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**UNIVERSITY OF
CAPE COAST**

USAID/UCC FISHERIES AND COASTAL MANAGEMENT CAPACITY BUILDING SUPPORT PROJECT



YEAR TWO ANNUAL REPORT

1ST OCTOBER, 2015 – 30TH SEPTEMBER, 2016
DEPARTMENT OF FISHERIES AND AQUATIC SCIENCES
UNIVERSITY OF CAPE COAST

October
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LIST OF ABBREVIATIONS

CCM	Center for Coastal Management
CSLP	Coastal Sustainable Landscapes Project
CAADP	Comprehensive Africa Agriculture Development Program
CDCS	Country Development Cooperation Strategy
DFAS	Department of Fisheries and Aquatic Sciences
EMMP	Environmental Monitoring and Mitigation Plan
FtF	Feed the Future
FCM	Fisheries and Coastal Management
GIS	Geo-Information Systems
GSSP	Ghana Strategy Support Program
GoG	Government of Ghana
ICM	Integrated Coastal Management
M & E	Monitoring and Evaluation
METASIP	Medium Term Agricultural Sector Investment Plan
MDG	Millennium Development Goal
MoFAD	Ministry of Fisheries and Aquaculture Development
MEAS	Modernizing Extension and Advisory Service
METSS	Monitoring, Evaluation and Technical Support Services
PMP	Performance Monitoring Plan
PIRS	Performance Indicator Reference Sheets
SFMP	Sustainable Fisheries Management Project
USAID	US Agency for International Development
USG	United States Government
WARFP	World Bank West Africa Regional Fisheries Program

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Cover Photo: A rainy day in the field at Half Assini in the Jomoro District, Western Region of Ghana on a quest to initiate deliberations on the restoration of the Awiane Lagoon. In the picture are Ms. Esinam Attipoe, Dr. Joseph Aggrey-Fynn, Prof. Richard Burroughs, Dr. Isaac Okyere, Prof. John Blay and Ms. Success Sowah (left to right)

Photo credit: Department of Fisheries and Aquatic Sciences – UCC

TABLE OF CONTENTS

LIST OF FIGURES	7
LIST OF TABLES	8
EXECUTIVE SUMMARY	9
1.0 INTRODUCTION	10
Ghana’s Marine Fisheries Sector	10
Feed the Future Initiative of the United States Government	11
The USAID Fisheries and Coastal Management Capacity Building Support Project.....	12
Department of Fisheries and Aquatic Sciences of the University of Cape Coast.....	15
1.3.1 Strengths	17
1.3.2 Required Strengths.....	17
1.3.3 Challenges.....	18
1.3.4 Opportunities.....	18
1.3.5 Threats.....	19
2.0 PROGRAM COMPONENTS, MANAGEMENT AND ACTIVITIES IN THE SECOND YEAR.....	21
Summary of activities and accomplishments in the second year.....	21
Program Components.....	25
Project Monitoring and evaluation (M&E).....	25
2.5 Program management, technical support and collaborations.....	33
2.6 Renewal of contracts for project staff	35
Annual reporting and work planning for the Project	36
Development of procurement plan.....	38
2.7 Meeting with USAID and other Donor Implementing Partner meetings.....	38
3.0 PROJECT OUTPUT 1.1: IMPROVED INFRASTRUCTURE	41
3.1 Activity 1.1.1: Renovating and Equipping Fisheries and Coastal Research Laboratory.....	41
<i>DFAS Research Vessel</i>	46
3.2 Activity 1.1.2: Refurbishing and Equipping office/Lecture/Computer rooms and Library.....	48
3.3 Activity 1.1.3: Acquisition of Vehicles to Support Educational, Training, Research and Extension Activities	49
4.0 PROJECT OUTPUT 1.2 INCREASED TECHNICAL AND SCIENTIFIC KNOWLEDGE.....	52
4.1 Activity 1.2.1: Academic and Technical Staff Capacity Strengthening	52
4.2 Activity 1.2.2: Operationalization of the Centre for Coastal Management	55

4.3	Activity 1.2.3: Support for Postgraduate (M.Phil & PhD) Training Program	60
4.4	Activity 1.2.4: Undergraduate Research Grants.....	64
5.0	PROJECT OUTPUT 2.1: INCREASED MARINE AND COASTAL RESEARCH AND RESOURCE ASSESSMENTS	70
5.1	Activity 2.1.1: Conducting Fisheries Stock Assessment.....	70
5.2	Activity 2.1.2: Conducting Research and Assessment on Marine Fisheries Governance Issues	72
5.3	Activity 2.1.3: Research on Fish and Shellfish of Commercial Value	75
5.4	Activity 2.1.4: Analysis of Value Chains of Fish Trade	77
5.5	Activity 2.1.5: Monitor the Biodiversity and Health of Coastal Ecosystems	77
5.6	Activity 2.1.6: Developing Marine and Coastal Fisheries Database.....	83
6.0	PROJECT OUTPUT 2.2: COMMUNICATION, EXTENSION AND OUTREACH IMPROVED.....	89
6.1	Activity 2.2.1: Developing Material and Conducting Training on Integrated Coastal Management.....	89
6.2	Activity 2.2.2: Developing Material and Conducting Training on Fisheries Management.....	91
6.3	Activity 2.2.3: Developing Manuals and Updating Training Materials on Climate Change Adaptation and Mitigation	92
6.4	Activity 2.2.4: Developing Material and Conducting Training on the use and Application of Geographical Information Systems (GIS)	93
6.5	Activity 2.2.5: Engaging Policy Makers to Address Coastal and Fisheries Issues... 95	
6.6	Activity 2.2.6: Building Institutional Partnerships and Collaboration.....	99
	USAID Coastal Implementing Partners Meeting.....	103
6.7	Activity 2.2.7: Wetlands Ecological Health Monitoring Using School Clubs and Communities	111
6.8	Activity 2.2.8: Strengthening Community-based Groups.....	114
	Activities Undertaken	115
	Recorded Output/Results	116
	Planned Activities for March 2016	116
6.9	Activity 2.2.9: Promoting Supplementary Livelihoods in Coastal Communities... 118	
	Activities Undertaken	118
	<i>Selection of communities and trainers for supplementary livelihood activities</i>	119
	<i>Community remobilization</i>	120
	<i>Local market survey</i>	120
	<i>Training of actors in snail farming, bee-keeping and oyster rearing</i>	120
	Appendix 2a: Call for Applications for Scholarships 2016/17 Academic Year.....	132

LIST OF FIGURES

Figure 1: Fish is a major source of protein for many Ghanaians	10
Figure 2: Trends in Ghana’s total fish catch	10
Figure 3: Map of Ghana showing zones of focus for the project	13
Figure 4: The President of the University of Rhode Island led a delegation of 7 dignitaries from URI to visit the UCC to expand collaborative relationships with the UCC.....	24
Figure 5: Wetlands monitoring workshop by DFAS, FoN and Hen Mpoano	24
Figure 6: Cross section of community representatives at the stakeholder engagement at the Jomoro District Assembly on Tuesday 24th May, 2016.....	25
Figure 7: Project overview Project Results Framework	26
Figure 8: M&E Team from DFAS meeting with academic staff and consultants currently undertaking various activities of the DFAS/UCC FCMCBS Project	28
Figure 9: M&E Team, academic staff from DFAS and consultants on the DFAS/UCC FCMCBS Project in a group photograph after the meeting.....	29
Figure 10: Participants at the M&E workshop in Koforidua, April 2016	31
Figure 11: Annual work plans and reports produced by end of second year of the Project	38
Figure 12: Some laboratory equipment installed in the Fisheries and Coastal Research Laboratory	46
Figure 13: The DFAS research Vessel (RV Sardinella)	47
Figure 14: Offices being refurbished for DFAS lecturers to enhance teaching and learning..	49
Figure 15: Dr. Aggrey-Fynn receiving training at the fish age and growth laboratory at Old Dominion University	52
Figure 16: DFAS staff (Prof. John Blay, Prosper Dordunu and Thomas Davis Robin) at the Coastal Resources center, URI	53
Figure 17: Organogram of the Centre for Coastal Management	55
Figure 18: Approved CCM logo.....	56
Figure 19: Website banner used for publicity of the public lecture on DFAS website	59
Figure 20: Prof. Richard Borroughs.....	59
Figure 21: Total number of candidates admitted to various postgraduate programs on full scholarships at DFAS-UCC, by year and gender.....	64
Figure 22: DFAS final year undergraduate students (2015/16) on a field trip to the SFMP office in Accra.....	68
Figure 23: Bumper fish harvest from beach seining activity at Atwenbanso landing beach, Jomoro District: Suspected outcome of ban on light fishing in the District. July 2016	72
Figure 24: District Chief Executive (DCE) of Abura/Asebu/Kwamankese (AAK) District at Fisheries Governance Validation Meeting at Moree (June 2016)	74
Figure 25: Children perform 'oyster dance' at low-tide level to harvest oysters.....	75
Figure 26: Active beach by day	76
Figure 27: Coastal Map of Ghana showing fish landing ports and selected sampling stations	77
Figure 28: Awiane lagoon at Half Assini in the Western Region, Ghana	81
Figure 29: Current staate of some parts of the Awiane Lagoon	82
Figure 30: Participants at the stakehoder meeting at the Jomoro District Assembly, Western Region, Ghana.....	82
Figure 31: Research assistants filling questionnaires during the GIS needs assessment.....	93
Figure 32: GIS training held at the Centre for Coastal Management (CCM), UCC	94
Figure 33: The consultant (Mrs. Cynthia Okine) presents computer set and GPS device to the Project MAnager (Dr. Denis Aheto). Looking on is the Head of Department (Dr. Noble Asare).....	95

Figure 34: Policy and Research Dialogue on Sustainable Fisheries and Coastal Management in Ghana. In attendance was the Honourable Minister in Charge of Fisheries and Aquaculture Development Sherry Ayittey, Heads of Departments from sister universities, regional.....	96
Figure 35: Participants of the National Scientific Meeting on Fisheries and the Coastal Environment.....	99
Figure 36: Prof. D. D. Kuploe welcomes URI team at the	105
Figure 37: Signing of MoU between UCC and URI.....	105
Figure 38: Final year DFAS students at the SFMP office in Accra	106
Figure 39: Participants at the Fisheries Leadership Course.....	107
Figure 40: Aerial photograph of the Awiane Lagoon in the Jomoro District, captured with a drone	108
Figure 41: Children and some community members look on fascinated as drone is set for flight and remote controlled.....	109
Figure 42: Dialogue session at the forum	110
Figure 43: At the write-shop to develop a proposal to “Train African professionals in fisheries and aquaculture”	110
Figure 44: Wetlands monitoring workshop for Junior High School teachers	114
Figure 45: Trainers from DFAS teach oyster group how to prepare cultches for spat collection in lagoon.....	121
Figure 46: Cultches arranged on a rack ready for planting in the Narkwa lagoon	121
Figure 47: Two members of the oyster group carry cultches into Narkwa lagoon.....	121

LIST OF TABLES

Table 1: Details of the five courses offered at RMU	55
Table 2: Postgraduate PhD Research Topics (2015/2016 Academic Year)	61
Table 3: Postgraduate MPhil Research Topics (2015/2016 Academic Year)	62
Table 4: List of PhD students admitted with full scholarship from USAID (2016/17)	63
Table 5: List of MPhil students admitted with full scholarship from USAID (2016/17) ..	63
Table 6: Undergraduate Research Projects	65
Table 7: Summary of water quality variables (mean \pm SD) monitored form the two sampling points; February, 2016 (n=3)	80

EXECUTIVE SUMMARY

The Fisheries and Coastal Management Capacity Building Support Project was awarded by the United States Agency for International Development (USAID) to the Department of Fisheries and Aquatic Sciences (DFAS) of the University of Cape Coast (UCC) on the 24th October 2014. As per the agreement, UCC/DFAS is expected to submit an annual report to USAID highlighting programmatic and financial progress and challenges. This report refers to the period from 1st October 2015 - 30th September, 2016. It provides an update on progress made or otherwise in relation to the second year activities as detailed in the Scope of work and agreement. Key targets met during the period include receipt of shipment made up of consignments of laboratory research and field equipment, development of four (4) short courses in GIS, Fisheries Management, ICZM and Climate Change. The period also saw the completion of Year Two Annual Report and the development of Year 3 Work plan. Also a procurement plan was drafted for further review by UCC's Procurement Office. Several researches were commissioned within the project's thematic areas and linkages to policy through media engagement and workshops were achieved. During the period under review, students were admitted into DFAS programmes of study with scholarships funded by USAID at the MPhil and PhD levels. Small grants for research was provided to final year undergraduate students of the Department. Significant achievements were made on the M&E front facilitated through USAID Economic Growth Office M&E Specialist Working Group and USAID Monitoring and Evaluation Technical Support Services (METSS). The project is respectively thankful to USAID and university management for the financial and administrative support.

1.0 INTRODUCTION

Ghana's Marine Fisheries Sector

Ghana has valuable marine fisheries resources that contribute nearly 5% to annual national gross domestic product (GDP). The sector indirectly supports the livelihoods of 2.2 million people or 10% of the Ghanaian population. Unfortunately the economic fortunes from these fisheries are being dwindled due to low investment in fisheries management and value addition is not given priority. Illegal fishing is pervasive and there are too many vessels catching few fish leading to cost overruns i.e. cost of fishing exceed the amount of income that is being generated, at least compared to ten years ago. As a result the individuals and communities reliant on fishing are getting poorer. Indeed, the industry presently provides little prospect for improving the welfare of fisher folks with ramifications for the national economy as a whole.



Figure 1: Fish is a major source of protein for many Ghanaians

The decline is so grave that improving the management of the sector in Ghana to be able to realize the full potential of the industry will however take some time. This will require careful management to ensure impacts on individuals and communities are properly addressed. Based on experience elsewhere it will take 20 or more years to effect such change. Therefore a long term commitment to rebuild marine fisheries stocks and increase production through

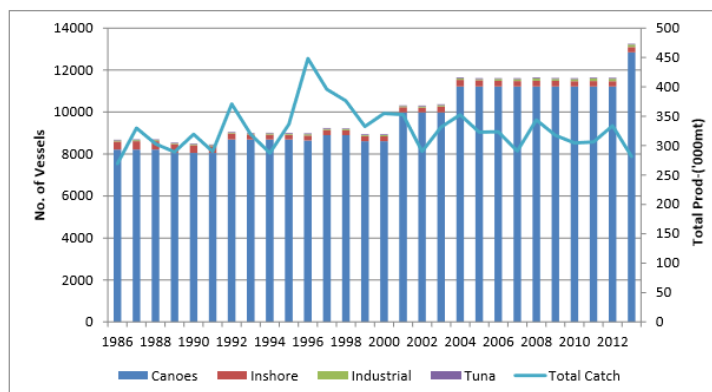


Figure 2: Trends in Ghana's total fish catch

effective fisheries management strategies and adoption of responsible fishing practices is crucial. To achieve these goals requires well-planned intervention to revitalize Ghana's fisheries sector and is expected to contribute to the Ghana Poverty Reduction Strategy.

The Fisheries and Coastal

Management Capacity Building Support Project was born out of this concern. It aims at promoting sustainable marine fisheries management in Ghana through capacity building of students, professionals and fishing communities using effective partnerships across public and private institutions locally and internationally. In respect of this, the United States Agency for International Development (USAID) committed US\$5.5 million dollars, sub-obligated through a multi-year partnership program with the University of Cape Coast's Department of Fisheries and Aquatic Sciences as lead implementers over five years (2014-2019). The project contributes to the Government of Ghana's national fisheries policies and coastal development objectives, and USAID's Feed the Future Initiative.

Feed the Future Initiative of the United States Government

The Feed the Future Initiative (FTF) was launched in 2010 by the United States government and the Obama Administration to address global hunger and food insecurity. According to the National Institute of Food and Agriculture, it is "the U.S. government's global food security initiative. In 2009 President Barack Obama committed \$3.5 billion over a 3-year period to a global initiative with the intent of combatting hunger and poverty; in May 2010 the United States Department of State launched and developed the Feed the Future Initiative. The Initiative is coordinated primarily by the U.S. Agency for International Development (USAID). According to USAID FTF website, "Recent studies suggest that every 1 percent increase in agricultural income per capita reduces the number of people living in extreme poverty by between 0.6 and 1.8 percent." No other investment has that return. FTF is funding initiatives in fisheries and coastal management in view of the fact that the capacity of most developing nations to utilize their coastal and marine assets, while sustainably protecting them from degradation, is lacking.

More so, Ghana is faced with growing challenges in managing coastal and marine resources, such as the dramatic decline of fish stocks and the degradation of coastal resources. The overexploitation of fisheries at artisanal and industrial scales using unsustainable fishing methods, and the pollution of coastal ecosystems, are further concerns. Coastal ecosystems, especially estuaries, lagoons and their associated wetlands, are becoming increasingly impacted by activities within their catchment areas, with deforestation, intensive agriculture, damming and irrigation all changing the nature of material fluxes (water, sediment, nutrients and pesticides). It is apparent that Ghana's marine and coastal resources are being lost or damaged in ways that are diminishing biodiversity. This is attributed to many factors, including deficiency in monitoring and enforcement of regulations, lack of education, training, research, data gathering and analysis, and low government investments in capacity building for effective management. The lack of adequate human resource capacity, good governance and well-functioning systems impede natural resource management in Ghana.

The USAID Fisheries and Coastal Management Capacity Building Support Project

The Fisheries and Coastal Management Capacity Building Support Project operates on a partnership agreement signed on 24th October, 2014 between the United States Agency for International Development (USAID) and the University of Cape Coast (UCC). The project adds value to the work of the Department of Fisheries and Aquatic Sciences (DFAS) of the University in terms of administrative, technical and financial assistance.

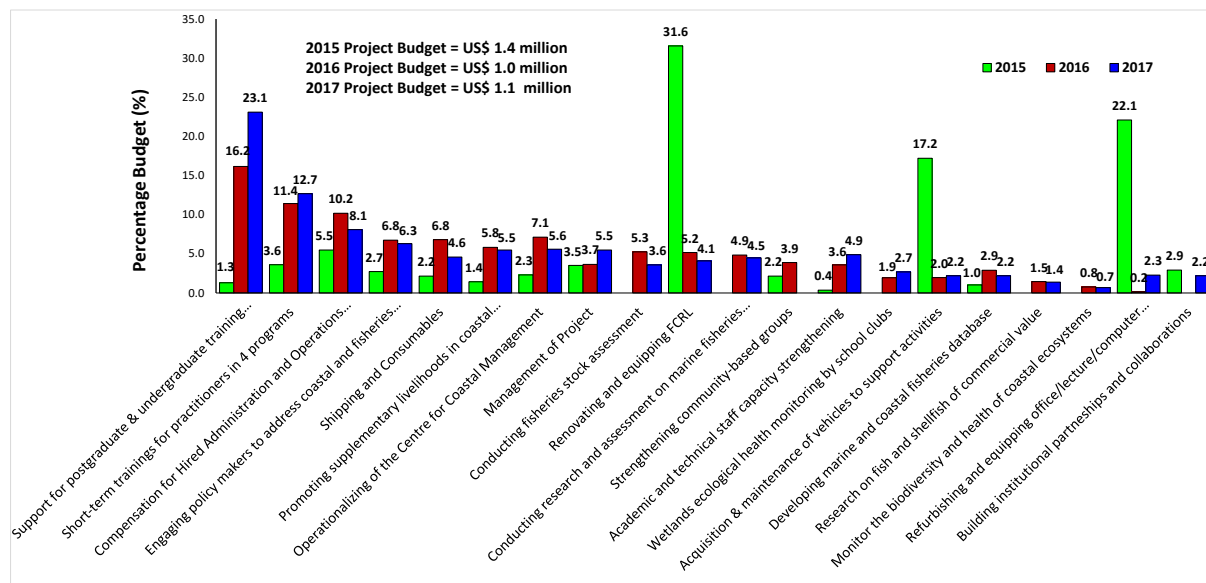


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USAID's total contribution to this Project is up to the tune of US\$5,500,000, which will be sub-obligated on yearly increments to enable DFAS effectively coordinate capacity building at various levels for sustainable marine fisheries management in 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 programmed under the US Government's Feed the Future Initiative¹ 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 US\$ 5.5 million award by USAID to the University of Cape Coast is aimed at contributing towards addressing capacity deficiency in fisheries and coastal management to a large extent. The USAID Fisheries and Coastal Management Project was modelled to respond to the issues raised in the SWOT Analysis. It aims at resourcing the Department to be able to train personnel for fisheries and coastal management, and strengthen the Centre for Coastal Management to be fully operational. It will also build stronger and more integrated information support systems to manage and streamline existing and new data on fisheries and

¹ Is US Government-led initiative for food security in developing countries

coastal issues to underpin future evidence-based policy formulation to help inform development strategy decisions at all levels.

Therefore the project activities contribute to USAID’s development strategy for Ghana as outlined in its Country Development Cooperation Strategy (CDCS), directly in support of the Development Objective Two: Sustainable and Broadly Shared Economic Growth². It is expected that by the end of the project, capacity building for sustainable marine fisheries management in Ghana can be quantitatively proven and demonstrable management outcomes for the country’s coastal-marine space and resources will be evident.

These achievements will come on the back of a strengthened local scientific capacity in specific areas of emphasis such as quality and relevant educational programs, practical research, extension and advisory services that will support the management of Ghana’s fisheries and coastal resources to enhance the country’s social and economic development. One of the key objectives to deliver this vision is to build sustainable partnerships 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 Departments at the University of Rhode Island (URI).

This project has also enabled targeted collaborations with relevant partners including the Ministry of Fisheries and Aquaculture Development (MoFAD) and the Fisheries Commission of Ghana, 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.

An add-on effect of this project will be the upgrade of skills of academic and technical staff in the use of new technologies and scientific equipment, refurbishment of the fisheries and coastal research laboratory, library and offices of academic staff, acquisition of vehicles for field research, extension and the procurement of equipment for the creation of fisheries and coastal management database working with other international data sources and host centers.

These improvements coupled with award of student scholarships will facilitate the training of 10 PhD, 20 masters and 150 undergraduate students. The package also includes financing of short courses on climate change adaptation, fisheries and coastal management for other



Figure 3: Map of Ghana showing zones of focus for the project

² To obtain the full report, please visit http://www.usaid.gov/sites/default/files/documents/1860/Ghana_CDCS_fy2013-17.pdf

relevant professionals over the course of five years. The short courses will be run under the ambit of the Centre for Coastal Management (CCM)³ as part of its operationalization. The project will also support the implementation of its strategic plan, develop business plans for the Centre, enhance roundtable policy dialogues, and undertake critical research with the help of its newly refurbished Fisheries and Coastal Research Laboratory within DFAS.



It will generate research results to fill key knowledge gaps on a needs basis that would help strengthen the further development and implementation of Ghana's Fisheries and Aquaculture Sector Development Plan. It is expected that implementation issues, such as prioritizing, sequencing, and phasing in of policy reforms will feature prominently; and will embark on community outreach and extension to improve long-term national capacity on fisheries and coastal issues, train personnel in relevant government agencies, and strengthen their links to a network of researchers within national research organizations and elsewhere.

Through this grant, formal partnerships (Memorandum of Understanding) have been strengthened or established with reputable local and international institutions as follows:

- I. ECOWAS Coastal & Marine Resources Management Centre, University of Ghana
- II. Coastal Resources Center - University of Rhode Island, USA
- III. Australian National Centre for Ocean Resources and Security, University of Wollongong, Australia
- IV. Florida Gulf Coast University, USA
- V. Ministry of Fisheries and Aquaculture Development, Ghana.

³ CCM was established in December 2013 by the Academic Board of the University of Cape Coast.



DFAS collaboration with URI and USAID Sustainable Fisheries Management Project

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

The University of Cape Coast (UCC) is located close to the ocean making the Department of Fisheries and Aquatic Sciences (DFAS) one of the leading institutions in the area of Fisheries and Marine Sciences in Ghana. Indeed, the Department since its inception in 2002 has the vision to become unique and an innovative partner in advancing healthy aquatic ecosystems for sustained provision of goods and services, in collaboration with public and private institutions, both local and international.



Some foreign students from Virginia Tech University with DFAS students and lecturers

This vision is beginning to see the light of the day through the USAID multi-year funding to the tune of US\$ 5.5 million. Through this grant, the capacity of the Department to deliver this vision is enhanced through the provision of adequate logistics and teaching infrastructure, increasing student numbers largely due to new knowledge about the capacity of the Department, possible job opportunities, enhanced sensitization about the Department and deepening relationships with related institutions. With this project coming on board, a lot of issues have been largely addressed. The USAID funds has enabled the Centre for Coastal Management effectively take off its operations and received formal institutional recognition.

The Department and the Centre now have a state-of-the-art laboratory with relevant and modern laboratory and field equipment procured and soon to be installed to allow hands-on practical based training of students. The Department 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.

With the USAID grant, several opportunities exist for DFAS students. For instance:

- i. Funding for undergraduate project work in the final year is guaranteed under the multi-year USAID/UCC Fisheries and Coastal Management Capacity Building Support Project (2014-2019).
- ii. Students could benefit from the J-TERM Student Exchange Program with the University of Rhode Island in the United States of America.
- iii. Graduate and Post-graduate studies - The Department offers MPhil and PhD programs in the fields of Integrated Coastal Zone Management, Aquaculture, Fisheries Science, and Oceanography and Limnology. This presents our undergraduate students with future academic prospects.

Staff and students also benefit from interactive teaching and learning alongside with field visits and real-time laboratory exposure for practical experience. It is anticipated that the graduates could engage in research work in Institutions (including CSIR, Water Resources Commission), Ministries (Fisheries and Aquaculture Development; Environment, Science and Technology; Agriculture), Environmental sector, Financial institutions, Oil and Gas industry, NGOs (local and international), Managers of Aquaculture Facilities, Navy, Academia, or become Entrepreneurs among others.



DFAS and other SBS students of coastal management course on an educational trip at an Oil Waste Processing Facility in the Western Region, Ghana

The Department strives to communicate with its students and stakeholders through staff blogs, Departmental websites and social interactive platforms such as Facebook. For further information, please see:

<https://dfas.ucc.edu.gh/>

<https://www.facebook.com/dfas.ucc.edu.gh>

A SWOT analysis conducted by the Departmental Board (2012) as part of Departmental Strategic Planning revealed the following issues:

1.3.1 Strengths

- Highly qualified academic staff
- Motivated personnel and students
- Library facilities
- Teamwork
- Suitable location of department for teaching and research work



Some academic staff (from left to right) Prof. John Blay, Prof. Kobina Yankson Dr. Noble Asare and Dr. Joseph Aggrey-Fynn

1.3.2 Required Strengths

- Visibility of the department (improved content of staff blogs, departmental website, departmental notices, media relations, etc.)
- Expanded income generation base i.e. research grants
- Changed mindsets regarding the name of the Department
- Student selection procedure reviewed
- Harmony among Departments in the School
- Equitable utilization of resources at the School level
- Up-to-date field and laboratory equipment acquired
- Modern hatchery facility
- Equipment maintenance culture

- Efficient technical staff
- Enhanced ICT systems
- Acquisition of vehicle/ transport
- Well-maintained and serene environment
- Effective and efficient administrative staff
- Efficient channels of communication between management, staff and students
- Dedicated academic, research and technical staff

1.3.3 Challenges

- Dwindling student numbers
- Poor quality of incoming students
- Financial difficulties
- Limited equipment and poor maintenance culture
- Limited office space for academic staff
- No transport/ vehicle
- Unhealthy competition among Departments in the School
- Limited book/ Journal supplies
- Poor teaching and learning facilities
- Inefficient administrative and technical Staff (e.g. poor record keeping, weak supervision, poor working attitude)
- Inadequate space for expansion of laboratory and library facilities
- Misconception regarding the name of the Department
- Negative propaganda by colleagues and students in other Departments
- Inability to conduct state-of-the-art research
- Unreliable power (electricity) supply
- Unreliable water supply in the laboratory
- Bureaucratic procurement procedures (quality of items, price of items, speed of purchase, delays in audit inspection process)
- Reluctance of other academic departments to share equipment in the pool
- Weak relationship with sister institutions (e.g. Council for Scientific and Industrial Research, University of Ghana, Kwame Nkrumah University of Science and Technology)
- Poor visibility of department

1.3.4 Opportunities

- Collaborative Projects with donor agencies e.g. USAID, World Bank, Danida, etc
- Establishment of the Centre for Coastal Management for community outreach
- Run short courses for professionals i.e. Fisheries Management, ICM, etc
- Offer consultancies and Short-term technical Assistance to Projects

- Networking opportunities with foreign universities e.g. Coastal Resources Centre, University of Rhode Island, Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong
- Partnership with Private Fish Farms e.g. Ainoo-Ansah Farms
- Collaboration with the Ministry of Fisheries and Aquaculture Development e.g. role of DFAS in National Aquaculture Development Plan

1.3.5 Threats

- Dwindling financial support from central administration
- Increased workload
- Non-committed partners

SUCCESS STORY



Left: Elsie and Daniel (6th and 7th from left) in a group photograph after the training session. Right: Elsie receiving a certificate upon completion of training

Being a beneficiary of the USAID/UCC Fisheries Coastal Management Capacity Building Support Project has created opportunities for two students – Elsie Debrah and Daniel Adjei to learn and impact their academic training at the University of Cape Coast. USAID support and the Department’s collaboration with the ECOWAS Coastal and Marine Resources Management Centre at the University of Ghana allowed the two students to work in the Monitoring for Environment and Security in Africa (MESA) Project.

