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CENTRAL WESTERN PACIFIC FISHERY INFORMATION NETWORK (WPACFIN) THREE-YEAR PLAN

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INTRODUCTION

This document provides a three-year plan for the Central Western Pacific Fishery Information Network (WPacFIN) program office of the National Marine Fisheries Service (NMFS) Honolulu Laboratory. It contains summary descriptions and schematics of activities to develop data processing systems and to provide technical support agencies participating in WPacFIN.[1] It also contains references to, and brief descriptions of, numerous other known needs and projects for which no resources are currently allocated, some of which are in response to requirements of the new Sustainable Fisheries Act (SFA). However, most of the activities and projects identified within this document address recommendations from the proceedings of a data workshop held in Honolulu in February 1997.[2] This two-day Council-WPacFIN cosponsored workshop included 30 participants from 15 agencies or offices and focused on identifying needs for improving fisheries management capabilities in the U.S.-affiliated Pacific island areas.

The document is divided into three sections. The first describes Central WPacFIN activities, primarily at the Honolulu Laboratory office, and some of the general area-wide needs or potential needs that are known but which currently have no resources allocated to them. The second section describes the data systems development work being done by WPacFIN support staff for each island agency, and the last section summarizes the WPacFIN support staffing requirements to accomplish tasks described in the first two sections.

Central WPacFIN staff currently include three NMFS employees supported by NMFS base funds. These NMFS staff work with 8.5 other full-time employees (FTEs) supported via grants to the University of Hawaii's Joint Institute for Marine and Atmospheric Research (JIMAR) which use add-on funds, specifically appropriated by Congress, to develop and maintain fishery information networks in the western Pacific (WPacFIN), Alaska (AKFIN), and the west coast states (PacFIN). Most of these UH staff are dedicated to providing support for participating island

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[1]Hamm, D. C. 1993. The Western Pacific Fishery Information Network--A fisheries information system. In: Boehlert, George W. (editor), The fisheries of Hawaii and U.S.-associated Pacific Islands. Mar. Fish. Review. 55(2):102-116.

[2]Data Workshop 2000: Preparing WPacFIN for the 21st Century--Report of a fisheries data workshop convened in Honolulu, Hawaii, 19-20 February 1997. Western Pacific Regional Fishery Management Council.

fisheries agencies and in meeting the needs of data and information users such as the Council and its various Plan Teams, Advisory Panels, and committees. Central WPacFIN staff also provide overall coordination, planning, interfacing with other NMFS and JIMAR staff, and help to support other Laboratory data management and processing functions.

In preparing this document, my senior staff and I have tried to be reasonable in our estimation of the amount of time that will be required to accomplish each activity, especially considering the significant amount of interaction that is required among geographically widely scattered individuals. However, I admit I am usually overly optimistic and typically do not allow for sufficient slippage due to circumstances beyond our control, but I believe this document reflects our best estimates at this time. Therefore, in reviewing this document, readers should be aware that many of the problems we are trying to solve are complex and require many interactions among many people, the upgrades we are trying to implement may require significant procedural changes on the part of island fisheries staffs, and many of the data systems we are developing are in a new and complex Windows-based environment. Nonetheless, because the programming staff is centrally located and working continuously in a team effort to coordinate and accomplish many diverse activities simultaneously, we have the flexibility to reallocate resources and modify strategies to maximize productivity to meet high priority needs.

The Central WPacFIN staff will strive to shorten the development and implementation cycles of all projects and complete the many upgrades to data-collecting and processing systems in the least amount of time possible. According to computer industry experts, once a programming team has mastered the new object-oriented programming paradigm while developing their first systems, they will have built the majority of the objects, forms, and code libraries that will be used in subsequent systems, thereby shortening the development cycle of future systems. Depending on how true this really is in developing fisheries applications, we may be able to significantly shorten the schedules presented in this planning document. Shortened schedules should result in resources being available to work on some of the many additional projects for which no resources are currently available.

