

PROJECT COMPLETION REPORT

97-2 “Expansion of the ‘FishGuts’ Fish Anatomy, Health and Necropsy Software Training Program for the Aquaculture Community”

Termination Report Period: July 1, 1997 – August 30, 2001

NRAC Total Funding: \$ 71,491 (July 1, 1997 – June 30, 1999)
(No-Cost Ext. through August 30, 2000; 2nd through August 30, 2001)

Principal Investigator: Dr. Andrew Kane, University of Maryland, College Park

Participating Investigators/ Cooperative Agencies:

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REASON FOR TERMINATION:

Indicate objective(s) completed, funds terminated, or other specific reason for project termination.

End of funded project period.

PROJECT OBJECTIVES:

List objectives as written in approved proposal.

The objectives for this project involve the expansion and revision of the “FishGuts” fish anatomy, health and necropsy software (version 1.0). The proposed scope of work included:

1. The addition of an "aquaculture-friendly" introductory section,
2. The addition of four new fish species (cultured species within the NRAC region) to the Species Reports section,

3. A picture atlas ("What's My Lesion" section) showing grossly visible parasites/lesions common in cultured finfish, and
4. A directory of fish pathologists and diagnostic services available within the NRAC region.

The revised program is in final stages of development, and being made cross-platform compatible (playable on Macintosh and Window-based computers), for distribution (as version 2.0) to extension contacts and aquaculture offices throughout the NRAC region. A workshop and a mailed fact sheet will acquaint NRAC contacts with the program. The specific objectives for this project included:

Objective 1. Storyboard construction. A storyboard was developed to direct how the media elements (text, pictures, animation, narration, sound, and movies) will be incorporated into the updated FishGuts software program.

Objective 2. New media archival. Media elements for new sections of FishGuts were archived and digitally optimized for use in the interactive software.

Objective 3. Software development. Digitally-optimized media elements are being “authored” into an integrated, user-navigable format. This objective will produce a final test version of the new program, ready for final review, revision and debugging.

Objective 4. Review of program test version. Collaborating participants will review the final test version of the new program for content and continuity.

Objective 5. Progress report to NRAC. Yearly interim reports to NRAC have indicated progress to date and comments regarding the program’s development.

Objective 6. Final programming. The final test version of the FishGuts software will be updated to incorporate final media additions, comments from participants (content/continuity) and be debugged for programming errors. The program will be tested on a spectrum of different personal computers to insure compatibility.

Objective 7. Mastering. A final version of the software will be made into a hybrid (cross-platform) program (i.e., usable on both Macintosh and Windows-based computers). The hybrid software will be tested on both platforms, further debugged if necessary, “cut” onto a master hybrid disk, and duplicated for distribution.

Objective 8. Outreach. Instructional package materials will be developed to accompany the software product. FishGuts will be distributed to all extension contacts and aquaculture offices within the NRAC region through an organized workshop. Additional outreach will include presentations and publication in appropriate aquaculture/scientific venues.

Objective 9. Final report to NRAC. This final report, detailing all efforts, has been sent to NRAC describing work accomplished to date, and reasons for delay in final product development and distribution.

ANTICIPATED BENEFITS:

State how the project will benefit the aquaculture industry either directly or indirectly.

There is an increased need for fish culturists, extension agents, veterinarians, and graduate and veterinary students to care for and prepare diagnostic samples from cultured, wild and feral fish for disease analysis. The updated FishGuts software will provide a valuable teaching tool to assist aquaculturists and technicians with the necessary observation skills and preparative techniques to generate samples for analysis by a trained fish diagnostician, pathologist, or other fish health personnel. Production of the updated FishGuts software will provide a cutting-edge resource to support early disease detection, and will promote the application of appropriate and consistent necropsy (and other preparative) techniques.

PRINCIPAL ACCOMPLISHMENTS:

Summarize in a concise form the findings for each objective for the duration of the project. Measurement data are to be given in metric units. However, to minimize confusion, a dual system of measurement may be used to express results.

A storyboard and over 200 MB of media have been amassed to produce the updated FishGuts software. Media elements include pictures, movies, text, narration and animations that all fit within the existing FishGuts screen layouts and overall design. The scope of work on this project has been expanded thanks to new, outside support from the Maryland Agricultural Extension Service, University of Maryland College of Agriculture and Natural Resources. This funding will support an additional section on “Bacteriology” (beyond the original scope of the NRAC-funded project. The “Bacteriology” section is being co-authored with Dr. Ana Baya, Aquatic Microbiologist. In addition, the section on lesions, entitled “What’s My Lesion,” that was to include external, grossly visible lesions and parasites has been divided into two separate sections: “What’s My Lesion” and “What’s My Parasite.” Media elements have been digitally archived and are being incorporated into the interactive software.

Project delays: At least three factors have cumulatively lead to a significant delay in producing the final product within the initial timeframe. These

factors include: (1) The move of the University of Maryland Aquatic Pathobiology Center (APC) from Baltimore to College Park. This move of the 4,000 sq. ft. APC research and education program, including a large aquatic animal facility, has taken approximately 2 years to complete. The move has been a major hindrance to this, and other projects; (2) Change of technical personnel (software programmer); and (3) On a positive note, the ability to secure additional funding from an outside source, in order to add a bacteriology section, has allowed us to broaden the scope the software beyond the original scope of effort. Although the extra development effort resulted in some additional delay, it will ultimately enhance the final product. Development is expected such that CD-ROM disks of the program will be distributed in 2003.