The MESA Project created the opportunity for them to be introduced to an innovative inshore fisheries monitoring technology called Advanced Class B Satellite Enabled AIS (ABSEA) for monitoring fishing vessels entering and exiting Ghana’s Exclusive Economic Zone (EEZ). Their project collaborated with the USAID/UCC Project to build case studies using Elmina and Sekondi to develop protocols that could improve the quality of fisheries stock assessment research, monitoring of illegal activities at sea, documenting fishing vessel trajectories, ocean governance including the delineation of marine protected areas. Their research outcomes has the potential to translate into effective fisheries management practices and the development of fisheries policies on small scale inshore vessel monitoring in Ghana and the control of illegal fishing activities and transshipment.

2.0 PROGRAM COMPONENTS, MANAGEMENT AND ACTIVITIES IN THE SECOND YEAR

Summary of activities and accomplishments in the second year

During the second year of project implementation, key programmatic actions completed include:

- As part of the ongoing collaboration between the University of Rhode Island (URI) and the University of Cape Coast (UCC), the URI hosted a high level delegation of five people from the UCC led by the Vice-Chancellor (VC). The purpose of the visit was to further expand the development of the existing formal partnership between the URI and the UCC in areas of marine fisheries, aquaculture and coastal resources. The specific objective of the trip was to promote the implementation of the Memorandum of Understanding (MoU) signed between the URI and the UCC.
- Acquisition of a 4X4 multi-purpose Ford pick-up vehicle (F150) to support field research and the day-to-day running of project activities and other local travels.
- Following a request by Project Management to the University librarian, a librarian was appointed by the University on a full-time basis to manage the recently refurbished Integrated Coastal Zone Management (ICZM) library at DFAS.
- Call for applications for the next round of PhD and MPhil scholarships were advertised in the daily newspapers and other electronic media to select eligible candidates to receive funding for full-time postgraduate studies at DFAS beginning 2016/17 academic year. Interviews were subsequently conducted for shortlisted applicants and successful candidates admitted into various programs. The students have since been enrolled and have started their programs of study beginning 2016/2017 academic year.
- The Project Management Board awarded contracts for the provision of Technical Assistance in support of project activities in various capacities. The contracts awarded covered the procurement of the services of an Information Technology (IT) Specialist to develop a fisheries and coastal management relational database, the procurement of the services of experts in Integrated Coastal Management (ICM) and Geographic Information Systems (GIS) respectively, towards operationalization of the Centre for Coastal management.



Developed sample of the Coastal Resources Database (www.fishcomghana.com) displayed at the Project Management Board Meeting



Project Management Board meeting at the Pempamsie Hotel, Cape Coast

- An MoU was signed between DFAS and the DFWR of UENR to frame collaboration between DFAS and DFWR on the development of joint research activities and professional training programs particularly in fisheries management
- MoUs were signed between DFAS and Friends of the Nation (FoN) and also between DFAS and Hen Mpoano to collaborate on issues related to the conservation, restoration and monitoring of coastal wetlands in Ghana and initiated the process by organizing a 2-day training workshop at UCC to sensitize and train 20 teachers from the Central and Western Regions on ecological benchmarks for monitoring coastal wetlands, identify key issues and facilitate the development of monitoring and management programs for the selected wetlands.
- The project participated in the Annual USAID Feed-the-Future Implementing Partners meeting at the Alisa Hotel in Accra.
- The project also participated in a joint program with the University of Ghana and other USAID project Implementing Partners which was organized by AfricaLead for Implementing Partners to network and share experiences across program areas.
- The President of the University of Rhode Island led a delegation of 7 dignitaries from URI to visit the UCC to expand collaborative relationships with the UCC. During the visit, the President signed an MoU between URI's Coastal Resources Center (CRC)

and the UCC's DFAS and CCM. The President also delivered a Public Lecture at UCC entitled "Internationalization and Globalization: Education, Research, Diplomacy and Intelligence". During the visit also one of the dignitaries, the Associate Director of URI Cooperative Extension gave a seminar on the Role of Extension at the College of Agriculture and Natural Sciences, UCC.

- As part of project activities on research and policy dialogue on fisheries and coastal management issues, the project organized a national scientific meeting on fisheries and coastal environment on the theme: "Sustainable Fisheries and the Coastal Environment through Research". The meeting brought together fisheries and coastal environment research scientists at the Hans Cottage Hotel in Cape Coast to discuss research issues to inform policy decision-making.
- A selected team of USAID/UCC project staff other academic staff attended a 5-day training workshop on Monitoring, Evaluation and Results-Based Management organized by AfricaLead at the Capital View Hotel in Koforidua, Eastern Region of Ghana.
- USAID/UCC project M&E staff attended a USAID EG Office IPs M&E group meeting organized by METSS at the Golden Bean Hotel in Kumasi, Ashanti Region of Ghana.
- DFAS hosted the Coastal Management Specialist, Prof. Rick Burroughs from URI in Ghana to meet with the District Chief Executive (DCE) of Jomoro District Assembly in the Western Region and his team, the Traditional Chief of Half Assini in the Western Region and fishing community representatives to work together on efforts at ecological restoration of the Half Assini Lagoon as part of activities of the CCM.
- The last of 3 containers with field and laboratory equipment was successfully cleared from the Tema Harbour, safely transported to Cape Coast and delivered to UCC authorities.
- Acquisition of a 30-seater Toyota Coaster Bus to support field research and the day-to-day running of project activities and other local travels.
- A professional driver was hired on full-time basis by the project to drive project vehicles for official purposes. The driver has the responsibility of ensuring the maintenance of all project vehicles and to ensure that road worthy and insurance certificates for all project vehicles are always valid.



Figure 4: The President of the University of Rhode Island led a delegation of 7 dignitaries from URI to visit the UCC to expand collaborative relationships with the UCC



Figure 5: Wetlands monitoring workshop by DFAS, FoN and Hen Mpoano



Figure 6: Cross section of community representatives at the stakeholder engagement at the Jomoro District Assembly on Tuesday 24th May, 2016

Program Components

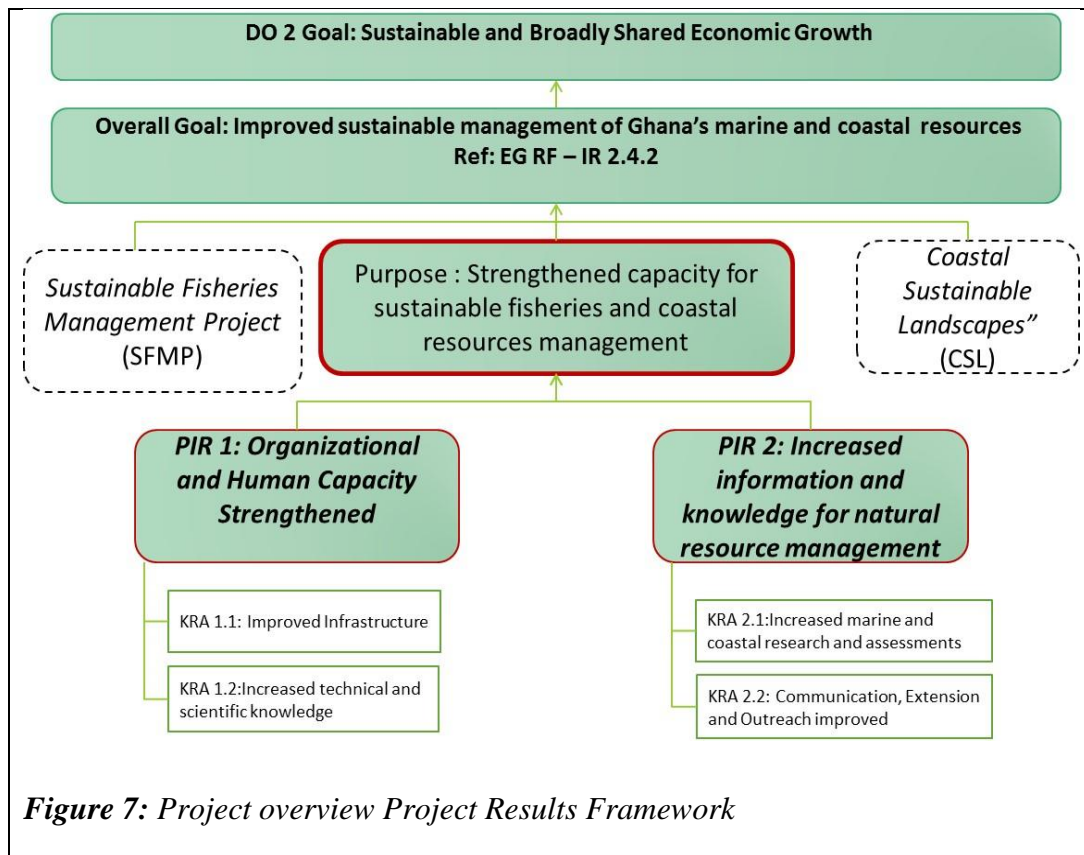
The overall objective of the project is to improve the sustainable management of Ghana's marine and coastal resources on the basis of capacity strengthening. Specifically, USAID's technical and financial support is designed to strengthen UCC's capacity in developing and providing quality and relevant education programs, practical research and advisory services that will support the management of fisheries and coastal resources on a sustainable basis to enhance the nation's social and economic development. This capacity building program is aimed to facilitate individual and organizational learning which builds social capital and trust, develops knowledge, skills and attitudes and when successful creates an organizational culture and a set of capabilities which will enable the university to set objectives, achieve results, solve problems, and create adaptive procedures which enable them to support national development.

Project Monitoring and evaluation (M&E)

To begin the FY 2016, the Project M&E Coordinator and the Project M&E Support participated in a USAID Economic Growth Office M&E Specialist Working Group meeting in Accra which was organized by METSS. The main purpose of the meeting was to discuss the USAID Feed-the-Future Monitoring System (FTFMS), its reporting procedures and requirements, data collection and how IPs can collectively improve performance management.

During the period under review, significant improvements were achieved in the M&E front facilitated through USAID Economic Growth Office M&E Specialist Working Group and USAID Monitoring and Evaluation Technical Support Services (METSS). The meeting took

place at Coconut Grove Hotel, Accra in October 2015. The Project M&E Coordinator and the Project M&E Support were in attendance.



The meeting brought together all USAID Implementing Partners (IP) M&E teams to discuss the USAID Feed-the-Future Monitoring System (FTFMS) and its reporting procedures and requirements, data collection and how IPs can collectively improve performance management within USAID. The meeting took the form of a training session for participants to familiarize themselves with USAID M&E systems, procedures and reporting requirements and the responsibilities of all IPs.

The methodology and approach for conducting indicator data verification as well as key findings of previous Data Qualities Assessments (DQAs) conducted were presented to participants to equip them with skills needed for the collection of good quality data. The online FTFMS, menu and tabs, roles and responsibilities of users as well as setting baseline values for FTF output indicators were introduced to participants. This was followed by a FTFMS practical exercise where participants were given hands-on training on FTFMS including the selection of indicators, entering data and narratives, generating reports and exporting data. Meeting participants were also taught how to develop and implement annual Performance Monitoring to enable them to improve their M&E systems.

Also in the first quarter of FY 2016, USAID and METSS conducted a joint project review with DFAS to have an overview of the overall project performance of the activities planned and implemented in Year One, performance indicators and knowledge management. The review team also conducted a Data Quality Assessment (DQA) of the project's M&E systems to offer an opportunity for learning and improvement in Year Two. As part of the review exercise, more appropriate indicators for the project were selected and agreed upon where project indicator baselines and targets for Year Two were also set. The project Performance Management Plan (PMP) was reviewed and amended after the joint project review.

In a related development, the project also undertook a second Joint Project Monitoring and Evaluation (M&E) Review with the support of METSS. Indeed, Year One of the FCMCBSP project was mainly dedicated to assembling a team to carry out the mandate of the project, setting up project management structures, improving DFAS and CCM infrastructure and providing laboratory and field equipment. Therefore not that much technical activities and program interventions were planned and executed in the first year. The project was designed such that the actual implementation of program activities would start in full swing from the second year of the project. The project therefore intended to use the beginning of the second year as a baseline against which project performance will be measured.

In view of this, the project management team considered it necessary to review the project's Performance Monitoring Plan (PMP) that was prepared in the first year, review the list of indicators which were selected to measure performance and report to USAID based on the learning and experience gathered since the inception of the project. Project management was of the view that the PMP needed to be reviewed with indicators redefined and reselected to become more relevant for the project vis-à-vis project activities. With that in mind, project management had a discussion with the USAID to plan a project M&E review meeting with support from USAID Monitoring and Evaluation Technical Support Services (METSS).

During the USAID Economic Growth office M&E Specialist Working Group meeting in Accra, Project M&E staff shared that concern with the USAID, METSS and AfricaLead who agreed to support the project set up and improve its M&E system. The project therefore put in an official request to USAID for approval which the USAID did and planned for the meeting in December 2015 with participation from METSS. The agenda for the meeting was to review the PMP, selecting indicators, setting baselines and annual targets and reporting to USAID.

The ensuing led to a week-long joint (USAID, METSS and DFAS) meeting at the University of Cape Coast to have an overview of the project and Year One activities that touched on the activities planned and implemented in Year One, performance indicators (project results and linkage to indicators) and knowledge management. There was then a Data Quality Assessment (DQA) session to discuss what the project had done well or had not done well in Year One as far as M&E was concerned to offer an opportunity for learning and improvement in Year Two. The project PMP was then thoroughly reviewed and discussed dwelling more on the Results Framework to identify its strengths and weaknesses and also how it could be improved to ensure efficiency. Following a review of the PMP more

appropriate indicators for the project were selected with the setting of project baselines and targets for Year Two. There was also a review of the project electronic, online and filing database. It was expected that the project will have a revised M&E Plan to include suggestions made by the M&E review team which has already been produced awaiting comments and approval from the USAID. With a revised project M&E Plan, the project has positioned itself on a better platform to improve its M&E system in Year Two and beyond. Below is a table showing indicators, selected and agreed upon for tracking progress of the FCMCBSP, baselines and targets for FY 2016.



Furthermore, the Project M&E team organized a meeting to bring all academic members of DFAS and other project staff up to speed with what was learned at the M&E Specialist working group meeting in Accra and the joint project review exercise in Cape Coast since all of these people are project activity team leaders and members who have responsibilities to make sure project activities are implemented and reported as part of project M&E. This was an opportunity to update all academic staff and other project staff members on the overall project M&E system and also to remind them of their responsibilities and their contributions to data and information gathering and reporting as far as project M&E is concerned.



Figure 8: M&E Team from DFAS meeting with academic staff and consultants currently undertaking various activities of the DFAS/UCC FCMCBS Project

To achieve results, it was also decided that monthly meetings be organized once a month for project activity team leaders and their members to update others on the progress of their activities in the past months and what they plan to carry out in the months ahead. This will go a long way to ensure efficiency and timely implementation and reporting of planned project activities.

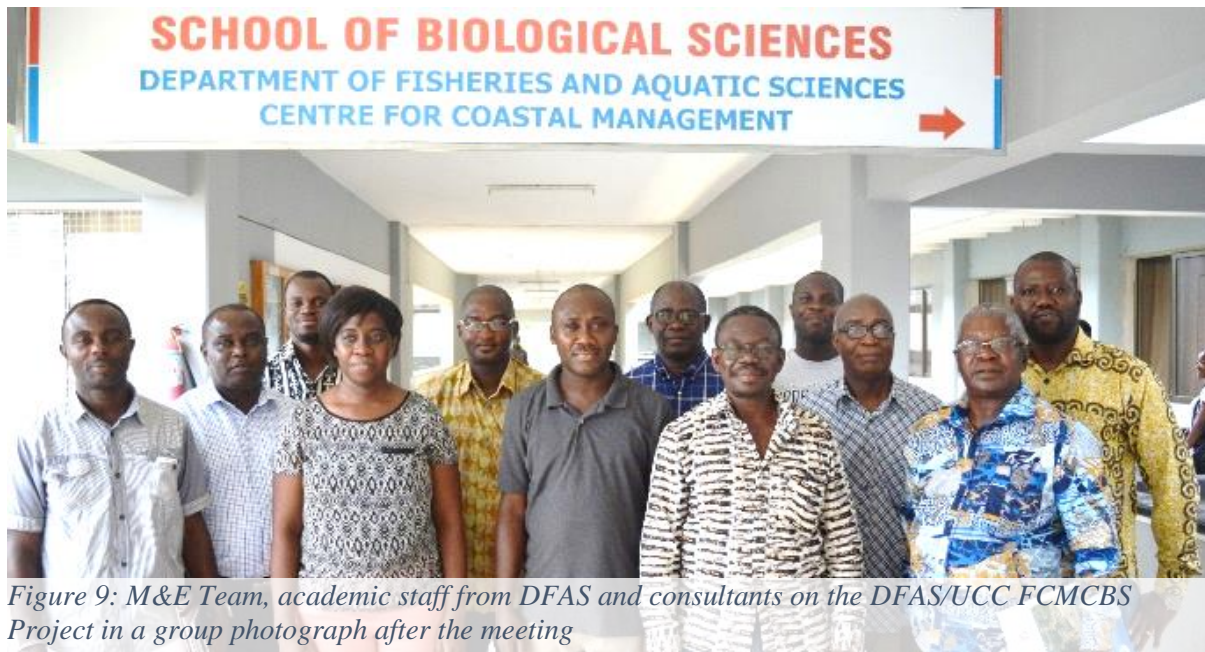


Figure 9: M&E Team, academic staff from DFAS and consultants on the DFAS/UCC FCMCBS Project in a group photograph after the meeting

A number of Year Two activities were outsourced to Technical Assistants (consultants) who worked in the field to support the project to achieve its Year Two deliverables. These activities were all designed to generate data and information to feed the project's performance indicators that are used to report on progress to the USAID. In this regard, project management had to equip all project Technical Assistants with relevant monitoring tools and the necessary skills they needed to collect data and generate relevant information for reporting. Project Management invited all project Technical Assistants to attend a workshop in Cape Coast to discuss the responsibilities of all Technical Assistants in contributing to the Project's M&E system as spelt out in their consultancy contracts and to brief them on how to carry out those responsibilities. During the workshop, the Technical Assistants were introduced to the Project's M&E system, details of the project Performance Monitoring Plan, project indicators, data collection methods and reporting. The Technical Assistants were reminded of their responsibilities in the timely implementation of their activities and in contributing data to support the M&E systems and were also provided with the tools to collect the data. This was a very important meeting to bring all Technical Assistants on the same level as far as monitoring and reporting of project activities were concerned.

As part of AfricaLead's efforts at providing capacity building support services to strengthen institutions to implement their projects and program activities, AfricaLead organized a 5-day M&E and Results-Based Management (RBM) training workshop at the Capital View Hotel in

Koforidua from 25th to 29th of April, 2016. The key objective of the training was to equip participants with the effective use of modern RBM & M&E tools. The workshop covered the building blocks and key elements of RBM as well as reporting. It did not only teach participants how to effectively use modern RBM & M&E tools but also how to communicate information on project performance to their organization and stakeholders. The following topics were covered in the short course:

- M&E/RBM concepts and terminologies
- Knowledge Management framework within and Performance Management Lifecycle
- Developing performance indicators
- Log frame/Results Framework Concepts
- Operationalizing the Knowledge Management framework
- Developing data collection tools and determine methodologies for data collection
- Data analysis techniques
- How to develop a Performance Management Plan (PMP)
- Reporting: report writing, organization of data, and formatting
- Developing a roadmap to operationalize the M&E system

The workshop was organized for 3 main USAID IPs; USAID/UCC Fisheries and Coastal Management Capacity Building Support Project, the University of Ghana Agriculture Technology Capacity Building Support Project and the Ghana Commercial Agriculture Project (GCAP) to improve on their planning, analysis, and decision-making capacity, increase the availability, applicability and use of high-quality evidence-based data for decision-making. This training workshop was targeted at people directly involved in M&E and Project Management as well as Administrative staff. It was attended by 6 people from UCC, 4 from DFAS and 2 from the Department of Molecular Biology and Biotechnology (DMBB) of the School of Biological Sciences (SBS). In attendance from UCC were:

- Dr. Noble K. Asare (Lead) - DFAS
- Mr. Godfred A. Asiedu - DFAS
- Dr. Aaron Tetteh Asare - MBB
- Dr. Foster Kyei - MBB
- Mrs. Lesley Ntim - DFAS
- Mr. Ernest Obeng Chuku - DFAS

From the training the UCC team learnt the various components of M&E system and in detail, the elements of M&E plan. One of the key highlights of the training was M&E results. It was learnt that objectives must be translated into results which are presented in the logical framework and the results framework. The team also got a clearer understanding of different levels of results (output, outcome, impact) and how to select “SMART” indicators for the different levels of results. An important ingredient in M&E for RBM is team work, which was demonstrated in several simple team-building exercises which brought out the essence of

team work engaging and allowing participants to solve problems together in teams. In general, the training on M&E and RBM was very beneficial since it used very innovative techniques to help participants get basic understanding of the subject matter. By the end of the training, participants had completed action plans and results frameworks to build M&E systems for their respective institutions and/or project. The UCC team developed an action plan each, to improve the M&E system for the ongoing USAID/UCC Fisheries and Coastal Management Capacity Building Support Project and to set up an M&E system for the Department of Fisheries and Aquatic Sciences.



Figure 10: Participants at the M&E workshop in Koforidua, April 2016

A comprehensive structure was further designed, to support the establishment of an M&E system for DFAS, which could be a model for the School of Biological Sciences and other departments of the School. This included an introduction to the M&E plan, and introduction

to the plan, and a results framework. Certificates were issued to all participants and all training materials were made available on pen drives to participants as well.

The following conclusions and lessons were drawn from participating in the workshop:

1. The USAID/UCC project M&E system should be improved based on the skills and knowledge acquired from the workshop to enhance accurate reporting on project performance.
2. M&E systems should be developed for DFAS and other Departments of the School of Biological Sciences building on the knowledge acquired by workshop participants from the UCC.
3. The Dean of the SBS should appoint an M&E coordinator and team who will be responsible for overseeing the M&E system for the School and all departments within the School.
4. It is recommended that the UCC establishes an operational M&E system for the entire University.

USAID/Ghana Economic Growth Office Implementing Partners (IP) M&E Staff Working Group Meeting

The USAID/Ghana Economic Growth Office Implementing Partners M&E staff working group meeting is an annual event organized by METSS which brings together all USAID/Ghana IPs M&E staff to review their M&E systems, activities, reporting requirements and responsibilities of all IPs and share experiences across projects that lead to improvements in project performance. FY2016's meeting was held in Kumasi in the Ashanti Region of Ghana at the Golden Bean International Hotel from 27th -30th June. There were representations from all projects including the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project. The meeting was attended by Dr Noble Asare (Project M&E Coordinator) and Mr Godfred Ameyaw Asiedu (Project M&E Support) from the UCC. The purpose of the meeting was to review M&E activities for all projects, to facilitate learning across projects and to clarify all issues relating to M&E with METSS so that all Implementing Partners will have a common understanding and agreements on M&E reporting requirements to USAID/Ghana. The workshop was intended to contribute to improvements in all project activities relating to monitoring, evaluation, learning and communication.

The crux of the working group meeting was on the following: review of indicator targets and achievements; updates from IPs and identification of project performance shortfalls; collaborating, learning and adapting for impacts; approaches in conducting beneficiary-based surveys; integrating Environmental Monitoring and Compliance into M&E functions; mainstreaming Gender in FTF Project implementation and M&E; introducing the METSS Knowledge Management Portal; introduction to AIDTracker+ and AIDTracker training and Experience Sharing across projects. The meeting provided an opportunity for the M&E team to learn more on USAID policies, M&E reporting requirements and responsibilities of M&E staff with more emphasis on tracking progress of project activities, FTF indicators,

definitions and data collection methods. It was also an opportunity for the M&E team to introduce the USAID/UCC project and its M&E system to other IPs to foster knowledge sharing and learning. The M&E team received training on the operations of the new online USAID reporting system (AIDTracker+) which will be commissioned soon for IPs to enter project M&E data and information. Knowledge acquired from this group meeting will be applied to strengthen the USAID/UCC Project M&E system and reporting to USAID.


2.5 Program management, technical support and collaborations



The Project Management Board (PMB) met on 12th November, 2015 to review project activities, particularly Year 2 Work plan. The PMB was established by the Vice-Chancellor of the University of Cape Coast at the inception of the project to have fiduciary responsibility and serve as an advisory and decision-making body authority for the project.





Project Management Board Meeting held at Pempamsie Hotel, Cape Coast

The meeting was used to select short-term technical assistants for some specific collaborative activities with DFAS on the USAID/UCC FCMCBS Project as follows:

	Assignment	Institution	Lead Expert	
i.	Assessment of Biodiversity and Health of Coastal Ecosystems in Ghana	Dept. of Fisheries and Watershed Mgt., KNUST	Drs. Regina Esi Edziyie and Daniel Adjei-Boateng	

	Assignment	Institution	Lead Expert	
ii.	Collaborative Research on Fisheries Stock Assessment of Some Selected Commercially Important Marine Fish Stocks in Ghana	Department of Fisheries and Marine Sciences, University of Ghana	Prof. Patrick Kwabena Ofori-Danson	
iii.	Assessment of Marine Fisheries Governance Issues in Ghana	Department of Animal Biology & Conservation science, University of Ghana	Dr. George A. Darpaah	
iv.	Capacity Strengthening of Community-Based Groups	Private Consultant/ World University Service, Canada	Abena Adubea Acheampong	
v.	Promoting Supplementary Livelihoods in Coastal Communities in Ghana	Private Consultant/ World University Service, Canada	Abena Adubea Acheampong	
vi.	Implementation of Policy and Research Dialogues in Ghana	Dept. of Fisheries and Watershed Mgt., KNUST	Dr. Benjamin Betey Champion	

	Assignment	Institution	Lead Expert	
vii.	Developing Material and Conducting Training on the use and Application of Geographical Information Systems (GIS)	Forestry Commission	Mrs. Cynthia Okine	
viii.	Wetlands Ecological Health Monitoring Using School Clubs and Communities	HenMpoano Friends of the Nation (FoN)		

2.6 Renewal of contracts for project staff

Key project staff were appointed at the onset of the project to provide program, administrative, technical and research support for the efficient management of USAID technical and financial support to the Department of Fisheries and Aquatic Sciences. The support comes in the form of staff with requisite background and experience employed to the following specific positions:

- Project Management & Technical Support – 1 person
- Project Monitoring & Evaluation Support – 1 person
- Research Assistants – 6 persons

In principle, as per the terms of employment, contract appointments to these positions are renewed annually. Therefore the appointments were renewed or extended in the first quarter for another financial year i.e. up to 30th September, 2016.

Two research assistants, Evans Arizi and Fredrick Jonah, who were employed at the beginning of the project, resigned in December 2015 and August 2016 following scholarships awarded them to pursue PhD in Fisheries Science and Oceanography and Limnology respectively. Evans Arizi is currently at the University of Rhode Island, USA under USAID funding from the CRC SFMP project whilst Fredrick Jonah studies with the University of Cape Coast, Ghana, also under USAID funding from the USAID/UCC FCMCBS Project.

Vacant research assistant positions were therefore advertised and the two replaced in a competitive appointment process.

Details of research assistants appointed in the second year:



Bernard Ekumah
BSc. (Natural Resources Management),
Department of
Silviculture and Forest
Management, Kwame
Nkrumah University of
Science and Technology



Joshua Adotey
MPhil. (Integrated Coastal
Zone Management),
Department of Fisheries and
Aquatic Sciences, University
of Cape Coast

Annual reporting and work planning for the Project

In the first quarter of the year under review, an annual report covering the period of Year One (October 2014-September 2015) was submitted to the USAID and received approval. This requirement is in line with the agreement (PIL. 641-A18-FY14-IL#007). It is mandated that recipients will submit annual progress report by October 30 of each year to the USAID Activity Manager for review and verification of accomplishment of the activities. The report also provided updates on progress in meeting the indicators detailed in the annual M&E plan.

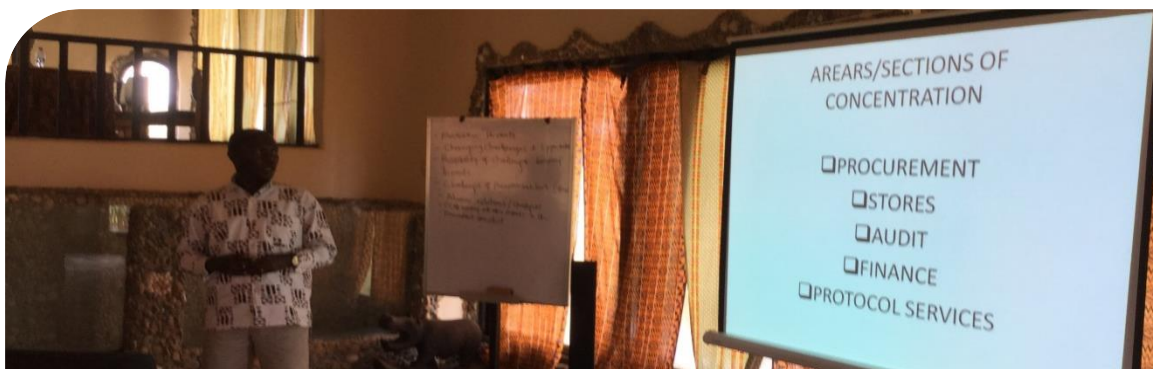
The project organized a work planning session for the second year during a workshop involving project stakeholders at Axim Beach Hotel in the Western Region in October, 2015. The objective was to discuss and provide strategic overview and approach for the Year 2 timeline activities. The program was facilitated by AfricaLead and attended by university management and other key USAID funded sister projects including the Sustainable Fisheries Management Project (SFMP) and the Coastal Sustainable Landscapes Project (CSLP). The workshop also resulted in a plan aimed at achieving more effective and efficient support services at the university level that can ensure smooth project implementation towards achieving desired established Goals of the Project.