CENTRAL WPACFIN SYSTEMS DEVELOPMENT AND SUPPORT

Figure 1 summarizes the general program areas, support activities and projects conducted by the Central WPacFIN staff. Each item is discussed separately.[3]

1.1. Overall WPacFIN and FDCC coordination: These essential and frequently time-consuming activities are primarily handled by the WPacFIN Program Manager but they also require support from many of the other Central staff. Activities include all of the planning, budgeting, administrative, and supervisory responsibilities required to operate WPacFIN. Interfacing with island agency staff to help prepare and coordinate annual funding proposals and functioning as the Executive Officer of the WPacFIN Fisheries Data Coordinating Committee (FDCC) are two of these responsibilities.

1.2. Computer and biological technical support: This general category is, by far, the biggest activity of Central WPacFIN staff and within it falls virtually all of the technical hardware and software support, computer programming, and training activities being done in direct support of island fisheries agencies. This category includes all of the extensive systems development and programming activities accomplished in support of each agency and these are described in more detail in the next sections of this document. It also includes the considerable hardware support needed to run the network, including every aspect from planning, through procurement, maintenance and repair. Providing and supporting computer hardware and off-the-shelf software is a critical and frequently time-consuming activity conducted by the Central staff. This program area also includes the analysis and biological support, provided by the Program Manager and WPacFIN Fisheries Biologist, to each of the island agencies. This includes a broad range of activities from designing data-collecting methodologies and forms and training local staff on sampling techniques to conducting data analyses, literature searches, and obtaining research materials for islanders.

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[3]Gant Chart type schematics located at the end of this document are used to identify work elements and resource needs. The broad, shaded, boxes indicate full-time, intense, or major activities, while the continuing single lines indicate lesser demanding maintenance level activities. Blank spaces next to some of the projects in the charts indicate unplanned activities which could very likely become important or high priority items, and will probably require additional resources to accomplish without negatively impacting progress on existing planned activities.

1.3. Technical and data support to Council staff and Plan Teams: The Council staff, contractors, Plan Teams (PTs), Scientific and Statistical Committee (SSC), and Advisory bodies are the most important clients of WPacFIN, and as such, are supported as a high priority by Central WPacFIN staff. Each year, considerable effort goes into meeting the needs of island Plan Team members in producing their various annual report modules. Although the WPacFIN Program Manager is an ex-officio member of all Council Plan Teams, he is typically active in only the Bottomfish, Pelagics, and new Coral Reef Ecosystem Plan Teams. Therefore, high priority is placed on assisting island members of these teams to obtain, analyze, and provide as accurate and extensive understanding and descriptions of the fisheries as possible, given the limitations of various data systems and analytical tools available.

1.4. SWP Production: Each year the Central WPacFIN staff summarize data from each of the island agencies and produce a volume of "Fisheries Statistics of the Western Pacific" (FSWP) which is published and distributed as a Honolulu Laboratory Administrative Report. Recent volumes are about 200 pages long and include nearly 100 tables of annual and monthly summaries of available commercial and total landings data for all species. Volumes also include about 100 figures of fisheries categories trends, important species seasonalities, and time series plots of significant fisheries parameters. The most recent volumes are also being placed on the WPacFIN website for on-line Internet access.

1.5. Data queries from users: Central WPacFIN staff fulfill many requests for summary and detailed data from a wide array of users, including Council staff, NMFS and University researchers, international organizations such as SPC and FFA, fishing industry representatives, and the general public. Providing ready access to data and information is an important aspect of the Central WPacFIN function and much effort is going into improving our ability to do this, using the Internet with direct access to the WPacFIN website. It is envisioned that in the not-too-distant future virtually all queries for non-confidential and summary level statistics will be filled through direct on-line access. Access to detailed level data will always be protected and available only through specific request on a case-by-case basis, as approved by the donor agency as specified in the WPacFIN guidelines for data share.

