Jemimah Etornam Kassah	Fisheries Science	PhD	Due	2015/2016	Sep 2018	Full	Prof. John Blay	Dr. Najih Lazar
14	Rebecca K. Essamuah	ICZM	PhD	Due	2015/2016	Sep 2018	Full	Prof. Denis Aheto	Dr. Emmanuel Acheampong
15	Margaret F. A. Dzakpasu	Oceanogr. & Limnol.	PhD	Due	2015/2016	Sep 2018	Full	Prof. Kobina Yankson	Dr. Emmanuel Lamptey
16	Success Adjeley Sowah	Oceanogr. & Limnol.	MPhil	3rd Year	2016/2017	Sep 2018	Full	Prof. Kobina Yankson	Dr. Noble K. Asare
17	Paulina Okpei	Fisheries Science	MPhil	3rd Year	2016/2017	Sep 2018	Full	Prof. Joseph Aggrey-Fynn	Dr. Isaac Okyere
18	William Dogah	Aquaculture	MPhil	3rd Year	2016/2017	Sep 2018	Full	Prof. Edward A. Obodai	Dr. George Darpaah

19	Nunana Agbemebease	ICZM	MPhil	3rd Year	2016/2017	Sep 2018	Full	Prof. Denis Aheto	Prof. John Blay
20	Justina Ekuwa Annan	ICZM	MPhil	3rd Year	2016/2017	Sep 2018	Full	Prof. Denis Aheto	Prof. Edward A. Obodai
21	Fredrick Ekow Jonah	Oceanogr. & Limnol.	PhD	3rd Year	2016/2017	Sep 2019	Full	Dr. Noble K. Asare	Dr. Emmanuel Acheampong
22	Miriam Y. Ameworwor	Fisheries Science	PhD	3rd Year	2016/2017	Sep 2019	Full	Prof. John Blay	Prof. Joseph Aggrey-Fynn
23	Rhoda Lims Osae Sakyi	Aquaculture	PhD	3rd Year	2016/2017	Sep 2019	Full	Prof. Kobina Yankson	Dr. Mike Osei-Tweneboana
24	Gertrude Lucky Aku Dali	ICZM	PhD	3rd Year	2016/2017	Sep 2019	Full	Prof. Denis Aheto	Prof. John Blay
25	Lesley Ntim	ICZM	PhD	3rd Year	2016/2017	Sep 2019	Full	Prof. John Blay	Dr. Denis W. Aheto
26	Elizabeth Effah	ICZM	PhD	3rd Year	2016/2017	Sep 2019	Part	Prof. Denis Aheto	Dr. Emmanuel Acheampong
27	Sheila Fynn-Korsah	Fisheries Science	PhD	3rd Year	2016/2017	Sep 2019	Part	Prof. Joseph Aggrey-Fynn	Dr. Najih Lazar
28	Ebenezer Delali Kpelly	Fisheries Science	PhD	3rd Year	2016/2017	Sep 2019	Part	Prof. John Blay	Prof. Joseph Aggrey-Fynn

29	Rahmat Quaigrane Duker	Oceanogr. & Limnol.	PhD	3rd Year	2016/2017	Sep 2019	Part	Dr. Noble K. Asare	Prof. Edward A. Obodai
30	Isaac Kofi Osei	Fisheries Science	PhD	3rd Year	2016/2017	Sep 2019	Part	Prof. Kobina Yankson	Prof. Edward A. Obodai
31	Alberta Jonah	ICZM	PhD	2nd Year	2016/2017	Sep 2019	Part	Prof. Denis Aheto	Dr. Isaac Okyere
32	Gabriel Gator	Fisheries Science	MPhil	2nd Year	2017/2018	Sep 2019	Full	Prof. John Blay	Prof. Kobina Yankson
33	Bernard Assiam	ICZM	MPhil	2nd Year	2017/2018	Sep 2019	Full	Prof. Denis Aheto	Dr. Isaac Okyere
34	Delove Asiedu Abraham	Oceanogr. & Limnol.	MPhil	2nd Year	2017/2018	Sep 2019	Full	Dr. Noble K. Asare	Dr. Emmanuel Acheampong
35	Grace Nikoi-Olai	Aquaculture	MPhil	2nd Year	2017/2018	Sep 2019	Full	Prof. Kobina Yankson	Prof. Edward A. Obodai
36	Eugenia Amador	Fisheries Science	MPhil	2nd Year	2017/2018	Sep 2019	Full	Prof. Joseph Aggrey-Fynn	Prof. John Blay

4.4 Activity 1.2.4: Undergraduate Research Grants

The fourth year saw the final submission and successful completion of project works of level 400 undergraduate students of DFAS. Twenty-seven undergraduate students conducted researches in various areas of fisheries and coastal management as part of their final year project. Project topics were selected within the broad thematic areas of the USAID/UCC Fisheries Project.

Table 3: L400 PROJECT RESEARCH TOPICS (2017/2018)

Lecturer	Project Title	No. of Students	Name of Student
Prof. Denis Aheto	Governance of the oyster fishery in the Densu Delta of Ghana	1	Omane Maxwell
	Valuation of the oyster fishery in the Densu Delta of Ghana	1	Korang Richmond
	Socioeconomic implications of foreign direct investments in aquaculture on indigenous fish farmers in Ghana	1	Esther Acheampong
Prof. John Blay	Aspects of the Biology of the blackchinned tilapia *Sarotherodon melanotheron* in three floodplain pools of the Kakum River estuary	1	Yeboah Michael
	Plankton community and productivity in three floodplain pools of the Kakum River estuary.	1	Opoku Martin
Dr. Emmanuel Acheampong	Morphological adaptation of *Crassostrea tulipa* from two contrasting habitats	1	Davies Evans
	Phytoplankton and zooplankton composition in the Ankobra River Estuary	1	Bentum Nana Justice
	Laboratory culture and alimentation of marine fish	1	Timothy K. D. Amuah
Dr. Noble Asare	Evaluating the ecological health of Fosu lagoon: from the perspective of organic matter and nutrient loads	2	Ahiati Fred Kwaku
			Takyi Gabriel
	Anthropogenic perspective to pollution of a coastal lagoon in the Central Region of Ghana	1	Bog-Yena Martin K.
Prof. Joseph Aggrey-Fynn	Studies on blackchinned tilapia in Fosu, Benya and Brenu Lagoons	1	Odjelua Solomon Tetteh
	Studies on various marine fish species that enter Kakum estuary	1	Gyimah S. David
	Biological studies on grey mullets in Benya Lagoon and Kakum estuary.	1	Abarike A. James
Prof. Kobina Yankson	Studies on condition index and reproductive status of mangrove oysters	2	Mohammed Alhassan K
			Ofosuhene Williams

	Studies on morphometric parameters of mangrove oysters	1	Mercy Sekum
Mr. Joseph Debrah	Length-weight relationships of *Sarotherodon melanotheron* in an estuarine system	1	Morris Isaac
	The CPUE of *Oreochromis niloticus* in the Kakum lake, Brimso	1	Ofosu Emmanuel Sandy
	Length-weight relationships of three crustaceans species in the Kakum lake, Brimso	1	Juliet Obeng Afrah
Dr. Isaac Okyere	Investigations on the spawning habits, embryonic development and diapauses periodicity of the banded lampeye killfish *Aplocheillicthyes spailauchen*	1	Juliet Obeng Afrah
	Relationship between the size of arborescent organ of mudfish and length of survival period out of water	1	Edna Arthur
	Synergies between scientific and fishermen's traditional knowledge in interpretation of fisheries related climatic, oceanographic and biological processes.	1	Boakye Daniel
	Experiments on the hatching rate and post-hatching food alternatives for survival of cuttlefish *Sepia hierredda.*	1	Siba Maswoud
Prof. Edward Obodai	Effect of copepod infestation on the gill volume of the gar fish	1	Nutsugah S. Derek
	Sex ratio and condition index of the mangrove oyster in the Benya Lagoon	1	Kwadwo A. Baah
	Sex ratio and condition index of the mangrove oyster in the Nakwa Lagoon.	1	Richmond Asante
	Total Number of Students	**27**	

The J-Term Student Exchange program planned to offer DFAS undergraduate students the opportunity of international exposure in the United States of America was initiated and executed successfully in Year 4. The program was publicized, with participation limited to DFAS undergraduate students, application forms made available to interested students and interviews conducted. Ten students applied and five (5) were selected on merit of interview performance and background checks before final departure.