Work Planning Workshop involving Key Project Stakeholders at Axim

Key issues highlighted under the Year Two Plan cover:

- a) Development of a Procurement Plan for Year 2
- b) Review of Implementation Guidelines (tools) relative to: the Performance Monitoring Plan (PMP); the Environmental Monitoring and Mitigation Plan (EMMP); Monitoring and Evaluation (M&E) System and Gender Mainstreaming Plan
- c) The need to enhance publicity of the Project through radio and other electronic media including the development of website for CCM
- d) Outlining PhD and MPhil research topics and assigning supervisory roles
- e) Development of a Laboratory Management Plan (LMP).
- f) Development of maintenance schedule for equipment
- g) Awarding contracts for research and extension activities
- h) Enhancing publicity activities of the project
- i) Equipping the Fisheries and Coastal Research laboratory with equipment
- j) Refurbishing of offices of academic staff
- k) Initiating processes for acquisition of relevant books and journals for the library
- l) Procurement of additional project vehicles
- m) Development of a Business Plan for CCM
- n) Hiring a driver to complement the effort of university drivers to support ongoing extension and field research travels of the Project.



Work Planning Sessions with Key Stakeholders, University Management and Partners from the USAID Sustainable Fisheries Management and Coastal Sustainable Landscapes Projects and AfricaLead.

The last quarter of the second year also saw the development of a working document to guide activities for the next year ahead i.e. the third year. Ongoing activities of the second year were reviewed and inputs as well as lessons learnt incorporated into the work plan for the third year of the Project.

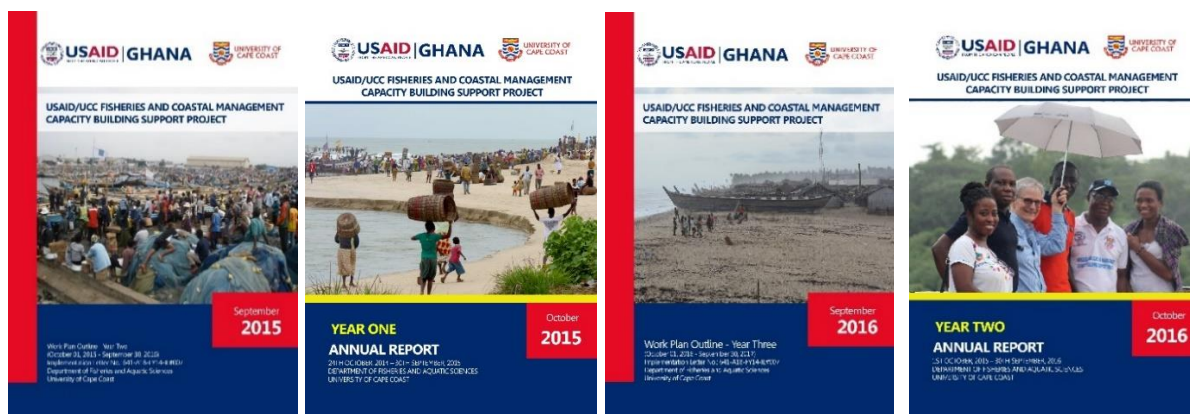


Figure 11: Annual work plans and reports produced by end of second year of the Project

Development of procurement plan

One of the major challenges encountered in Year One of the Project was the issue of procurement of project items and contracting. Project procurement issues are dealt with at the Procurement Section of the University. Procurement and contracting processes normally take a long time to complete which resulted in the delay of project activities in the first year. Learning from experiences in Year One, Project staff met with officials of the Procurement Section to discuss and develop a Procurement Plan for Year Two and budget lines based on planned activities for Year Two of the project to ensure the smooth and timely implementation of project activities. After useful discussions about what to do and what the plan should entail, the Head of the Procurement Section was asked to actually develop the Plan and members of Project staff were also tasked to closely monitor the Plan to make sure it is fully implemented. The procurement plan was developed and used in the second year which saw an improvement in project implementation compared to the first year.

2.7 Meeting with USAID and other Donor Implementing Partner meetings

In the first quarter of FY 2016, there was a visit by the new Director of the USAID/Ghana Economic Growth Office, Mr. Kevin Sharp and Mr. Justice Odoi (Environmental Officer) who paid a half day working visit to the University of Cape Coast and the Department of Fisheries and Aquatic Sciences on the 24th November, 2015. The two were welcomed by the Pro Vice-Chancellor of UCC, Prof. John Nelson Buah and some members of the Project Management Board at the Council Chamber of the university. In attendance was the Dean of the School of Biological Sciences Prof. Johnson Boampong, the Project Manager Dr. Denis

Aheto. Also Prof. John Blay, the Coordinator of the Centre for Coastal Management and Dr. Noble Asare, M & E Coordinator of the Project were in attendance.



Mr. Kevin Sharpe (Director of the Economic Growth Office, USAID) in a meeting with Pro-Vice Chancellor of University of Cape Coast, Prof. John Nelson Buah and some Project Management Board Members

The visit was to familiarize himself with the USAID/UCC FCMCBSP, meet with some top officials of UCC, Academic and Project staff as well as students of DFAS. After meeting with some top officials of the University to discuss the collaboration between USAID and the University, the Director was brought to the DFAS to be briefed about the project and program activities by the Project Manager with other staff in attendance. There was a question and answers session where the Director sought clarifications from DFAS staff and DFAS staff also sought clarifications from the USAID Director of Economic growth office.

The discussions mainly centered on challenges encountered by the project in Year One as well as the opportunities, ways forward for tackling the challenges and making use of the opportunities in subsequent years, ensuring the sustainability of the project and project facilities where the Business and Strategic Plans of the CCM were seen as means of long-term sustainability and project finance issues and reporting. After meeting with the Academic and Project staff, the Director also met with Students of DFAS to discuss the USAID/UCC project scholarship application process, students' research areas and projects, challenges and opportunities. The visit ended with a tour of the fisheries and coastal management research laboratory where the Director promised to be part of the commissioning of the laboratory after stocking it with all the laboratory and field equipment.

SUCCESS STORY



The Project Manager and Director of the Centre for Coastal Management (CCM) Dr. Denis W. Aheto has received the University of Cape Coast award of honor as Distinguished Lecturer for the 2015/16 academic year at the university's reward and recognition ceremony that was held in September, 2016. The award which was presented by the new Vice Chancellor of the University Professor Joseph Gharthey Ampiah has recognized his meritorious efforts, dexterity and hard work at the University of Cape Coast. The USAID grant contributed to this great achievement. The award has recognized his contributions to the internationalization process of the university through his facilitation of the collaboration with the University of Rhode Island in terms of staff and student capacity development, improvement in laboratory and library infrastructure notably scientific equipment and books respectively among others. The extension outlook of CCM are among compelling reasons for the award. The USAID supported Project is the largest donor funded program being managed within the University of Cape Coast and the award is a great success for the project and for DFAS (See: The University of Cape Coast website: www.ucc.edu.gh)

3.0 PROJECT OUTPUT 1.1: IMPROVED INFRASTRUCTURE

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

This component broadly aims at refurbishing the existing laboratory for the Department of Fisheries and Aquatic Sciences to facilitate execution of the project. It is expected that at the end of this activity, the Fisheries and Coastal Research laboratory would have been refurbished and provided with relevant equipment acquired and installed.

During the first quarter of Year 2, processes were initiated for sole sourcing for remaining field and laboratory equipment, and chemicals. Significant achievement was that all consignments of field and research equipment arrived at the Tema Port and by the third quarter, all consignments had been delivered at UCC stores. Appendix 1 shows the list of items that have been received at UCC stores for inventory. Application for duty exemption for the remaining equipment was also made for clearing remaining shipments. Space was also secured at the School of Biological Sciences to keep the containers used for the shipping of the laboratory equipment for storage. This was approved by the Directorate of Physical Development and Estate Management (DPDEM) at UCC.



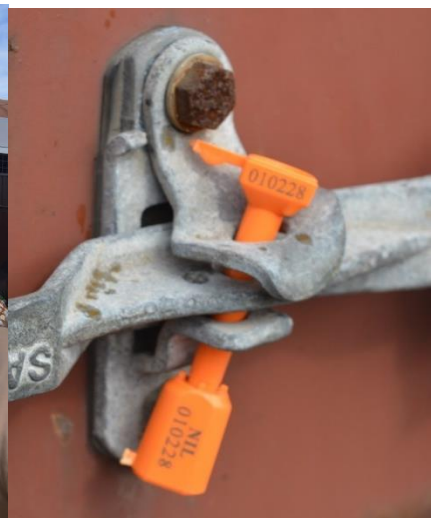


First consignment of laboratory and field research equipment



USAID/UCC Project Research Boat Bayliner 175BRE fibreglass boat with 135hp Mercruier WPS Engine - 5.36 metre long

Renovation works on the fisheries and coastal management laboratory was completed with the laboratory now being used for academic work. However, what remains more to be done now is equipping it with all the instruments, tools and accessories as well as chemical reagents to enable the place to function. University authorities together with project staff have taken inventory of all the equipment that have arrived and are undergoing administrative formalities for them to be released to DFAS and be placed in the laboratory for use.





DFAS team, UCC Central Stores management and Audit section taking inventory of the laboratory equipment from the second of container successfully received by DFAS, UCC

Another concern being addressed before installation of equipment to begin full operation of the laboratory is the establishment of health and safety procedures, development of a maintenance schedule and the appointment of a competent person to have an oversight responsibility for managing the affairs of the lab. Members of DFAS academic staff have deliberated extensively on the issues and have nominated people to be responsible for various tasks.





DFAS team, UCC Central Stores management and Audit section inspecting equipment in the second container



Opening of the third container

On the issue of the person to have oversight responsibility, DFAS is of the view that an individual who is not a member of academic staff should be employed on a full-time basis to manage the lab. A Business Plan for DFAS and the CCM is currently under preparation to assess the feasibility of using the lab for income generating activities. This means the laboratory is going to be used for other things other than for teaching purposes. This presents more work for the person who is going to manage the laboratory and because members of academic staff are already overloaded with work, it would be better for someone else to be appointed to man the laboratory. Discussions are still ongoing and that decision will very much depend on the outcome and recommendations which will be given in the Business Plan.

In program efforts at operationalizing the use of the fisheries and coastal research laboratory, an important requirement is the certification of the laboratory by the Ghana Standards Authority (GSA). The project, recognizing the need, contacted the GSA and embarked on a trip to its Head Office in Accra to make enquiries regarding the types of certification that may be required for the lab, any other requirements as well as procedures involved in obtaining such certification and permits to operate the laboratory. In course of the enquiries a consultative meeting was held with the Head of Management Systems Certification Department of GSA. Information gathered during the meeting suggests the following:

1. The lab will require an ISO 17025 accreditation and not certification.
2. ISO certifications and accreditations are provided by third parties.
3. GSA does not provide any form of ISO certification or accreditation for the operations of research laboratories in the country.

4. At present, all third parties providing ISO accreditation are internationally-based and no local parties in Ghana.
5. GSA however provides consultation services to laboratories interested in ISO accreditation.



Figure 12: Some laboratory equipment installed in the Fisheries and Coastal Research Laboratory

Actions have been initiated to contract the Ghana Standard Authority to begin the process for the certification of the laboratory. Procedures for the procurement of the second batch of laboratory and field equipment have also been initiated.

DFAS Research Vessel

Another issue concerns the registration of the newly acquired research vessel for the project. The project has taken delivery of a research vessel which needs to be formally licensed by the appropriate Government of Ghana agency before its use. Again there was the need to make enquiries to find out the responsible agency and the procedures involved in the registration process. Enquiries were made with the Ghana Maritime Authority (GMA) and the Fisheries Commission in Accra regarding the requirement and procedures involved in the registration of research vessel and use for academic purposes. The following information was obtained from initial discussions with the Ghana Maritime Authority:

1. The Ghana Maritime Authority (GMA) will only issue registration for the vessel only after the application has been submitted through the Ministry of Transport (MoT).
2. The MoT's response to the application should then be forwarded to the GMA.
3. The Fisheries Commission is expected to play a role in the process but this could not be clarified by the GMA.
4. The GMA also cautioned that the registration process should have been initiated before the vessel was brought into the country. Now that the vessel is already here in the country, a penalty fee is likely to be charged before the vessel is registered.

It was also gathered from the enquiries with the Fisheries Commission that:

1. The application for vessel registration for the purpose of fisheries research should be submitted to the Ministry of Fisheries and Aquaculture Development (MoFAD) with a copy to the Director of the Fisheries Commission
2. The intended purpose of the vessel must be clearly stated in the application
3. All documentations on the vessel including vessel specifications, ownership as well as all other relevant documents should be included in the application
4. One other requirement is that the vessel must have a name

Although the GMA indicated that registering the research vessel could cost between 500 and 2000 US Dollars, the Fisheries Commission has hinted that a research vessel for education purposes should attract no registration fees and could be completed within 2 weeks. It was also made clear that the vessel cannot be used until registration process has been completed. As a prerequisite to registration, the research vessel has been named *RV Sardinella*, registration process has been initiated and DFAS has suggested names of technical staff to be trained to operate the vessel.



Figure 13: The DFAS research Vessel (RV Sardinella)

In view of this, the Minister of Fisheries and Aquaculture Development, Hon. Sherry Ayittey, outlined clearly in a letter dated 26th July, 2016 (Ref. PE 122/166/01), the procedure for registration of the vessel as follows:

1. The University should first register the research vessel under the Ghana Flag with the Ghana Maritime Authority in accordance with the Ghana Shipping Act, 2003 (Act 645).
2. Thereafter, the University should apply for the issuance of Fisheries Registration License from the Ministry/Fisheries Commission upon submission of the following:

- a) Certificate of Ghanaian Registry
 - b) Condition Survey Report
 - c) Valid Safety Certificate
 - d) Valid Radio Certificate
 - e) Valid Hull and Machinery Insurance
 - f) Valid Crew Insurance
3. The University is therefore advised to send the application together with the relevant documents on the vessel to Ghana Maritime Authority for necessary action.

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

During the first quarter of Year 2 timeline, notice was given to lecturers on refurbishment of their offices based on the submitted and approved schedule provided by contractor.



Main entrance to the laboratory within the SBS building



Students in a lecture at the refurbished laboratory with overhead projector to enhance interactive learning

Other activities accomplished include the following:

- Processes for laboratory certification enquired
- Provision internet services at the CCM
- Initiated processes for securing e-journals, books and librarian for DFAS library
- The University Electrical Engineer was involved relative to supply of power to various offices
- Followed up with DPDEM on refurbishment of existing lecturers' offices
- Fifteen desktop computers were also installed with software at CCM for use by students and staff of DFAS. The software include MICROSOFT OFFICE PACKAGE, MINTAB, STATISTICA, MATLAB and SIGMAPLOT
- Two photocopiers, two inverted projectors and other computer accessories were installed at DFAS and CCM for the benefit of students and staff.



As part of the ongoing works to refurbish and equip existing offices at DFAS to facilitate and improve work efficiency of academic staff members, six (6) offices have been completely refurbished with floor tiles and carpets, overhead cabinets and glazed aluminum windows. Electrical and data points have been re-installed, new door locks fixed and offices painted.



Figure 14: Offices being refurbished for DFAS lecturers to enhance teaching and learning

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

The project planned to procure three (3) project vehicles (1 4X4 cross-country vehicle, 1 4X4 multi-purpose pick-up truck and 1 bus) in the first year to support all program activities including the day-to-day operations of both academic and administrative staff of DFAS,

transport of equipment, student travels related to academic work, field research and all other local travels. However due to administrative difficulties, only one vehicle (the 4X4 cross-country) could be procured in the first year. Project management still continued to work very hard after the first year to ensure the arrival of the two additional vehicles since the absence of those vehicles hindered the progress of planned project activities. The project is happy to report the arrival of the 4X4 multi-purpose pick-up and the 30-seater Coaster bus in the current reporting period which have been duly registered and already in use.



Multi-purpose pickup truck for DFAS activities



4x4 cross-country vehicle (Toyota Prado) to support research within the Department



30-seater Toyota Coaster Bus (Registration No. GW 6675 – 16)

4.0 PROJECT OUTPUT 1.2 INCREASED TECHNICAL AND SCIENTIFIC KNOWLEDGE

4.1 Activity 1.2.1: Academic and Technical Staff Capacity Strengthening

In the last quarter of the year under review, four members of academic staff and two technicians of DFAS engaged in three separate study tours to the United States as part of the project's activity on Academic and Technical Staff Capacity Strengthening. One member of academic staff traveled to the Center for Quantitative Fisheries Ecology at Old Dominion University in Norfolk, Virginia and the National Oceanic and Atmospheric Administration in Silver Spring, Maryland to participate in a fish ageing and growth training program and data management in fisheries and oceanography training program respectively. DFAS is receiving support through the project to set up a fish ageing and growth laboratory and there was the need for DFAS staff to be trained in the set up and operations of such a laboratory. In course of the training in fish ageing and growth at the Center for Quantitative Fisheries Ecology, an equipment list for setting up DFAS fish ageing and growth laboratory and draft protocols for fish ageing for four marine fishes from Ghana were developed. Also, an agreement was reached with NOAA to provide DFAS with technical assistance in data management in fisheries and oceanography.



Figure 15: Dr. Aggrey-Fynn receiving training at the fish age and growth laboratory at Old Dominion University

As an Action Plan for the training, protocols for processing fish otoliths and scales as well as protocols for ageing (fish species specific) will be jointly finalized and published by the training participant from DFAS and a staff of the Center for Quantitative Fisheries Ecology. Knowledge acquired from the training will be shared among other members of academic and technical staff of DFAS.

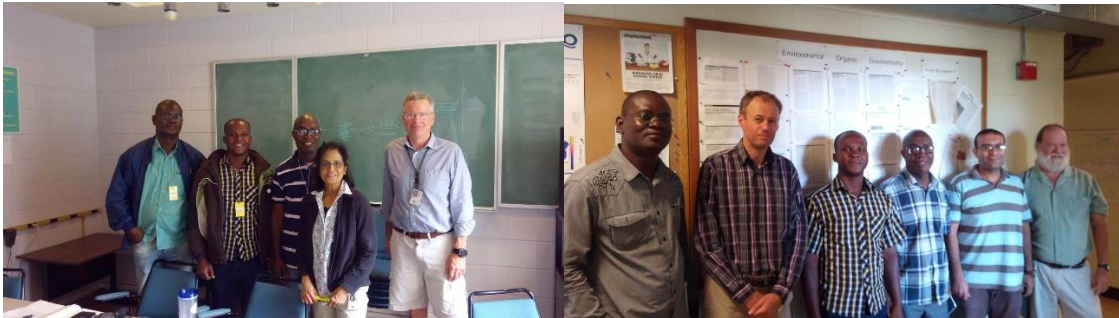


Figure 16: DFAS staff (Prof. John Blay, Prosper Dordunu and Thomas Davis Robin) at the Coastal Resources center, URI

Three DFAS members of staff (1 academic and 2 technical staff members) also traveled to the University of Rhode Island in the United States to participate in a training program in the operation, use and maintenance of the Atomic Absorption Spectrophotometer (AAS) and Gas Chromatograph instrumentation. The purpose of the travel was to gain experience in the use of AAS to determine concentrations of heavy metals and Gas Chromatograph unit to measure the concentration of Poly Aromatic Hydrocarbons (PAHs), Organochlorine pesticides (OCPs) and Polychlorinated biphenyls (PCBs) in sediments, fish and water. The training was aimed at providing the participants with some theoretical knowledge about the use and operation of these instruments to analyse heavy metal content of water, sediments and fish, Poly Aromatic Hydrocarbons (PAHs), Organochlorine pesticides (OCPs) and Polychlorinated biphenyls (PCBs) in sediments, fish and water. Specifically, it was targeted at building the capacity of faculty and technical staff of DFAS to be able to operate newly acquired equipment to enhance teaching and research. The participants traveled with sediment and black chinned tilapia samples from Fosu and Half Assini lagoons, Pra and Ankobra estuaries from Ghana to the US for analysis during the learning process. As an action plan, they participants are required to maintain communication with US EPA on possible shipment of used glassware and other materials to support DFAS laboratory work and to continue with the reading of manuals on operation, analysis and maintenance of AAS and Gas Chromatographic unit.

Two members of academic staff also traveled to the University of Rhode Island for a shellfish aquaculture study tour. The purpose of the travel was to study shellfish culture technology in

Rhode Island with particular reference to oyster, study culture of the algal feed for feeding oyster spat at the hatchery and build capacity for oyster/shellfish production in coastal communities in Ghana. The team visited government agencies responsible for management of aquaculture and shellfisheries, institutions with experience in culture techniques and hatchery systems as well as marketing (wholesale and retail) of the commodity. Knowledge gained from the study tour will be applied in the research on shellfish component of the project. On their return the participants gave presentations on their study tour experiences at a seminar of DFAS faculty, technical and administrative staff and students,

DFAS plans to train academic and technical staff on the use and operation of the newly acquired research vessel *RV Sardinella*; how to properly and safely man, operate and maintain the vessel. The Regional Maritime University (RMU) in Accra was identified by DFAS as the most appropriate institution to provide such training. The RMU was therefore contacted to find out the possibility of the university providing such training and also the kind of short courses that are offered at the RMU that would be suitable for the purpose. It was gathered during the enquiry that the Department of Maritime Safety of the RMU was the right place for such training. Discussions were held with the Head of Department and the information received was that:

1. Short courses (each of which last for a few days) are run by the University on weekly basis particularly from February to June.
2. Participants can select and register from the list of short courses available and their preferred dates for participation
3. Participants receive certificates after the course.
4. Specially tailored training package can be organized for groups from institutions by application through the Vice Chancellor
5. A minimum of 5 participants are however required to allow for such specially packaged training arrangement to take place.
6. Special arrangements attract different charges compared to the mainstream training programs
7. Prices of short courses are quoted in US dollars (ranging from US\$102.00 to US\$662.00 per participant from member states including Ghana) payable in the Ghana Cedi equivalence.

The conclusions drawn were that if DFAS wants to pursue this training based on the above details, a member of the Marine Safety Department at RMU will plan to carry out an inspection of the research vessel at the expense of DFAS and also full specifications and photographs of the vessel must be provided to the Maritime Safety Department, RMU. Based on the nature of this training, it was decided that DFAS participants can benefit from a package involving 5 short courses from the Marine Safety Department with a possible 6th course on Maintenance to be arranged with a different Department.

Table 1: Details of the five courses offered at RMU

Short Course	Code	Registration + Tuition (\$)	Duration
Elementary First Aid	EFA	134.00	2 days
Personal Survival Techniques	PST	134.00	3 days
Personal Safety & Social Responsibility	PSSR	134.00	3 days
Life Boat	L/BOAT	134.00	5 days
Steering (Simulator)	STEERING	102.00	5 days

DFAS has written to ask the office of the Vice Chancellor of UCC to send an application letter to the Department of Marine Safety, RMU through their Vice Chancellor requesting for assistance in training some personnel of DFAS in manning a research vessel in selected short courses.

4.2 Activity 1.2.2: Operationalization of the Centre for Coastal Management

As part of operationalization of the Centre for Coastal Management, a CCM Board meeting was held with a focus on the organogram and logo of CCM that were approved by the Board at the meeting. For promoting the Centre car windshields and other promotional materials including magnetic stickers for vehicles were approved. The Board also discussed among others strategic partnerships and linkages on the basis of the strategic plan for the Centre.

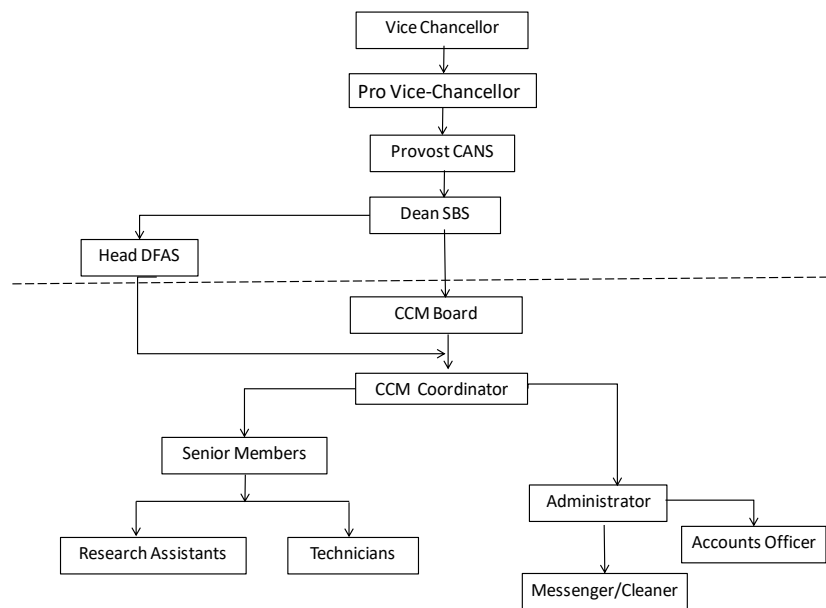


Figure 17: Organogram of the Centre for Coastal Management



The Board and Co-Opted Members of the Centre for Coastal Management (CCM)

Front row sitting from Left: Mrs. Regina Amoako-Sakyi, Geography & Regional Planning; Prof. Bondzie-Simpson, Founding Dean of the Law Faculty (Chairman); Prof. John Blay, Coordinator of CCM; Ms. Margaret Winwah, DFAS Administrator. **Back row standing:** Dr. Joseph Aggrey-Fynn, DFAS faculty member and Director of Oil & Gas Institute ; Dr. Noble Asare, DFAS Member and M&E Coordinator; Dr. Denis Aheto, HOD & Project Manager USAID/UCC Project, Ms. Esinam Attipoe, USAID/UCC Project Support & Mr. George Anti, Fisheries Commission of Ghana



Figure 18: Approved CCM logo

Authority was also given to develop a business plan for the Centre and a 5-member Committee was appointed by the Board including: Prof. John Blay, Coordinator, CCM as Chairman, Dr. Denis W. Aheto. HOD, Fisheries & Aquatic Sciences, Mrs. Regina Amoako-Sakyi, Geography & Reg. Planning, Mr. George Anti, Fisheries Commission, Cape Coast, Mr. Abraham Esson, School of Business, (Incubation Centre) as members. Following advertisements, two applications were received and Mr. Jacob Ainoo-Ansah, a business development specialist and entrepreneur was selected to cooperate with DFAS in the development of a business plan for CCM. A content for a proposed website for CCM was also discussed and agreed upon. The Board mandated the Project to engage a Website Developer outside UCC to secure a Domain Name for the Centre's website.



Mr. Jacob Ainoo-Ansah, Business Development Specialist

The short-term technical assistance is aimed at framing a business plan that evaluates all activities of DFAS and account for their economic viability including descriptions and analysis of identifiable business prospects for income generation, where possible. The plan will serve as a sound guide for working towards a desired future, envisioning sustainability and financial self-reliance.

As part of operationalization of the Centre for Coastal Management (CCM), the plan should identify key strengths, weaknesses, opportunities and threats (SWOT) and relate them to the strategic goals⁴ of CCM and DFAS in order to introduce or recommend specific business models with detailed operational activities towards the achievement of the Vision and Mission of the Centre.

⁴ Please refer to the following documents:

- Strategic Plan for the Department of Fisheries and Aquatic Sciences (2014-2017)
- Strategic Plan for the Centre for Coastal Management (2012-2017)
- Proposal for the Establishment of the Centre for Coastal Management (2012)
- The USAID/UCC Fisheries and Coastal Management Capacity Building Support Project (2014-2019)
- The Second Corporate Strategic Plan of the University of Cape Coast (2012-2017)
- The School of Biological Sciences Strategic Plan (2014-2017).