1.6. HQ data products (FUS and summary databases): The NMFS Headquarters Fisheries Statistics office in Silver Spring, MD. maintains summary databases in a National Oracle database, and maintains on-line links to other NMFS Science Center Oracle servers. NMFS HQ also produces an annual volume of "Fisheries of the United States" (FUS) and distributes it to a worldwide audience. For several years the Central WPacFIN office has been providing summary commercial landings data for Pacific Islands to

HQ for inclusion in FUS. This requires extensive reformatting, recoding and resummarization of island databases to fit these data into the prescribed categories in FUS. Central WPacFIN staff have worked some in the past to automate routines to recreate the appropriate summary databases for HQ, but HQ's methods of required input are still evolving, so new methods have been developed each year. This will change once we have our data standardized and available in a local Oracle format. However, for the time being, meeting HQ FUS input needs and their various requests for data will remain a requirement of the Central WPacFIN staff.

1.7. Central data management and archive: One of the principal functions of the Central WPacFIN office is to archive and manage copies of all databases submitted by the participating island agencies. This creates one central location where all important fisheries data from the island agencies can be obtained and made available for researchers and users. It also creates an automatic off-site storage for all island fisheries statistics for recovery of the data in case of disaster in any of the areas. Central data are stored in multiple locations on multiple off-line storage media to maximize security. Central staff also perform various quality control checks and cross-validations of data, where possible, to improve the quality of data in the island and central databases. The Central staff also make summary and detailed data available to outside agencies and researchers if the donor agencies request it or approve it.

1.8. Assist in HL data entry, QC, Management and archive: Since much of the data that fisheries managers and data users need in the western Pacific are collected and maintained by other groups in the Honolulu Laboratory, WPacFIN staff assist the HL Fisheries Data Management Program (FDMP) staff with some of their data entry, quality control, archiving and management functions. Copies of the WPacFIN island data are also maintained on multiple media in fireproof safes within the FDMP office to increase security. Occasionally, data maintained by FDMP are used to help cross-validate and quality control island agency collected data. An example of this is the new application being developed for the American Samoan longline fishery where NMFS logbook and cannery data and DMWR creel survey and commercial purchase data are being compared to identify discrepancies and improve all monitoring tools. The WPacFIN Program Manager also manages the FDMP activities and staff which helps coordinate the essential cooperation needed between these two data management groups. Currently, half of his salary is paid out of the FDMP base NMFS budget.

1.9. Website Phase I (static pages): One of the founding principles and goals of WPacFIN is to "provide ready access to quality fisheries data needed for fisheries management and planning purposes." Fulfilling this goal is the major purpose for developing a WPacFIN website at the Central office. Internet

technology has opened tremendous opportunities for providing on-line data at the fingertips of users all over the world for a very inexpensive price tag. The first phase of developing the WPacFIN website has been to design the outline of pages for each of the participating agencies and to fill those pages with static pages of fisheries descriptions and summary statistics. We have been working on this phase since the dedicated WPacFIN web programmer was hired last year. There are now over 5000 static pages loaded on the WPacFIN "developmental" website (http://wpacfin.nmfs.hawaii.edu) and we are encouraging island agencies and web browsers to provide comments and suggestions on the website's content, design, and user friendliness. Since web development tools and the basic information contained on many of the pages are continually evolving, updating and maintaining the static pages will always be a significant activity for the web manager.

1.10. Website Phase II (auto update of static pages): Early next year we will begin developing software that will help us automate the process of updating many of the static pages on the website. Tables and figures of basic summary fisheries statistics is the major area where automated updates can be made to reduce the amount of person time required for this activity. Programs will need to be written to automatically (e.g., with the push of a button or selection of a menu option) process the newest versions of databases to recalculate appropriate fisheries statistics and feed these new summary statistics to update static tables and charts to reflect the new data. Some manual work will still be required to verify the process and to ensure pages remain properly formatted etc., but the actual processing of the data should be considerably more streamlined than the initial phase when the static pages were first generated. Running these automatic update routines and maintaining the affected pages will be a continuous task as long as the website exists.