The J-Term exchange programme sought to enhance the academic knowledge of participating undergraduate students in global fisheries and coastal resource management issues whilst deepening their appreciation to a multi-disciplinary approach and cross-cultural perspective to addressing these issues. The programme was executed over a two-week period from the July 11 – 26, 2018. Activities which was meant to promote the development of interpersonal skills, critical thinking and team building included fisheries, aquaculture, oceanography and coastal management. These were interspersed with socio-cultural activities and sightseeing to enhance their appreciation of a new culture. In the end, participants assessed the program

and made recommendations that would strengthen subsequent ones (see Appendix 2). The Program exposed student participants through the following activities:

Day 1: Familiarization and Campus Tour
Day 2: Ocean Fisheries and Coastal Zone Management
Day 3: History and Culture of Rhode Island
Day 4: Learning by Doing - Oceanography and Fisheries
Day 5: Learning by Doing - Ecosystem Fisheries Science and Management
Day 6: Learning by Doing – Aquaculture
Day 7: Rhode Island Native Culture and Heritage
Day 8: Water Quality & Small Scale Fisheries
Day 9: Coastal Zone Management and Tourism
Day 10: Cultural Heritage
Day 12: Local Fisheries Resource Management
Day 13: Coastal Zone Management
Day 14: Debriefing and Wrap up

Figure 25: *DFAS undergraduate students selected for the JTERM program at URI in June 2018*

Figure 26: *DFAS Undergraduate students get experiential learning through the J-TERM at URI*

Figure 27: *HoD in a group photograph with graduands who received awards from DFAS*

5.0 PROJECT OUTPUT 2.1: INCREASED MARINE AND COASTAL RESEARCH AND RESOURCE ASSESSMENTS

5.1 Activity 2.1.1: Conducting Fisheries Stock Assessment

The objective of this activity is to provide information on the status of stocks of some selected commercially important marine fish species in Ghanaian coastal waters to inform management decision making. Research for the last three years focused on determining the status of important fish species including cuttlefish, shrimp, *Carangidae* and Sparidae.

As part of a PhD research, a student studied the bottom set gillnet fishery in the Central region of Ghana with the objective to assess the fishery in terms of their operations, their catch and bycatch, and possible ecological impacts of their operations on the marine ecosystem. Her activities in this year include data collection and preparing fish eggs pending counting. Preserved eggs have been wash and awaiting drying so they can be counted.

Figure 28: *Field sampling by DFAS PhD student*

Similarly, an ongoing M.Phil research on the "Population dynamics of penaeid shrimps (Penaeidae: Decapoda) in Ghanaian waters" is contributing to the above objective. Three shrimp species were sampled for eight (8) months to determine their habitat distribution and abundance; length-frequency distribution and biometric relationships; mortality parameters and exploitation rates; and finally assess fishing techniques used in the fishery.

Figure 29: Specimen sorted and identified into species level from samples (left) Carapace length measurement of Penaeus monodon (right)

Other important marine fishes of commercial value were studied during this period. For instance, the fishery, biology and nutrient value of Atlantic chub mackerel has been comprehensive studied by a P.hD student currently in her third year. As she is approaching the end of her research, she has determined oocyte diameter and fecundity of Atlantic chub mackerel from preserved samples as well as conducted marginal increment analysis of otolith samples. These analyses were necessary to estimate the age and number of eggs of specimens sampled.

Figure 30: Shaking oocytes (left) and aging analysis using otolith (right)

The study is expected to be concluded by the first quarter of Year 5. Population dynamics and reproductive studies of three seabreams from Ghanaian waters have been ongoing for the past three years. For the period under review, the student determined the ova diameter and counted the matured eggs in the female gonads of the three species. This would serve as an indicator for the sustainable management of the fisheries.

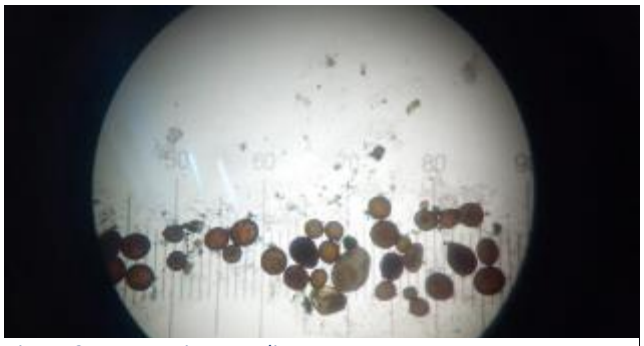

Figure 31: Measuring ova diameter

5.2 Activity 2.1.2: Conducting Research and Assessment on Marine Fisheries Governance Issues

This activity has, in previous years, been led by external facilitators and management Management's intention to continuously engage the services of external facilitators to lead this activity in Year 4 is on hold due to lack of funds. Tentatively, the Project has engaged postgraduate students to execute this activity. Studies on "Traditional Fisheries Governance Systems and its Socio-ecological Implications on Artisanal Fisheries Management in Western

Region of Ghana" continued to assess the impacts of traditional fisheries governance systems on fisheries management in Ghana and provide alternative models that can blend both modern and traditional systems resource governance. Specifically, existing forms of traditional governance systems at six study sites have been documented through focus group discussions and interviews. Also, sources of conflict within the existing governance framework were identified, and structural and functional governance system developed following an established historical hierarchy of the coastal fisheries governance systems.

Figure 32: *Focus Group Discussion with the coastal District members and Officials*

5.3 Activity 2.1.3: Research on Fish and Shellfish of Commercial Value

There is ongoing study on "molecular diagnosis of disease causing pathogens of cultured fish in Southern Ghana" is led by a second year P.hD student. The focus is to develop molecular markers for rapid diagnoses of fish diseases and to enhance effective management of diseases in culture systems. Besides collecting shrimp samples for PCR analyses and comparing pathogen load for both wet and dry seasons, she interviewed managers of six (6) aquaculture farms on the extent of threat caused by diseases to the commercial fisheries (aquaculture industry).

Figure 33: *Measuring water quality parameters in the Benya lagoon at Elmina.*

A P.hD student is researching the nutrition of the Black-chinned Tilapia *Sarotherodon melanotheron* to determine indices of nutrition that will enhance the growth of the fish during culture to make it a preferred candidate for aquaculture. In Year 4, he conducted a 24-hr sampling of fish species from the Benya lagoon and Kakum Estuary in addition to constructing shed and platform for culture experiments. The platform is mounted with aquaria, aerators and fittings pending culture experiments.

In terms of freshwater fish, a second year MPhil student is studying the comparative biology of *Heterobranchus longifilis* and *Clarias gariepinus* in the Offin River; towards the culture of the former. The study focuses on the food and feeding habits, sex ratio, and fecundity of these two species. This research is to provide scientific data on the biology of *Heterobranchus longifilis* for culture purpose.

Figure 34: *Postgraduate researcher takes measurements of catfishes in the Fisheries and Coastal Research Laboratory at DFAS, UCC*

Further studies, supported by the project, aims to make this observation more resolute. Two students are leading efforts in this activity. A P.hD student is studying the fishery, aspects of the Biology and culture of oyster (*Crassostrea Tulipa*) at the Densu Estuary, Tsokomey, Greater Accra Region. The study seeks to furnish stakeholders with necessary information on the current state of the fishery, aspects of the biology and the right culture methods for the sustainable management of oysters at Densu Estuary. Socioeconomic studies were conducted to assess the current state of the oyster fishery. Also, population density of oysters was determined, fouling organisms were identified and their effects on the performance of the oysters were assessed. Finally, a comparative study on the performance of oysters grown by bottom and suspension cultures was conducted. As an on-going research, there remains four months sampling duration as the study will be supported by the Project through Year 5. The period after sampling will be used for laboratory work and thesis writing.