Centre for Coastal Management Office located in the Faculty of Education Lecture Theatre (FELT) Complex, University of Cape Coast

- Training of personnel to support operations of the Centre in critical areas is underway
- The Centre is in collaboration with the Coastal Resources Centre (CRC) of University of Rhode Island (USA) which is contributing significantly to developing CCM's strategic plan.
- An MoU was developed to establish relations with ECOWAS Coastal and Marine Resources Management Centre (University of Ghana). The two Centres are currently undertaking a joint project in the monitoring of canoes and semi-industrial boats fitted with transponders to track their fishing grounds, species caught, catch per vessel to assess fish stocks. Two DFAS MPhil students in integrated coastal management were assigned on this project to undertake research for their MPhil theses.
- The CCM hosted Prof. Rick Burroughs, the coastal management specialist from the University of Rhode Island in May to support the Centre in developing its community outreach and extension programs, strategic and business plans.
- As part of activities planned for his visit, he participated in a field trip to Half Assini in the Western Region to engage with stakeholders in relation to the restoration of the Half Assini lagoon. He paid courtesy calls on the DCE of Jomoro District at Half Assini and also the chief of Half Assini and his council of elders as well as meeting with fishing community representatives. The DCE expressed his interest and joy in the project and pledged his support for the project on behalf of the Assembly. The chief and the council of elders also expressed their willingness to participate in the project because restoration of the Half Assini lagoon was a concern that had already been raised by the youth of the community. The elders and members of the fishing community equally expressed their readiness to be part of the project, as the current state of the lagoon impacts negatively on their lives. The consultant who conducted research on the ecological status of the Half Assini lagoon accompanied the Coastal Management Specialist and DFAS representatives to Half Assini to present his

findings on the baseline studies he did on the current state and restoration of the Half Assini lagoon to foster stakeholder buy-in.

- The Coastal management Specialist also paid courtesy calls to some important personalities of UCC including the Vice Chancellor, Pro-Vice Chancellor, the Registrar, Provost of the College of Agriculture and Natural Sciences, Dean of the School of Biological Sciences and Chairman of the Centre for Coastal Management Board. He also met with DFAS faculty to present updates on the work he is doing for the Centre and also solicit inputs from members of DFAS. He also continued with the review of the strategic plan for the Centre for Coastal Management. Prof. Richard Burroughs gave a public lecture on the topic: “Changing the Rules for Coastal Lands and Water”.

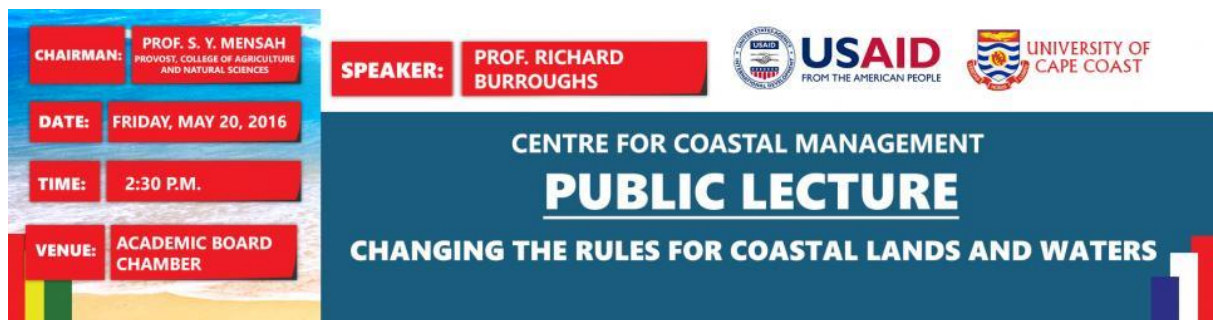


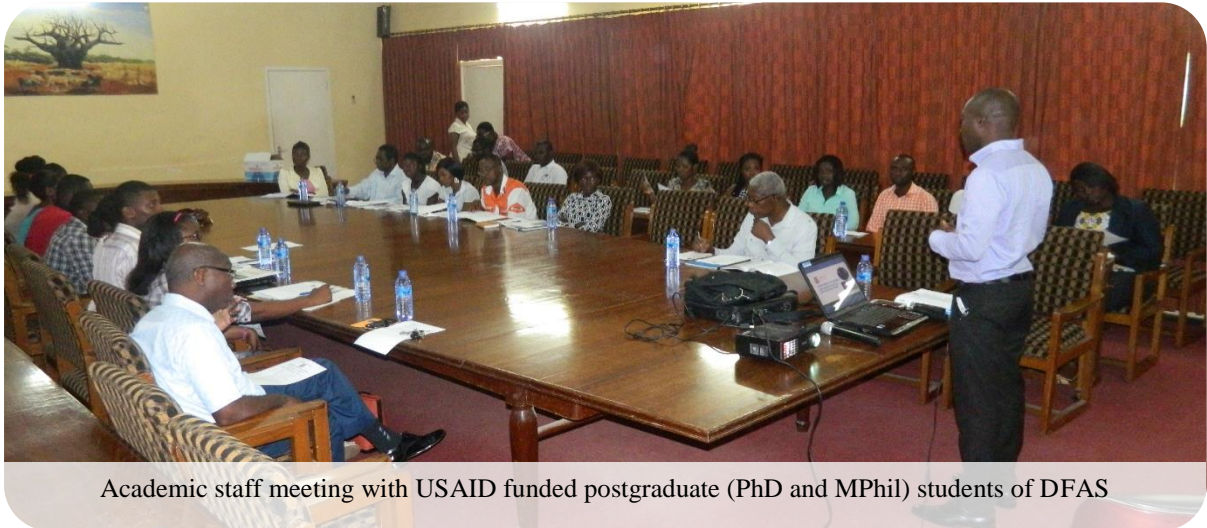
Figure 19: Website banner used for publicity of the public lecture on DFAS website



Figure 20: Prof. Richard Borroughs

4.3 Activity 1.2.3: Support for Postgraduate (M.Phil & PhD) Training Program

This aspect of the project provides financial and material support for the training of graduate students in Fisheries Science, Aquaculture, Integrated Coastal Management, Oceanography and Limnology. Additional expertise for the training of students will be sought from within Ghana and US through split-site arrangements. It is expected that at the end of the project, ten (10) PhD graduates will be produced alongside twenty (20) M. Phil. Graduates. Study programs for postgraduate students who started in 2015/2016 academic year are still ongoing.



Academic staff meeting with USAID funded postgraduate (PhD and MPhil) students of DFAS

Table 2: Postgraduate PhD Research Topics (2015/2016 Academic Year)

No.	Name of Student	Gender	Programme of Study	Research Topic	Thematic Area	Supervisors
<i>PhD Students</i>						
1	Ahiah Lawrence Armah	M	Aquaculture	Culture potential of selected populations of black-chinned tilapia (<i>S. melanotheron</i>) in Ghana	Activity 2.1.3: Research on Fish and Shellfish of Commercial value	Prof. John Blay Prof. Kobina Yankson
2	Michelle Naa Kordei Clottey	F	Fisheries Science	Assessment of the Threadfin (Polynemidae) Fisheries in the Central and Western Regions of Ghana	Activity 2.1.1 Fish Stock Assessment	Dr. Joseph Aggrey-Fynn Prof. John Blay
3	Jemimah Etorname Kassah	F	Fisheries Science	Assessment of the fishery and nutrient value of chub mackerels (<i>Scomber japonicas</i> Houttuyn, 1782) in Ghana	Activity 2.1.1 Fish Stock Assessment	Prof. John Blay Dr. Najih Lazar
4	Rebecca K. Essamuah	F	Integrated Coastal Zone Management	Developing decision support system for prioritizing conservation of marine spaces in urban areas of Ghana: A case study of the Fosu Lagoon, Cape Coast	Activity 2.1.5: Monitor Biodiversity and Health of Coastal Ecosystems	Dr. Denis Aheto Dr. E.A. Acheampong
5	Margaret F.A. Dzakpasu	F	Oceanography & Limnology	Assessment of ecological conditions of some coastal lagoons and estuaries using a bioindicator approach	Activity 2.1.5: Monitor Biodiversity and Health of Coastal Ecosystems	Prof. Kobina Yankson Dr. Emmanuel Lamptey

Table 3: Postgraduate MPhil Research Topics (2015/2016 Academic Year)

No.	Name of Student	Gender	Programme of Study	Research Topic	Thematic Area	Supervisors
<i>MPhil Students</i>						
1	Pearl Sakyi Djan	F	Fisheries Science	Stock assessment of some commercially important small pelagics of coastal waters of Ghana	Activity 2.1.1 Fish Stock Assessment	Dr. Joseph Aggrey-Fynn Dr. Najih Lazar
2	Elsie Akushika Debrah	F	Integrated Coastal Zone Management	A pilot study on small-scale fisheries monitoring using earth observation system and value chain analysis	Activity 2.1.1 Fish Stock Assessment	Dr. Denis Aheto Dr. George Wiafe
3	Daniel Adjei	M	Integrated Coastal Zone Management	Monitoring of remote sensing and catch data to evaluate hot spots for Tuna species in Ghanaian coastal waters	Activity 2.1.1 Fish Stock Assessment	Dr. Denis Aheto Prof. John Blay
4	Bright Asare	M	Aquaculture	Current status and culture potential of the mangrove oyster (<i>Crassostrea tulipa</i>) in Central Region of Ghana	Activity 2.1.3: Research on Fish and Shellfish of Commercial value	Prof. Edward Obodai Dr. Emmanuel Acheampong Mr. Jacob Ainoo-Ansah
5	Prince Dela Tseku	M	Aquaculture	Culture performance of <i>Sarotherodon melanotheron</i> fed on different formulated feeds	Activity 2.1.3: Research on Fish and Shellfish of Commercial value	Prof. Kobina Yankson Dr. Emmanuel Acheampong Mr. Jacob Ainoo-Ansah

As part of the project's long-term training activities, applications were invited from suitably qualified candidates for the award of five (5) full scholarships to pursue PhD and five (5) full scholarships to pursue MPhil degrees respectively in Fisheries Science, Aquaculture, Limnology and Oceanography and Integrated Coastal Zone Management. The PhD study will cover a period of three (3) years while the MPhil study will cover a period of two years beginning 2016/17 academic year. The scholarships cover tuition, monthly stipends, and field research grants as well as other material and technical support. A major requirement for admission was that all applicants must generally qualify for admission into a PhD or MPhil program at the University of Cape Coast.

As part of activities to select suitable candidates for the award of postgraduate scholarships to enroll in PhD and MPhil programs at UCC, positions were advertised for eligible candidates to apply for scholarships. Applications received for the award of scholarships to pursue postgraduate studies were shortlisted and the shortlisted applicants were invited for interviews. After a very competitive exercise, successful applicants (5 PhD students and 5 MPhil students) were selected and informed about their success and were encouraged to apply to the University for formal admission. These students were admitted by the University following the application process and have since started their programs of study at the beginning of the 2016/2017 academic year in August/September this year.

Table 4: List of PhD students admitted with full scholarship from USAID (2016/17)

No	Name	Gender	PhD Programme
1	Fredrick Ekow JONAH	M	Oceanography & Limnology
2	Gerdrude Lucky Dali	F	Integrated Coastal Zone Mgt.
3	Joseph Onwona ANSONG	M	Integrated Coastal Zone Mgt.
4	Miriam Yayra AMEWORWOR	F	Fisheries Science
5	Rhoda Lims Osae SAKYI	F	Aquaculture

Table 5: List of MPhil students admitted with full scholarship from USAID (2016/17)

No	Name	Gender	MPhil Programme
1	Ms. Success Adjeley Sowah	F	Oceanography & Limnology
2	Ms. Paulina Okpei	F	Fisheries Science
3	Mr. William Dogah	M	Aquaculture
4	Mr. Nunana Agbemebiese	M	Integrated Coastal Zone Mgt.
5	Ms. Justina Ekuwa Annan	F	Integrated Coastal Zone Mgt.

Women were particularly encouraged to apply in accordance with the project’s gender strategy. Successful students are expected to conduct research in one of the following thematic areas in either the Western or Central Region of Ghana: Fisheries Stock Assessment, Studies on Marine Fisheries Governance Issues, Research on Fish and Shellfish of Commercial Value, Analysis of Value Chains of Fish Trade, Assessment of Biodiversity and Health of Coastal Ecosystems. Request has also been made by the project to USAID to approve the support of additional postgraduate students at no extra cost which is still under consideration by USAID.

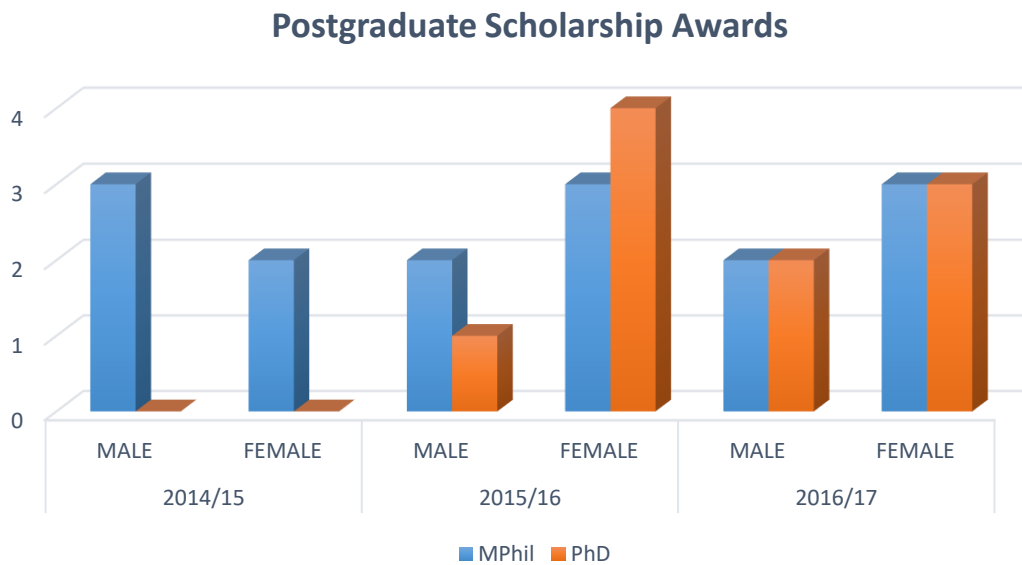


Figure 21: Total number of candidates admitted to various postgraduate programs on full scholarships at DFAS-UCC, by year and gender

4.4 Activity 1.2.4: Undergraduate Research Grants

This involves small grants given to undergraduate students to support their final year project work. It is expected that this initiative will increase enrolment of undergraduate students. In principle, it is targeted to fund one hundred and fifty (150) students’ projects over the five-year period. Since its inception, the program has supported 38 undergraduate students. The second quarter was used to evaluate student proposals for award. During the period the project also developed specific guidelines for use of the grants by the students as follows:

- *Receipts:* Receipts for all purchased goods and hotel accommodation must bear the project's name - USAID/UCC Fisheries Project (in-short). A VAT receipt (most often) must be obtained if possible. On the VAT receipt, and the students are to ensure the VAT component is clearly stated.
- *Transportation:* In cases where students are unable to secure receipts e.g. Taxi or transport (bus ticket could be handed in if applicable), they are expected to note down the various expenses on transport.

- *Accounting for fish:* Ensure you pick up certificate of honor from the office of the Project Management Support for the said purpose. It is the duty of all students to render accounts to their supervisors for onward submission to the Project Management office.

This guideline is also applied to the MPhil and PhD students' research grant as well.



DFAS Undergraduate Student beneficiaries of research grants busy with their project work in the laboratory (left) and at a seminar (right)

In addition to technical training offered undergraduate students through teaching and other advisory services, DFAS also provides financial assistance, paid through the project, to final year undergraduate students to conduct fieldwork and other academic activities for their dissertations in partial fulfillment for the award of BSc degrees by the University. In the second year, the department provided such support to 30 undergraduate students who are studying in the final semester of their undergraduate course. For the efficient use of the funds and good accountability, the undergraduate students are required to prepare and submit budgets which cover all expected expenditures to the project management authorities for consideration in consultation with their academic advisors. The budgets are discussed with the students and their academic advisors until such time that project management is convinced that the budgets are justified. Project management then disburses the funds directly to the students through their bank accounts with the notice of their academic advisors in order to track the use of the funds for their intended objectives. Each student had a grant award of US\$ 500 to specifically support field research, covering transportation, collection of samples and printing costs. The research topics completed and assessed are as follows:

Table 6: Undergraduate Research Projects

NO	NAME OF STUDENT	TITLE OF RESEARCH PROJECT	SUPERVISOR
1	MICHAEL AMEKUDZI	OBSERVATIONS ON THE BIOLOGY OF <i>CHLOROSCOMBRUS CHRIYSURUS</i> , <i>TRACHINOTUS OVATUS</i> AND <i>SARDINELLA SPP</i> FROM BEACH SEINE CATCHES IN CAPE COAST.	PROF. JOHN BLAY
2	CHRISTIAN KWAME BOAME	LENGTH FREQUENCY DISTRIBUTION AND LENGTH-WEIGHT RELATIONSHIP OF	PROF. JOHN BLAY

NO	NAME OF STUDENT	TITLE OF RESEARCH PROJECT	SUPERVISOR
		CUTTLEFISH (<i>SEPIA OFFICINALIS</i>) FROM BEACH SEINE LANDINGS AT CAPE COAST.	
3	EVELYN NYHIRABA QUARSHIE	LENGTH-WEIGHT RELATIONSHIP AND SIZE DISTRIBUTION OF CUTTLEFISH (<i>SEPIA OFFICINALIS</i>) FROM ANLO BEACH SHAMA, IN THE WESTERN REGION OF GHANA.	PROF. JOHN BLAY
4	MICHAEL FRIMPONG APPIADU	OCCURRENCE, DIVERSITY AND FOOD OF JUVENILE MARINE FISHES IN BENYA LAGOON AND KAKUM ESTUARY, GHANA.	PROF. JOHN BLAY
5	ABENA BOATEMAAH SARPONG	ECOLOGICAL ASSESSMENT OF THE LITTORAL FLORAL COMMUNITY OF THE FOSU LAGOON, GHANA.	DR. DENIS AHETO
6	GREGORY ESSIEH	ECOLOGICAL ASSESSMENT OF THE ZOOPLANKTON COMMUNITY OF THE FOSU LAGOON, GHANA.	DR. DENIS AHETO
7	OBED ADJEI	ECOLOGICAL ASSESSMENT OF THE FISH POPULATION OF THE FOSU LAGOON, GHANA.	DR. DENIS AHETO
8	IRENE OWUSUWAAH	ECOLOGICAL ASSESSMENT OF THE BENTHIC FAUNA COMMUNITY OF THE FOSU LAGOON, GHANA.	DR. DENIS AHETO
9	PERPETUAL MARFO	ECOLOGICAL ASSESSMENT OF THE COMMUNITY STRUCTURE OF PHYTOPLANKTON IN FOSU LAGOON.	DR. DENIS AHETO
10	PROSPER ASARE	EFFECTS OF TIDAL EXPOSURE ON SHELL MORPHOMETRICS AND ASPECTS OF REPRODUCTION OF THE MANGROVE OYSTER (<i>CRASSOSTREA TULIPA</i>) IN BENYA LAGOON.	PROF. KOBINA YANKSON
11	MICHAEL FEYI	THE USE OF TRADITIONAL MEANS OF TIDE PREDICTION IN ARTISANAL AND SEMI-INDUSTRIAL FISHERY IN TWO COMMUNITIES IN THE CENTRAL REGION OF GHANA.	NOBLE KWAME ASARE
12	DOMINIC DUNCAN MENSAH	HYDROGRAPHIC INFLUENCE ON THE UTILIZATION OF MANGROVE PONDS BY JUVENILE FISH ASSEMBLAGE IN THE KAKUM ESTUARY, GHANA.	NOBLE KWAME ASARE
13	ADUTWUM KWAME ISAAC	INFLUENCE OF HYDROGRAPHIC CONDITIONS ON FISH ECOLOGY IN AN ESTUARINE SYSTEM.	NOBLE KWAME ASARE
14	RUTH PRAMANG SEKYERE	CLIMATE CHANGE IN OUR BACKYARD: IN INVESTIGATION INTO HOW WARMING OF THE OCEAN THEREATENS THE PRODUCTION OF SARDINELLA IN GHANA.	DR. EMMANUEL ACHEAMPONG
15	BOATENG KUSI	MONITORING OF BEACH SEINE LANDINGS FOR TWO COASTAL FISH SPECIES (<i>BRACHYDEUTERUS AURITUS</i> AND <i>DECAPTERUS PUNCTATUS</i>) OF COMMERCIAL IMPORTANCE ALONG OLA-DUAKOR BEACHES IN CAPE COAST.	DR. JOSEPH AGGREY-FYNN
16	BERNARD YEBOAH ASSIAM	MONITORING OF BEACH SEINE LANDINGS FOR TWO COASTAL FISH SPECIES (<i>PSEUDOTOLITHUS SENEGALENSIS</i> & <i>TRICHIURUS LEPTURUS</i>) OF	DR. JOSEPH AGGREY-FYNN

NO	NAME OF STUDENT	TITLE OF RESEARCH PROJECT	SUPERVISOR
		COMMERCIAL IMPORTANCE ALONG OLA-DUAKOR BEACHES IN CAPE COAST.	
17	GATOR, GABRIEL	EFFECTS OF COPEPOD INFESTATION ON THE CONDITION INDEX OF THE GARFISH (<i>ABLENNES HIANS</i>) LANDED AT THE ELMINA BARBOR.	PROF. E.A. OBODAI
18	APUGYA AYINBOYA JOSEPH	A COMPARATIVE STUDY OF CONDITION INDICES OF MALE AND FEMALE OYSTERS, (<i>CRASSOSTREA TULIPA</i>) IN NAKWA LAGOON.	PROF. E.A. OBODAI
19	SAMUEL-RICHARD BOGOBEY	ASPECTS OF THE BIOLOGY OF <i>BRACHYDEUTERUS AURITUS</i> AND <i>SPHYRAENA SPHYRAENA</i> FROM BEACH SEINE LANDINGS AT ANLO BEACH, SHAMA	PROF. JOHN BLAY
20	FREDA TAFOA	THE EFFECT OF TIDAL EXPOSURE ON ASPECTS OF GROWTH OF THE MANGROVE OYSTER (<i>CRASSOSTREA TULIPA</i>) IN BENYA LAGOON	PROF. KOBINA YANKSON
21	JEREMIAH OTEYINYE ABDULAI	THE EFFECT OF CLIMATE CHANGE ON COASTAL FISHERIES: A CASE STUDY ON COASTAL UPWELLING AND SHRIMP PRODUCTION	DR. EMMANUEL ACHEAMPONG
22	YAW YEBOAH	CLIMATE VARIABILITY EFFECT ON COASTAL FISHERIES: A CASE STUDY ON THE IMPACT OF CLIMATE CHANGE ON THE PRODUCTION OF TUNA IN GHANA	DR. EMMANUEL ACHEAMPONG
23	AUGUSTINE M. K. ABOTSI	CLIMATE CHANGE IN OUR BACKYARD: INVESTIGATION INTO HOW WARMING OF THE OCEAN THREATENS FISHERIES PRODUCTION IN GHANA	DR. EMMANUEL ACHEAMPONG
24	EMMANUEL OBENG DEKYI	MONITORING THE BEACH SEINE LANDINGS OF TWO COASTAL FISH SPECIES (<i>GALEOIDES DECADECTYLUS</i> AND <i>CARANX HIPPOS</i>)	DR. JOSEPH AGGREY-FYNN
25	PRECIOUS KORLEKIE MATEY	DETERMINATION OF TIDAL EXPOSURE LEVELS OF COLONIES OF MANGROVE OYSTERS (<i>CRASSOSTREA TULIPA</i>) AND ASSOCIATED FOULING ORGANISMS IN BENYA LAGOON, GHANA	PROF. KOBINA YANKSON
26	PETER ANNOR OBENG	DETERMINATION OF SEX RATIO AND CONDITION INDEX OF MANGROVE OYSTER (<i>CRASSOSTREA TULIPA</i>) FROM BENYA LAGOON	PROF. E. A. OBODAI
27	ADELAIDE ANSERE	MONITORING THE BEACH SEINE LANDINGS OF TWO COASTAL FISH SPECIES (<i>CYNOGLOSSUS SENEGALENSIS</i> AND <i>ALECTIS ALEXANDRINUS</i>) OF COMMERCIAL IMPORTANCE ALONG OLA-DUAKOR BEACHES	DR. JOSEPH AGGREY-FYNN
28	DELOVE ABRAHAM ASIEDU	EFFECTS OF COPEPOD INFESTATION ON SOME GILL PARAMETERS OF THE GARFISH (<i>ABLENNES HIANS</i>) LANDED AT THE ELMINA LANDING QUAY	PROF. E. A. OBODAI
29	FLORENCE DZIDZOR FLEKU	INFLUENCE OF HYDROGRAPHIC CONDITIONS ON ASPECTS OF FISH ECOLOGY IN THE KAKUM ESTUARY, GHANA	DR. NOBKE KWAME ASARE
30	ELLEN NYARKO	INVESTIGATING ASPECTS OF POLLUTION IN	DR. NOBKE

NO	NAME OF STUDENT	TITLE OF RESEARCH PROJECT	SUPERVISOR
	YEBOAH	FOSU LAGOON, CAPE COAST, GHANA	KWAME ASARE



Figure 22: DFAS final year undergraduate students (2015/16) on a field trip to the SFMP office in Accra

SUCCESS STORY



DFAS undergraduate students on their graduation day for the 2015/16 academic year; September, 2016.

Improved Enrolment and Excellence in Performance at the Undergraduate Level

The enrolment of students into the undergraduate BSc. Program in Fisheries and Aquatic Sciences has generally seen marked improvement since the beginning of the USAID support to DFAS. Hitherto, DFAS suffered setbacks in student enrolment due to misconceptions concerning the name of the Department. The increase in enrolment since 2004/2005 academic year has come along with improved academic performance of the students. DFAS now has recorded successes of First and Second Class (Upper Division) students. This is as a result of the better quality of incoming students that are attracted to the Department in view of the improved infrastructure, logistical support and provision of small grants in support of undergraduate work. Improved communication through the project's activities and the involvement of students in some aspects of the project including their involvement in project seminars has exposed them to the opportunities in the fisheries sector of Ghana. DFAS is thankful to USAID for the state-of-the art facilities that will better prepare these students for the job market and help improve the sector.

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

5.1 Activity 2.1.1: Conducting Fisheries Stock Assessment

This activity assessed the status of commercially important marine fish stocks using length-based stock assessment methods. Different measures of effort and catch per unit effort (CPUE) based on number of boats, number of fishermen, number of nets, mesh sizes, hours spent at sea were also investigated. Modeling for quantitative prediction of consequences of management actions were also undertaken. The TOR for the assignment is as described below:



- This assessment aims to gather monthly data on the landings (kg) and species abundance from 20 canoes (5 from Half Assini, 5 from Elmina, 5 from Tema, and 5 from Keta), 12 semi-industrial boats (3 from Sekondi, 3 from Elmina, 3 from Apam and 3 from Tema), and 5 industrial vessels (2 from Sekondi and 3 from Tema)
- Data on landings to be obtained from Fisheries Commission recorders at the landing beaches. Length-based assessment methods will be used to estimate growth and mortality characteristics, exploitation rates and size at first capture of cuttlefish *Sepia officinalis*, shrimp species, Carangidae (e.g. *Caranx hippos*, *C. chrysos*, *Trachurus* spp. and *Decapterus* spp.) and Sparidae (*Pagellus* spp., *Dentex* spp., and *Pagrus* spp.).
- Otoliths of fish specimens will be removed for analysis to establish age structure of the stocks. The food and feeding habits to determine the trophic status of the species, and aspects of the reproductive biology, e.g. sex ratios, maturity size, fecundity, and will be studied.

After a competitive tendering process, a contract was awarded to a consultant, Prof. Patrick Ofori-Danson of the University of Ghana to provide a short-term technical assistance for research on fisheries stock assessment of some selected commercially important marine fish stocks in Ghana. The purpose of the contract was to conduct fish stock assessment to evaluate the status of some selected commercially important marine fish stocks in Ghana to predict the response of the stocks to various exploitation and management scenarios. Targeted species include cuttlefish (*Sepia officinalis*), shrimp species, carangidae (e.g. *Caranx hippos*, *Caranx chrysos*, *Trachurus* spp., *Decapturus* spp.), Sparidae (e.g. *Pagellus* spp., *Dentex* spp., *Pagrus* spp.). Major events and accomplishments to date under the Terms of Reference of the contract include:

- Literature review on past fisheries stock assessment studies

- Reconnaissance survey undertaken at the 6 designated fish landing ports, namely, Elmina, Sekondi, Half Assini, Apam, Tema and Keta for data on selected stocks belonging to the Carangidae, Sparidae, shrimps, and the cuttlefish, *Sepia officinalis*
- Collection of on daily catch (kg) per canoe, semi-industrial boat and industrial boat; Size distribution, maturity stages; length-weight relationships from beach seine and offshore catches; salinity and surface temperatures for monitoring upwelling indices
- Collection and storage of specimens, fish stomachs, gonads and otoliths
- Continuation of catch and stock assessment survey at 6 designated sampling stations (Elmina, Sekondi, Half-Assini, Apam, Tema and Keta) for relevant data on selected fish stocks still needs to be done
- Stomach content analysis and fecundity studies in the laboratory

Scientific evidence points to the fact that Ghana's marine fisheries are in crisis, with fish landings declining over the last decade. The overarching objective to arrest the decline in the fisheries industry should be the long-term conservation and sustainability of the exploitation of Ghana's fish stocks. Any deliberations to achieve these objectives urgently require the best and up to date information about the stocks through fisheries stock assessment research.

