CEPF FINAL PROJECT COMPLETION REPORT

I. BASIC DATA

Organization Legal Name: Museum of Natural History, University of Louisiana at Monroe

Project Title (as stated in the grant agreement): Habitat Assessment, Ichthyological Inventory and Management Recommendations for High Priority Coastal Mangrove Zone and Fouta Djalon of Guinea

Implementation Partners for this Project:
Kirk Winemiller, Department of Wildlife and Fisheries, Texas A&M University; Walter Dimmick, Museum of Natural History, University of Kansas; Samba Diallo, Centre National des Sciences Halieutiques de Boussoura, Conakry, Guinea

Project Dates (as stated in the grant agreement): January 1, 2002 – June 30, 2005

Date of Report (month/year):
August 2005

II. OPENING REMARKS

Provide any opening remarks that may assist in the review of this report.
This project proposed activities intended to increase basic systematic and ecological research necessary for conservation decision-making. A foundation of research materials, an integrated database of species occurrences and habitat information, and research collaborations between American and Guinean scientists were our major goals. The field collections, associated laboratory identifications, and database development were identified as obtainable objectives within the life term of the grant from CEPF. The broader objectives would be best evaluated after project information and materials were available to the greater scientific community and the newly engaged parties had time to develop parallel or complementary projects of their own.

III. ACHIEVEMENT OF PROJECT PURPOSE

Project Purpose*:* Basic systematic and ecological research, including the monitoring of Guinean fish populations and development of indices of biotic integrity (IBIs) for Guinean watersheds increases.

Planned vs. Actual Performance

Indicator	Actual at Completion
Purpose-level:	

Activities using and adding to databases and collections increase by 50%. 3 years after project ends	At this time our partner at CNSHB is a co-PI with scientists from Louisiana State University (LSU) on a grant proposal requesting $685,954 World Bank. These funds will be focused on sustainable coastal fisheries, a part of which will necessitate protection of the coastal mangroves. This contact with biologists at LSU was a direct result of the workshop at ULM during which the Guinean scientists were introduced to regional biologists interested in West African collaboration. In addition, a participant in one of the CEPF-funded expeditions has just received a $780,000 grant from the US National Science Foundation which includes funds for systematic research in Guinea on the parasites of coastal fishes. Fish collections through these projects will result in the deposit of voucher specimens in the museum at CNSHB.
Collections and databases grow by 20% 3 years after project ends	To date, we have added nearly 200 collection records of more than 1500 specimens to the research museum at CNSHB. A total of approximately 20,000 specimens will be added over the coming year.

Describe the success of the project in terms of achieving its intended impact objective and performance indicators.

In the course of our fieldwork we identified several threats to fish populations, including desertification, agriculture, animal husbandry, dam construction, and pollution. Field observations also led to the distinction of two stocks of a commercially harvested freshwater species for which tissue samples were taken for genetic analysis which is currently underway. We took tissue samples for genetic analysis from about 1,000 fish specimens. While identifying specimens in the laboratory, we have uncovered several taxonomic problems and suspect there are several undescribed species. These problems are being studied using a combination of museum specimens and tissues collected in the field. Specimens collected in this project have already contributed to three publications and nine presentations on Guinean fish systematics, ecology or conservation. In addition, ichthyologists at a number of universities and museums have requested specimens and tissues of freshwater catfishes and cyprinid fishes from the Fouta Djalon for study in their labs. In summary, materials produced through this project are stimulating increased interest in West African fish research by American scientists. This will lead to the dedication of American funds for conservation-related research previously unavailable to needs in the region.

Were there any unexpected impacts (positive or negative)?
No.