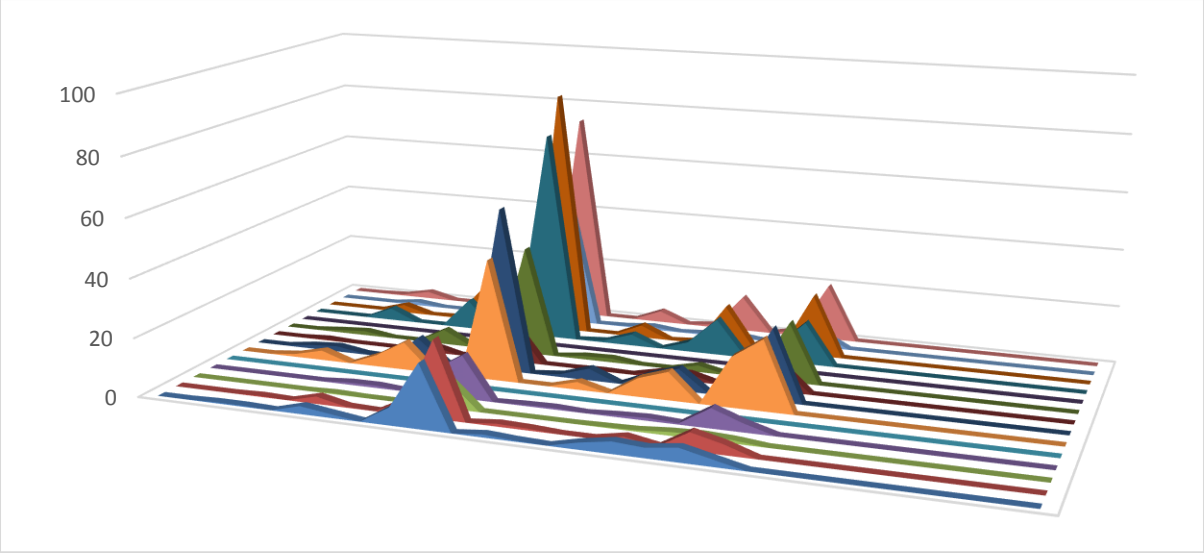

Figure 35: *Preliminary assessment showing spatfall trend over six months*

Figure 36: *Research on finding strategies for optimum oyster spat collection in four coastal waterbodies to promote aquaculture as supplementary livelihood for coastal dwellers. (Top) Racks mounted to hold spat collectors, (bottom) oyster spat settle on collectors after one month - (oyster shell – left, tile – middle, all collectors – right)*

Figure 37: *An interview section with the oyster fishers at Tsokomey on the Socio-economics of the oyster fishery at Densu Estuary (left) An in situ field assessment of Fouling and Growth Culture Experiments during a low tide at Densu Estuary (right)*

Complementarily, an MPhil student is assessing "water quality of some selected coastal water bodies toward the development of oyster culture in Ghana". Parameters of interest include microbial load and heavy metal concentration of the water and the oyster meat, physico-chemical parameters and sediment grain size.

Figure 38: *Inoculation of samples for microbial load determination (left). Washing sediments for particle size analysis (right)*

5.4 Activity 2.1.4: Analysis of Value Chains of Fish Trade

The research to investigate the value chain of a commercial fish of high value is led primarily by a P.hD student with support by academic staff of the Department. The fish species of interest is the cassava croaker (*Pseudotolithus* species) and the aim is to investigate the costs of the various forms of processing the croakers, examine the roles played by the various institutions in the cassava fish trade in the Central and Western Regions of Ghana, and identify the contributions of the financial institutions in the fisheries value chain. As a work in progress, data collection on the forms of processing (identified as smoked, fried, salted, salted and dried and filleted), and cost of operation (from the supply chain stages through the value addition stage to consumption stage). Also, work identification of the roles of the institutions and financial outlets working with the actors along the value chain was completed. In its second year, this study is will receive support through Year 5.

Figure 39: *Interviewing fish processors at Sekondi*

5.5 Activity 2.1.5: Monitor the Biodiversity and Health of Coastal Ecosystems

Following the halt on the engagement of external facilitators due financial challenges, this activity has been largely supported by M.Phil and Ph.D students who are conducting research on several coastal ecosystems. For the Year under review, seven (7) students, comprising one (1) M.Phil student and six (6) P.hD students led efforts to achieve the objectives of this activity. The focal areas in this activity include lagoons, estuaries, rivers, beaches and mangrove ecosystems in the Central and Western regions of Ghana. With focus on the beaches, an MPhil student is conducting a study the characterization and quantification of marine litter at beaches within central region, towards the management and proper disposal of waste in Ghana. The student has investigated the opinion of beach users on the sources and perception of beach litter as well as best management and mitigation practices. He has collected, sorted and counted litter from Bakano, Moree and Anomabo beaches in the Central region, pending further analyses. The study has the goal of facilitating efforts for integrated planning to reduce the accumulation and impacts of beach litter and litter generating activities and help in sustainable management of the marine and coastal environment of Cape Coast.

Figure 40: Student interviewing fisherman (left); Weighing of beach litter (right)

Research continued in the Cape-Three-Points area of the Western Region of Ghana to identify critical areas towards its potential designation as a Marine Protected Area. A P.hD student leads this study with the aim to assess the ecological and socio-economic values of ecosystems within the focal area. She has completed about 50 % of the ecological assessment of lagoon, river, sandy beach, rocky shore and mangroves in the study area. The ecological assessment was complemented by land use-and land cover change assessment using an UAV. The economic values of the ecosystems as well as threats to these ecosystems were identified primarily through interviews and focus group discussions.

Figure 41: Estimating the coverage and density of Sargassum (brown macroalgae) on the Cape Three Points beach to assess climatic threats to ecosystems (left). Interviewing the Head of local tourism at Princess Town to investigate the economic value of ecosystems

In a similar study, another PhD student is researching on the "Assessment of the ecological conditions of the Ankobra estuary and their implications for coastal livelihoods" with the aim to quantify the anthropogenic impacts on the health of the Ankobra estuary. Data collection has gone well beyond ten (10) months and is expected to continue alongside data analyses. Comparatively, an assessment of the ecological health of mangrove forests in the Kakum and Pra estuaries in the Central and Western regions respectively is underway. This study has the focus to produce a comprehensive data needed for the sustainable management of these mangrove ecosystems.

Figure 42:

This Year saw to the completion of data collection on litter production and sampling of macroinvertebrates awaiting analyses. In addition, mangrove cover along the two estuaries was mapped with UAV to assess spatial changes in land use. This study is expected to continue through year 5.

Focusing the health of coastal water bodies a study was commissioned in the second year to investigate the distribution and eco-toxicological effects of polycyclic aromatic hydrocarbons (PAHs) in lagoons in Ghana. The study sough to assess the levels of PAHs in the Fosu, Benya and Brenu lagoons using the fish biota and to determine the efficacy of activated charcoal in sediment remediation under laboratory conditions. Within the reporting year, *in situ* measurements for temperature, pH, salinity, turbidity, conductivity, dissolved oxygen and total dissolved solutes were recorded.

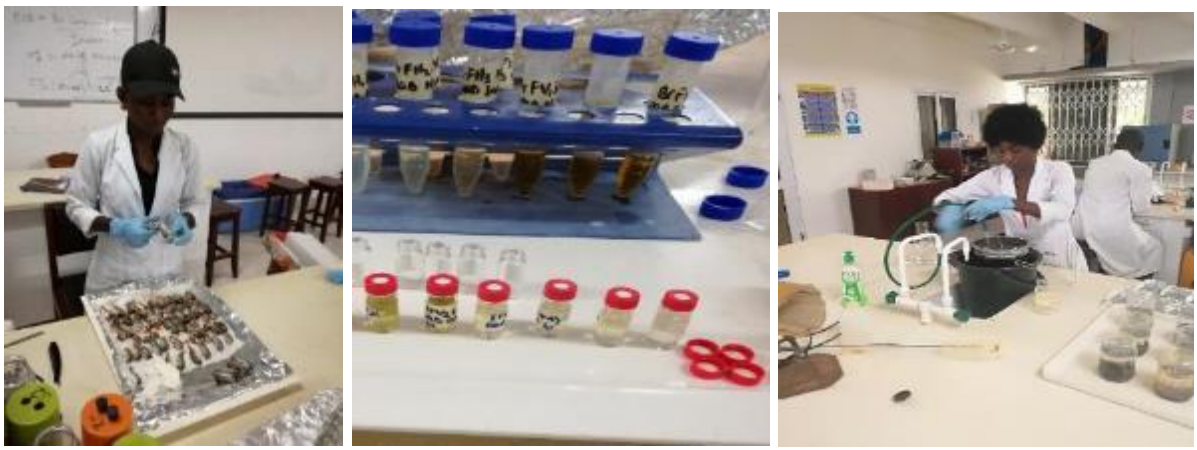

Figure 43: *Photographs highlighting research activities*

In a related study, a second year Ph.D student is investigating the productivity of selected lagoons and estuaries through nutrient inventories and primary production assessments. These assessments are done in Ankobra estuary and Sumina lagoon in the Western and Central regions respectively. To achieve the goal of the study, the student aims to assess nutrient dynamics in the water bodies using stable isotope techniques, estimate sediment and

organic matter flux into the Atlantic Ocean, and finally develop a dynamic model of processes in the coastal system to explore the consequences of environmental change. Samples have been shipped for major analysis at URI during the one semester dual degree program.