1.11. Website Phase III (dynamic data queries): This final phase of developing the WPacFIN website involves creating data queries that users can develop and submit while on-line. The queries will make direct access to the latest version of databases thereby providing near "real-time" access to fishery statistics from all participating agencies. Providing direct data access carries a significant technological overhead to ensure data integrity and security. In June, 1998 the Honolulu Laboratory hired a new web design coordinator for all the Lab-related websites. He will be very active in resolving the complications to permit on-line data queries while insuring security. At this point, the WPacFIN Program Manager plans to provide only summary level statistics via the Internet, so users could create their own queries on the WPacFIN website, but only non-confidential data would be transmitted back to the users. Once the technical and security issues are all resolved, it will be decided by the FDCC and each participating agency whether any

of their data should be directly available on-line to qualified users at the detailed, confidential level.

1.12. Oracle data inputs: The NMFS has selected Oracle as the agency's standardized database management system. It will soon become a requirement for summary WPacFIN data to be loaded into various Oracle tables so they can be accessed by users within the NMFS-distributed Oracle database system. The central WPacFIN staff will be working very closely with the Lab's FDMP staff to accomplish the initial data loads and to coordinate updates of the Oracle database whenever new island data become available.

1.13. Coding system upgrades (especially species, vessel, and fisherman): Since the early 1950's in Hawaii, and early 1980's in the other island areas when WPacFIN began computerizing fisheries data in conjunction with island agencies, various coding systems have evolved in each of the island areas. Although we tried to maintain standards between island agencies whenever possible, it soon became apparent that varying needs would necessarily result in divergent evolution of coding systems. In some cases, significant shortcomings and even duplication and errors have sneaked into some files. Since we are undergoing a network-wide redesign, reprogramming, and upgrading of many of our island data systems, we are trying to upgrade and re-standardize some of our coding systems as part of this project. For instance, the species coding files are being upgraded to include various quality control parameters such as minimum and maximum sizes and prices, allowable fishing gears, and, in some cases, being linked to relational tables with numerous species grouping categories which can be used by new reporting modules and query systems. We are also investigating a complete revamping of some island agency species coding systems. In most cases, the vessel and fisherman coding systems also have become very problematic and difficult to use and maintain. The Central WPacFIN staff are designing new vessel coding systems which will improve our ability to track individual vessels over time and be able to document changes in ownership, vessel names, equipment used, and fishing power. This has always been a problem in monitoring fisheries, and solving it is not a trivial task. To successfully implement the new systems will take a considerable commitment by island agencies to improve their fleet monitoring capabilities. Standardizing, upgrading, and maintaining coding systems will continue to be an ongoing project for the Central staff as well as all island agencies.

1.14. Historical data redesign, update, conversion, and standardization: Hand-in-hand with upgrading coding and processing systems is the major job to redesign and convert all existing data files and databases to operate in the new environment. Wherever possible, improving the quality of historical data is also a goal of this conversion process. As we design and implement the new integrated data quality control and improved editing systems, we are trying to standardize data and

correct errors that were not detected in the past. This can be a very time-consuming and arduous process, and in many cases will involve a considerable commitment on the part of the island agencies and their data management staffs. It is unlikely that all discrepancies or errors will be fixable, but we should at least strive to document them to improve data usability. Reformatting and improving data sets will be a major aspect of the new systems development cycle for another year or so and will remain a continuing project for all data systems in the future.

WPACFIN POSSIBLE BUT UNSUPPORTED PROJECTS

Figure 2 identifies some known and some potential projects and systems development needs that could become a major activity for one or all of the participating WPacFIN agencies, but for which no resources are currently identified. The top "General" portion of Figure 2 lists five of these possible projects that are of concern to all or several island agencies, and these are discussed within this section of this document. Several of these projects are related to new requirements identified in the new Sustainable Fisheries Act (SFA). The remaining portions of Figure 2 list items which concern specific island agencies and those are discussed within each of the island sections of this document.

2.1. Coral Reef Ecosystem FMP Support Systems: The Council is in the process of developing a Coral Reef Ecosystem FMP for the federal waters in each of the island areas. Depending on the requirements of this FMP, island agencies may be required to develop new data-collecting and processing systems to report on and monitor changes in these resources. If new systems are needed, Central WPacFIN staff assumably will be required to help the island agencies design and develop the sampling methodologies to obtain the data, and to program the processing systems to computerize, summarize, and report on these resources.