IMPACTS:

In concise statements (possibly a bulleted list) indicate how the project has or will benefit the aquaculture industry either directly or indirectly and resulting economic values gained (where appropriate).

- The new FishGuts software will empower aquaculturists to make more careful observations relative to the health of their fish stock. This can lead to earlier detection of disease entities and subsequent treatment. Ultimately, reduction in disease-related problems will foster increased production and improved economic gain.
- The new FishGuts software will also foster greater independence for fish farms. This independence stems from a better ability to take proper samples for fish health and diagnostic purposes. Proper observations, and samples of both tissues and parasites, are key in aiding fish pathologists and veterinarians in making accurate and timely diagnoses.
- Since the FishGuts software is being distributed throughout the NRAC region with support from this project, and a small “loan collection” of the software will be available through the NRAC office, the information will be available to a larger number of aquaculturists in the NRAC region.

RECOMMENDED FOLLOW-UP ACTIVITIES:

State concisely how future studies may be structured.

PUBLICATIONS, MANUSCRIPTS, OR PAPERS PRESENTED:

List under an appendix with the following subheadings: *Publications in Print*; *Manuscripts*; and *Papers Presented*. For the first two subheadings, include journal articles, popular articles, extension materials, videos, technical reports, theses and dissertations, etc. using the format of the Transactions of the American Fisheries Society (example below). Under *Papers Presented* subheading include the authors, title, conference/workshop, location, and date(s).

Manuscripts:

We anticipate at least one peer-reviewed publication in an appropriate journal.

WWW Outreach through the University of Maryland Aquatic Pathobiology Center:

<http://aquaticpath.umd.edu/fg>

Abstracts (since 1998):

Kane, A.S. 2002. *FishGuts: An Updated Multimedia Guide to the Art and Science of Fish Anatomy, Health and Necropsy*. Accepted for presentation in the Fish Health Section at the annual meeting of the American Fisheries Society, August 2002, Baltimore, MD. Abstract # 24564429-32

Kane, A.S. 2002. *FishGuts: An Updated Multimedia Guide to the Art and Science of Fish Anatomy, Health and Necropsy*. To be presented at the Fourth International Symposium on Aquatic Animal Health, September 2002, New Orleans, LA.

Abstract.

FishGuts (updated version 2.0) is a discovery-based, interactive computer program developed to provide training in fish health and necropsy. The program is intended for use by researchers, veterinarians, graduate and veterinary students, fish health professionals, and persons interested in fish anatomy and necropsy. Rainbow trout, bluegill

and channel catfish are used as models to illustrate basic external and internal anatomy. Additional species are included to show inter- and intra-specific variation. Viewers can observe all aspects of a diagnostic examination including case history, gross necropsy, tissue and bacteriology sampling, examination of glass slides and preparation of final reports. Additional sections focus on observing parasites, describing lesions, and microbiological sampling. The new CD-ROM-based FishGuts software contains over 300 MB of digitized sound, narration, photographs, micrographs and QuickTime movies, and serves as an effective, self-paced learning and teaching tool. Viewer-controlled movies are an invaluable tool for identification of live parasites and observing sampling protocols. FishGuts was developed using Adobe Premier and Photoshop, and Macromedia Director software. This project was supported, in part, by the UM Aquatic Pathobiology Center; Maryland Sea Grant; the Northeast Regional Aquaculture Center; The Maryland Agricultural Experiment Station, College of Agriculture and Natural Resources; and numerous contributors and constructive reviewers.

Overall Project Objectives.

This project involved the expansion and revision of the FishGuts fish anatomy, health and necropsy software, and distributing it throughout the aquaculture community within the NRAC region. Version 1.0 of the existing program was released in 1997. Revisions (i.e., updates) to version 1.0 covered under this proposal included a) the addition of an "aquaculture-friendly" introductory section, b) four new fish species (cultured species within the NRAC region) in the Species Reports section, c) a picture atlas showing grossly visible parasites and lesions commonly observed in cultured finfish, and d) a directory of fish pathologists and diagnostic services available within the NRAC region.

The New FishGuts Application. Version 2.0 of the FishGuts software is divided into five navigable sections. These sections, each with separate subsections, include:

Section 1: About FishGuts

- Updated introduction (*new*)
- How to use the program (an animated narrative)
- Program credits and resources including:

1. bibliography (*updated*)
2. listing of fish health specialists in the NRAC region (*new*)

Section 2: Anatomy

- Differences worth knowing (special sense organs, poisonous and dangerous fish, intraspecific differences)
- External anatomy (channel catfish model)
- Internal anatomy (rainbow trout, bluegill and channel catfish models)

Section 3: Sampling Techniques

- Taking a Case History
- External examination (non-lethal methods to examine a fish including anesthesia, general observations, skin scrape, gill biopsy, blood sampling, hematocrit and plasma protein, and gill function animations)
- Internal examination (sacrifice, systematic methods to dissect all organ systems and take samples for preservation and histopathology)
- Bacteriology Sampling (*new*)

Section 4. Case Reports

- Weedy Sea Dragon
- Channel catfish
- Toadfish
- Tilapia (*new*)
- Atlantic salmon (*new*)
- Goldfish (*new*)
- Striped bass (*new*)

Sections 5 and 6. What's My Lesion and What's My Parasite (*new*)

- Thumbnail views and expanded presentation of different lesions and parasites.