Figure 44: Field experimental setup for nutrient flux determination at Sumina Lagoon (left). Student preparing reagent for laboratory analysis of samples (right)

In addition, determination of the influence of the environment on the benthic macroinvertebrate communities of six coastal water bodies in Ghana to develop some pollution indices for ecological assessment of coastal water bodies is ongoing. Towards developing a decision support for prioritizing management of marine spaces in urban areas of Ghana, a study is being conducted on the Fosu Lagoon.

Mapping and Monitoring of Coastal Ecosystems

The Project Activity 2.1.5 is to monitor the biodiversity and health of coastal ecosystems. In view of this, the GIS team is using UAV technology to collect spatial data on some vital to coastal ecosystems including coastal waterbodies, wetlands and mangrove forests. The team is also employing UAV technology to monitor changes that are occurring along the coast such as shoreline changes and mangrove degradation. The figure below shows areas that have been covered so far.

Figure 45: Areas mapped using UAV technologies to track ecosystem changes

5.6 Activity 2.1.6: Developing Marine and Coastal Fisheries Database

An online database was fully developed and functional to manage historical data, new field observations and experimental results on Ghana's fisheries and other coastal resources in Year 3. The database, FishCoMGhana®, is accessible online via http://fishcomghana.com. No new data has been added to the platform during the year under review although the period was used for editorial tasks on the back-end of the platform. Below are some reports of access to the platform and acquisition of data.

Figure 46: Percentage composition of titles available on fishcomghana.com (N = 376)