2.2. PIAFA Support Systems: If fisheries access agreements are put in place in any of the island areas, data collecting and reporting will be a requirement for foreign nations to fish in our EEZs. Forms and data processing systems will be needed to capture and process the data.

2.3. Bycatch, Spawning Potential Ratio (SPR) Research Systems: The new Sustainable Fisheries Act (SFA) requires that all FMPs address certain aspects of monitoring the fisheries. Although it is believed that according to the current definition, very few of our Pacific fisheries have much in the way of bycatch, we may be required to conduct research or establish monitoring systems to scientifically quantify and document this belief. If projects are undertaken, sampling and processing systems will be needed.

Additional research is also needed to help fill the information gap on SPRs for many of the islander's bottomfish resources.

2.4. Charter Boat Monitoring Systems: The new SFA specifically identifies data needs for reporting on charter boat fisheries. Currently, only the new Guam DAWR offshore creel survey system will be capable of producing statistics for its charter boat industry. All other areas will require special projects or new monitoring systems to obtain and process these new data.

2.5. Expand to Other Pacific Islands (e.g., Palmyra, military controlled, M.I., FSM, Palau): Over the years, the Pelagics Plan Team has repeatedly requested that data from other Pacific Islands be included in our available databases to enhance our analytical capabilities of the highly migratory species. In the early developmental years of WPacFIN, many requests for assistance were received from fisheries agencies in our former Trust Territories, and we actually provided some support to them. Several databases were established in the FSM and in Palau and island staff were trained by the WPacFIN Program Manager on special projects funded by outside sources. However, regular support to maintain and improve these contacts never became available and all the systems eventually failed from lack of contact. Now, more than ever, fisheries are continuing to develop in these areas, and in other U.S.-affiliated places such as the Marshall Islands, Palmyra, and military-controlled areas. No fisheries monitoring systems exist in most areas, and where they do exist, they are inadequate and we do not receive any of the data. Additional resources will be needed if we want to change this.

The next section of this document describes the work being done within each island agency to design, program, and implement new data processing systems to improve our fisheries monitoring and reporting capabilities. Each island section also includes descriptions of data systems not currently being developed or possible projects for which no resources are currently available.

HAWAII DAR SYSTEMS DEVELOPMENT AND SUPPORT

The State of Hawaii's Division of Aquatic Resources (HDAR) is currently making very significant progress in trying to upgrade and modify their fisheries data-collecting and processing systems to help better meet their and the Council's fisheries management needs. Over the past 2 years, major changes have been occurring in how HDAR is approaching their fisheries monitoring activities. This agency is taking a very active role in trying to implement many changes in their data systems that have been suggested to them over the years by various NMFS-Council-related

teams and committees. Figure 3 identifies the most significant projects currently underway and some other areas of concern for which no resources are presently available. Recently, FoxPro for DOS has been the primary applications development and data processing environment within HDAR, however, in September 1998 two very significant decisions were made by the HDAR statistics section which greatly modified the approach and priorities for developing and implementing future improvements to the data systems. These decisions were to begin converting their processing environment to Visual FoxPro operating within Windows 95, and to replace their contracted external keypunch service with new integrated in-house data entry/validation and quality control systems which will help to increase the timeliness and quality of the data collected and processed. The activities described below address Data Workshop 2000 Hawaii recommendation numbers 1-12, 15-17, and 19.

3.1. NWHI Bottomfish Monitoring System (NWHI BMS): Referred to originally as the "Fast-Track" system, this data system was designed around 1995 as a prototype for implementing new fisheries monitoring forms which required fishermen to fill out daily logs of their effort and estimated catch during the trip, and a single trip sales report following each trip. The two sets of forms were submitted and processed together, and the data integrated together to produce the most accurate and easily recorded catch, effort, area, size frequency, and sales data available for the federally regulated NWHI bottomfish fishery. The data were integrated based on fairly complex quality control and adjustment algorithms developed and agreed to by a committee of scientists and statistical staff from HDAR and the Honolulu Laboratory. The majority of the programming for this system was completed some time ago, but considerable effort is still going into refining the system and improving reports and fisherman feedback. Since processing of data for this fishery is done completely within HDAR's Statistical Unit, the system includes extensive quality control and cross-validation procedures built into the data entry module.