In recognition of the need to close the gap of the requisite information for fisheries management in Ghana, the project is undertaking fisheries stock assessment research through a short-term consultancy by a Technical Assistant. The primary objective of the fisheries stock assessment is to provide information on some selected commercially important marine fish stocks in Ghanaian coastal waters to facilitate sustainability and conservation of the stocks. The assessments are concentrated at 6 designated fish landing ports, namely, Elmina, Sekondi, Half Assini, Apam, Tema and Keta for data on selected fish stocks. Data was collected on daily catch (kg) per canoe, semi-industrial boat and industrial boat; size distribution, maturity stages; length-weight relationships from beach seine and offshore catches; salinity and surface temperatures of water for monitoring upwelling indices.

Analysis of the data collected indicated decline in the stocks possibly due to increased fishing effort. The mean catch per unit effort (CPUE) values were not uniform (ranged between 0.097 and 0.459 kg per canoe per day) which might indicate that the ichthyomass distribution is not uniform. In addition, the modal sizes of most of the targeted species fall below the minimum permissible landing sizes of commercially important fish species proposed in section 139 (1) of the Fisheries Act and also enshrined in the Fisheries Regulations 14 (1). In order to reverse the decreasing trend, some bold and immediate management interventions may have to be undertaken if the future livelihood support provided by the fisheries are to be sustained. The highest fishing effort of 1,680 boat days was estimated for canoes at the Sekondi landing beach.

In addition, the data obtained covered various aspects of the biology of the targeted species including, the length-weight relations, sex-ratios, condition factor, food and feeding habits, sexual maturity, spawning and fecundity. The stomach content analysis showed that the food spectra are mixed with general carnivorous diet bias by most of the species investigated with

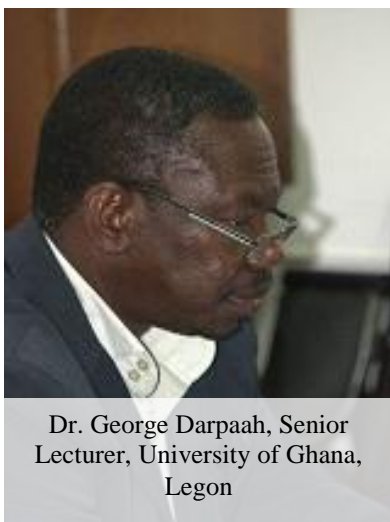
distinct preferences for fish and shrimps. This bias across the majority of the species examined could in the long run exacerbate competition among them.

The collection of monthly length-frequency data and previous catch-effort data from the fisheries were compiled to allow application of the length-based FAO FISAT program to estimate growth and mortality parameters and the appropriate Surplus Production Model for Maximum Sustainable Yield (MSY) estimation respectively.



Figure 23: Bumper fish harvest from beach seining activity at Atwenbanso landing beach, Jomoro District: Suspected outcome of ban on light fishing in the District. July 2016

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



Dr. George Darpaah, Senior Lecturer, University of Ghana, Legon

The first quarter of the second year was also used to frame research that will inform the introduction and/or strengthening of policies or actions in fisheries in Ghana beginning the Second Quarter. It will provide guidance to the Fisheries Commission and MOFAD, particularly in the implementation of the Fisheries Management Plan. It is the intended goal that this activity will strengthen the governance capacity at the community level particularly, but also at the district, regional and national levels by clarifying institutional roles and responsibilities on the basis of the assessment and sharing of the scientific knowledge. The PMB approved the proposal of Dr. George Darpaah of the University of Ghana to lead this intervention.

It was intended to be research-based with the aim of investigating traditional governance structures or customary social arrangements, local governance and decentralization, collaborative, community and any available community rights based management and their legal dimensions.

At the end of this activity the following outcomes were expected:

- Key social issues at the local level militating against the industry outlined
- The role of women, traditional authority, and rules of engagement identified
- Various local management strategies identified and evaluated
- Effective community resilience strategies proposed
- Management strategies through media publications and workshops disseminated.

Project activities related to research and assessment on marine fisheries governance issues in the current fiscal year were given to a consultant who is actively working to unearth the critical issues at all levels. The consultant provided a comprehensive plan detailing all activities to be carried out and the timelines within which they will be completed. The consultant also conducted a desktop review of literature on marine fisheries governance issues and made initial field visits to some of the fish landing sites and communities in the Western and Central Regions of Ghana to familiarize himself with the issues on the ground and to prioritize those that require immediate attention. Data and information were gathered through interviews, workshops, interactions and discussions with stakeholders at different levels.

During the period under review, landing beaches were studied in the Central and Western Regions. The following are some of the key achievements during the period:

- The Cape Coast Metropolitan Assembly agreed to supply waste bins to Cape Coast landing beaches to improve on the sanitation conditions at the beaches.
- Traditional Authority agreed to discuss implementation of ban on monofilament nets and use of other unauthorized fishing accoutrement with Local Authority and the Fisheries Commission.
- Local Administration at the Abura/Asebu/Kwamankese (AAK) District is linked to the local Traditional Authority. District Chief Executive agreed to address issues on bad fishing methods, environment & sanitation and MASLOC loans to fish processors was agreed to be addressed by DCE.
- The Komenda/Edna/Eguafo/Abura (KEEA) Metropolitan Assembly agreed with local traditional authority to implement by-laws on the following: address discrepancies in the distribution of pre-mix fuel; keeping register of canoes in KEEA; sorting out toilet facilities at the beaches; regulating fishing activities; pre-departure inspection and post/arrival inspection of canoes and instituting collaboration

between Department of Fisheries & Aquatic Sciences, UCC and KEEA to address fishing and environment issues.

- Children activity of fishing bivalves from the sea at low tide for domestic use in Western region termed as ‘Child work’ was pointed out to traditional authority for further discussion and possible ban with by-laws from Local Administration.
- Crocodile ponds with potential tourists attraction as agreed on by local authority for development in Ellembele District.



District Chief Executive (DCE) of Abura/Asebu/Kwamankese (AAK) District at Fisheries Governance Validation Meeting at Moree (June 2016).
Seated up: Traditional Authority at Moree
Inset: Section of Fisheries Practitioners and Opinion Leaders in AAK District .

Figure 24: District Chief Executive (DCE) of Abura/Asebu/Kwamankese (AAK) District at Fisheries Governance Validation Meeting at Moree (June 2016)



Figure 25: Children perform 'oyster dance' at low-tide level to harvest oysters

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

This activity is part of ongoing research by DFAS MPhil and PhD students. See activities 4.3 and 4.4 for reference.

Shellfish aquaculture has been identified as one of the project's supplementary livelihood interventions in some selected coastal communities. This will be done on pilot basis and will be scaled up to include other communities following the successful implementation of such an activity. Research needs to be carried out to identify specific aquatic environments in the selected communities that will be suitable for shellfish aquaculture and also research on the species of shellfish to be cultured. The project has identified an expert in shellfish aquaculture who is currently working with a supplementary livelihoods consultant to carry out research into shellfish aquaculture in the selected communities. The shellfish aquaculture expert met with project management to discuss his plans about the pilot activities, submitted a detailed budget to carry out those activities and trained local people who are interested in engaging in shellfish farming as a supplementary livelihood. Demonstration farms are currently being set up in the selected communities which will be used as sites to carry out more research into shellfish farming and equip people with the needed skills to set up and manage their private farms.

This activity also aims to provide information on some commercially important marine fish stocks in Ghanaian coastal waters to facilitate sustainability and conservation of the stocks. The study was completed in selected landing sites (Figure) with targeted species belonging

to the family Carangidae, Sparidae, shrimps and cuttle fish (Sepiidae). Analysis of the data collected within the period indicated decline in the stocks possibly due to increased fishing effort. The mean CPUE values were not uniform (ranged between 0.097 and 0.459 kg per canoe per day) which might indicate that the ichthyomass distribution is not uniform. In addition, the modal sizes of most of the targeted species fall below the minimum permissible landing sizes of commercially important fish species proposed in section 139 (1) of the Fisheries Act, 2002 (Act 625) and also enshrined in the Fisheries Commission Regulation 14 (1). In order to reverse the decreasing trend, some bold and immediate management interventions may have to be undertaken if the future livelihood support provided by the fisheries are to be sustained. The highest fishing effort of 1,680 boat days was estimated for canoes at the Sekondi landing beach with corresponding highest Boat Activity Coefficient (BAC) of 0.45.



Figure 26: Active beach by day

In addition, the data obtained covered various aspects of the biology of the targeted species including, the length-weight relations, sex-ratios, condition factor, food and feeding habits, sexual maturity, spawning and fecundity. The stomach content analysis shows that the food spectra are mixed with general carnivorous diet bias by most of the species investigated with distinct preferences for fish and shrimps. This bias across the majority of the species examined could in the long run exacerbate competition among them. The sparid, *Dentex ronchus* and the carangid, *Trachurus tracae* showed the most stenophagy of all the species due to the narrow spectrum of food items they consumed.

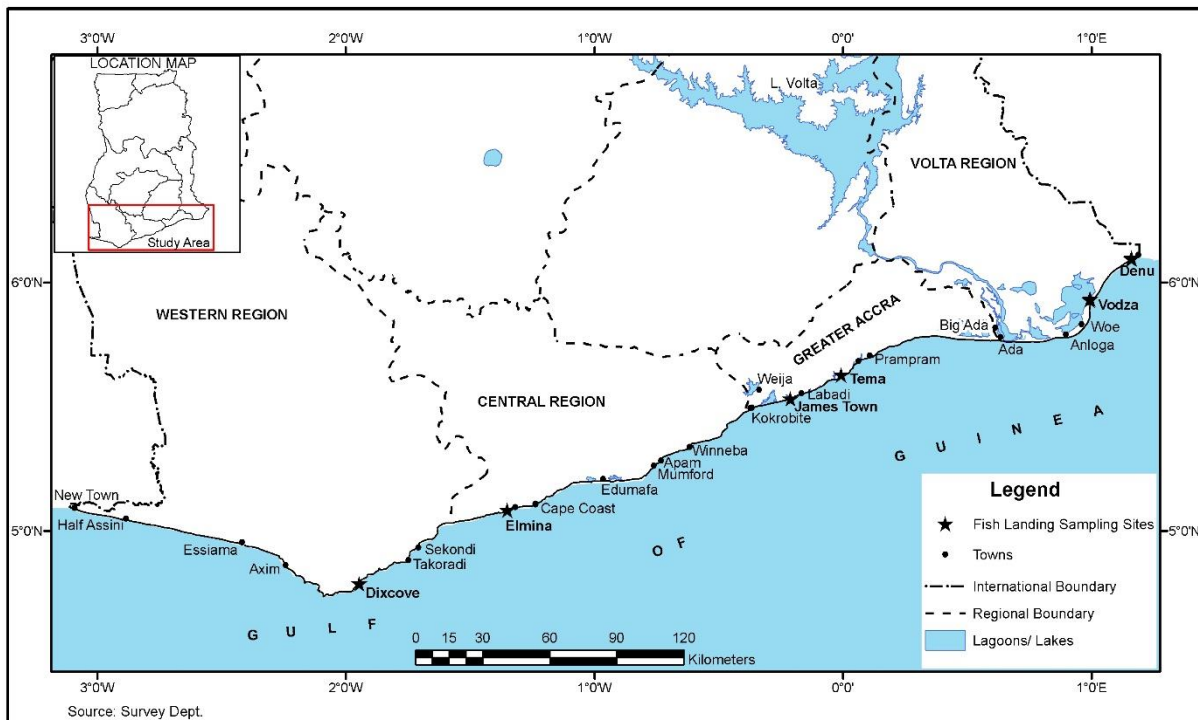


Figure 27: Coastal Map of Ghana showing fish landing ports and selected sampling stations

The collection of monthly length-frequency data and previous Catch-effort data from the fisheries are being compiled to allow application of the length –based FAO FISAT program to estimate growth and mortality parameters and the appropriate Surplus Production Model for MSY estimation respectively. It is expected that the routine monthly fishery surveys and data collection will continue in the next quarter to confirm and build upon the preliminary data collected and findings.

5.4 Activity 2.1.4: Analysis of Value Chains of Fish Trade

This activity was latent during the year under consideration but it is envisaged that some PhD students will initiate research in this field from the 2016/2017 academic year.

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

This project activity contributed to long-term effort towards the restoration of a closed lagoon in Half Asini (Awiane Aluonu) which is under serious threat of extinction due to pollution and other forms of degradation. It is intended to use the ecosystem-based approach to conduct boundary surveys on the lagoon to inform local Government

Agencies and other stakeholders in advocating for its conservation and the creation of necessary bye-laws on their wise use. The PMB awarded the activity to experts from the Department of Fisheries and Watershed Management of the Kwame Nkrumah University of Science and Technology.

The TORs for the project were as follows:

- Collect data on the general flora and fauna species content of the lagoon including documentation on threatened species within the ecosystem.
- Provide ecological monitoring and evaluation indicators for that biological system
- Propose measures to support enrichment and management plan preparation.
- Recommend appropriate stakeholder engagement strategies for the sustained management of the wetland.

Expected Outputs:

- Data on the general flora and fauna species content of the lagoon collected
- Information on threatened species within the ecosystem compiled
- Indicators for the ecological monitoring and evaluation the lagoon provided
- Measures to support enrichment and management plan preparation proposed
- Strategies for committed stakeholder engagement for the sustained management of the wetland recommended.



Research team from KNUST's Department of Fisheries and Watershed Management Collaborative Research on the Ecological Studies on the lagoon in the Western Region of Ghana

During the period under review, the project also hired the services of a consultant to conduct baseline ecological research on a closed lagoon in Half Assini, locally referred to as Awiane Aluonu, which is under serious threat of extinction due to pollution and other forms of degradation. The wetland provides significant ecosystem services and its sustainable management is key to achieving the objectives of the USAID/UCC Fisheries and Coastal

Management Project. The results from these studies will help DFAS/CCM collaborate with local Government Agencies and other key stakeholders in advocating for committed community engagement for restoration of the lagoon and the creation of necessary bye-laws for its wise use and management.



Singing of contract agreement between DFAS and the team from KNUST

According to the surveys conducted, initial observations indicated that the lagoon has multiple uses such as bathing, drinking, laundry, fishing and recreation. It is surrounded by a local community, whose activities have had a negative impact on the health and status of the lagoon. The major problem with the lagoon is the high load of solid waste dumped into the water because the surrounding fishing community has no facility to handle solid waste. Measuring turbidity levels using a Secchi disk indicated that the water was clear. The Secchi disc could still be seen beyond the 1m mark.

Before the start of the ecological studies, a team comprising members of DFAS and the Department of Fisheries And Watershed Management, Kwame Nkrumah University of Science and Technology (KNUST), conducted site visits to the lagoon in Half Assini to familiarize themselves with the lagoon and the surrounding community and to collect water samples for analysis.



Preliminary samples (water quality and macro-invertebrates) were collected as well as a photo documentation of the lagoon and surrounding areas. Fish samples were also purchased to be later analysed in the laboratory. Dissolved oxygen concentration, pH, conductivity, total dissolved solid, salinity, alkalinity, nutrients (nitrate, nitrite and phosphate), chlorophyll a, Secchi depth, macro-invertebrate samples were collected for organic matter and to help determine soil type. Results are shown the Table below.

Table 7: Summary of water quality variables (mean \pm SD) monitored from the two sampling points; February, 2016 (n=3)

Samplin g Point	*pH	Conductivity μ S/cm	TDS mg/L	Salinity PSU	DO (mg/L)	Alkalinity mg/LCaCO ₃	Phosphate mg/L	Nitrate (as N) mg/L	Nitrate (as NO ₃) mg/L
Beach	6.00-6.52	273.3 \pm 4.5	136.7 \pm 2.5	0.3 \pm 0.0	1.9 \pm 0.1	103.3 \pm 10.4	4.8 \pm 1.0	1.2 \pm 0.3	5.4 \pm 1.4
Bridge	6.88 -6.98	299.3 \pm 3.8	149.7 \pm 2.3	0.3 \pm 0.0	1.2 \pm 0.0	36.7 \pm 11.5	5.3 \pm 3.3	2.2 \pm 1.0	9.6 \pm 4.5

* Range given

The project embarked on the ecological restoration of the Half Assini lagoon as a pilot project to demonstrate the monitoring of the biodiversity and health of coastal ecosystems. As part of that activity a team made up of researchers from the University of Cape Coast and the Kwame Nkrumah University of Science and Technology (Project Technical Assistants) and the Coastal Management Specialist from the URI embarked on a two-day visit to Half Assini to strengthen the collaboration between the project and the District Assembly in Half Assini, the Traditional Authorities as well as the local fishing community and to discuss ways forward for working together towards the restoration of the lagoon. On arrival in Half Assini, the team first went on a tour around the lagoon to access the state of the water body and the extent of pollution and to have a general impression on what can be done to bring the lagoon

back to a desirable condition. The team gathered some information on the social, cultural and economic benefits derived from the lagoon by the surrounding community.

After the tour round the lagoon, a stakeholder meeting to discuss what could be done on the status of the lagoon was organized at the Jomoro District Assembly. In the absence of the DCE, the meeting was chaired by the District Coordinating Director of the Jomoro District Assembly who expressed his joy on behalf of the all members of the Assembly about such an important initiative by the USAID/UCC project. The Coordinator for the Centre for Coastal Management used the opportunity to highlight on the importance of the lagoon as spawning grounds for all kinds of aquatic organisms, for flood control, provision of fresh air and the protection of the land against storms and tidal waves. He further pointed out findings of an earlier project which was undertaken in 2013 to investigate the environmental issues in six communities including Half Assini led to the adoption of the Half Assini lagoon for special attention by the DFAS and the CCM. The Coordinator asked all stakeholders to do their part to save the lagoon because of its aesthetic value, ecological and economic importance. It is anticipated that the success of such a project will provide a model for other communities. The team from KNUST who recently conducted research in the lagoon made a presentation on their initial findings about the current status and use of the lagoon. Findings indicated that (1) The lagoon currently measures about 3.5 hectares indicating a reduction in size mainly due to siltation and the dumping of refuse and other wastes causing over-flooding (2) number of species has reduced (3) fishing has reduced in the lagoon leading to loss of economic opportunity. The presentation ended with the conclusion that community members were willing to support all efforts aimed at changing the current state of the lagoon for the better.



Figure 28: Awiane lagoon at Half Assini in the Western Region, Ghana



Figure 29: Current state of some parts of the Awiane Lagoon



Figure 30: Participants at the stakeholder meeting at the Jomoro District Assembly, Western Region, Ghana.

Summary of key issues (poor sanitation, defecation, dumping of refuse, piggery on the banks and reduced size of the lagoon) for consideration regarding behavior change in the practices around the lagoon was given by the Chairman of the Centre for Coastal Management. It was suggested that the community should refrain from dumping of refuse in the lagoon, move pig farms away from the banks of the lagoon and stop defecation near the lagoon but of course that also required some actions by the District Assembly and community members themselves like the community members joining hands to clear the plastic wastes in the lagoon and District Assembly providing the community with a new dumping site. The District Coordinator hinted that it would be difficult for the District to provide financial support at that moment since the District had exceeded their budget but he however promised the Assembly's support for other logistical needs to the community. The Coastal

Management Specialist expressed his appreciation to the community for attending the meeting in their numbers and pledged his continuous support to make the change happen by all means possible.

5.6 Activity 2.1.6: Developing Marine and Coastal Fisheries Database

As part of project activities, DFAS plans to develop a database on marine and coastal fisheries in Ghana with the view to organizing historical scientific data, new field observations and experimental results on the marine/coastal environment and fisheries in Ghana into a comprehensive database that can easily be accessed by researchers, students, marine and coastal environmental as well as fisheries managers in the country and elsewhere.

The project advertised calls for proposals from eligible consultants, preferably Information Technology specialists, to provide technical assistance towards the development of application software for an online relational database on fisheries and coastal management in Ghana. In all three applications were received for consideration by a selection committee set up by the Project Management Board which selected a successful applicant for the job. Working contracts were developed and signed by both parties for the consultant to start work. Work on development of the online relational database progressed steadily in the second year. Development of the database involves the following:

- Procure equipment for marine fisheries database
- Establish contacts with relevant data sources and host centers
- Data gathering mechanisms established
- Establish links with relevant government agencies, universities and research institutions
- Create a platform for regular interactions with government agencies and universities both local and foreign
- Organize researcher and stakeholder conference

The Project Management organized a two day workshop to assemble the necessary conditions for the development of a prototype database on fisheries and coastal management in Ghana. The workshop was facilitated by experts from Computer House Technologies. The primary goal of the workshop was to come up with a framework for the organization, publishing, editing and maintenance of fisheries and coastal research data. The workshop was expected to outline efficient strategy for critical data collation, management and online distribution to support coastal resources management and research.



Database workshop with experts from Computer House Technologies Ltd. in Cape Coast. In attendance were Dr. Denis Aheto, Dr. Emmanuel Acheampong and Dr. Noble Asare of DFAS

The objectives of the workshop were to:

- Investigate and decide on the appropriate content management system for coastal/fisheries research data.
- Reach a consensus on critical data for fisheries and coastal research database.
- Establish a conceptual design for the database, its query interface and creation insightful reports from database.
- Develop a protocol for the collation of data for the database.

At the end of the workshop, it was understood that the Project develops a user-friendly information and knowledge hub that can deliver large amount of constantly changing information and research works to its key audiences.

Pre-authenticated users will have access to specified information not available to un-authenticated users. The website front-end will interface with a database where users can search for materials in the resource collection. The back-end of the database shall be updated through a browser-based interface. It was concluded that to be effective, the website must be:

- easy and intuitive to navigate and update
- provide an intuitive search functionality connecting to an easily updated database
- provide customized content for authenticated users
- safe and secure
- the database should have the capability to interface with an online analytical processing tool in the future
- the database should be design utilizing a current language and allow room for upgrade.
- the database should be accessible from all major browsers
- access to data and ability to perform specific actions within the database should be predefined by permission levels.

The Project officially registered the domain name “FishCoM Ghana” referring to “Fisheries and Coastal Management” (<http://www.FishCoM Ghana/index.html>). The database is currently being populated with scientific data and information.

The image shows a conceptual website interface for FishCoM Ghana. At the top, there is a browser address bar with the URL 'incies/USAID/Database mgt/FishCoM Ghana/index.html' and a search icon. Below the address bar is a logo on the left and a search input field on the right. A dark blue navigation bar contains the following menu items: COASTAL ECOSYSTEMS, FISHERIES, AQUACULTURE, and COASTAL MANAGEMENT. The main content area features a large image of fishermen pulling a net, with the text 'Studying impact of fisheries' overlaid. Below this is a 'Welcome to FishCoM Ghana' section with placeholder text and a 'View More+' button. A 'Research Update' section follows, containing three items: a diagram of a fish, a photo of fish, and a bar chart. The right sidebar includes a vertical menu with links: Home, About Us, Director's Message, Research Projects, Library and Publications, Latest Research Findings, Right to Information, GIS, and Contact Us. At the bottom, there are three blue buttons: INSTITUTIONAL REPOSITORY, PHOTO GALLERY, and JOURNAL OF FISHERIES. The footer contains three columns: Latest News, Events, and EVENT CALENDAR.

Proposed Conceptual Front End Interface for the Database on Fisheries and Coastal Management in Ghana (FishCoM Ghana).

A consultant was contracted to work closely with DFAS team members on the activity involving the development of a marine and coastal fisheries database. A preliminary design of the website to host the database has been developed by the consultant and discussed with DFAS faculty for their inputs. Activity team members met to discuss the next steps to be

followed in efforts to have the database to become fully operational. It has now been decided that the project organizes a workshop at the national level preferably in Accra that will bring together potential collaborators for a national dialogue on sharing of scientific data and information and to develop modalities for the sharing of information as well as issues to deal with access to the database. In terms of accessibility, institutions will have varying levels of accessibility depending on the extent of their contributions. This national level stakeholder meeting has been scheduled to take place in August this year in Accra. In preparations towards the organization of this workshop invitation letters are being prepared to be sent out to the relevant organizations well in advance. Memorandum of Understanding (MoU) between the project and all partners were drafted and finalized after clearance by the UCC Legal Section. However, the project envisages a challenge where potential partner institutions will not be very much willing to participate in the development of the database and therefore their readiness to contribute and share data and information that they have. Despite the challenge, bringing the stakeholders together to dialogue is an important step moving forward.

The project discussed all issues that may hinder the progress of this activity and also bring about conflicts in a national dialogue forum with all stakeholders to ensure that an operational database. In preparation towards the launch of an online database portal and information clearing house on Fisheries and Coastal Management for Ghana, it was important to meet with scientists and stakeholders across the country to elicit their views, input and support for this activity being rolled out as part of DFAS Capacity Building Support Intervention with funding from USAID. "**FishCom Ghana**" (Acronym meaning "**Fish**"eries and "**Co**"astal "**M**"anagement) will serve as Ghana's leading Fisheries and Coastal Management Information Clearing House and Knowledge Management System on fisheries and coastal issues in Ghana.





The event was coordinated by AfricaLead and attended by the Heads, Directors and Representatives of the following institutions partnering DFAS in rolling out this activity:

- Environmental Protection Agency of Ghana
- Ministry of Fisheries and Aquaculture, & Fisheries Commission
- University of Energy and Natural Resources
- University of Ghana
- Kwame Nkrumah University of Science and Technology
- University for Development Studies
- Council for Scientific and Industrial Research
- University of Rhode Island
- United States Agency for International Development and
- Civil Society Representatives

FishCom Ghana is a comprehensive service to be provided by the Centre for Coastal Management (CCM) which has a special affiliation to the Department of Fisheries and Aquatic Sciences, both at the University of Cape Coast. It will serve to provide real-time and archived social and scientific information on Ghana's aquatic ecosystems in general and their resources in particular for access by students, scientists, policy makers, government agencies, non-governmental agencies and the private sector both local and international.

SUCCESS STORY



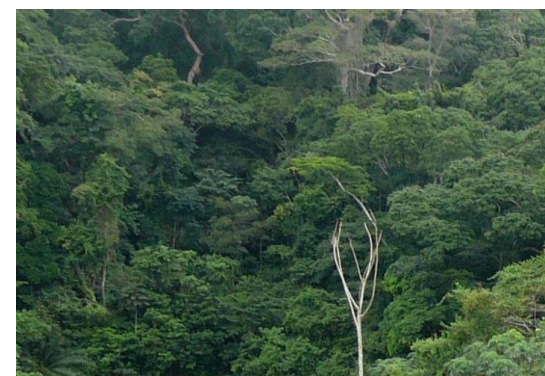
Left: RV Dr. Fridtjof Nansen. **Right:** Pearl analyses cuttlebone of *Sepia sp.* in a laboratory on board RV Nansen

PEARL SAKYI-DJAN, an MPhil Candidate in Fisheries Science and funded through the USAID grant has been involved in some life changing experiences first through her nomination to participate in this year's Ghana Fisheries Survey organized by the Ministry of Fisheries and Aquaculture Development (MoFAD) in conjunction with the Food and Agriculture Organization (FAO) and a Norwegian research vessel Dr. Fridtjof Nansen. In April, 2016, the vessel conducted exploratory surveys of Ghanaian waters to update the data and information base of Ghanaian marine fisheries resources. The Ecosystem Approach to Fisheries (EAF)-Nansen project is intended to strengthen fisheries knowledge for the implementation of an Ecosystem Approach to Marine Fisheries in Developing Countries. This was a first time experience for a student on the USAID funded program within DFAS to participate in this voyage on the famous RV Dr. Fridtjof Nansen vessel. There was technical skills that was gained working with other fisheries and oceanographic experts from Norway, Italy among others and the sharing ideas and networking opportunities. This survey exposed her to relevant fisheries protocols and software such as-Nansis (used on board the vessel), electronic systems and capabilities and the use of manta trawl for micro plastics sampling. From this experience gained, another opportunity for her to attend a training course on taxonomy and fish species identification organized under the EAF-NANSEN project also emerged. In September 2016, FAO organized a training program for ten Eastern Central Atlantic countries at the University of Ghana in Accra. The course further built her expertise on species on-sight identification and knowledge in the use of taxonomic keys to distinguish between species that are identical morphologically. Pearl is very grateful for these opportunities extended towards her future career prospect and development of the fisheries industry in Ghana that is based on science for decision-making. This opportunity for her to participate in this event would not have been possible without the support she received from the USAID/UCC Support Project.

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

Integrated coastal management (ICM) is an important tool for sustainable management of the coastal environment and resource utilization. The coastal zone of Ghana represents a paltry 6.5 percent of its total land area but is inhabited by 25 percent of the country's population because of the numerous benefits that can be derived in this area. Although ICM as a policy tool was adopted by Ghana in the mid-1990s following a study by the World Bank/EPA Ghana (see "*Towards an Integrated Coastal Zone Management Strategy for Ghana*"), the country's coastal zone environments and resources continue to face multiple and serious challenges. This can largely be attributed to the lack of stakeholders' knowledge and understanding of the basic principles and skills to address the challenges in the coastal zone.



The USAID/UCC Fisheries and Coastal Management Capacity Building Support Project hired a technical assistant to develop a training manual and materials in ICM for Ghana which will be used to train various stakeholders- planners, disaster managers, District, Municipal and Metropolitan Assemblies, environmental officers, fisheries officers, fishermen, fishmongers and community-based management groups. Doubtless strengthening the capacity of stakeholders to manage the coastal zone and its resources will support the quest of the Government of Ghana for sustainable management of the coastal resources. Furthermore it will complement the commitment of the Ghana Government to the Feed the Future Program of the US Government's global hunger and food security initiative.