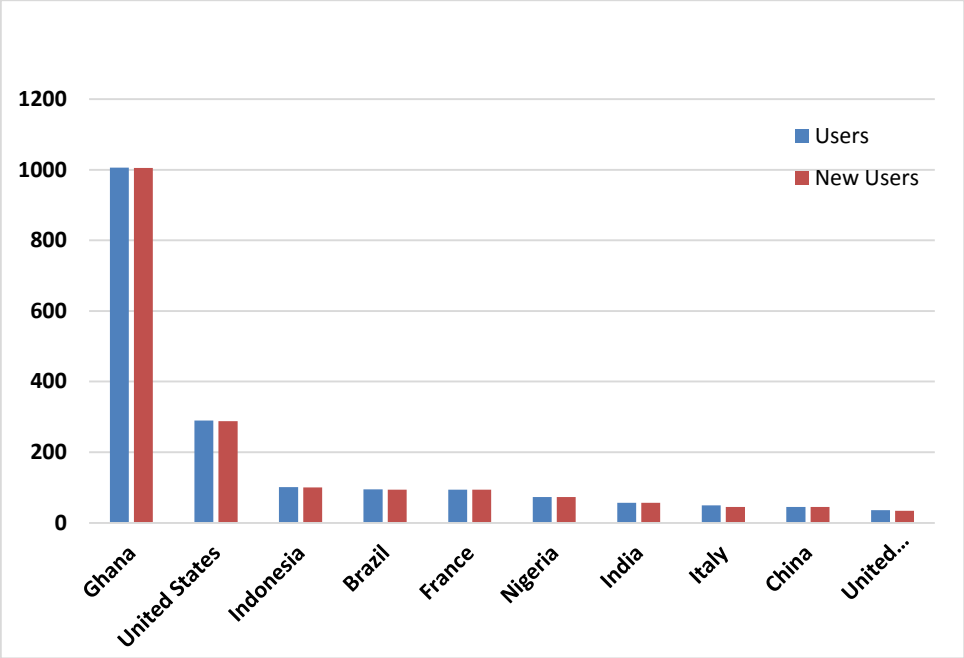

Figure 47: *Top ten acquisitions on fishcomghana.com by country*

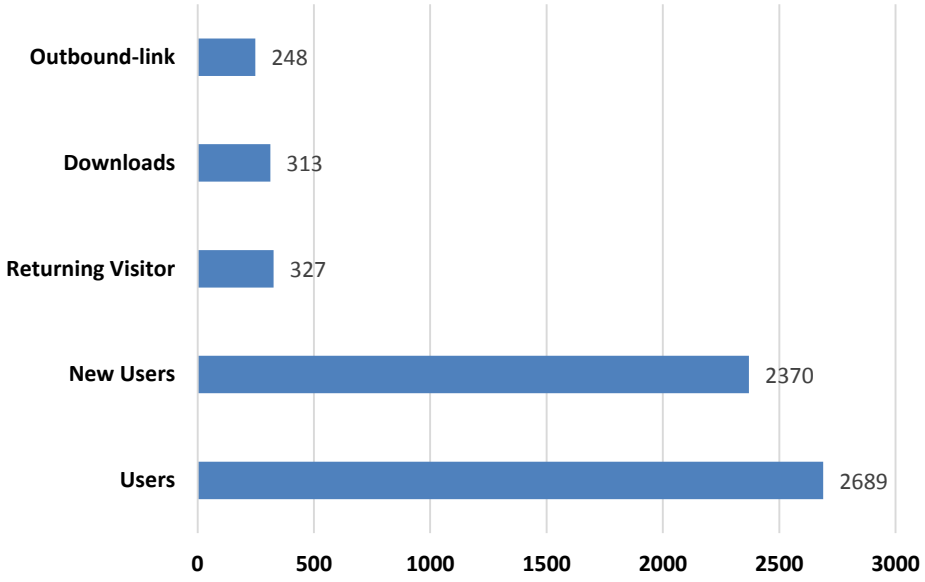

Figure 48: *Access to FishComGhana from October 2017 to September 2018*

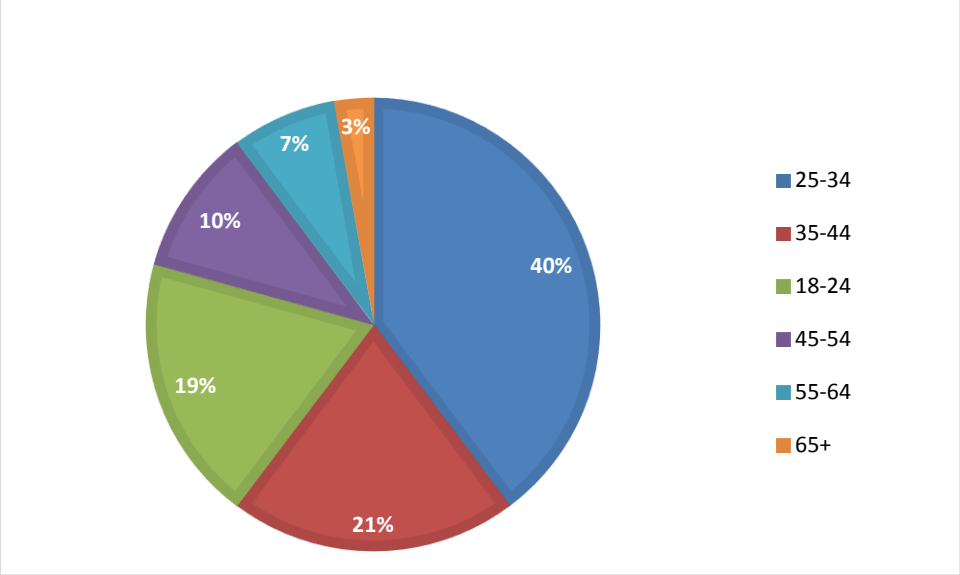

Figure 49: *Age distribution of fishcomghana.com users*

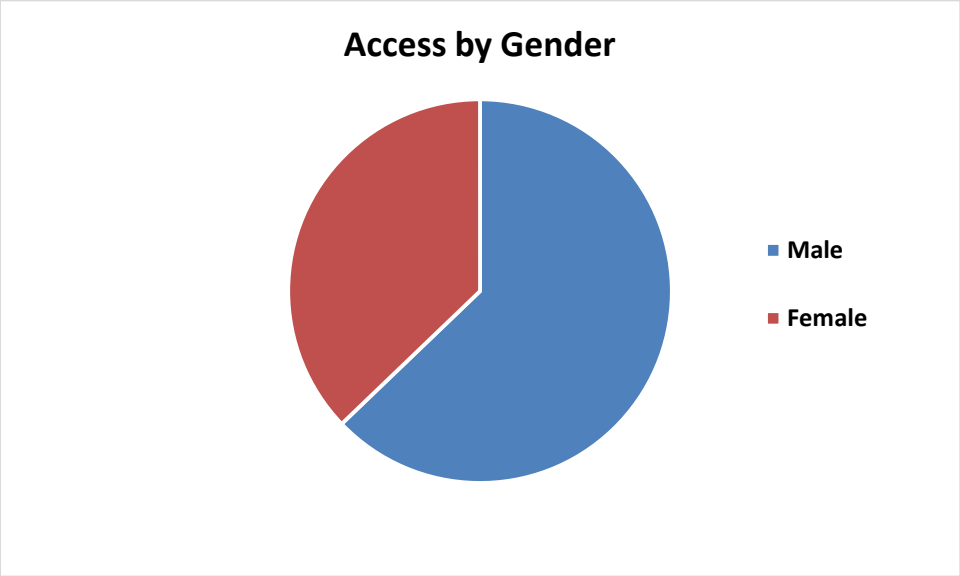

Figure 50: Access of fishcomghana.com by gender

In addition, a greater part of this year had been spent receiving and working on manuscripts for publication in the Journal of Fisheries and Coastal Management (JFCoM). A number of manuscripts have been dispatched to be peer-reviewed. Accepted manuscripts will be published on http://jfcom.fishcomghana.com.

Figure 51: Web banner of the Journal of Fisheries and Coastal Management established by CCM

A total of seventeen manuscripts were received through the online portal of the Journal of Fisheries and Coastal Management. All manuscripts received went through preliminary assessments by editorial assistants. Upon this assessment, manuscripts were sent back to reviewers for initial corrections. Ten of the manuscripts were returned by the authors, and subsequently forwarded to the Editor-in-Chief for onward forwarding to reviewers, some of whom have returned their reviews. See Table 3 for a summary of progress of work with respect to author manuscripts submitted to JFCoM. To guide the process of review and to ensure a standard of operation, a reviewers guide was developed (Appendix 1) by Editorial Assistants. This guide was attached to all manuscripts that were sent for review for their reporting as well.

Ongoing activities include compilation of email addresses and contacts of universities and other relevant institutions, within and outside the African region, that are considered to potentially have individuals with interest in fisheries, aquaculture and coastal management at large. This will help in a targeted advertisement of the Journal. In addition, processes are underway to appointment of editorial board members and all staff of the Journal. Materials and policies are being put together towards indexing the Journal as well.

Table 4: Summary of manuscripts submitted to the JFCoM

17	**10**	**07**
Submitted	*In review Reviewers assigned*	*Sent to authors for corrections after preliminary assessment*

6.0 PROJECT OUTPUT 2.2: COMMUNICATION, EXTENSION AND OUTREACH IMPROVED

6.1 Activity 2.2.1: Developing Material and Conducting Training on Integrated Coastal Management

Although this activity was scheduled to take place in Year 4, it did not materialize due to financial difficulties.

However, in Year 4, announcements went out to seek the services of an external facilitator to play a leading role in the organization of the course. The proposals received were reviewed

by the project management team and a decision was made to select a facilitator who will lead the implementation of the course. They were planned to take place in the second quarter but could not take place due to financial difficulties.

6.2 Activity 2.2.2: Developing Material and Conducting Training on Fisheries Management

Although this activity was scheduled to take place in Year 4, it did not materialize due to financial difficulties.

6.3 Activity 2.2.3: Developing Manuals and Updating Training Materials on Climate Change Adaptation and Mitigation

Although this activity was scheduled to take place in Year 4, it did not materialize due to financial difficulties.

6.4 Activity 2.2.4: Developing Material and Conducting Training on the use and Application of Geographical Information Systems (GIS)

6.5 Activity 2.2.5: Engaging Policy Makers to Address Coastal and Fisheries Issues

A major output of this activity in Year 4 is the development of the Journal of Fisheries and Coastal Management (JFCoM) which has been extensively described under activity 2.1.6 [Developing Marine and Coastal Fisheries Database] given that activity 2.1.6 is uniquely positioned to host the development of the journal.

6.6 Activity 2.2.6: Building Institutional Partnerships and Collaboration

The project through the Centre for Coastal Management has established a special linkage with the Department of Forensic Sciences of the University of Cape Coast and the Sustainable Fisheries Management Project (SFMP) to developed a guide on illegal fishing practices in Ghana. This activity commenced in the third quarter of FY 3 and was finalised in Year 4. A greater part of the first quarter was focused on reviewing the final draft by the Centre for Coastal Management and Centre for Coastal Resource, University Rhode Island. The guide was developed to inform stakeholders in the fisheries industry, particularly, fisheries watchdogs, fisheries enforcement personnel and the marine police on how to detect fish obtained through illegal means. The development of the manual employed both qualitative (local knowledge) and scientific methods of detection. The qualitative approach used included key informants interviews and focus group discussion with fishers/processors, government and non-governmental institutions from the Central and Western Region of Ghana.

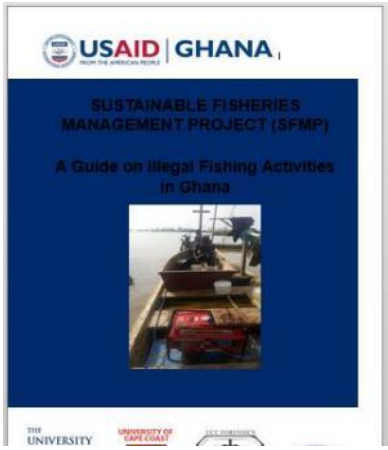

Figure 52: *Front cover of forensic guide*

The guide which describes what evidence one would need to collect, as well as how and what test would be needed to provide valid evidence in criminal cases against individuals using chemicals or other illegal methods in catching fish. It also highlights how fish samples are to be collected and preserved in the field, sent to accredited laboratories for scientific testing and how a chain of custody of such evidence needs to be documented for such samples to be used as evidence in a court of law. The manual also includes the laws that prohibit

use of chemicals and other illegal fishing methods and penalties associated with use and/or possession of such illegal products. The guide is currently under review by fisheries stakeholders in the Centre for Coastal Resources (CRC), University of Rhode Island (URI).

Also in Year 4, the Project manager of the participated in a two-day workshop in Accra as an effort to build partnership with a consortium of academics from UK and West Africa. The British and West African academics are collaborating to prepare an interdisciplinary joint research bid targeted in expectation of the next relevant Global Challenges Research Fund (GCRF) call for research bids. Expectedly, expertise of the collaborators will be garnered to brainstorming ideas to create a Centre of West African Urban Research located at the Manchester School of Architecture. This Centre would collaborate and work directly with its African-based colleagues to develop a Centre of West African Urban Research located in West Africa run by African professionals, with strong collaboration links with Manchester. DFAS and CCM hopes to capitalise on this opportunity to establish linkages with other relevant institutions.

Figure 53: *Lessons on oysters at the DAA office at Tsokomey*

As part of community engagement, oyster pickers were supervised to collect data on some hydrographic parameters such as temperature, salinity, turbidity and pH with simple tools- digital thermometer, refractometer, Secci disk and pH test strip respectively. Data was collected twice in a month following moon phases, i.e. full moon and half-moon. Data was collected based on tidal trends (low tide and high) for each moon phase. Two individuals of the data collection group started training on data entering and analysis in excel. About 30 individuals of the DAA Oyster Pickers Association (DOPA) were taken through training on oyster culture. The training involved classroom session where participants went through basic oyster culture practices, culture methods and management. Result will feed into the Oyster management plan at the Densu delta.