3.2. Improve existing Commercial Marine Licensing System (CMLS): When HDAR first developed and implemented this state-wide, on-line licensing system in 1993, they did so by contract to a private consultant software developer. That developer is no longer available to modify or maintain the system, and specific State funds also are no longer available to upgrade this software. The Central WPacFIN staff have already made numerous modifications to this system and have many more upgrades to make. A major module within this system is currently used to log in receipt of fishermen's reporting forms and mailing various delinquency form letters. This portion of the system has also received numerous upgrades to allow issuing and tracking of multiple forms for individual fishermen. This system will become a vital part of HDAR's data processing systems as each of the systems gets integrated to improve quality control and cross-

validation. At some point in the future (possibly within 3.6 below) this state-wide, on-line system will need to be converted to VFP.

3.3. Fisherman Reporting System (FRS) Phase I (computerize and modernize current processing procedures and forms): This FRS has been a major project for HDAR and Central WPacFIN staff. At least 2-man years of Central WPacFIN staff development and programming effort has already gone into this project, and we are nearing the final testing and implementation phase. This project's major focus has been to modernize, streamline, and computerize many time-consuming, primarily manual procedures and has required the complete redesign of virtually all HDAR databases and many of their data handling procedures. Quality control and data-validation routines have been changed from using hundreds of stand-alone, hard-coded SAS routines requiring individual manipulation and execution to a menu-driven, integrated database application (which handles all importing and processing of data in large batches received from the keypunch contractor by selecting a few simple menu options and answering some basic input questions). This system, as it is implemented and further developed and converted to VFP in subsequent phases, will become the most significant processing system used by the HDAR Statistical Unit staff for years to come. The FRS is the backbone of HDAR's fishery monitoring system and will be the central integrating system for all other processing systems.

3.4. FRS Phase II (implement new forms and develop on-line data entry and quality control procedures): In response to requests by Council and NMFS staff, HDAR has been working on developing new fisherman reporting forms for use in its major fisheries. HDAR staff has held numerous meetings with NMFS staff, industry representatives, and fishermen to design new forms similar to those used in the NWHI BMS, (e.g., daily logs of effort and catch, and separate trip sales reports). Although the new data entry software will be developed in VFP, the existing NWHI BMS will probably be the template for developing and implementing the data integration algorithms when the new forms are implemented. HDAR is targeting January 1999 to begin implementing the new forms. It is believed that implementing the new forms will significantly increase the amount of information and pieces of paper HDAR staff will be required to handle and that increased resources within HDAR's statistics unit will be required to implement the planned data system upgrades. However, since the new VFP data entry software will incorporate on-line quality control and editing features, it is also believed that a considerable savings in resources will be realized by reducing the amount of time required to perform post-entry data validation and editing functions. These types of on-line validation and quality control functions cannot be performed by contracted keypunch/verify services because knowledge of the fisheries is required. It is not known, at this time, to what extent the increased number of forms will need to be processed, and the

improved data handling procedures will offset each other in determining the actual amount of staff that will be required to implement the system upgrades.

3.5. FRS Phase III (combine NWHI BMS and FRS Phase II databases and convert historical databases to VFP): Once the Phase II FRS software is developed and refined, the contents of the VFP databases produced will be similar to those produced by the NWHI BMS FoxPro for DOS system, but the database formats, themselves, will be incompatible. Likewise, all historical databases will be incompatible with the new VFP structures. Therefore, all databases will need to be converted and standardized to work within the new VFP and Windows operating environment.