IV. PROJECT OUTPUTS

Project Outputs*: Enter the project outputs from the Logical Framework for the project*

Planned vs. Actual Performance

Indicator	Actual at Completion
Output 1: Ichthyological survey, specimen and tissue collection and habitat assessment of	Done.
1.1 Two coastal mangrove regions (Alkatraz and Benty) are sampled for fishes using	Coastal collections were concentrated in the Alkatraz region, in the vicinity of Boffa and Kamsar in January due to logistical considerations, and extended during later months to the Fatala and

diverse methods during the 2002-2003 dry season (40 collections)	Benty estuaries. A total of 55 collections were made during CEPF-funded expeditions between 1 January and 8 May 2003.
1.2 Twelve habitat parameters are evaluated in two coastal mangrove regions (Alkatraz and Benty) during the 2002-2003 dry season	Habitat parameters recorded included water temperature, pH, conductivity, turbidity, salinity, dissolved oxygen levels, total dissolved solids, oxidation-reduction potential, substrate, water depth, and channel width.
1.3 Field meters for assessing environmental parameters purchased for CNSHB	A Mini-current meter set, 2 Etrex Vista GPS receivers, Horiba U-22 portable water quality meter, YSI 556 Multiprobe system with cables, a pH/Oxidation-reduction potential kit and accessories were purchased and delivered to CNSHB.
Output 2: Ichthyological survey, specimen and tissue collection and habitat assessment of the Fouta Djalon region of Guinea by international team	Done.
2.1 The Fouta Djalon region of Guinea sampled for fishes using diverse methods during the 2002-2003 dry season (40 collections)	Electrofishing proved ineffective at a number of sites due to low conductivity, so sampling protocol was changed to timed seines and dipnets to allow better comparison of effort. 102 sites were sampled in January 2003 alone (vs 40 projected for the entire project) by splitting into three teams once the expedition moved in from the coast. Another 55 collections were added in March-April 2003 for a total of 157 collections, nearly 4 times our projected number.
2.2 Fifteen habitat parameters are evaluated in Fouta Djalon streams during the 2002-2003 dry season	Water temperature, dissolved oxygen, conductivity, pH, canopy cover, stream width, left and right bank structure, left and right bank riparian vegetation, water velocity, stream depth, substrate and instream cover were evaluated at Fouta Djalon sites.
2.3 Backpack electrofishing unit purchased for University of Kankan and ONCHO	A backpack shocker was originally purchased for the fieldwork, but was later transferred from the CEPF budget and returned to the US because the field protocol changed (see above).
Output 3: Ichthyological research collections developed and enhanced at three Guinean institutions.	Our efforts were focused on developing the collection at one institution, Centre National des Sciences Halieutiques de Boussoura (CNSHB), to concentrate our resources and efforts.
3.1 Three institutions (Centre National de Sciences Halieutique de Boussoura, University of Kankan and new university at Labe) receive and use supplies required to conserve specimens	Formaldehyde, alcohol, jars and caps were shipped to CNSHB for use in the collections.
3.2 Fish specimens are identified to species, new species are described	More than 40,000 fish specimens in perhaps 175 species have been identified. Several forms recognized in sorting appear to be undescribed and are being studied further.
3.3 50% of all specimens collected are deposited in the three institutions	127 lots (collections of a single species from a single locality on a single date) containing 892 fish specimens and 167 reptile and amphibian

deposited in the three institutions	specimens collected in the Parc National du Haut Niger through complementary funding from NSF have been received by CNSHB. Specimens of species collected in the mangroves have been verified since sorting and are being prepared for shipment. Another parcel containing 71 lots and 500+ specimens of mangrove fishes has been shipped.
Output 4: Computerized databases of museum records and GIS/environmental data are developed	Done.
4.1 Computers, software and computer supplies in place at three Guinean institutions for use in museum collection development	Two Gateway Pentium 4, 1.8 GHz computers with 17" LCD flat panel screens were shipped directly to Guinea. One was housed at CNSHB to hold museum collection records and the other directed to the University of Conakry for use in fish ecology data analysis and the development of a book on the freshwater fishes of Guinea. Each machine was equipped with Windows XP Professional.
4.2 Computerized GIS/environmental database constructed of information derived from LandSat images, topographic maps, environmental field notes and fish capture records	A server has been purchased for the ULM Museum of Natural History which will hold a web accessible version of the GIS database. A GIS database containing fish records, habitat parameters, site and specimen photos, etc. has been constructed. Some of the fish records require verification. Authorities studying the taxonomy of different groups will be invited to borrow specimens for examination and to check this *beta* version and comment upon the records. Once specimens have been verified and shipped, an updated copy of the GIS database will be shipped to CNSHB on an external hard drive.
4.3 Catalogued fish collection records (from project and other sources) are entered into MS Access database at each of the three Guinean institutions	As specimens are received at CNSHB they are being catalogued and entered into the database there.
4.4 Four Guinean researchers are trained in GIS and museum curation at ULM	Five Guinean researchers traveled to the US for instruction in GIS and museum technology.
4.5 Students from Guinea and ULM hosts digitize images and maps of the coastal zone and Fouta Dialon	Done and incorporated into the GIS database.
Output 5: Two Guinean students will be trained in systematic and ecological research	Objective not accomplished.
5.1 Two Guinean undergraduate students assist in fish collections during the 2002-2003 dry season working under direction of Guinean research advisors	Two students assisted in collections as part of an international team including American, Guinean and French scientists in January 2003. They continued collections from March through May 2003 under the direction of Guinean advisors.
5.2 Two Guinean students enter MS program at ULM working under direction of Drs Aku and Pezold, Drs Winemiller and Dimmick	The two students were not able to pass the TOEFL and GRE exams required for admission to the university despite enrollment in several sessions of English as a Second Language (ESL).