In addition, CCM partnered the Department of Fisheries and Aquatic Sciences and Ainoo-Ansah Farms to showcase some of their innovations. Industry-Research Exhibition organized by the Directorate of Research, Innovation and Consultancy at the University of Cape Coast.

Figure 54: *CCM, DFAS and Ainoo-Ansah Farms showcase products at Industry-Research Exhibition*

As part of the preparatory process of the Norwegian funded Fish for Development (FfD) Project, a team of six (6) Ghanaians with research, marine, aquaculture and academia background were delegated by the Honorable Hon. Elizabeth Afoley Quaye, Minister for Fisheries and Aquaculture Development to visit Norway to have an overview of their fisheries sector in order to help determine the details of the cooperation process on the fisheries and aquaculture project to be carried out between the two countries. The visit which was led by the Honorable Deputy Minister of Fisheries and Aquaculture Development (Hon. Francis Kinsley A. Cudjoe had the primary objective to strengthen the institutional linkages, understand existing structures in Norway and legal basis for fisheries and aquaculture in that country to be able to share and draw lessons with the Norwegian counterparts through the cooperative effort. It is the intended goal of the FfD Project to strengthen the roles of government participation, research and the private sector through strategic partnerships and promote coordination with other donor programs.

Linkages to relevant institutions and local government authorities in Norway established through key institutions that were visited during the trip:

- Institute of Marine Research
- Directorate of Fisheries
- The Veterinary Institute
- University of Bergen
- Norwegian Food Safety Authority
- Morten Storebo, the Mayor of Austevoll
- Private Hatcheries e.g. Marine Harvest and other industry players.

Figure 55: *Prof. Denis Aheto at the Institute of Marine Research, Bergen*

Two major outputs have emerged, resulting from that visit:

1. A collaborative proposal was jointly developed by UCC's Department of Fisheries and Aquatic Sciences (DFAS), the UG's Department of Fisheries and Marine Sciences and the Institute of Marine Research and submitted to NORPAT, a funding cooperation between Norway and developing countries (https://www.siu.no/eng/For-the-

media/News/Funding-for-cooperation-between-Norway-and-developing-countries) for a joint project on capacity building at postgraduate masters and PhD levels in fisheries and aquaculture that also allows for exchange of students and scientists between Norway and Ghana.

2. The Centre for Coastal Management (CCM) selected to contribute to technical discussions in upcoming workshops in August 2018 within the context of the Fish for Development Project (FfD) relative to Fisheries and Oil and Gas interactions in Ghana.

Figure 56: *Institute of Marine Research, Bergen*

6.7 Activity 2.2.7: Wetlands Ecological Health Monitoring Using School Clubs and Communities

This activity is implemented using the coastal zone wetlands educational curriculum developed to educate senior and junior high school level and undergraduate university level students on the nature, types and importance of wetlands, the ecological conditions, biodiversity and anthropogenic threats to coastal wetland habitats, and the techniques for monitoring the ecological health of wetlands. In the first quarter, the Centre for Coastal Management in collaboration with Friends of the Nation (FoN) organized quiz competitions in the Western and Central Regions to raise awareness of the importance of wetlands and promote their wise use. The quiz comprised of multiple sets of questions and a drawing competition to assess the ability of the contestants to forecast how they would want to see their wetlands in the next five years. Some members of the community also had the opportunity to share their views and experiences in wetlands management. In course of the events, students and schools were presented with books and other stationary to support academic work. Further collaborations with Hen Mpoano and CSLP are expected in Year 4.

Figure 57: *Wetlands monitoring clubs measure physicochemical parameters of wetland ecosystems in the Western Region of Ghana*

Figure 58: *Students of Anlo Beach D/A JHS reading the brochure on wetlands*

In furtherance of this activity, the Project through CSLP sought to provide heuristic experience for pupils of Yabiw Methodist Junior High School as part of their mandate for Wetland School Club in the Shama Constituency of the Western Region of Ghana. A field trip to the Fosu and Benya lagoons in the Central Region covered identification of threats to wetlands, identification of some wetland fauna and flora and a demonstration on how to measure some physicochemical parameters in aquatic systems. This activity is intended to educate existing schools in the Wetland School Club as well as introduce new schools to the club.

Figure 59: *JHS pupils take lessons on wetlands*

Under the reporting year, the project assisted the Coastal Sustainable Landscapes Project (CSLP) to organize a two-day training for six JHS teachers from Yabiw and Akwaidaa communities to mentor wetland school clubs. The participants comprised of five males and a female. The training involved both practical and theoretical modules in the following modules:

Module: 5 -Water quality and Invertebrate Monitoring
Module: 6 – Fisheries Monitoring
Module: 7- Wildlife Monitoring

Figure 60: Training of JHS teachers on wetlands monitoring

6.8 Activity 2.2.8: Strengthening Community-based Groups

This activity was merged into Activity 2.2.9

6.9 Activity 2.2.9: Promoting Supplementary Livelihoods in Coastal Communities

In Year 4, Project Management made a decision to provide support to individual community members to set up their own farms after receiving training from the demonstration farms. Interested and committed community members were identified to receive support from the

project to operate their own farms where activity facilitators were asked to prepare and present financial statements to support their implementation. The financial statements and other logistics have been assessed to kick-start activity. Nonetheless, its implementation has delayed due to unavailability of funds.

Figure 61: Inspection of bee hives by facilitators and trainees

APPENDICES

Appendix 1: Application form for DFAS Undergraduate student exchange programme

USAID/UCC FISHERIES AND COASTAL MANAGEMENT CAPACITY BUILDING SUPPORT PROJECT

STUDENT EXCHANGE PROGRAMME (J-TERM) APPLICATION FORM

PLEASE COMPLETE FORM IN BLOCK LETTERS

ABOUT THE PROGRAMME:

The Department of Fisheries and Aquatic Sciences of the University of Cape Coast, through the USAID/UCC Fisheries and Coastal Management Project, is collaborating with the University of Rhode Island is organising the maiden edition of a 2-week fully sponsored summer student exchange programme at the University of Rhode Island, USA. The exchange programme seeks to enhance the academic knowledge of participating students in global fisheries and coastal resource management issues whilst deepening their appreciation to a multi-disciplinary and cross-cultural perspective to these issues.

APPLICANT BIODATA			
Surname			
First Name			
Other Names			
Date of birth (DD-MM-YYYY)			
Nationality			
Gender			
Home address			
Email			
Phone number			
Do you have a relative in the USA?		YES	NO

ACADEMIC DETAILS	
Programme of Study	
Registration Number	
Level	
Current CGPA	

SUPPLEMENTARY REQUIREMENTS Please attach a copy each of all of the following documents

Passport No. (if already available)	
Motivation letter	Please provide as an attachment
Police report (if already available)	Please provide as an attachment

NB: All selected applicants will require passports and police report

Appendix 2:

STUDENTS' EVALUATION OF THE J-TERM PROGRAMME 2018

Student 1

Living accommodations

- The logistic team did very well with the accommodation they provided us. Each of us was given a separate room which gave us more privacy to do things the way we wanted it.

Programme duration.

- The programme duration was very short and that made us to do things at the least pace. I think the duration could be at least extended for us to have enough time for the things we were to acquire before going back to Ghana.

Content

- The content was very bulky especially considering the short period of time we have.

Amount of time off

- The amount of time of free time given us was very limited.

Student 2

The pre-departure

- The pre-departure information, orientation and travel was really helpful because it was our first time travelling and we had no idea of what to do, things to bring along and the required luggage size and weight.

Living accommodation

- Living accommodation was better than what we, especially me in particular expected.
- Living together was fun because we really got to know each other better. Cooking was great because we were able to decide what we wanted to eat and how to go about it. Cleaning wasn't that fun because only a few people actually wanted to do it.

Programme duration

- The duration was short and I still can't believe that two weeks are up already.

Programme Content

- The content was rich and included a variety of subject ranging from history, recreational activities, coastal zone management, climate change and restoration programmes examples are the oyster, trout and eel grasses.
- The pace was okay even though it was my first time learning this was great.
- I think an hour or two of classroom before going to the field or experiential oriented stuff will be great.
- The materials were really helpful because we got to know exactly what to do and on which day.
- Programme handouts were detailed and rich in information.

Student 3

Pre-departure.

- Pre-departure orientation by Kim provided all needed information so I did not have problem during travelling.

Accommodation

- Accommodation suited me well.