The key product of this technical assistance is an ICM training manual with PowerPoint presentations, videos of interactions of the coastal zone and human activities and other materials. The specific objectives were:

- a) Develop an ICM training manual with modules to be delivered within a period of five days highlighting the coastal environments found in Ghana, methods of assessing the condition of coastal environments and their resources, integrated management approaches, and coastal management instruments (regulatory and economic instruments, and conflict resolution)
- b) Prepare an instructor's guide (including field and laboratory work) on the training manual as an Annex spelling out what is expected of the trainer
- c) Produce ICM materials including PowerPoint presentations of the modules, videos, charts and other relevant material
- d) Test the manual on a stakeholder group in the Cape Coast area

The need to train relevant personnel and other stakeholders in ICM cannot be overemphasized if Ghana's coastal ecosystems and resources are to be managed sustainably for the benefit of communities and future generations. A training manual in ICM would represent a major step towards realizing this goal. Developing a manual and conducting training on Integrated Coastal Management has the broad aim of building the capacity of stakeholders in governmental and non-governmental agencies, and fishing communities to better understand the nature of the coastal zone, be able to identify challenges, and learn basic skills for addressing problems.

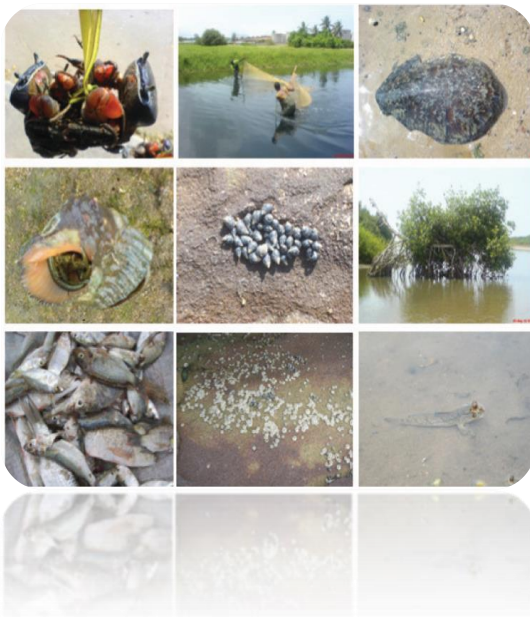
Specifically, this activity is aimed at developing a five-day training manual in ICM for governmental and non-governmental officers whose mandate relate to the coastal zone and community-based groups highlighting the coastal environments found in Ghana, methods of assessing the condition of coastal environments and their resources, integrated management approaches, and coastal management instruments, prepare an instructor's guide (including field and laboratory work) as an Annex of the training manual, organize ICM materials including PowerPoint presentations, videos, charts and other relevant material as well as testing the manual developed on a stakeholder group in the Central and Western Regions of Ghana.

The project identified and signed a working contract with an expert to provide technical assistance in developing a training manual and materials and conducting training on Integrated Coastal Management. This is targeted towards spatial planners, disaster managers, District, Municipal and Metropolitan Assemblies, environmental and fisheries officers, fishermen/fishmongers, and community-based fisheries and coastal management groups. The training manual and other materials were developed by the Technical Assistant and also tested in a workshop involving participants from the groups mentioned above.

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

Ghana's fisheries resources have been under serious threat over the years due to several factors including open access, overcapacity, inappropriate fishing methods, environmental degradation, and non-compliance of fisheries regulations among others. As a result the total fish catch from the marine fisheries has declined from previous high levels despite an expansion in fishing effort. This is indicative of overexploitation of the fishery and calls for concerted actions to manage the resources sustainably to benefit the present and future generations. In this regard, the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project hired a technical assistant to develop a manual with supporting materials on fisheries management for training stakeholders in Ghana's fisheries sector. Personnel of the Fisheries Commission, environmental officers of the District Assemblies, community-based fisheries management groups, and NGOs were targeted beneficiaries of the training.

Strengthening the capacity of stakeholders to manage the fisheries at all but especially the local level will go a long way to supporting Ghana Government's agenda for sustainable



management of the coastal resources of the country. It will also complement the commitment of the Government of Ghana to the Feed the Future Program of the US Government. The ToRs for services provided by the Technical Assistant include:

- a) Develop a training manual on fisheries management that targets lower and middle level governmental and non-governmental officials working in the fisheries sector as well as community-based fisheries management groups. The manual should incorporate modules that can be delivered within a period of five days including community-based fisheries management as it is impossible for government fisheries agencies to properly manage fisheries without community involvement which encourages ownership of fisheries management actions and regulations.
- b) Prepare an instructor's guide (including field and laboratory work) on the training manual as an Annex spelling out what is expected of the trainer
- c) Produce fisheries management materials including PowerPoint presentations of the modules, videos, charts and other relevant material
- d) Test the manual on a stakeholder group in the Western Region

The key product of this technical assistance is fisheries management training manual with PowerPoint presentations, videos of interactions of the coastal zone and human activities and other materials.

The project signed an MoU with the Department of Fisheries and Water Resources (DFWR), University of Energy and Natural Resources (UENR), Sunyani to collaborate with the DFWR to develop materials and conduct training on fisheries management. The purpose of the MOU was to frame collaboration between DFAS and DFWR of the (UENR) on the development of joint research activities and professional training programs within the context and objectives of the project. Both institutions are collaborating on the following activities:

- Curriculum development on fisheries management, notably practical field exercises for students and professionals
- Targeted student data collection on coastal zone and fisheries and
- Field research projects involving scientists on relevant fisheries monitoring programs in inland and coastal areas of Ghana.

The two institutions developed a training manual on fisheries management that targets lower and middle level governmental and non-governmental officials working in the fisheries sector as well as community-based fisheries management groups. The program also produced fisheries management materials including PowerPoint presentations of the modules, videos, charts and other relevant material and test the manual on a stakeholder group in the Western and Central Regions. Work on the development of the manuals and the other training materials was completed in the second year. The materials will be tested in the ensuing quarter.

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

A short course on climate change adaptation and mitigation was planned to take place in the third quarter of the second year but due to time constraints the course was postponed until the first quarter of the third year. A Technical Assistant for the training was however selected through a competitive bidding process during the last quarter of the second year. A training manual and other materials have already been developed by DFAS which were used for previous training programs including that of last year. Three members of academic staff of DFAS had the opportunity to attend a training program in Climate change and adaptation at the University of Rhode Island last year. New knowledge and special skills acquired have been used to update the existing manual and training materials on climate change. The short-term technical assistant is expected to work with the academic staff who attended the training at URI last year to conduct the training..

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

DFAS advertised for GIS experts to apply to be considered for a short-term technical assistance to provide services related to the application of GIS to fisheries and coastal management. The GIS expert was expected to work in close collaboration with the Department of Geography and Regional Development of the University of Cape Coast to assess opportunities to work together in the area of GIS in fisheries and coastal management. Only one application was received during the advertisement period which therefore was not reviewed in accordance with procurement regulations. The Project Management Board therefore requested for its re-advertisement

The applications received were shortlisted and a successful applicant was selected to provide GIS training services to the project. The consultant initially conducted a GIS training needs assessment for DFAS and CCM staff and developed training course curriculum, course notes and course exercises based on the findings from the needs assessment. A GIS Specialist from the Department of Geography and Regional Planning, UCC carried out an expert review of all the training course materials and provided a number of suggestions to improve the materials.



Figure 31: Research assistants filling questionnaires during the GIS needs assessment

The course is designed to develop the technical and soft skills of participants. It will provide participants with fundamental skills in GIS, Remote Sensing, teamwork, leadership and communication. It will enhance the intellectual capacity of participants to make systematic analysis of complex dynamic problems using GIS. The course consists of two interrelated components: (1) a theoretical component which focuses on the concepts and (2) a practical component which aims at developing hands-on skills in using GIS tools.

Again with the help of the consultant, the Department of Fisheries and Aquatic Sciences (DFAS) – UCC organized a five-day training in Geographical Information System (GIS) for some staff and post-graduate from 11th to 15th July, 2016. The purpose of the GIS training was to test the GIS manual that has been prepared by the consultant for the department. The training was delivered by two GIS experts from Kwame Nkrumah University of Science and Technology and Forestry Commission. It provided the participants with theoretical and practical, hands-on experience in the use and application of GIS. The participants were introduced to QGIS which is an open source GIS software. The training was divided into six (6) modules with corresponding comprehensive laboratory exercises. The modules were as follows: Introduction to Geographical Information Systems and Remote Sensing, Data Structures and Model, Coordinate Systems and Map Projection, Data Creation and Visualization, Introduction to Satellite Navigation (GPS) and Effective GIS Teams, Leadership and Communication.



Figure 32: GIS training held at the Centre for Coastal Management (CCM), UCC

The consultant also assisted the Department to procure a fifth generation personal computer and a Garmin 62 Global Position System (GPS) meant to provide immediate access for PhD and MPhil candidates within the Department of Fisheries and Aquatic Sciences (DFAS) and scientists at the Centre for Coastal Management (CCM) to GIS and GPS applications which

are deemed an important asset for modern scientists. The materials were presented in a short ceremony to the Project Manager on Friday 3rd August, 2016.



Figure 33: The consultant (Mrs. Cynthia Okine) presents computer set and GPS device to the Project Manager (Dr. Denis Aheto). Looking on is the Head of Department (Dr. Noble Asare)

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

Ghana has a very fragile ecosystem well-endowed with natural resources which are exploited by different sectors of the economy. This relatively small coast houses 25% of the nation's population and about 80% of the industrial establishments in Ghana thereby increasing the environmental pressure on the environment. Aside the environmental challenges, Ghana's fisheries sector is plagued with massive overcapacity of fleet, resulting in excess competition over the limited fish resources, declining productivity, economic inefficiency, and depressed fisher incomes. The traditional and political fisheries management arrangements and institutional have also, in recent times, failed to successfully manage the growing challenges in the fisheries sector. It is in the light of these environmental and fisheries management challenges that University of Cape Coast through the Fisheries and Coastal Management Capacity Building Support Project is conducting these research dialogues to facilitate the sustainable management of fisheries and the coastal zone of Ghana.

The highlight of these activities resulted in a national Stakeholders dialogue in December, 2015 at Mensvic Grand Hotel in Accra. In attendance was the Honorable Minister of MoFAD, Sherry Ayittey, Mr. Najih Lazar, Senior Fisheries Officer of the USAID Sustainable Fisheries Management Project and staff of DFAS.



Figure 34: Policy and Research Dialogue on Sustainable Fisheries and Coastal Management in Ghana. In attendance was the Honourable Minister in Charge of Fisheries and Aquaculture Development Sherry Ayittey, Heads of Departments from sister universities, regional

The overall finding of the National Policy and Research Dialogue is the general acceptance that illegal fishing methods is causing a decline in the catch and the willingness and unanimous agreement by all stakeholders that change is needed. At the meeting, stakeholders were unanimous that change has to be from the bottom: instigated and implemented by fishermen and fishmongers and supported by the local district assemblies, traditional authorities and the police. That is, existing fisheries and environmental laws and regulations can be enforced by these local stakeholders in order to attain the national fisheries management objectives.

It was concluded that as part of this capacity building objective of this project, DFAS should in the next years, among others, work with the Ministry of Fisheries and Aquaculture

Development to initiate and facilitate the drafting, acceptance and implementation of fisheries and coastal environmental bylaws by the various district assemblies in the country.

A consultant led the various components of this activity in the second year of the project based on the conclusions and recommendations made after the national stakeholder fisheries and coastal management dialogue held in Accra last year. So far, two research briefs have been written, a weekly radio programme on fisheries is on-going, four newspaper publications have been made and a meeting of fisheries and coastal environmental researchers has been organized.

An introductory policy brief that provides a general overview of the policy and research issues that confront Ghana's fisheries and the coastal environment as well as a sanitation brief that captures some scenes and makes recommendations for a bottom-up approach to managing this eyesore have been produced. These provide the processes and contribution of this project to confronting the issues. As a way of enabling DFAS to provide an effective extension service using local radio stations and to dialogue with community-based fisheries management groups, an MoU has been established with the ATL FM at UCC. Through this MoU, a faculty member of DFAS and a chief fisherman are now panellists adding new experiences and dimensions on the programme. This programme can be accessed on the broadcast days at ATL FM 100.5MHz with online streaming at <http://www.atlffmonline.com/radio>. The newspapers are being engaged to broadcast the policy and research issues to the wider public and to keep building the momentum for a continuous dialogue on fisheries and coastal environmental issues.

The need for researchers to conduct demand driven research to improve the lives of our people has been the challenge of many research stakeholders. As part of project activities last year, data and information were collected to facilitate research and policy dialogue among fisheries and coastal environmental stakeholders. As a follow up on advancing the data and information collected for fisheries and coastal management policy formulation, the project organized a two-day scientific meeting in Cape Coast which brought together research partners to deliberate on some research issues. The theme for the meeting was: "*Sustaining Fisheries and the Coastal Environment through Research*". The meeting was aimed at harnessing national expertise and resources to start to produce the much needed scientific information to better manage the fisheries and coastal environment in Ghana. It was attended by 16 participants from the following institutions: University of Cape Coast, Kwame Nkrumah University of Science and Technology, University of Ghana, University for Development Studies, University of Energy and Natural Resources, Water Research Institute (CSIR), Ministry of Justice and Attorney General's Department, Fisheries Commission and the Media.

Research issues for discussion in the meeting included:

- What triggers the occurrence of mats of seaweeds in Ghanaian waters and how can it be controlled? Does this weed have any economic value that can be utilized by the coastal communities?

- What are the tree species, energy content and efficiency of wood used in smoking fish in Ghana? What are the cultural underpinnings to the use of these species? What is the relationship between wood type, smoking method, smoker type and polycyclic aromatic hydrocarbon (PAH) and histamine concentration?
- Assess the spatial and temporal roles and interests of women in fisheries and coastal zone management/Explore the changing gender roles and dynamics in fisheries and coastal zone management
- Assess the spatial and cultural differences, gender roles and dynamics in sanitation among coastal communities
- Assess the potential for mariculture as an alternative to capture fisheries.
- Determine sustainable means of financing fisheries activities in Ghana
- Document and assess fish storage practices among the coastal communities of Ghana.
- Document and quantify the barter trade being practiced in the fishing communities (e.g. fish for food stuff; Fish for Sex....)
- Assess and develop a market matrix of the fish trade in Ghana.
- How to address political interference in the supply and sale of premix fuel
- Assess and quantify postharvest losses in the fishing industry

Following the identification of research issues, five research teams were formed with the appropriate expertise to facilitate and lead research in the identified thematic areas. The participants agreed to establish a society to facilitate fisheries and coastal environmental research in Ghana. Various working groups were established to stir the members towards the achievement of the research objectives and the formal launch of the society in April, 2017.

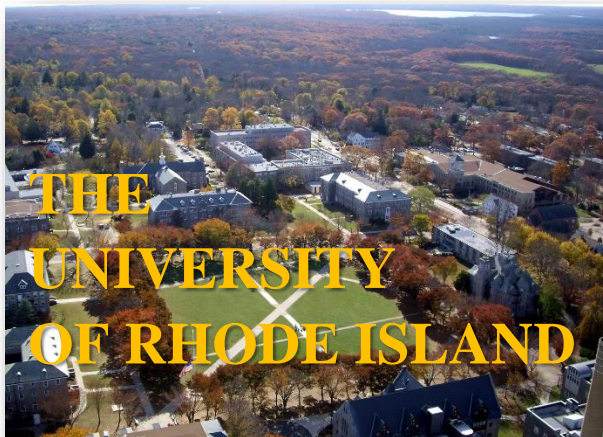




Figure 35: Participants of the National Scientific Meeting on Fisheries and the Coastal Environment

6.6 Activity 2.2.6: Building Institutional Partnerships and Collaboration

During the quarter partnerships were strengthened with URI on one hand and ACDI/VOCA on the other hand. Arrangements for a high level delegation of five persons from the University of Cape Coast (UCC-Ghana) led by the Vice-Chancellor of the University Prof. Domwini D. Kuupole to the University of Rhode Island was stepped up.



Collaboration with the CRC and ACDI/VOCA

DFAS also hosted Chris Davon and Dr. Don Rubadue from URI relative to specific research on the coastal zone to involve graduate students. During the period, DFAS also developed Scope of Work with ACDI/VOCA to be able to receive volunteers for some of its community interventions, especially those being managed by CCM. The specific activities under

consideration include supplementary livelihoods and DFAS requested for an expert to engage in long-term assignment (up to a semester) relative to teaching coastal management topics at DFAS.



Meeting with some members of the CRC (URI) and Geography Department (UCC)

UCC high delegation visit to the URI

As part of the ongoing collaboration between UCC and URI, in January 2016 URI hosted a high level delegation of five people from UCC led by the Vice-Chancellor of the University. The purpose of the visit was to further expand the development of the existing formal partnership between UCC and URI in areas of marine fisheries, aquaculture and coastal resources. This offered an opportunity for collaboration and exchange of expertise. The specific objective of the trip was to promote the implementation of the MoU signed between UCC and URI in March 2015 and the subsequent MoU between the URI-Coastal Resources Center (CRC) and the UCC-DFAS under review and considerations.



The Vice-Chancellor of UCC, Prof. D. D. Kuupole and the President of the University of Rhode, Dr. Dooley
Island exchange pleasantries



UCC delegation viewing under water activities at the Coastal Resources Center (CRC), University of Rhode
Island (URI), USA





The visit was meant to further expand the development of the existing formal partnership between UCC and URI in areas of marine fisheries, aquaculture and coastal resources. Other members of the UCC delegation are Prof. Ernest L. Okorley, Dean, School of Graduate Studies, Prof. Rosemond Boohene, Director of the Centre for International Education (CIE), Prof. Johnson Boampong, Dean, School of Biological Sciences and Dr. Denis Aheto, Head, Department of Fisheries and Aquatic Sciences and Project Director of the USAID/UCC Fisheries and Coastal Management Project.

The delegation discussed avenues of implementation in the following areas:

- Development of a short term students exchange program between UCC and URI. The program will allow UCC graduate students currently enrolled in MSc and PhD programs in marine fisheries, aquaculture and coastal resources to spend up to one semester at URI to audit classes and/or conduct research in special projects in areas of studies. Similarly, a sister program will be developed for URI graduate students to do the same at UCC.
- Development of an undergraduate exchange program (J-term). The program will allow URI students to visit Ghana and learn about the African culture and its environment. The program, hosted by UCC and facilitated by CRC-SFMP, will allow URI students to explore marine fisheries and coastal management issues in West Africa to better understand the challenges of sustainable resources management in developing countries.
- Development of a short-term training for professional development of UCC faculty and staff. The professors and research scholars from UCC can attend short-term trainings offered by URI.
- Development of joint research development and extension programs and exchange of information and access to peer-reviewed scientific material.

- Other areas of cooperation in the field of marine fisheries, aquaculture and costal resources.



Designated group from SBS, DFAS and SGSR pay a courtesy call on the Vice-Chancellor, UCC, to schedule for a return visit to Ghana by the President of URI, Dr. Dooley

USAID Coastal Implementing Partners Meeting

The meeting took place at B-Bovid Farms at Apowa in the Western Region. Project Manager and M&E Support attended. It was the first of such meetings in 2016 and the theme for discussion was Aquaculture Production and Processing. The meeting started with a review of all 2015 meetings and activities conducted. After the review of 2015 meetings, one major issue arose about how to add value to the monthly Implementing Partners meeting to make them useful to all partners as knowledge sharing by IPs helps projects not to reinvent what other partners are already doing. As partners learn from one another, it helps them avoid making mistakes others have made. One major value addition on the part of USAID/UCC project was the fact that the project has gained knowledge on what other projects are doing in the Western Region particularly in the area of fish and fisheries.

The project also expressed appreciation of the fact that many good linkages have been established with some of the implementing partners such as the Western Regional Coastal Foundation (WRCF).

The following themes were proposed for discussions in 2016: Fish value chain (healthy fish handling), vegetable production (opportunities and challenges), tensions between fishermen and oil and gas industry, livestock rearing, managing community expectations, land tenure system.

About the main discussion for the day, one fish farmer from the Western Region made a presentation on the practices he is using for his fish farming. He reported he integrates fish farming with poultry using chicken droppings as feed for the fish. This enabled him to

diversify his livelihood by having fish and poultry farms. He had a small fish hatchery in addition.

Following his presentation, there were concerns on his farming techniques as people thought it wasn't a good practice. The Sustainable Fisheries Management Project (SFMP) reported they are working with farmers to reduce the amount of bird droppings used as fish feed. B-Bovid Farms also reported that they are building capacity of farmers on good farming practices to increase their fish yield and also teaches farmers to add value to their fish production through smoking. B-Bovid is also in the process of producing smokeless briquettes for fish smoking to reduce wood use. Daasgift also reported they were working with fish processors to use good processing techniques.

The USAID/UCC project reported on the collaboration DFAS has with Ainoo-Ansah Farms in the Central Region to support the development of aquaculture production in Ghana. Through the collaboration, DFAS has developed a training manual on tilapia production which will be published this year. Some topics covered in the manual are using good quality fingerlings, feeding and marketing. DFAS plans to provide training to people who want to engage in aquaculture. The WRCF reported on the work they are doing in the Western Region to support the development of aquaculture, mainly the growing of catfish. One possible area to collaborate was for the WRCF to identify and support fish farmers who have existing ponds or have already acquired lands for ponds to receive training from DFAS.

There were concerns about the availability of land for fish farming where people suggested that projects should begin to look into cage culture on the rivers in the coastal districts of the Western Region.

President of URI visits UCC

During the year under review, the project and UCC for that matter, hosted the President of the University of Rhode Island (URI) and his team made up of the Associate Dean of Extension at the College of Environment and Life Sciences, an Adjunct Professor of Africana Studies and Special Advisor to the President, the Executive Director of the Coastal Resources Center, the Chief of Party of the USAID/Ghana Sustainable Fisheries Management Project (SFMP), the Senior Fishery Advisor to the USAID/Ghana SFMP and the Chief of Party of the USAID/West Africa ASSESS Project. The main purpose of the visit was to further develop the existing partnership with the UCC. The visit followed up on high level delegation from the UCC to URI and provided an opportunity to explore expanded partnerships with the UCC, including academic and student exchanges among other potential opportunities. The URI President gave a public lecture at the Main Auditorium of the University of Cape Coast entitled: "Internationalization and Globalization: Education, Research, Diplomacy, and Intelligence". The President noted that the current and future global context for higher education presents both substantial challenges and new opportunities. He stressed however,

that diplomacy and socialization, although less frequently emphasized, are also critical roles that university partnerships can provide.



Figure 36: Prof. D. D. Kuploe welcomes URI team at the



Figure 37: Signing of MoU between UCC and URI

After the lecture, an MoU was signed between the Coastal Resources Center of URI and the Department of Fisheries and Aquatic Sciences and Center for Coastal Management of UCC. Signing of the MOU symbolizes cooperation and mutual consent of the two parties to establish cooperative relations, and to strengthen synergies between the URI Coastal Resources Center and UCC Department of Fisheries and Aquatic Sciences in the implementation of each other's USAID-funded projects. Facilitating the symbolic MOU signing, the Senior Natural Resources Management & Energy Advisor of the Economic Growth Office of the USAID/Ghana Mission, Robert Buzzard, expressed continued commitment of the US Government and the USAID Mission to support government and university strengthening efforts and industry involvement to rebuild fish stocks and catches, thereby contributing to poverty and hunger reduction. Mr. Buzzard emphasized that

promoting higher education and research is a critical step for making informed science-based decisions for sustainable management of the fishery sector.

Student-Visit to the SFMP

In May, 2016, final year DFAS students visited the Sustainable Fisheries Management Project (SFMP) office in Accra where they met both the SFMP and the Netherlands Development Organization (SNV). The field visit was organized for the Integrated Coastal Zone Management (ICZM) II course taken by final year Fisheries and Aquatic Sciences students of the School of Biological Sciences, UCC. Students were briefed by way of presentations on critical issues regarding sustainable and integrated approach to managing Ghana's fisheries by the SFMP (by: Najih Lazer, Brian Crawford, Kofi Agbogah) whereas officials of SNV (Director and one senior staff) shared with the students the innovative technology they were using to develop energy efficient and climate smart stoves for smoking fish.



Figure 38: Final year DFAS students at the SFMP office in Accra

Fisheries Leadership Course

During the period under review (In July), SFMP-URI collaborated with DFAS/UCC to organise the second leadership for fisheries management course in Takoradi at Raybow International Hotel in Takoradi in the Western Region of Ghana from 11th to 16th July 2016 through a collaboration between USAID/Ghana's Sustainable Fisheries Management Project (SFMP) - University of Rhode Island (URI), and the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project implemented by the Department of Fisheries and Aquatic Sciences (DFAS) - University of Cape Coast (UCC). The objective of the course was to equip participants from the Ministry of Fisheries and Aquaculture Development, Fisheries Commission, NGOs, researchers and local communities with knowledge of processes for implementing management activities in pursuing management objectives for Ghana's fisheries resources. The main objective was to transfer the core competencies of fisheries management planning and implementation to these organization representatives so as to enable them facilitate participatory processes with stakeholders. The ultimate output involved facilitating the development and implementation of fisheries management plans at the local level and increasing effective dialogue between stakeholders on moving forward with the implementation of Ghana's fisheries management plans for the marine sector.

The course was led by three facilitators from the two universities, and attended by over twenty participants from coastal communities around the Pra and Ankobra Estuaries, fisheries oriented NGOs (Hen Mpoano and Friends of the Nation), Chief Fishermen from the Central and Western Regions, Fisher Associations (Trawlers, Inshore, Inland, Processors), Fisheries Commission and University of Cape Coast. In attendance from UCC were Mr. Godfred Ameyaw Asiedu, a facilitator, and Dr. Isaac Okyere, a participant, while the two facilitators from URI were Dr. Kathleen Castro and Glenn Ricci.



Figure 39: Participants at the Fisheries Leadership Course

The course concentrated on eliciting leadership responsibilities for managing Ghana's fishery by the various stakeholders through conceiving a vision, team building, negotiation skills, conflict resolution, facilitating a management plan, among others. Depending on the origin, participants were constituted into three groups namely the National Fisheries team, the Pra

Estuary team and the Ankobra Estuary team, with each team tasked to develop a process for facilitating a fisheries management activity in their fishery and present at the end of the training. On the final day of the training, the National team presented their strategies to tackle the use of chemicals and explosives in Ghana's artisanal fisheries while the Pra team presented their process to facilitate the development of a management plan for the estuary. The Ankobra team, led by Dr. Isaac Okyere presented on how they will facilitate the establishment of a Community Based Fisheries Management Committee (CBFMC) for the Ankobra Estuary which has already began, and further facilitate the development a management plan.

Certificates were presented to the participants at the end of the training. It is hoped that DFAS- UCC will take over the leadership for fisheries management course in the coming years and work together with potential facilitators from local NGOs and the fisher folk to offer the training.

CCM and DGRP (UCC) collaborate with SFMP on the use of UAVs

The Department of Fisheries and Aquatic Sciences (DFAS), the Centre for Coastal Management (CCM) and Department of Geography and Regional Planning extended their collaboration with the Sustainable Fisheries Management Project (SFMP) in an effort to develop capacity of University of Cape Coast (UCC) on the use of GIS and Remote Sensing tools as part of the SFMP's activities. The project coordinated with UCC to employ the use of Unmanned Aerial Vehicle (UAV) flights to capture ground control points and refine vertical accuracy of imagery in the Western/Central Regions of Ghana.



Figure 40: Aerial photograph of the Awiane Lagoon in the Jomoro District, captured with a drone

The activity paid particular attention to one coastal lagoon selected by CCM for management and restoration under the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project.



Figure 41: Children and some community members look on fascinated as drone is set for flight and remote controlled

Regional Universities Forum for Capacity Building in Agriculture

From the 17-24th May 2016, the Project Manager, Dr. Denis Aheto accepted a fully-sponsored invited visit to present the USAID/UCC Project on Fisheries and Coastal Management at the University of Makerere in Uganda under the auspices of the Regional Universities Forum (RUFORUM). The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), established by ten Vice Chancellors in 2004, is a consortium of 60 African universities operating within 25 countries spanning the African continent. RUFORUM is coordinated by a Secretariat hosted by Makerere University in Kampala, Uganda. RUFORUM supports universities to address the important and largely unfulfilled role that universities play in contributing to the well-being of small-scale farmers and economic development of countries throughout the sub-Saharan Africa region. The consortium has several unique features for building Africa's innovation capacity and for engaging universities in development process and practice; <http://www.ruforum.org/>.



Figure 42: Dialogue session at the forum

The Project Manager also used the opportunity to attend a write-shop to develop a proposal to “Train African professionals in fisheries and aquaculture” in response to a call from the European Commission to promote an “Intra-African Academic Mobility Scheme” to train PhD and Masters Students. The project, if successful, UCC will take the lead in the implementation and will work closely with five (5) other African universities in South Africa, Kenya, Uganda, Malawi, and Togo in cooperation with the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) based at Makerere University. To note that, the proposal was successfully submitted in May, 2016 awaiting outcome of the evaluations.