serve as student advisory committee members	
5.3 Two Guinean students receive book subsidy from grant	Students received subsidies for the books and materials required for ESL courses.
5.4 Two Guinean students apply to PhD programs at Texas A&M or University of Kansas for Fall 2005	Admission standards for the PhD programs at Texas A&M and the University of Kansas are more stringent than those for entry into the MS program at ULM. Consideration for admission to the PhD programs would be contingent upon successful completion of the program at ULM.
Output 6: Cross-cultural research linkages developed among American and Guinean	This has been very successful.
6.1 Four Guinean researchers selected for GIS/museum curation training and English language studies in US	Five researchers traveled to the US for the workshop.
6.2 Visiting Guinean researchers meet with American collaborators	During this workshop the five Guineans visited with other biologists at Louisiana State University (LSU) and the University of Southern Mississippi (USM) to discuss future collaborations. This networking has resulted in one successful proposal to NSF that includes research on Guinean coastal fish parasites and another pending for coastal fisheries sustainability assessment.
6.3 Four American and one French researchers travel to Guinea for field collections during 2002-2003 dry season, study of regional fish fauna and future research planning	This interchange resulted in one American initiating studies of Guinean cyprinodontiform fish diversity of the Fouta Djalon and another developing a successful research grant proposal that will lead to continuing work on coastal fish parasites.
6.4 Three collaborative research papers related to the project submitted within three years of project end	One research article and two book chapters based partly upon specimens collected during the CEPF expeditions have been published (Harrison et al. 2003, Gobiidae and Harrison et al. 2003, Eleotridae, both in Faune des Poissons d'Eaux Douces et Saumâtres d'Afrique de l'Ouest. 2nd ed. Vol 2., Paugy et al. eds., and Pezold 2004, Redescriptions and synonymies of the American-West African genus *Gobionellus* (Teleostei, Gobiidae). Copeia: 281-297.
6.5 Five collaborative presentations of project research results developed within three years of project end	Nine presentations of project information have already been given in venues including the Annual Meeting of the American Society of Ichthyologists and Herpetologists, Gulf of Mexico Graduate Student Symposium, Louisiana Remote Sensing and GIS Workshop and the Louisiana Academy of Sciences.
6.6 Two collaborative grant proposals written within three years of project start	Colleagues at CNSHB are co-PIs on a grant proposal with researchers at LSU that is pending with the World Bank. Another proposal has been funded that will include a collaboration between colleagues at CNSHB and USM investigating coastal fish parasites.
6.7 PI and cultural facilitator make planning visit to meet with representatives of	This was accomplished at the start of the project and was partially supported by complementary funds from the National Science Foundation.