Programme duration

- Duration was short but educative and fun.
- Combining cross culture with Fisheries and Coastal management was great.
- The programme was running really fast but I adapted along the line.

Programme Content

- I have had more classroom experience in Ghana already. Field experience exposed me to practical issues and required possible measures. Field experience is the best.
- Programme handouts were informative and I am taking them to use in Ghana

Student 4

Accommodation

- Accommodations were great; field experience was good because compared to our country field experience is poor. This is because they lack most of equipment needed in field trips to enhance learning.

Programme duration

- I think the speed limit was okay**.**

Programme Content

- Over-all, this J-Term programme have been very fruitful and educative. I hope that the organizers at CRC continue with this programme to help equip us so as to make a better economy for future generations.

Student 5

Accommodations

- The field experiments are great because there is a lot more practical exposure which makes learning easier.
- Cooking by ourselves in the fraternity house made us feel more at home.

Programme duration

- The programme duration was short. I believe it requires a lot in terms of content.

Programme Content

- Programme handouts were very useful.

CONCLUSIONS

The following conclusions can be drawn from the overall implementation of activities:

1. The programme was successfully executed with no hitches experienced primarily due to detailed planning put in place prior to the commencement of the programme.
2. The output after the implementation exceeded the expectations on the parts of both UCC and URI.
3. Enthusiasm on the part of the host institution to continue the J-Term Programme well into the future is high.
4. Experiential learning approach to the programme proved very effective for participants.
5. The nature of the housing facility for the programme created the perfect environment for social interactions and improved the demeanor for both participants and staff alike.
6. The exposure to a cultural and heritage imbued the participants with a rich knowledge and experience about new people, allowing them to compare and contrast with their own cultural knowledge back home.

RECOMMENDATIONS

Based on observations made and the students' evaluations; the following recommendations are made to improve subsequent editions of the programme:

1. Duration for the programme must be revised to either four weeks or at least three weeks since the two weeks duration was considered by all involved as insufficient. This will allow for a more thorough execution of programmatic activities at a more adequate pace and assimilation.
2. Problem-based tasks must be assigned to groups of participants at the beginning of the programme and proposed solutions presented during last day debriefing. This will allow firsthand observations and data gathering during the programme as well as foster team work.
3. Programmatic planning for subsequent editions of the J-Term must consider much needed rest days for participants to improve learning efficiency.

Appendix 3: Reviewers guide for JFCoM

Journal of Fisheries and Coastal Management
Department of Fisheries and Aquatic Sciences
College of Agriculture and Natural Sciences
University of Cape Coast

REVIEWERS GUIDE

Questions to guide the reviewer regarding decisions on ORIGINAL RESEARCH MANUSCRIPTS

1. Does the manuscript provide new information that is not already available in published form?
   If yes, please provide a description of what you believe is new.
   If no, then unless the manuscript has something else extremely important to offer, the manuscript likely should be rejected.
2. Do the authors provide a sound rationale for performing this study? If no, then the manuscript likely should be rejected.
3. Has the data been properly analyzed?
   If no, then the manuscript likely should be rejected or major revisions should be requested.
4. Have the results been clearly presented?
   If no, then a major revision should likely be requested.

Please list major comments that need to be addressed in a revision (i.e., the manuscript cannot be accepted unless these comments are adequately addressed)

1.
2.
3.

Please list other comments that you request to be addressed in a revision

1.
2.
3.

Other items to be considered when composing your review (please structure your review using the headings listed below)

The Abstract

- Does the Abstract appropriately summarize the manuscript?
- Do any discrepancies exist between the Abstract and the remainder of the manuscript?
- Can the abstract be understood without reading the manuscript?

The Introduction

- Is the Introduction concise?

- Is the purpose of the study clearly defined?
- Do the authors provide a rationale for performing the study based on a review of the relevant literature?
- Do the authors define terms used in the remainder of the manuscript?
- Is there is a well-defined hypothesis?

Methods

- Could another investigator reproduce the study using the Methods as outlined?
- Do the authors justify any choices available to them in their study design (e.g., choices of imaging techniques, analytic tools, or statistical methods)?
- Have the authors designed methods that could reasonably allow their hypothesis to be tested

Results

- Are the Results clearly explained?
- Does the order of presentation of the Results parallels the order of presentation of the Methods?
- Are the Results reasonable and expected?
- Are any Results introduced that are not preceded by an appropriate discussion in the Methods?

Discussion

- Is the Discussion concise?
- Do the authors state whether the hypothesis was verified or falsified?
- Are the author's conclusions justified by the results found in the study?
- Do the authors adequately account for unexpected results?
- Do the authors note limitations of the study?

Figures and Graphs

- Are the figures and graphs correct and are they appropriately labeled?
- Do the figures and graphs adequately show the important results?
- Do arrows need to be added to depict important or subtle findings?
- Do the figure legends provide a clear explanation that allows the figures and graphs to be understood without referring to the remainder of the manuscript?

Tables

- Do the tables appropriately describe the Results?

References

- Does the reference list follow the format for the journal?
- Does the reference list contain errors?
- Do any important references need to be added?

Appendix 4: List of Project Performance Indicators and FY 2018 Results

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
1	Quantities and/or sizes of fish landed by selected canoe fishermen in the Central and Western Regions of Ghana	-	-	-	-	-	-
Comments: Periodic stock assessment surveys conducted provide information and data for this custom indicator. The nature of the indicator makes it difficult to set baselines, annual targets and performance achieved in a particular reporting period which means results shown by this indicator could only be descriptive. The last fish stock assessment conducted by the project in FY 2017 indicated that quantities of fish landed by canoe fishermen have shown a gradual decline since 1986 mainly due to increase in fishing effort during the period. The assessments also showed that there is growth overfishing which is confirmed by lower modal sizes of fish landed. Beside data collection on fish stock by postgraduate students, no activity was conducted in Year 4 due to financial constraints. This indicator will not be reported on in Year 5 since the research commissioned to conduct the Stock Assessment Survey concluded in 2017.							
2	Fishing Mortality at MSY (F_{msy})	0.74	-	-	-	-	-
Comments: This is a custom indicator of the USAID/Ghana Sustainable Fisheries Management Project (SFMP) which is only tracked by the USAID/UCC Fisheries and Coastal Management Capacity Building Project. In 2014, the SFMP estimated Fishing Mortality at MSY (F_{msy}) to be 0.74 which was higher than the preferred Fishing Mortality at MSY (F_{msy}) of 0.40. In FY 2017, the SFMP reported Fishing Mortality at MSY (F_{msy}) to be 0.30 which indicates an increase in fishing mortality and a severe decline in population size. Current fishing effort is well beyond the level of sustainability for the small pelagic stocks. This indicator will not be tracked in FY 19.							

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
3	Biomass to produce MSY (B_{msy})	212,726	-	-	-	-	-
Comments: This is also a custom indicator of the USAID/Ghana Sustainable Fisheries Management Project (SFMP) which is only tracked by the USAID/UCC Fisheries and Coastal Management Capacity Building Project. In 2014, the SFMP estimated Biomass to produce MSY (B_{msy}) to be 182,726 tonnes which was less than the preferred Biomass to produce MSY (B_{msy}) of 310,476 tonnes. In FY 2017, the SFMP reported Biomass to produce MSY (B_{msy}) as 30,000 tonnes. Current estimated biomass is much lower than those estimated in 2014. This suggests diminishing economic returns. This indicator will not be tracked and reported on in FY 19.							
4	Number of hectares of biological significance and/or natural resources under improved natural resource management as a result of USG assistance	0	6.9	6.9	0	0	No
Comments: In Year 3, the project concluded research on the ecological conditions and the overall health status of the *Awiane* lagoon at Half Assini in the Western Region to acquire a more comprehensive baseline data on the lagoon for improved management. In Year 4, the project initiated processes to work with the community and their traditional authorities as well as the District Assembly to put the lagoon and its associated wetland area under improved management. However, since this activity was not executed due to financial constraints in Year 4, the target remains same for Year 5.							