Figure 43: At the write-shop to develop a proposal to “Train African professionals in fisheries and aquaculture”

Follow up visit to UCC by five Deans from URI

A delegation of Deans from the University of Rhode Island (URI) – US embarked on a five-day visit to Ghana, aimed at strengthening ties and exploring academic partnerships with Ghanaian institutions. The institutions visited were the University of Cape Coast (UCC), Kwame Nkrumah University of Science and Technology, the University of Ghana and Ghana Institute for Management and Public Administration.

The University of Cape Coast (UCC) hosted the delegation from URI on a two-day visit to University to explore opportunities for partnerships between the two in various thematic areas of research. Among the dignitaries from URI-CRC were Brian Crawford, Assoc Dean of Business Administration Shaw Chen, Dean of Pharmacy Paul Larrat, Nancy Stricklin, Dean of CELS John Kirby, Associate Dean of GSO David Smith and Najih Lazar and UCC representatives included Provost of College of Agriculture and Natural Science and members of selected faculties and some of the SFMP staff.

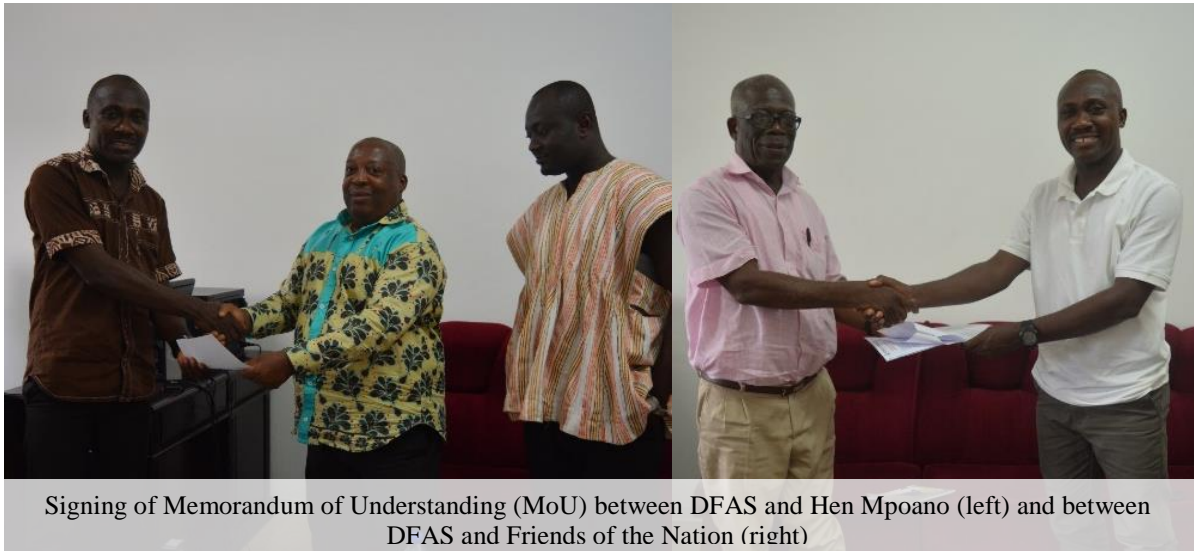
The visit was a follow-up to a previous inaugural trip of the President of URI to Ghana in April, which was intended to establish and strengthen cooperative relations between the URI Coastal Resources Centre and UCC Department of Fisheries and Aquatic Sciences in the implementation of each other's USAID-funded projects.



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

On this activity the project drafted Memorandum of Understanding (MOU) for cooperation with *Hen Mpoano* and *Friends of the Nation*, both community-based advocacy NGOs focused on coastal environment. The purpose of the MoUs was to frame collaboration between the Department of Fisheries and Aquatic Sciences of the University of Cape Coast (DFASUCC) and the two local organizations to develop joint outreach, research and professional training activities within the context and objectives of the “USAID/UCC Fisheries and Coastal Management Capacity Building Support Project“. The USAID/UCC Fisheries and Coastal Management Capacity Building

Project seeks to implement activities jointly with local institutions that will be mutually beneficial and also contribute to the wise use of natural resources, biodiversity conservation, food security, and livelihoods development for the coastal communities in Ghana.



To this end, it is the intent of DFAS to work with both institutions and collaborate on the following activities:

- The development of wetland monitoring programs in coastal communities of Ghana.
- Targeted research, case study reviews and data collection on coastal zone issues and fisheries management by graduate students;
- Integrated coastal zone management issues (e.g. climate change adaptations, vulnerability assessments, where necessary) particularly practical field exercises for students and professionals.

In relation to wetland monitoring program, the following process are applied:

1. DFAS has developed a coastal zone wetlands educational curricula made up of teacher's guide, students' manuals, visual presentations, outdoor classroom and field data monitoring sheets and test questions as well as competitive scorecards for monitoring wetlands' ecological health status, governance issues and threats to the wetlands. It is expected that these two organizations, working with undergraduate students of DFASUCC will use these resources to train selected junior and/ high school students and communities in the Western and Central Regions to monitor the ecological health, governance issues and threats of selected coastal habitats in those regions.

2. DFAS will strengthen the technical and institutional capacities of the two organizations to pursue this outreach/ educational program and use the curricula to educate and sensitize the select schools and communities for a concerted effort towards ecosystem restoration and conservation of the wetlands
3. Logistical support and related costs will be coordinated jointly by DFAS and the two local organizations.

In relation to graduate student research projects:

1. DFASUCC will prepare communications that announce available positions for research by DFAS undergraduate students within the wetlands monitoring portfolio
2. DFASUCC and the organizations will delineate responsibilities relative to the field research and expected outputs.

In relation to professional training program:

1. DFASUCC will jointly develop field based practical exercises on relevant coastal zone management issues
2. The two institutions shall develop seminar programs on the research and related outcomes.

Memoranda of Understanding (MoUs) were signed between DFAS and Friends of the Nation and between DFAS and Hen Mpoano (both local NGOs), to frame collaboration between DFAS and the two NGOs focused on fisheries and coastal governance issues in Ghana. The intention was to develop joint outreach, research and professional training activities. The purpose of the MoUs was to contribute to the conservation, restoration and monitoring of coastal wetlands in Ghana. DFAS and both institutions have operationalized the MoU and are actively collaborating on the development of wetland monitoring programs in coastal communities of Ghana. DFAS has developed a coastal zone wetlands educational curricula made up of teacher's guide, students' manuals, visual presentations, outdoor classroom and field data monitoring sheets and test questions as well as competitive scorecards for monitoring wetlands' ecological health status, governance issues and threats to the wetlands. It is expected that Friends of the Nation and Hen Mpoano will use these resources to train selected junior and high school students and communities in the Western and Central Regions to monitor the ecological health, governance issues and threats of selected coastal habitats in those regions. This Wetlands monitoring program will further collaborate with the Coastal Sustainable Landscape Project (CSLP) to provide support for additional wetland areas and communities in the Western Region. The wetland monitoring project has received approval from the Ghana Education Service. In operationalizing the MoUs, the Department of Fisheries and Aquatic Sciences organized a two-day training workshop at the University of Cape Coast to sensitize and train twenty (20) teachers from the project areas in the Central and Western Regions. The objective of the workshop was to introduce the teachers to the

training modules and ecological benchmarks for monitoring coastal wetlands, identify key issues and facilitate the development of monitoring and management programs for the selected wetlands.



Figure 44: Wetlands monitoring workshop for Junior High School teachers

6.8 Activity 2.2.8: Strengthening Community-based Groups

It is the intention to use this activity to establish and/or strengthen eight (8) community-based fisheries management programs for the promotion of effective fisheries governance and livelihood security in the beneficiary communities involving the following activities:

- Strengthen the capacity of identified community groups to understand the management structures, regulations, bylaws and rules pertaining to the management of fisheries and coastal resources in general.
- Partner with the community groups, Fisheries Commission and District Assemblies to implement relevant management strategies for sustainable resource exploitation

- Facilitate skills development of the community groups in conflict resolution, advocacy, negotiation, and persuasive communication.
- Provide the trainings above to specific community actors benefiting from the supplementary livelihood programs in snail farming, beekeeping and oyster farming
- Create awareness for behaviour change to enhance coastal resources management using several media platforms and avenues such as local radio programs, communicative bill boards and posters, newspapers, and communicative T-shirts.

Expected Outputs:

- Community-based groups strengthened and better positioned to engage in fisheries management
- CBOs strengthened to support development of coastal communities
- Improved fisheries resources management practices established
- Information gathered disseminated through electronic and print media, publications and dialogues
- Collaborators in the communities engaged
- Training for community members in Sustainable Livelihood (SL) activities undertaken.



Activities Undertaken⁵

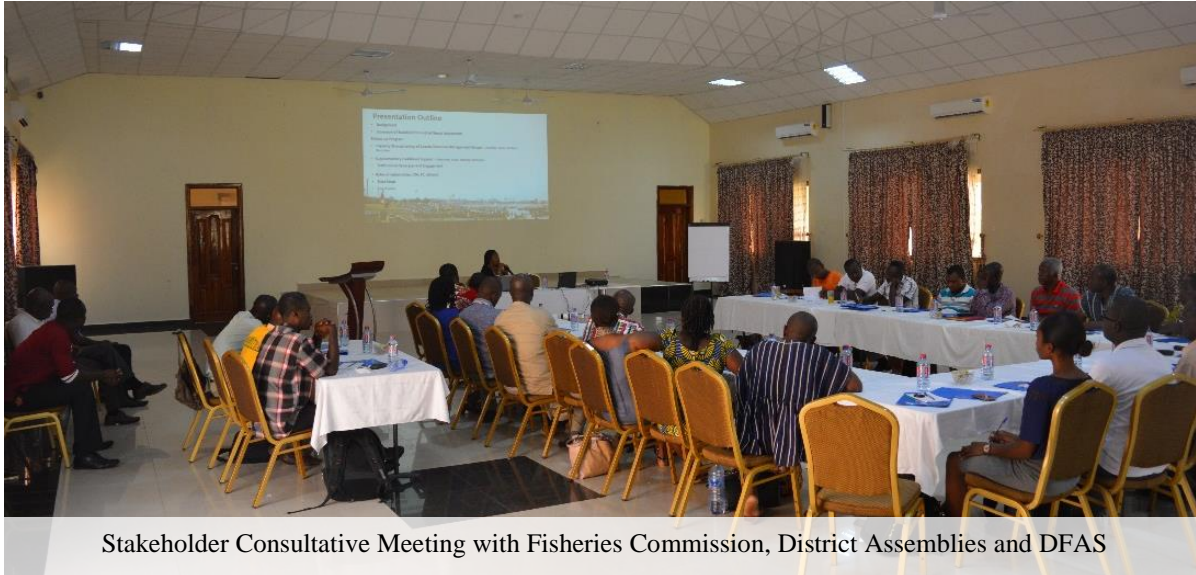
For the month of February 2016, the planned activities mainly consisted of preparatory meetings and activities that set the tone for the delivery of the planned project activities in subsequent months. These included:

- Initial visit to project communities with Project management Team (PMT) and the selected Trainers for the supplementary Livelihood activities This trip is part of the re

⁵ Some of the activities may overlap due to the strategy being adopted for the 2 components of the project. For instance, stakeholder engagement meeting was for both the Capacity Strengthening and Supplementary Livelihood activities. The consultant will however try to state the outputs and results achieved under each component as much as possible

engagement process for the second phase of the project and it was to engage community leaders on the various components of the project and to solicit their support.

- Stakeholder Consultative Meeting with Fisheries Commission, District Assemblies and DFAS



Recorded Output/Results

Among the outputs recorded during the period under review are:

- Community leaders engaged on expected activities on the Capacity Strengthening and supplementary Livelihood activities. The visit afforded the consultant and DFAS the opportunity to explain activities in the second phase and how both the supplementary Livelihood and capacity strengthening activities would work together to ensure the sustainability of the expected results.
- Stakeholder meeting to solicit the support and buy in of the District/municipal assemblies, Fisheries Commission staff and other stakeholders within the target communities. The support of the various stakeholders will also ensure the sustainability of the outcomes of the project in the communities. At the end of the meeting, a list of activities that would require the support of the stakeholders were outlined and the type of support communicated and agreed on. All stakeholders understood the purpose of the USAID/UCC Capacity support project and their various roles in the project. The DAs and FC staff also understood and made commitments to support the capacity building and Supplementary Livelihood project in their various communities and to ensure the sustainability of the results to be achieved in the project.

Planned Activities for March 2016

- Training for Community Facilitators for remobilization exercise
- Remobilization and sensitization of communities towards the capacity building and educational campaigns towards sustainable coastal resource management
- Facilitate community based groups formation
- Orientation of committee members and leaders for Coastal resource management
- Development of Information and Practice Handbook

- Development of management training modules and training Manual and Guide Development of Training Manual and Guide

The project intends to tackle the challenges associated with fisheries and other coastal resources management from the bottom-up approach; working with stakeholders at the community level to sustainably exploit and manage their own resources while at the same time engaging policy makers at the national level. Community-based groups need to be strengthened in various capacities to act as champions in their communities in natural resources management and to support development in their communities. Capacity needs assessments for community-based groups in 8 selected communities were conducted by the project in year one and one of the major findings was the lack of community structures with the required skills, capacity and institutional support for the implementation of sustainable coastal and fisheries resource management in the various communities. It was also one of the key recommendations of the needs assessment to support the formation of such community-based group and build their capacity to be able to work within their respective communities. Going forward, community-based groups have been formed for this purpose. The formation of the groups were participatory in nature at community meetings as community members were allowed to choose their own group members they were confident and comfortable working with.

Following from formation of the groups, community facilitators were selected, trained and dispatched into all 8 communities with the objective of supporting the revival of existing community-based groups where they existed and facilitate the formation of new groups where they did not exist. A remobilization exercise was then carried out to re-engage the communities in readiness, review community action plans and awareness created for the project activities in all communities. The selection criteria for the formation of the Community-Based Fisheries Management Groups (CBFMGs) took into account all interest groups in the communities including women, youth and religious and traditional orientation. Community members were oriented on the activities and Terms of Reference (ToRs) of the CBFMGs to gain support for the groups in the communities.

Community coastal resources management guide and manual were developed as material to be used in the training of the CBFMGs. Training workshops were organized for the community facilitators, representatives of the Fisheries Commission from all participating Regions and Districts and representatives of the CBFMGs as well as training for all members of the CBFMGs in each of the selected communities to equip them with basic skills in conflict resolution, advocacy, negotiation, resource mobilization, networking and persuasive communication for coastal resource management. All CBFMGs have developed action plans for their activities within the communities which included strategies for ensuring the compliance of bye laws and regulations around effective management of the coastal resources, implementing activities that will ensure the safety and cleanliness of the shoreline and beaches and networking with external stakeholders such as the District Assemblies.

6.9 Activity 2.2.9: Promoting Supplementary Livelihoods in Coastal Communities

Similar to activity 2.2.8, the PMT reviewed and completed specific TORs that seeks to promote supplementary livelihoods among selected community-based fisheries management groups in the Western and Central Regions of Ghana towards realization of the goal of sustainable fisheries as follow:

- Establishment of community-based fisheries management groups as specified in the approved needs assessment report
- Introduce diversification in livelihoods to improve income opportunities and reduce the pressure on natural resources among the community groups
- Train the fishers in black-chinned tilapia and mangrove oyster culture, apiculture (stingless bee culture), and rearing of the African land snail in collaboration with experts from the University of Cape Coast.
- Assist the communities to develop marketing strategies for the harvested products.
- Develop capacity strengthening strategies for realization of the objectives of the community-based groups
- Monitor and evaluate supplementary livelihood outcomes introduced to the fishers
- Disseminate outcomes through publications, electronic media and workshops including inception and close-out workshops.

Expected Outputs:

- Community-based fisheries management groups in the identified communities fully established
- Livelihoods and income generating opportunities in the communities successfully introduced
- Capacity strengthening in snail farming, apiculture and mangrove oyster culture quantitatively proven
- Supplementary livelihood outcomes introduced to the fishers monitored and evaluated
- Outcomes publicized through publications, print and electronic media
- Inception and close-out workshops for each community organized.
- Pressure on fisheries and other coastal resources reduced

Activities Undertaken

Planned activities for the period under review consisted of preparatory meetings and activities that set the tone for the delivery of activities under the contract. The highlights were:

- Identification and engagement of Trainers for Supplementary Livelihood (SL) activities;
- Community familiarization visit with PMT and SL Trainers for orientation and initial meeting with community leaders to orient them on second phase of the project;

- Follow up Meeting with SL Trainers and PMT to determine SL activities for the various target communities. Selected communities and SL activities are: 1. Narkwa – Oyster Farming and Snail rearing, 2. Anlo Beach – Bee Keeping, 3. Ankobra – Snail Rearing, 4. Half Assini – Bee Keeping and Snail Rearing;
- Stakeholder Consultative Meeting with Fisheries Commission, District Assemblies and DFAS to solicit support for planned activities and to ensure sustainability of results to be achieved within the project. At the end of the meeting, a list of activities that would require the support of the stakeholders were outlined and the type of support communicated and agreed on. All stakeholders understood the purpose of the USAID/UCC Capacity support project and their various roles in the project. The DAs and FC staff also understood and made commitments to support the capacity building and Supplementary Livelihood project in their various communities and to ensure the sustainability of the results to be achieved in the project.

Promoting supplementary livelihoods in selected coastal communities in the Central and Western Regions of Ghana is one of the flagship activities of the project because if coastal community members have other sources of livelihoods and income, the pressure on fisheries resources will be reduced. To achieve this objective, the capacity of community members must be enhanced to enable them engage in other supplementary livelihood activities other than fishing. The project plans to build the capacity of community-based organizations to provide effective governance at the community level in support of coastal resource management and supplementary livelihoods in eight selected communities in the Western and Central Regions. A livelihoods consultant has been contracted by the project to provide capacity building support to selected actors in eight targeted coastal communities in snail farming, bee-keeping and oyster farming to enhance community livelihoods. It is thought that when supplementary livelihoods provide a second stream of income for community members, the objective of sustainably managing coastal and fisheries resources will be realized.

Activities undertaken so far by the project to realize that aim include:

Selection of communities and trainers for supplementary livelihood activities

As part of recommendations from the initial assessments carried out in all 8 communities, 3 supplementary livelihood activities were selected. These are snail rearing, bee-keeping and oyster farming. The oyster project was expected to be a pilot project since it is the first of its kind to be cultivated in Ghana. Narkwa in the Central Region was selected for the pilot oyster farming and snail rearing; Anlo Beach in the Western Region for bee-keeping; Ankobra in the Western Region for snail rearing and Half Assini in the Western Region for bee-keeping and snail rearing. Trainers were identified for the selected activities and logistical arrangements made in all 4 selected communities for the training. Community visits were organized by the livelihoods consultant and the trainers together with the Project Management Team (PMT) to introduce the supplementary livelihood activities and trainers to the community leaders. The trainers also used the visits to inspect possible sites for the

various activities. Community leaders were tasked to prepare sites in readiness for the activities.

Community remobilization

Community facilitators were selected and trained by the consultant to re-engage the communities in preparation for the activities. Community-Based Fisheries Management Groups (CBFMG) were also formed to support the implementation of the activities. The lists of participants for the training for all 3 activities were compiled according to an agreed formula with the community and the leadership of the CBFMG. As part of the remobilization process, the sites selected by the various communities in consultation with the trainers as suitable for the activities were confirmed as being available and ready for use by the project.

Local market survey

The main objective of the promotion of the supplementary livelihood activities is to find a second stream of income for communities as a way of reducing the pressure on existing coastal resources. A local market survey was therefore necessary to determine the suitability and profitability of the selected trades to meet this objective. The survey was conducted on all 3 chosen activities in the Western and Central Regions to determine these variables. Initial findings suggested a marketability and profitability of commercial production of snail rearing and bee products. Bee-keeping has the potential to be developed to generate additional income for beneficiaries and open up for the participation of many more people. Oyster farming is not known apart from the coastal communities and needs to be marketed more to make it viable especially for commercial production if the pilot becomes successful. The research also found out that the selected beneficiaries and community members were very interested in pursuing the livelihood options to improve on their quality of lives and reduce the financial burden on them and their families during the lean fishing season.

Training of actors in snail farming, bee-keeping and oyster rearing

Three out of the four communities with a total number of 60 people have so far benefited from training in bee-keeping and snail rearing. These communities are Anlo Beach for bee-keeping and Ankobra for snail rearing. The setting up of the pilot Oyster farm in Narkwa has also started and the selected trainees are undertaking the training program with the support of the trainer.

These successes have also been accompanied with some challenges:

1. The availability of trainers for the training programs especially bee-keeping and snail rearing was a challenge. This caused unnecessary delays in the training schedule. It is recommended that other trainers who would be available for the training period are identified to reduce the delays on the program.
2. Sustaining the interest of the communities that are not benefiting from the livelihoods activities was a difficult task for the community facilitators especially knowing that other communities are benefitting. Reassuring them of fact that they will benefit subsequently seemed to be make marginal impact.
3. There seemed to be other development projects engaging the same communities and working with community- based organizations as well. Perhaps the project could engage

these projects to come up with an engagement strategy that will reduce the number of organizations and staff who hold meetings and activities with the communities to reduce fatigue on beneficiaries. This has the potential to reduce interest that the communities have in the project



Figure 45: Trainers from DFAS teach oyster group how to prepare cultches for spat collection in lagoon



Figure 46: Cultches arranged on a rack ready for planting in the Narkwa lagoon



Figure 47: Two members of the oyster group carry cultches into Narkwa lagoon

APPENDICES

List of Project Performance Indicators and FY 2016 Results

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
1	Quantities and/or sizes of fish landed by selected canoe fishermen in the Central and Western Regions of Ghana.	To be determined	To be determined	-	-
<p>Comments: Work is still ongoing with the collection of daily fish catch per canoe, fish size distribution, maturity stages and length-weight relationships by the project's fish stock assessment Technical Assistant. The work is scheduled to continue until the end of the 2016 fiscal year after which averages will be calculated to have a baseline for quantities and/or sizes of fish landed by canoe fishermen.</p>					
2	Fishing Mortality at MSY (F_{msy})	To be determined	To be determined	-	-
<p>Comments: Work is still ongoing by the project's fish stock assessment Technical Assistant which will enable analysis of fish catch and effort data for establishment of MSY (F_{msy}). Results will be compared with that of the SFMP project.</p>					
3	Biomass to produce MSY (B_{msy})	To be determined	To be determined	-	-
<p>Comments: Establishment of MSY (B_{msy}) will be determined from fish catch and effort data from targeted commercially important fish stocks through the work of the fisheries stock assessment Technical Assistant. Results will be compared with that of the SFMP project.</p>					

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
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 hectares	-	-
<p>Comments: Preliminary survey on the ecological health of the Half Assini lagoon with the project's biodiversity and ecosystems health Technical Assistant has been completed. The lagoon is generally shallow with a total water surface area of 3.5 hectares and a wetland area of 6.9 hectares. This area will be earmarked and monitored for improved management in subsequent years.</p>					
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 hectares	-	-
<p>Comments: Preliminary survey on the ecological health of the Half Assini lagoon with the project's biodiversity and ecosystems health Technical Assistant has been completed. The lagoon and the wetland area will be constantly monitored and the number of hectares showing improved biophysical conditions will be determined periodically in subsequent years.</p>					
6	Number of training and capacity building activities conducted with USG assistance	0	5	220	Yes

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
<p>Comments: Eleven (11) training activities took place in the period under review; 1 Geographic Information Systems (GIS) training for DFAS staff and 19 Community-Based Organizations' capacity strengthening for supplementary livelihoods training programs in selected communities in Central and Western Regions.</p>					
7	Number of people receiving USG supported training in natural resources management and/or biodiversity conservation	0	150	110	Yes
<p>Comments: Ten (10) different training programs in natural resources management and/or biodiversity took place during the period under review. 171 (122 males and 49 females) people participated in all the trainings.</p>					
8	Number of person hours of training in natural resources management and/or biodiversity conservation supported by USG assistance	0	400	669	Yes
<p>Comments: Nine (9) different training programs in natural resources management and/or biodiversity conservation took place during the period under review summing up to 2,676 person hours of training.</p>					

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
9	Number of individuals who have received USG supported long-term agricultural sector productivity or food security training	0	35	45	Yes
<p>Comments: During the period under review, the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project supported 16 students in total; 6 PhD students (2 males, 4 females), and 10 MPhil students (5 males, 5 females). 5 more PhD students and 7 MPhil students have been selected for scholarships to begin next academic year.</p>					
10	Number of individuals who have received USG supported short-term agricultural sector productivity or food security training	0	280	0	No
<p>Comments: During the period under review no short-term agricultural sector productivity or food security training took place.</p>					

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
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	0	15	53	Yes
<p>Comments: Eight (8) Community-Based Fisheries Management Groups (CBFMGs) have been formed in 8 selected fishing communities in the Central and Western Regions who received assistance in capacity strengthening for natural resources management and supplementary livelihoods support by the project.</p>					
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	0	15	0	No

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
<p>Comments: The Community-Based Fisheries Management Groups (CBFMGs) are currently undergoing training to undertake natural resources management and supplementary livelihood activities in their communities. Those who will apply new technologies during the actual implementation phase of supplementary livelihood activities will be monitored, counted and reported periodically.</p>					
13	Number of members of producer organizations and community based organizations receiving USG assistance	0	200	75	Yes
<p>Comments: 150 members in total in the 8 Community-Based Fisheries Management Groups (CBFMGs) formed in the 8 selected fishing communities received assistance in capacity strengthening for natural resources management and supplementary livelihoods support by the project in this reporting period.</p>					
14	Number of farmers and others who have applied new technologies or management practices as a result of USG assistance	0	200	0	No
<p>Comments: The Community-Based Fisheries Management Groups (CBFMGs) are currently undergoing training to undertake natural resources management and supplementary livelihood activities in their communities. Those who will apply new technologies will be monitored, counted and reported periodically.</p>					

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
15	Number of rural households benefiting directly from USG interventions	0	200	75	Yes
<p>Comments: 150 members belonging to 150 rural households in total in the 8 Community-Based Fisheries Management Groups (CBFMGs) formed in the 8 selected fishing communities benefitted directly from project interventions during the period under review.</p>					
16	Number of vulnerable households benefiting directly from USG interventions	0	200	20	No
<p>Comments: Forty (40) of those 150 rural households are vulnerable households living in the flood prone areas close to the River Pra and the Ankobra River in the Western Region of Ghana.</p>					
17	Score, in percent, of combined key areas of organization capacity amongst USG direct and indirect local implementing partners	To be determined	To be determined	-	-
<p>Comments: AfricaLead has agreed to conduct an organizational capacity strengthening assessment for DFAS. DFAS is yet to decide with AfricaLead the most appropriate time for that activity. Score, in percent, of combined key areas of organizational capacity will be reported after the assessment.</p>					

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
18	Number of beneficiaries receiving improved infrastructure services due to USG assistance	0	96	106	Yes
<p>Comments: Nine (9) members of Academic Staff, 8 Research Assistants, 2 Project Support Staff, 5 Administrative Support Staff, 3 Technical Staff and 75 students in DFAS (102 in total) are beneficiaries of refurbished library, fisheries and coastal management laboratory, project vehicles and the premises of the Center for Coastal Management.</p>					
19	Number of new research collaborations established between USG-supported beneficiaries and other institutions	0	10	30	Yes
<p>Comments: Three (3) new research collaborations were established with the University of Energy and Natural Resources in Sunyani Ghana to collaborate in fisheries management research, the local Non-Governmental Organizations Hen Mpoano and Friends of the Nation on Wetlands Ecological Monitoring in the Central and Western Region.</p>					
20	Number of scientific studies published or conference presentations given as a result of USG assistance for research programs	0	40	5	No
<p>Comments: No Scientific studies were published but 2 conference presentations were given by 2 DFAS academic staff at the Makerere University in Uganda in this reporting period.</p>					

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
21	Number of dialogues and stakeholder consultations held on fisheries and coastal management	0	13	15	Y
<p>Comments: The project organized a 2-day scientific dialogue with research partners to deliberate on fisheries and coastal management research issues. The theme for the meeting was: “Sustaining Fisheries and the Coastal Environment through Research”. There was also a 2-day national dialogue on the collective establishment of fisheries and coastal management database with partners in Accra in this reporting period.</p>					
22	Percentage of graduates from USG-supported tertiary education programs employed	0	20	0	No
<p>Comments: No DFAS graduates were employed during this reporting period.</p>					
23	Number of CSOs and government agencies strengthened	0	20	40	Yes
<p>Comments: Eight (8) CBOs and government agencies were strengthened through capacity building activities delivered by the project in this reporting period.</p>					

No.	Indicator	Baseline	Annual target	Performance achieved in reporting period (%)	On target? Yes/No
24	Total number of direct beneficiary	0	500	54	Yes
<p>Comments: Two hundred and seventy-two (272) people (112 DFAS students and academic staff and 160 training participants in the 8 selected fishing communities in the Central and Western Region) were direct project beneficiaries in the period under review.</p>					

Appendix 2a: Call for Applications for Scholarships 2016/17 Academic Year



Call for Applications for Scholarships – Doctor of Philosophy (PhD) and Master of Philosophy (MPhil) Degrees for the 2016/2017 Academic Year at the University of Cape Coast

Background:

In support of the Government of Ghana's (GoG) initiatives on food security, the United States Government (USG) through the United States Agency for International Development (USAID) is supporting a five-year capacity building programme for fisheries and coastal management in Ghana. The project contributes to GoG's overall grand fisheries and coastal development programme and USAID's Feed the Future (FtF) Initiative, the USG led global hunger and food security project designed to enhance economic growth in beneficiary countries. In this context, the Department of Fisheries and Aquatic Sciences (DFAS) at the University of Cape Coast is presently leading the USAID Capacity Building Support Programme for the Fisheries and Coastal Management sub-component in collaboration with coastal research institutes at the University of Rhode Island, USA.