Use of the software.

Viewers learn how to use the program in the first section, and can take advantage of bibliographic information on fish anatomy, physiology and pathology, as well as look up fish health diagnosticians in the NRAC region. The viewer may then move on to learn about fish anatomy. The use of interactive "rollovers" becomes apparent in the Anatomy section. By rolling the mouse cursor over external and internal anatomical parts of the representative fish, viewers can identify the different

anatomical features. The chapter "Sampling Techniques" reviews the collection of pertinent case history information while taking a relevant account of an animal's recent background (including water quality and animal- and tank-specific observations). This chapter also contains necropsy subsections with over 50 QuickTime movies that allow the user to view a real necropsy of a rainbow trout. QuickTime movies permit the user full viewing control over movies, including stop action, frame advance, fast forward and rewind. Internal and external necropsy subsections systematically go through sampling procedures for all organ systems. Once the viewer has gone through the first four sections, they can proceed to go through different sample cases. The sample cases are presented with a case history and results of examination procedures. Results include skin scrapes, gill biopsies and gut scrapes for parasites, histopathology, bacteriology, and parasitology (there is a movie of each of the parasites found, with information on parasite taxonomy and the ecological relationship with the host). A final diagnosis is presented for the user to compare their observations with.

The Development Process.

The development of FishGuts, like any multimedia software application, began with storyboard development. This involved envisioning the "big picture" and putting it into logical divisions or chapters. These chapters were then developed into a series of panels, similar to the tiles of a comic strip. Each tile contained information concerning which media elements (text, sound, narration, animation, picture(s), movies and navigation tools) would be present for each screen display. Development of text and narration, and selection of pictures and movie cuts (subject matter) used in each screen occurred either prior to, or during, storyboarding.

The next steps were to develop the new table of contents screen, and modify the program screen layout a user interface. Screen layouts required the capacity to incorporate all of the media elements in a consistent format. In FishGuts each of the program sections were given different color backgrounds to help the user identify with each chapter. To maintain continuity within the program, individual chapter formats remained consistent with regard to layout, fonts and design. The existing interface was maintained as part of the screen layout. The interface gives the user navigation control within the program, i.e., "next screen," "previous screen," "go to table of

contents," "more information" and "quit." Once chapter and individual screen layouts were adjusted as necessary, media elements were incorporated into the program's new sections.

The software application used for authoring FishGuts was Macromedia Director. Director is just one of many authoring applications available. The Director development platform is somewhat analogous to production of a stage show. Media elements are imported as *cast members*. Actions of cast members are controlled in a separate *score* window. Cast members are controlled with a *script* within the score, which dictates cast member appearance and action on the *stage*. The stage is synonymous with that which is seen on the computer screen. These concepts, however, are transparent to the viewer when using the final stand-alone software.

Storyboard and content development were some of the most important and time-consuming efforts of the FishGuts update. Approximately 8 person-months were spent on storyboard, content development and media acquisition alone. Approximately 12 additional person-months were dedicated to media digitization and manipulation, incorporation into the authoring software (Director), interface and screen design, and interactive scripting and debugging (still ongoing).

Using the FishGuts Application.

Minimum system requirements for running the new FishGuts software include access to a Macintosh or Intel-based computer (running Microsoft Windows) with a CD-ROM drive, 32 MB RAM, QuickTime (software to run the movies), and a 14" color monitor (640 x 480 pixels or greater). Most Macintosh computers with a CD-ROM drive are likely to be "multimedia smart," and ready to use. For Windows-based computers, a sound board is also required to take advantage of the audio portions of the program. In general, as with all multimedia CD-ROMs, the faster the computer, the smoother the program will run.

Use of a software application, like the updated FishGuts program, does not substitute for gaining actual necropsy experience, nor does it serve as a fish health diagnostic program. However, the software does offer an excellent review of general fish anatomy, methods for making accurate observations, executing a standard fish necropsy protocol,

identifying parasite characteristics, and properly preserving specimens for further analysis.

With the increased need for fish culturists, extension agents, veterinarians, and graduate and veterinary students to care for and prepare diagnostic samples from cultured, wild and feral fish for disease analysis, the updated FishGuts software, supported by NRAC, will provide a valuable teaching tool. The new FishGuts software will assist users with making appropriate observations and generating samples for analysis by a trained fish diagnostician or pathologist. Production of this updated FishGuts software will provide a cutting-edge resource to support early disease detection, and will promote the application of appropriate and consistent diagnostic techniques.

The Full Report with all the data, graphs and tables is available at the NRAC office upon request.