3.6. FRS Phase IV (convert NWHI BMS, FRS Phase II, and other FoxPro for DOS systems to VFP): Although some Macintosh computers are used by some HDAR staff, the principle data processing environment within HDAR's statistical unit continues to be IBM-compatible PCs running DOS applications, primarily FoxPro, SAS, spreadsheets, and word processing on a LAN. The September 1998 decision to convert all DOS FP applications to VFP Windows 95 applications has created an immediate increase in the hardware and software resources required to make the conversion in a timely manner. Many of HDAR's computers need to be upgraded in order for them to move to the more "modern" and demanding Windows and VFP environment. Redesigning and reprogramming HDAR's DOS applications to VFP will, undoubtedly, be the most demanding and time consuming of the activities required to implement the new operating environment. It is unknown at this time exactly how these reprogramming needs will be met and if, for instance, all systems including the CMLS will be included in this major project. Some hardware upgrades have already been made, but many more are needed.

3.7. FRS Phase V (integrating FRS, DRS, CMLS, and DBOR Vessel Registration to improve data validation and QC): Although this phase of developing and implementing a fully integrated FRS is shown to begin midway through 1999, it is already taking place to some degree and will be taken into consideration in all of the design phases of each of these systems. Integrating and cross-linking data sets to improve data quality are usually complicated tasks that require much user input and coordination, many value judgments, and an iterative and evolutionary process that can commonly take a considerable amount of time and effort. Developing and modifying computer programs to accomplish these activities will undoubtedly be long-term evolutionary projects that will ultimately result in improved fisheries statistics for all data systems integrated and/or cross-validated. For instance, it is currently envisioned that cross-validating fisherman-reported sales data with the soon-to-be-developed dealer-reported sales data will help to improve the data quality reported by both of these data sources, and that ultimately, the

dealer data system will provide such high quality data that it will be possible for the fisherman reporting of sales data to be eventually eliminated as a requirement without loss of information.

3.8. Dealer Reporting System (DRS) Phase I (automated inputs): In reality, this project began in the mid 1980's when the Central WPacFIN office first developed a data processing system using the Revelation DBMS for the Suisan fish auction and, in return, began receiving computerized Suisan data on diskettes through the mail. When the system was reprogrammed into an xBASE language in the late 1980's, it included a utility to produce a separate set of data in a format more acceptable to HDAR, so Suisan also sent copies of their data to HDAR. This very amiable working relationship continued to develop, and today, the Central WPacFIN staff can dial directly into the Suisan LAN and download data whenever needed or appropriate, but typically only monthly. However, the DRS Phase I that is referred to in this document is the continuation and expansion of this type of automated dealer input, but transfers the data uploading responsibilities to the dealers to meet their mandated data submission requirements. In short, HDAR and Central WPacFIN will develop and implement the technology required to allow dealers, who have computerized data, to dial into a secure HDAR computer and copy their fisheries transaction files to the HDAR storage device. This will meet their data submission requirements. The detailed transaction records (e.g., fish purchases) that they use to run their businesses will be copied to their secure area on the HDAR system, thereby eliminating the dealers' time and expense in compiling detailed monthly reports and, at the same time, precluding HDAR from having to enter and quality control the data from the pieces of paper submitted by the dealers. Obviously, only computerized dealers could take advantage of this service, but a recent survey conducted by HDAR of the major dealers in Hawaii indicated that most large dealers are already computerized and that most of them were very interested in using an automated data input capability. This extremely important first phase of the DRS project will include implementing the hardware and software at HDAR, developing the needed databases and processing software to handle the data, and very importantly, working with the dealers to develop their capabilities to use the system and provide reasonably standardized inputs.

3.9. DRS Phase II (non-automated inputs processing system): All dealers who do not computerize their fish purchases data or do not wish to participate in the on-line transfer of their data will be required to submit their detailed transaction data to HDAR in paper format. A data processing system will need to be designed and programmed to input or import, validate, and edit data submitted on paper. Every effort will be made to encourage and assist dealers to take advantage of the automated input as it will provide many side benefits for the dealers, and will greatly

reduce the workload of HDAR staff and the cost of obtaining and quality controlling the data.