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
5	Number of hectares in areas of biological significance and/or natural resource showing improved biophysical conditions as a result of USG assistance	0	6.9	6.9	0	0	No
Comments: In Year 3, the project concluded research on the ecological conditions and the overall health status of the *Awiane* lagoon at Half Assini in the Western Region to acquire a more comprehensive baseline data on the lagoon for improved management. In the quarter under review, the project initiated processes to work with the community and their traditional authorities as well as the District Assembly to put the lagoon and its associated wetland area under improved management. Areas, in hectares, of the lagoon and wetlands showing improved biophysical conditions will be determined in Year 5 since this activity could not executed in Year 4 due to financial constraints.							
6	Number of training and capacity building activities conducted with USG assistance	18	40	10	0	0	No
Comments: No training and capacity building activities took place in within Year 4. Therefore, five (5) training and capacity building activities are planned to be conducted in Year 5.							
7	Number of people receiving USG supported training in natural resources management and/or biodiversity conservation	223	250	100	6	6	Yes

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
Comments: In Year 4, ToT session was organised for six (6) teachers comprising 5 males and 1 female in relation to the Wetland Monitoring Club for Schools. Although hundred (100) participants were targeted to be trained in Year 4 this target is expected to be achieved in Year 5. These participants are expected to benefit from natural resources management and/or biodiversity conservation training in FY 2019.							
8	Number of person hours of training in natural resources management and/or biodiversity conservation supported by USG assistance	2676	15000	3000	96	3.2	Yes
Comments: In year 4 one training session was organised to train six (6) participants in natural resources management and/or biodiversity. The number of person hours is expected to increase in Year 5 on the basis of planned training activities.							
9	Number of individuals who have received USG supported long-term agricultural sector productivity or food security training	36	40	35	31	88.6	Yes
Comments: Thirty-six (36) students (13 males and 23 females) received USG supported long-term agricultural sector productivity or food security training in from Year 1 till Year 4. In Year 4, the first batch of MPhil students had graduated and were no longer supported by the project. Therefore only 31 students were supported in Year 4. In Year 5 the last cohort of five (5) MPhil students and five (5) PhD students will be supported to complete their studies.							

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
10	Number of individuals who have received USG supported short-term agricultural sector productivity or food security training	178	250	80	0	0	Yes
Comments: Eighty (80) people were targeted to receive USG supported short-term agricultural sector productivity or food security training in FY 2018. However, since none of such trainings took place in Year 4, the target will be carried over to Year 5.							
11	Number of food security private enterprises (for profit), producers organizations, water users associations, women's groups, trade and business associations, and community-based organizations (CBOs) receiving USG assistance	18	10	5	5	100	Yes
Comments: Five (5) community-based organizations (CBOs) were targeted in Year 4 to receive technical assistance in supplementary livelihood activities (snail farming and bee-keeping) in 4 selected coastal communities in the Western and Central region of Ghana. These organisations were only engaged during the first quarter of the year due to due to financial challenges. It is therefore planned that activities feeding into this indicator will be pursued again in Year 5.							

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
12	Number of private enterprises (for profit), producers organizations, water users associations, women's groups, trade and business associations, and community-based organizations (CBOs) that applied new technologies or management practices as a result of USG assistance	5	10	4	4	100	Yes
Comments: Four (4) Community-Based Organizations (CBOs) that received technical assistance in supplementary livelihood activities applied new management practices in bee-keeping and snail farming in this reporting period. A follow up engagement will be conducted for these organizations in the fifth year.							
13	Number of members of producer organizations and community based organizations receiving USG assistance	196	200	100	80	80	Yes

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
Comments: One-hundred (100) members have been targeted to receive assistance in FY 2018. Eighty (80) members in total belonging to the four (4) Community-Based Fisheries Management Groups (CBFMGs) formed in 4 selected fishing communities received technical assistance in supplementary livelihoods activities (snail farming and bee-keeping) by the project in Year 4. In the FY 19, a follow up engagement will be conducted to evaluate the outcome of the assistance given to the eighty (80) members.							
14	Number of farmers and others who have applied new technologies or management practices as a result of USG assistance	87	200	100	80	80	Yes
Comments: Eighty (80) members of the 4 Community-Based Fisheries Management Groups (CBFMGs) formed in 4 selected fishing communities applied new management practices in snail farming and bee-keeping from FY 3 into FY 4. In the FY 19, a follow up engagement will be conducted to evaluate the outcome of the assistance given to the eighty (80) members.							
15	Number of rural households benefiting directly from USG interventions	196	200	100	80	80	Yes
Comments: Eighty (80) rural households benefited directly from project inventions through supplementary livelihood support in snail farming and bee-keeping in the period under review. In the FY 19, a follow up engagement will be conducted to evaluate the intervention given to the rural households.							

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
16	Score, in percent, of combined key areas of organization capacity amongst USG direct and indirect local implementing partners	80.13	95	90	80.13	95	Yes
Comments: AfricaLead conducted an Organizational Capacity Assessment for DFAS and CCM. The assessment covered 8 major areas; 1) Governance 2) Administration 3) Human Resources 4) Financial Management 5) Organizational Management 6) Program Management 7) Network Capacities and 8) Policy Analysis and Advocacy and arrived at a total score of 80.13% as the combined key areas of organization capacity. This assessment was conducted in Year 3. In Year 5, a final assessment will be conducted to measure the progress of DFAS and CCM in all 8 areas and reported on accordingly.							
17	Number of beneficiaries receiving improved infrastructure services due to USG assistance	136	150	150	162	108	Yes
One-hundred and twenty-seven (162; 105 males and 57 females) people made up of 11 senior staff members, 6 Research Assistants, 6 Administrative staff, 8 Technical staff, 46 post-graduate students and 50 undergraduate students were beneficiaries of refurbished library, fisheries and coastal management laboratory, project vehicles and the premises of DFAS and the Center for Coastal Management. An additional staff was employed at the Centre for Coastal Management during the second quarter in FY 4. A total of 35 individuals comprising 22 undergraduate students, 6 postgraduate students and 7 staff from sister departments in the University of Cape Coast benefited from the refurbished Fisheries and Coastal Research Laboratory and associated services.							

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
18	Number of new research collaborations established between USG-supported beneficiaries and other institutions	15	10	5	4	80	Yes
Comments: Centre for Coastal Management collaborated with the Technical University of Denmark's Institute for Aquatic Resources (DTU Aqua), National Geographic, the French Embassy and World Academy of Sciences in FY 18. Five (5) more collaborations are envisaged in FY 19.							
19	Number of scientific studies published or conference presentations given as a result of USG assistance for research programs	52	10	5	3	60	Yes
Comments: Three students, supported by USG through the FCMCBS Project, delivered presentations at CERF conference in Rhodes Island during a semester-long exchange program in FY 4. In Year 5, it is envisaged that thirty (30) new scientific studies will be published or conference presentations given. This figure is founded on the basis that most students supported on the FCMCBS Project are at the final stages of their studies and will be required to publish their findings. Also the second conference on Fisheries and Coastal Environment (CFCE) will be organised to provide the platform for such presentations.							

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
20	Number of dialogues and stakeholder consultations held on fisheries and coastal management	8	20	3	1	33.33	No
Comments: In the period under review, one consultative dialogue was held regarding acquisition of Fort St. Jago as an off-campus site for the Centre for Coastal Management. Five (5) dialogues and consultations are planned to be held in FY 19 particularly on Closed season and other coastal management related issues.							
21	Percentage of graduates from USG-supported tertiary education programs employed	3	50	5	1	20	No
Comments: Since the inception of the FCMCBS Project, only three (3) graduates supported by the project have been successfully employed. In the fourth year, one (1) graduate (MPhil. Fisheries Science) was employed by Conservation Foundation Ghana. It is therefore envisaged that as a result of dialogues and consultative meetings more graduates can be employed in relevant fisheries and coastal sectors							
22	Number of CSOs and government agencies strengthened	28	25	25	0	0	Yes
Comments: Representatives of CSOs and government agencies are strengthened through their participation in the GIS, Fisheries Management, Climate Change and Integrated Coastal Management short courses. None of those short courses took place in Year 4. A total of twenty-five (5) CSOs and government agencies are expected to be strengthened through the organization of short courses.							

No.	Indicator	Baseline	Life of Project (LOP) target	Annual target	Performance achieved in FY 18 (actual)	Performance achieved in FY 18 (%)	On target? Yes/No
23	Total number of direct beneficiary	612	800	350	243	69.43	No
Comments: In Year 5 it is planned that a total of two hundred (200) new people will directly benefit from the implementation of the FCMCBS Project.							