DNRST, CNSHB, CERESCOR and ONCHO to discuss the project and make final arrangements	
Output 7: A series of management recommendations and suggestions for threat mitigation for high priority sites in the Fouta Djalon and coastal mangroves are produced.	Assessment delayed due to Guinean students not entering graduate program.
7.1 International team will observe and record environmental conditions at high priority sites in the coastal mangrove zone in year 1	This was accomplished.
7.2 International team will observe and record environmental conditions in streams of the Fouta Djalon in year 1	This was accomplished.
7.3 Fish habitat specificities will be recorded in the coastal mangrove zone in year 1	Data are being analyzed at ULM and Texas A&M University. In addition to the GIS database which will allow fish distributions to be described, principal components analysis of fish assemblages and canonical correspondence analysis of the association of fish species with specific habitat parameters are planned upon the completion of habitat data entry and final verifications of freshwater fishes.
7.4 Fish habitat specificities will be recorded in the Fouta Djalon in year 1	See 7.3.
7.5 Ecological data from fish collections will be compared to knowledge of local fishing practices for both high priority areas in year 2	Once final data analyses are completed (see 7.3) we will consult with Guinean colleagues regarding local fishing practices and the implications for species obtained in our samples.
7.6 Recommendations for habitat conservation will be developed within two years of field work	Recommendations for habitat conservation will be offered with the canonical correspondence analysis of field data.
7.7 Recommendations for alternative fishery practices will be offered for threatened species within two years of field work	Recommendations for alternative fishery practices will be offered after consultation with our Guinean partners (7.5).

Describe the success of the project in terms of delivering the intended outputs.

Our fieldwork was extremely productive and has generated a lot of data on fish species and their environment. The research collection at CNSHB is growing with the addition of specimens from the coastal mangroves and freshwater streams from around the country. Guinean researchers have developed promising and successful collaborations with American researchers. There is growing interest in the American research community specifically for further study of Guinean fish diversity. Capacity building in Guinea has included assistance through the provision of computers for data analysis and collection records and field equipment necessary for the acquisition of environmental data. Guineans received training in English language and technical expertise required for geographic information systems and museum curation which will increase the

likelihood of productive interactions with American scientists. This collaboration will identify new funding organizations for support of Guinean research on organismal diversity and ecology. Such studies are required for effective conservation decision-making. The developing GIS database provides baseline information on existing conditions and fish distributions for many streams, and includes information for many new sites. Already we have discovered the establishment of an introduced fish species, the mud sleeper, *Butis koilomatodo*n (Eleotridae), in the coastal mangroves, and possible undescribed species of barbs (Cyprinidae), *Nannocharax* (Distichodontidae), mountain catfish (Amphiliidae) and elephantfish (Mormyridae).

Were any outputs unrealized? If so, how has this affected the overall impact of the project?

Yes, we were unable to adequately prepare the two Guinean students for admission into the graduate program in Biology at ULM. This prevented them from continuing with their personal career and skills development and has delayed data organization and analysis.

V. SAFEGUARD POLICY ASSESSMENTS

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.

NA

VI. LESSONS LEARNED FROM THE PROJECT

Describe any lessons learned during the various phases of the project. Consider lessons both for future projects, as well as for CEPF's future performance.

1) Resources are very limited with our Guinean partners such that work is almost on a "cash and carry" basis, and all partners have a continuing need for some infrastructure support and development.
2) Expectations of students having both the scientific background required for advanced research and English language skills sufficient for admission into US graduate programs are unrealistic.
3) Guinean universities have a heavy emphasis on teaching and most are to some degree specialized. As a result they are not generally centers of research and may not have faculty in a field appropriate to a particular study. Research efforts seem concentrated in government organizations like CERESCOR, DNRST and CNSHB.
4) Shipping is expensive and unreliable. Not shipping great amounts frequently, our order was a lower priority than those for other parties.
5) Heightened US national security has made the acquisition of visas more difficult.

Project Design Process: (aspects of the project design that contributed to its success/failure)

1) Having a written and signed official convention or memorandum of understanding with a Guinean government office helped us to avoid the imposition of unbudgeted duties on equipment and supplies shipped for the project. It would be even better to ensure that the document is also cleared with the national customs office.
2) Working in a non-English-speaking country it would have been better to budget for visiting researchers than graduate students. The language hurdle proved unsurpassable and diverted funds and time from the original project goals. A downside to visiting researchers is that it removes the potential for matching funds from the university in the form of assistantships. This type of project requires long-term supervision and training of developing researchers in current technologies, organismal diversity and theory. It could

possibly be constructed in future projects such that there was a brief training period at US facilities followed by extended support for a US investigator in Guinea, perhaps a post-doctoral researcher.