(i) Doctor of Philosophy (PhD) Degree

Applications are hereby invited from suitably qualified candidates for the award of five (5) full scholarships to pursue PhD degrees at the Department of Fisheries and Aquatic Sciences of the University of Cape Coast in the following areas:

- *Fisheries Science – One (1) Candidate*
- *Aquaculture – One (1) Candidate*
- *Limnology and Oceanography – One (1) Candidate*
- *Integrated Coastal Zone Management – Two (2) Candidates*

The PhD study will cover a period of three (3) years, beginning the 2016/17 academic year. The scholarships cover tuition, monthly stipends, and field research grants as well as other material

and technical support. Successful candidates will spend a maximum of 6 months at the University of Rhode Island in the United States to cover part of their studies.

General Requirement: Applicants must generally qualify for admission into a PhD programme at the University of Cape Coast.

Specific Requirements: In addition, all applicants must satisfy the following specific requirements:

- 1) Must hold a good master's degree (Grade: B+ or A would be an advantage) from a recognized university in a relevant field of study namely:
 - Fisheries Science, Oceanography, Limnology, Aquatic Ecology, Integrated Coastal Zone Management, Coastal Resources Management, Aquaculture, Environmental Science, Environmental Governance, Marine Policy, Conservation Science or Natural Resource Management.
- 2) All candidates must submit:
 - an application letter
 - Curriculum Vitae (CV)
 - Motivation letter
 - Two letters of recommendation
- 3) Successful candidates will be expected to conduct research in one of the following thematic areas in either the Western or Central Region of Ghana. Therefore, all applicants **MUST** in addition to the above (i.e. 1 & 2), submit a 5-page research proposal on one of the following areas of emphasis:
 - i. **Fisheries Stock Assessment**
Studies will be conducted to assess the status of commercially important marine fish stocks.
 - ii. **Studies on Marine Fisheries Governance Issues**
Research in this area would involve a survey and review of various social issues in fishing communities as well as existing adaptive management strategies.
 - iii. **Research on Fish and Shellfish of Commercial Value**

Research on the coastal tilapia (black-chinned tilapia), shrimps and mangrove oysters would involve growth, reproduction and survival of juveniles and their culture potential.

iv. **Analysis of Value Chains of Fish Trade**

This activity will investigate the different phases of production, processing and marketing of the different commercial fish species in the country. Factors affecting the various stages in the chain will be investigated.

v. **Assessment of Biodiversity and Health of Coastal Ecosystems**

This work will involve examination of aspects of biodiversity of fish, benthic invertebrates, and mangrove communities in lagoons and estuaries to establish the scientific basis for future monitoring in view of the ongoing offshore oil and gas exploration and production. Aquatic environmental factors, occurrence of algal blooms and invasive species will also be investigated.

- 4) In addition to all of the above (1-3), all candidates seeking for scholarships must separately apply for admission to **one** of the **four** academic programmes offered in the Department and MUST meet the admission requirements of the University of Cape Coast.

(ii) **Master of Philosophy (MPhil) Degree**

Applications are invited from suitably qualified candidates for the award of five (5) full scholarships tenable at the University of Cape Coast. The Master of Philosophy Degree study will cover a period of two academic years beginning 2016/17 academic year. The scholarships cover tuition, monthly stipends, and field research grants as well as other material and technical support to successful candidates to pursue any of the following programmes of study:

- Fisheries Science
- Integrated Coastal Zone Management
- Oceanography and Limnology
- Aquaculture

Requirements:

- i. Applicants must generally qualify for admission to masters' programme at the University of Cape Coast. In addition, all applicants must satisfy the following specific requirements/prerequisites:

- ii. Must hold a Bachelors' degree preferably Second Class Honours (Upper Division) from a recognized university in a relevant field of study notably Fisheries and Aquatic Sciences, Integrated Coastal Zone Management, Coastal Resources Management, Aquaculture, Environmental Science, Environmental Governance, Marine Policy, Conservation Science, Natural Resource Management among others.
- iii. All candidates must submit the following:
 - an application letter
 - Curriculum Vitae (CV)
 - Motivation letter
 - Two letters of recommendation

Contact:

Only shortlisted applicants will be invited for an interview after the closing date. Females are particularly encouraged to apply.

All applications must be delivered by regular mail/ courier to:

*The Project Manager
USAID/UCC Fisheries and Coastal Management Capacity Building Support Project
Department of Fisheries and Aquatic Sciences
School of Biological Sciences
University of Cape Coast, Cape Coast
GHANA*

Deadline: 31st March, 2016.

Funding Agency: United States Agency for International Development (USAID)

Appendix 2b: Advertisement for Scholarship Applications to pursue postgraduate programmes at the Department of Fisheries and Aquatic Sciences, University of Cape Coast as it appeared on page 30 of the Daily Graphic, February 16, 2016.

30 VISIT WWW.DAILYGRAPHIC.COM/Daily Graphic Tuesday, February 16, 2016

UNIVERSITY OF CAPE COAST **USAID | GHANA**
FROM THE AMERICAN PEOPLE

Call for Applications for Scholarships – Doctor of Philosophy (PhD) and Master of Philosophy (MPhil) Degrees for the 2016/2017 Academic Year at the University of Cape Coast

Background

In support of the Government of Ghana's (GoG) initiatives on food security, the United States Government (USG) through the United States Agency for International Development (USAID) is supporting a five-year capacity building programme for fisheries and coastal management in Ghana. The project contributes to GoG's overall grand fisheries and coastal development programme and USAID's Feed the Future (FF) Initiative, the USG led global hunger and food security project designed to enhance economic growth in beneficiary countries. In this context, the Department of Fisheries and Aquatic Sciences (DFAS) at the University of Cape Coast is presently leading the USAID Capacity Building Support Programme for the Fisheries and Coastal Management sub-component in collaboration with coastal research institutes at the University of Rhode Island, USA.

(i) Doctor of Philosophy (PhD) Degree

Applications are hereby invited from suitably qualified candidates for the award of five (5) full scholarships to pursue PhD degrees at the Department of Fisheries and Aquatic Sciences of the University of Cape Coast in the following areas:

- Fisheries Science – One (1) Candidate
- Aquaculture – One (1) Candidate
- Limnology and Oceanography – One (1) Candidate
- Integrated Coastal Zone Management – Two (2) Candidates

The PhD study will cover a period of three (3) years, beginning the 2016/17 academic year. The scholarships cover tuition, monthly stipends, and field research grants as well as other material and technical support. Successful candidates will spend a maximum of 6 months at the University of Rhode Island in the United States to cover part of their studies.

General Requirement: Applicants must generally qualify for admission into a PhD programme at the University of Cape Coast.

Specific Requirements: In addition, all applicants must satisfy the following specific requirements:

- 1) Must hold a good master's degree (Grade: B+ or A would be an advantage) from a recognized university in a relevant field of study namely:
 - Fisheries Science, Oceanography, Limnology, Aquatic Ecology, Integrated Coastal Zone Management, Coastal Resources Management, Aquaculture, Environmental Science, Environmental Governance, Marine Policy, Conservation Science or Natural Resource Management.
- 2) All candidates must submit:
 - an application letter
 - Curriculum Vitae (CV)
 - Motivation letter
 - Two letters of recommendation
- 3) Successful candidates will be expected to conduct research in one of the following thematic areas in either the Western or Central Region of Ghana. Therefore, all applicants MUST in addition to the above (i.e. 1 & 2), submit a 5-page research proposal on one of the following areas of emphasis:
 - i. **Fisheries Stock Assessment**
Studies will be conducted to assess the status of commercially important marine fish stocks.
 - ii. **Studies on Marine Fisheries Governance Issues**
Research in this area would involve a survey and review of various social issues in fishing communities as well as existing adaptive management strategies.
 - iii. **Research on Fish and Shellfish of Commercial Value**
Research on the coastal tilapia (black-chinned tilapia), shrimps and mangrove oysters would involve growth, reproduction and survival of juveniles and their culture potential.
- iv. **Analysis of Value Chains of Fish Trade**
This activity will investigate the different phases of production, processing and marketing of the different commercial fish species in the country. Factors affecting the various stages in the chain will be investigated.
- v. **Assessment of Biodiversity and Health of Coastal Ecosystems**
This work will involve examination of aspects of biodiversity of fish, benthic invertebrates, and mangrove communities in lagoons and estuaries to establish the scientific basis for future monitoring in view of the ongoing offshore oil and gas exploration and production. Aquatic environmental factors, occurrence of algal blooms and invasive species will also be investigated.

4) In addition to all of the above (1-3), all candidates seeking for scholarships must separately apply for admission to one of the four academic programmes offered in the Department and MUST meet the admission requirements of the University of Cape Coast.

(ii) Master of Philosophy (MPhil) Degree

Applications are invited from suitably qualified candidates for the award of five (5) full scholarships tenable at the University of Cape Coast. The Master of Philosophy Degree study will cover a period of two academic years beginning 2016/17 academic year. The scholarships cover tuition, monthly stipends, and field research grants as well as other material and technical support to successful candidates to pursue any of the following programmes of study:

- Fisheries Science
- Integrated Coastal Zone Management
- Oceanography and Limnology
- Aquaculture

Requirements:

- i. Applicants must generally qualify for admission to masters' programme at the University of Cape Coast. In addition, all applicants must satisfy the following specific requirements/prerequisites:
- ii. Must hold a Bachelors' degree preferably Second Class Honours (Upper Division) from a recognized university in a relevant field of study notably Fisheries and Aquatic Sciences, Integrated Coastal Zone Management, Coastal Resources Management, Aquaculture, Environmental Science, Environmental Governance, Marine Policy, Conservation Science, Natural Resource Management among others.
- iii. All candidates must submit the following:
 - an application letter
 - Curriculum Vitae (CV)
 - Motivation letter
 - Two letters of recommendation

Contact:

Only shortlisted applicants will be invited for an interview after the closing date. Females are particularly encouraged to apply.

All applications must be delivered by regular mail/ courier to:


The Project Manager
USAID/FF Fisheries and Coastal Management Capacity Building Support Project
Department of Fisheries and Aquatic Sciences
School of Biological Sciences
University of Cape Coast
Cape Coast
GHANA

Deadline: 31st March, 2016.

REGISTRAR


Appendix 3: Advertisement for short term technical assistance towards the development of a relational database on fisheries and coastal management in Ghana as it appeared in the Daily Graphic on Friday, January 29, 2016

08 Visit www.dailygraphic.com.gh Daily Graphic, Friday, January 29, 2016



UNIVERSITY OF
CAPE COAST

**USAID/UCC Fisheries and Coastal Management
Capacity Building Support Project**



USAID | GHANA
FROM THE AMERICAN PEOPLE

CALL FOR PROPOSALS FOR SHORT-TERM TECHNICAL ASSISTANCE TOWARDS THE DEVELOPMENT OF A RELATIONAL DATABASE ON FISHERIES AND COASTAL MANAGEMENT IN GHANA

BACKGROUND TO THE ASSIGNMENT

The United States Agency for International Development (USAID) is supporting the Department of Fisheries and Aquatic Sciences (DFAS), University of Cape Coast, to develop a database on marine and coastal fisheries in Ghana. The goal of the project is to organize historical scientific data, new field observations and experimental results on the marine/coastal environment and fisheries in Ghana into a comprehensive database that can easily be accessed by researchers, students, marine and coastal environmental as well as fisheries managers in the country and elsewhere.

OBJECTIVE FOR THIS CALL

This call aims to procure the services of an IT specialist to develop an application software for relational database for the management and online distribution of critical scientific data to support fisheries and coastal resource management and research in Ghana.

The consultant specialist is therefore expected to assist DFAS

- Secure a domain name for hosting the database and website
- Secure a server for the proposed database and website
- Develop a safe and secure website and database with security features for the management of fisheries and coastal research data
- Establish a front-end of a website that will interface with the database
- Develop a user-friendly website with navigation system that allow for privileged access to the public, decision-makers, and other scientists
- Export data to excel and other formats for additional analysis
- Create a back-end of the database by customizing a Drupal or WordPress content management application
- Staff easily and cost effectively update content and modify site design after launch
- Easily update and expand the platform as the case may be

EXPECTED OUTCOMES

The following outputs are expected at the end of the assignment:

- A domain name for hosting the proposed database and website registered
- A server the proposed database and website secured
- A user-friendly website and database for the management of fisheries and coastal research data is developed

The assignment is expected to be completed between 4-6 months from inception. The proposed inception date is February 15, 2016.

MINIMUM QUALIFICATIONS AND EXPERIENCE REQUIRED

- An IT expert with proven abilities in application software development
- Excellent understanding of web-based database design, development and management
- Proven ability to translate technical needs into database specifications
- Proven ability to develop a fully functional and user friendly database application
- Knowledge and experience with Web-based applications development and languages
- Excellent communications skills

SUPERVISION AND REPORTING

The consultant will report to the Manager of the USAID/UCC Fisheries and Coastal Management Capacity Building Support Project, with direct supervision by the leader of DFAS marine and coastal fisheries database team.

OWNERSHIP AND FUNDING

All database tools and information products and applications will belong to the Department of Fisheries and Aquatic Sciences of the University of Cape Coast funded by the United States Agency for International Development (USAID).


APPLICATION

Proposals detailing how a project of interest will be undertaken with clear goals, activity timelines, methods to achieve the set targets, a budget and curriculum vitae must be submitted alongside the application. **Applications MUST be delivered via email or courier by close of work Friday 5th February, 2016 to:**

The Project Manager,
USAID/UCC Fisheries and Coastal Management Capacity Building Support
Project, Department of Fisheries and Aquatic Sciences,
University of Cape Coast, University Post Office, Cape Coast, Ghana
Email: daheto@ucc.edu.gh

UNIVERSITY OF CAPE COAST

Appendix 4: First shipment/consignment of field and laboratory equipment received at UCC

		<p>COPY</p>		<p>PACKING LIST Page 1/8</p>
<p>24 Low Farm Place • Moulton Park • Northampton • NN3 6HY • United Kingdom Tel (01604) 646495 Fax (01604) 648241 e-mail info@parksscientific.com</p>				
<p>University of Cape Coast Department of Fisheries and Aquatic Sciences Cape Coast Ghana</p>				
<p>Reference : PSQ6605r4</p>				
<p>IDF Number CD201507MOTIIDF10000187091 L/C Number GLC014-150130 Invoice No.: PSL5807/8844 Part Shipment</p>				
Item No	Qty	Code	Product Description	
Fisheries & Coastal Research Laboratory Equipment				
R7.1	2	MIX5000	Vortex-Genie 2 complete with 3 inch platform and cup head. Variable speed vortex action mixer which offers gentle to vigorous shaking or low to high-speed vortex action. With an automatic start/stop feature for one-handed operation, Quick-Change™ mixing heads snap on and off to accommodate flasks, tubes, beakers, inserts for up to 60 micro centrifuge or micro-tubes and most 96 well plates and a Turbomix attachment dramatically increases vortex efficiency and has particular applications in the cell disruption of yeast, bacteria, plant and animal tissue	
R12.2	6	FB12AM	1.8m x 1.2m Fire Blanket in Rigid Case – Fire Shield. Hard Case for Easy Removal in an Emergency 200g Cloth ensures both flexibility and durability Kite marked to BS EN3 & CE Certified with 5 year Warranty	
R14.1	2	SLS7702	Adjustable Pipettes Fully autoclavable for absolute sterility Lightweight, ergonomic, low force design Display clearly displays the volume setting Easy to calibrate and maintain with tool supplied Calibrated in accordance with ISO8655. Each pipette supplied with an individual test certificate 0.5-10µl	
R14.2	2	SLS7708	Adjustable Pipettes Fully autoclavable for absolute sterility Lightweight, ergonomic, low force design Display clearly displays the volume setting Easy to calibrate and maintain with tool supplied Calibrated in accordance with ISO8655. Each pipette supplied with an individual test certificate 10-100µl	
R14.3	2	SLS7714	Adjustable Pipettes Fully autoclavable for absolute sterility Lightweight, ergonomic, low force design Display clearly displays the volume setting Easy to calibrate and maintain with tool supplied	

PACKING LIST

Item No	Qty	Code	Product Description
			Calibrated in accordance with ISO8655. Each pipette supplied with an individual test certificate 100-1000µl
R14.4	2	SLS7718	Adjustable Pipettes Fully autoclavable for absolute sterility Lightweight, ergonomic, low force design Display clearly displays the volume setting Easy to calibrate and maintain with tool supplied Calibrated in accordance with ISO8655. Each pipette supplied with an individual test certificate 1000-5000µl
R14.5	2	SLS7720	Adjustable Pipettes Fully autoclavable for absolute sterility Lightweight, ergonomic, low force design Display clearly displays the volume setting Easy to calibrate and maintain with tool supplied Calibrated in accordance with ISO8655. Each pipette supplied with an individual test certificate 2-10ml
R15.2	3	E0030073061	epT.I.P.S. Box Contamination-free transfer of trays to the working box System optimised for use with multichannel pipettes Colour-coded trays for simple identification of tips and matching Eppendorf pipette Tips can be attached to the pipette from the refill trays Eppendorf Quality tips, refill trays and epT.I.P.S. boxes are entirely autoclavable for future use Volume 2-200µl
R15.3	3	E0030073100	epT.I.P.S. Box Contamination-free transfer of trays to the working box System optimised for use with multichannel pipettes Colour-coded trays for simple identification of tips and matching Eppendorf pipette Tips can be attached to the pipette from the refill trays Eppendorf Quality tips, refill trays and epT.I.P.S. boxes are entirely autoclavable for future use Volume 50-1000µl
R15.4	3	E0030073169	epT.I.P.S. Box Contamination-free transfer of trays to the working box System optimised for use with multichannel pipettes Colour-coded trays for simple identification of tips and matching Eppendorf pipette Tips can be attached to the pipette from the refill trays Eppendorf Quality tips, refill trays and epT.I.P.S. boxes are entirely autoclavable for future use Volume 100-5000µl

Item No	Qty	Code	Product Description
R15.6	4	PIP9456	Pipettor Stands 6 place pipettor stands are designed to hold most major pipettor brands. Upper slots are 25mm wide and the lower slots are 20mm wide.
R22.1	5	SAF3105	Heat Resistant Glove, heat resistant up to 300°C (450°C for short periods) flexible and waterproof. 350mm long with nitrile and cotton lining
R22.3	5	SAF3105	Heat Resistant Gloves Unique glove, heat-resistant up to 300°C(450°C for short periods), flexible and waterproof. 350mm long with a nitrile and cotton lining.
R24.1	1	363401K	Nunc Cryotubes™ Internal Thread Capacity 1.8ml Round Bottom Nunc Internal-Thread Cryotubes now come supplied with a new cap that features an integrated thermoplastic elastomer gasket. Intended for cryogenic transportation and storage of biological material Non toxic, USP, Class VI Non pyrogenic Sterile (SAL10-6) Reclosable zippered bags Catalogue No. and Lot No. are printed on the bags Internal thread, PP with screws Sterile with writing area PK/500
R24.2	1	363452K	Nunc Cryotubes™ Internal Thread Capacity 4.5ml Round Bottom Nunc Internal-Thread Cryotubes now come supplied with a new cap that features an integrated thermoplastic elastomer gasket. Intended for cryogenic transportation and storage of biological material Non toxic, USP, Class VI Non pyrogenic Sterile (SAL10-6) Reclosable zippered bags Catalogue No. and Lot No. are printed on the bags Internal thread, PP with screws Sterile with writing area, PK/300
R28	2	AM14-1	14 in 1 Multi-Purpose Ladder includes Free 2 Work Platforms and 1 Tool Shelf Multipositional hinge system enables it to be easily transformed into many different configurations Lightweight and strong with a load capacity of 150kg. Compact and easy to store. Manufactured to EN131 part 1 and 2 specifications. Easy to assemble, easy to store, easy to transport

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Item No	Qty	Code	Product Description
R29.1	1	TRO1106	Trolleys Plastic Shelf 3 Shelves 686 x 1003 x 845mm Integral handles in top shelf. Made from strong polyethylene structural foam shelves. Choice of 2 or 3 shelves. Chrome plated posts. Raised shelf lips to confine spills. Adjustable height on centre shelf. Colour Blue. Maximum capacity 65 Kg per shelf, 180 Kg per unit.
R29.2	1	GAS1202	Gas Cylinder Trolleys For cylinders up to 300mm diameter Manufactured specifically for oxygen cylinders in accordance with BS2718. Cylinders sit on a sheet steel base. Cushioned steel retaining straps with wing nuts secure the cylinders. Anti-static wheels. Front buffers protect adjacent equipment.
R30	6	FUR5366	Kangol Black P.U. chrome chair with gliders and asynchronous backrest with one finger lever adjustment Gas lift Height Range, 560-800mm
Teaching Laboratory Equipment			
T4	15	TIM1030	Stopwatch, Electronic Standard Quartz timer with clear 10mm display, 6-digit readout with one 100th second resolution. 24 hours capacity, split-time facility and full clock functions with alarm. Battery supplied. Key Features: Housed in an impact resistant ABS case this stopwatch is easy to use for timing single events. It is simple to operate having 3 function buttons, Stop/Start, Reset/Split and Mode Selection. Capacity 23hrs, 59mins, and 59secs Resolution: 1/100 sec. for first 30 minutes, 1 second thereafter Accuracy ± 0.5 seconds in 24hrs Power 1.5V button cell battery Dimensions 64 x 53 19mm Weight 60g Supplied with battery (ALR-43) and neck cord
T13	30	TC/SP/AM13	Liroyal Champion Sports Tally Counter Metal handheld tally counter available in 6 colour Counts up to 9999 with a zero clearing device Thumb ring for ease of use Suitable for counting people, traffic or stocktaking WxDxH: 28x42x44mm Weight: 71g
T20.1	6	FUN3004	Buchner funnel With fixed perforated plate. Funnels are glazed

PACKING LIST

Item No	Qty	Code	Product Description
			on inner and outer surfaces; 150 mL capacity; for filter size of 7 cm
T20.2	5	FUN3008	Buchner funnel With fixed perforated plate. Funnels are glazed on inner and outer surfaces; 510 mL capacity; for filter size of 11 cm
T23.1	3	SLS7714	100.0 to 1000.0 µL Adjustable-Volume Pipettors
T30	40	SAF5604	Disposable gloves Lightly Powdered Latex Examination Gloves "High quality and cost effective, Glove Plus lightly powdered latex examination gloves offer a barrier against blood borne pathogens, whilst the light powder enables easy donning. With a soft, smooth finish, it provides all the comfort the user needs. Supplied in packs of 100."
T31.1	3	353225	Falcon™ Multiwell Cell Culture Plates Reliable growth surfaces assure consistent cell performance. All tissue culture treatments render polystyrene hydrophilic and result in the incorporation of a variety of anionic functional groups that support cell culture. To ensure reproducible results and conditions, all Falcon™ TC treatments are performed in a vacuum chamber. Key features include: Patented labyrinth lid, condensation rings and deep-well design control contamination, reduce evaporation, and minimise edge effects Reliable vacuum-gas plasma tissue culture treatment provides well-to-well and plate-to-plate consistency 12 well Multidish with lid, flat bottom cell, PS, Case of 36
T37	15	SAF0050	Laboratory Coat, Howie "A unisex coat in white polyester cotton, designed to DHSS specifications. The coats have an overlapped, studded front to allow quick removal and give extra protection. All sizes are 1080mm long. We offer size 44 inch - other sizes available at this price"
T39.2	5	BOT1212	Clear glass specimen jar excellent for use with biological and pathological specimens with pp cap; 480ml 33/pack
T43.2	20	PET1008	Anumbra optically clear, flint glass culture dishes that will withstand repeated sterilization(wet or dry); 100 mm diameter, 15 mm depth; 18/pack
T44	2	SAF9600	First Aid Box Eclipse First Aid Kits cover all requirements specified by the British Health Trade Association. Wall mountable with simple and quick release. Dust proof closure and easily

PACKING LIST

Item No	Qty	Code	Product Description
			cleaned with a large solid handle.
T45.1	29	MIC2000	Plain microscope slides for general purpose applications. Measure 76 x 26 mm and are 1 mm thick; Quantity: Pack of 50 slides
T45.2	24	MIC3114	Cover Slips 22 x 22 mm square, Thickness No.1 (0.13 to 0.16 mm), pack 200
T49.1	72	CRU2022	Crucible, Porcelain, 10ml, 30mm top OD, 25mm H
T50.1	1	MOR2006	Mortar and Pestle Set, Porcelain; 125ML, 1 pair each
Field Equipment			
F2	1	170	Fibreglass Boat, Bayliner 175BRE, with 135hp Mercruier WPS Engine, 5.36 metre/18ft, Fuel : Petrol.
F3	1	R2-1500EL	Boat Roller/Trailer, suitable for boats up to 18 ft, carrying capacity 1100Kg
F6	2	DA6	<p>Ekman Grab Sampler designed for sampling sediments in lakes, riverbeds and estuarine environments. The basic construction consists of a 316 stainless steel cabinet, which has two spring loaded jaws attached that are released by a triggering mechanism. This is activated by either a messenger when it is being deployed from a rope, or via a special closing mechanism when being deployed using poles (for use when operating in shallow water).</p> <ul style="list-style-type: none"> • Removable mild steel weights are supplied with a painted finish. • A brass messenger is provided. • The dimensions of the cabinet are 150mm x 150mm x 150mm. • The overall size of the grab is 200mm x 200mm x 400mm. • The weight of the grab, including the mild steel weights, is approximately 7kgs. • The effective sampling area is 225cm sq. • Two flaps on the top of the cabinet allow water to pass through during lowering, and close on retrieval to prevent wash-out. • There is an option of a mesh screen over the top of the cabinet (which is removable). • A stainless steel special closing mechanism complete with extending aluminium and fibre glass pole.
F7	2	DA7	Water Sampler Van Dorn Horizontal 2l complete with Rope and 500g messenger
F8	35	SCW-8	Waders, Chest type, durable waist wader constructed from reinforced PVC material with welded seams. Cleated sole with reinforced toe and heel. Elasticated waist, inside front pocket. Adjustable shoulder straps with quick release

PACKING LIST

Item No	Qty	Code	Product Description
			buckles
F9	15	FS8-12	Wellington Boots, rubber,, please state sizes required when ordering
F12	3	SS011096010	Clinometer, Suunto hand-held clinometers are precision instruments used all over the world by surveyors, engineers, cartographers, geologists, miners and architects and many others to measure vertical angles and slopes quickly and easily. PM-5/360 PC : Scales: 0 ± 90°, 0 ± 150 %, conversion table : cosines 0-45 °, optical adjustment for reading
F13	3	DA13	Plankton Net, 300mm diameter, 1000mm mesh length, 100 micron mesh. Complete with cord bridle and 250ml collection bottle
F14	15	BN11050	Binoculars 10x50 binoculars with fully coated optics for all uses including bird watching, astronomy, sports and wildlife. 10 x 50 high power magnification. Comes with case, lens caps, strap, cloth and warranty.
F15	3	DA15	<p>Secchi Disc The Secchi Disc is manufactured in high grade plastic. The round disc, 250mm diameter, has four alternating black and white quadrants. Beneath the disc is a sinker weight of stainless steel</p> <p>The Secchi Disc is equipped with a rope of 5m in length, 5mm in diameter. There are 10 marks in distances of 200mm on the first 2m above the disc.</p> <p>The disc is lowered into the water and a reading of the depth is made by means of the marks on the rope when the disc is no longer visible in the water.</p> <p>It is lowered another 0.5m and then hauled slowly again. The second reading is made when the disc becomes discernible.</p> <p>Now the arithmetical mean from both readings has to be made to determine the visibility depth. The Secchi Disc is manufactured in high grade plastic. The round disc, 250mm diameter, has four alternating black and white quadrants. Beneath the disc is a sinker weight of stainless steel</p> <p>The Secchi Disc is equipped with a rope of 5m in length, 5mm in diameter. There are 10 marks in distances of 200mm on the first 2m above the disc.</p> <p>The disc is lowered into the water and a reading of the depth is made by means of the marks on</p>



PARK SCIENTIFIC

PACKING LIST

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Item No	Qty	Code	Product Description
			the rope when the disc is no longer visible in the water. It is lowered another 0.5m and then hauled slowly again. The second reading is made when the disc becomes discernible. Now the arithmetical mean from both readings has to be made to determine the visibility depth.
F24	2	DA24	Core Sampler 0.001m sq Intertidal
F25	1	DA25	Surber Sampler with mesh size of 500 micron
F26.1	2	DA26	Fishing Net Siene 30ft long, 6ft high, 6.5mm mesh, leads and floats every 1ft, no poles provided

All packed in 1 20ft Container Seal number 0088230

Total Gross Weight 1600.000kg