3) Field team organization was effective both for the international team in January and the subsequent collections by Guinean parties. Extended interactions with the international team provided the Guinean teams with a good understanding of objectives and methods which they were able to employ in the later collections.
4) The summer workshop prior to the field work allowed an introduction of Guinean researchers to some methods associated with collection maintenance as well as training in geographic information systems (GIS) technology. More importantly it gave them a better appreciation of what could be done with these tools and of our project goals. The inclusion of a senior administrator from the primary partner institution (CNSHB) further ensured support of the program at the highest level.
5) It was also very helpful to have an itinerary and schedule of work posted with our collaborators well prior to our arrival to allow them to begin preparations for our visits and to give them a clear understanding of our objectives.

Project Execution: (aspects of the project execution that contributed to its success/failure)

1) Our Guinean partners did an excellent job of facilitating the success of our work in Guinea. All aspects of our work and travel were very ably and courteously accommodated to the best level possible. Our colleagues' knowledge of field conditions, local politics and customs, and potential hazards was critical to the success of our mission.
2) Field teams worked very effectively also. When the international team worked in January we were divided into as many as three or four groups to allow greater sampling from diverse freshwater localities. Along the coast we were divided into two groups only because the coastal collections were more labor intensive. We were able to quadruple the number of field collections as a result of this field design.
3) Our inability to enroll the Guinean students in the graduate program at ULM threatened the program's goal of processing, analyzing, and disseminating information and specimens obtained from our fieldwork in Guinea. Fortunately, we were able to reallocate museum resources and personnel and the ULM Office of Graduate Studies and Research has extended its support beyond the term of the grant from CEPF.

VII. ADDITIONAL FUNDING

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of Funding*	Amount	Notes
US National Science Foundation	A	$55,520	Financed expeditions to Upper Niger River basin and Zone Forestiere
Howard Hughes Medical Institute Undergraduate Science Education Program at ULM	A	$22,000	Financed student and faculty participation in expeditions to Upper Niger River basin and Zone Forestiere
University of Louisiana – Monroe	A	$14,426	Graduate assistantship, tuition and fee waivers contributed through term of CEPF grant
National Science Foundation	B	$11,677	Doctoral Dissertation Improvement Grant to Stephen Bullard studying

			fish parasites

Additional funding should be reported using the following categories:

- ***A*** *Project co-financing (Other donors contribute to the direct costs of this CEPF project)*
- ***B*** *Complementary funding (Other donors contribute to partner organizations that are working on a project linked with this CEPF funded project)*
- ***C*** *Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF funded project.)*
- ***D*** *Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)*

Provide details of whether this project will continue in the future and if so, how any additional funding already secured or fundraising plans will help ensure its sustainability.
The project is continuing. A server is being installed that will hold web accessible museum records at ULM and will include the GIS database developed for this project. Researchers have requested specimens of some of the more problematic taxa for systematic study. These researchers will be able to access the GIS database and comment on any changing patterns of species distribution and determine field conditions under which the species were taken. Once the *beta* version of the database has been reviewed, it will also be housed at CNSHB. Research is also continuing at ULM which will lead to the descriptions of new species. Specimens identified and verified will be shipped to CNSHB and museums in the US, particularly the American Museum of Natural History. ULM has committed an extension of funding for three graduate students to work on the project over the next two years. This contribution will amount to $82,340 in graduate student stipends and tuition and fee waivers over two years.

VIII. ADDITIONAL COMMENTS AND RECOMMENDATIONS

We are very grateful to CEPF for the opportunity the funding provided. The field collections and observations, the development of the GIS database and research collection in Guinea, as well as the new research collaborations resulting from our activities, will all provide a tremendous new suite of resources for continuing and future research. These systematic and ecological studies will form a critical base for informed management and conservation decisions relevant to the aquatic fauna of Guinea.

Any researchers interested in aquatic biodiversity research in Guinea may inquire using the contact information given below.

VIII. INFORMATION SHARING

CEPF aims to increase sharing of experiences, lessons learned and results among our grant recipients and the wider conservation and donor communities. One way we do this is by making

the text of final project completion reports available on our Web site, www.cepf.net, and by marketing these reports in our newsletter and other communications. Please indicate whether you would agree to publicly sharing your final project report with others in this way.
Yes ____X
No _____

If yes, please also complete the following:

For more information about this project, please contact:
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