3.10. DRS Phase III (integrate with FRS data to increase QC): One of the most obvious benefits of requiring commercial fishermen and fish dealers to separately report some of the same data for their transactions is to be able to cross-validate the data to improve accuracy and compliance. Integrating and cross-validating fisheries data from two separate sources is typically challenging and sometimes nearly impossible because of seemingly small discrepancies in the information recorded and the probability of Murphy's Law occurring. It is also an evolutionary process that takes time before the maximum benefits are reached. As the system is developed and implemented and feedback is provided to dealers and fishermen about the problems encountered, the quality of submitted data increases and the cross-validation process becomes easier. The time line for developing and fully implementing data integration procedures is expected to be fairly long and require much interaction with dealers and fishermen. As mentioned under 3.7 above, the ultimate goal of improving the dealer system through cross-validation with data submitted through the FRS is to eliminate the fishermen’s reporting requirement for sales data, thereby focusing fisherman reported data on improved catch and effort information.

3.11. Develop BPT and PPT reporting modules (HDAR's portions): Unlike with the "out-island" agencies, to date, the Central WPacFIN staff have not been involved with helping to develop or improve the Plan Team reporting software used by HDAR staff to produce their portions of the annual reports for the Bottomfish and Pelagics Plan Teams. However, this was identified as a specific need during Data Workshop 2000, so it may become a requirement at some point in the future. No resources are currently available for this project.

3.12. Bottomfish size-frequency monitoring program: The BPT has repeatedly recommended that more size data be collected for MHI-caught bottomfish, especially those landed on the neighbor islands. If a sampling program is implemented, a data processing system will need to be created to input, quality control, summarize, analyze, and report on the data.

3.13. Tournament sampling: Although Hawaii is the home of the most fishing tournaments of any Pacific island area, there is no routine collecting and processing of these data by a government agency, nor are these data readily available from any other source. Tournaments can be a valuable source of important fisheries data. If a system is developed to collect these data, a data processing system will be needed to process the data. No resources are currently available for either of these major activities.

3.14. Recreational data surveys: The new SFA specifically identifies requirements for providing statistics on the charter boat and recreational fishery sectors, but no systems exist in Hawaii to do this. Hawaii has more charter boats and more recreational fishers than any other Pacific area within the Council jurisdiction, but no systems are in place to provide these types of data to fisheries managers. Developing the data-collecting and processing systems to properly monitor these fisheries and provide accurate statistics on them is a very large job and will require a significant increase in resources and long-term commitment. Even taking snapshots of these fisheries through short-term or one-shot surveys requires a sizeable commitment of time, people, and money. For instance, a 12-month pilot creel survey project conducted on Oahu a few years ago required a $100K+ contract for sampling and an additional estimated 5-man years of Central WPacFIN and HDAR staff time to complete, and the results were less than stellar. Good and effective fisheries surveys take considerable resources and time to develop and implement, and success is highly dependent on the level of long-term commitment of the individuals and agencies involved. No WPacFIN resources are currently available for this magnitude of effort, and no funding at this level is expected through WPacFIN in the foreseeable future.

AMERICAN SAMOA DMWR SYSTEMS DEVELOPMENT AND SUPPORT

The Department of Marine and Wildlife Resources is the only agency in American Samoa (AS) responsible for monitoring and managing the marine resources of the Territory of American Samoa, which includes the main island of Tutuila, the Manu'a Islands of Ofu, Olesega, and Ta'u, and Swain and Rose’s Atolls. The vast majority of the fisheries activities in the Territory are based on Tutuila. Historically, fishing has been an important aspect of the Samoan culture and the fisheries have evolved and changed significantly over the years. For instance, the bottomfish fishery was very active in the mid-1980's and had landings approximately equal to the pelagic species, but today it is of a smaller magnitude, having been nearly replaced by a new longline fishery targeting albacore that has developed in the past 3 years. Fisheries monitoring systems have had to change over the years to help track these changes, and this is still true today, with more changes in the making. The DMWR is taking a very proactive role in monitoring their fisheries and is always looking for ways to improve their monitoring, reporting, and managing capabilities.

Figure 4 lists eight planned and scheduled activities and ten others for which no resources can currently be identified but which may become important and a matter of priority as time proceeds. These activities address American Samoa recommendation

numbers 2, 3, 4, 5, 6, 7, 8 and 9 in the Data Workshop 2000 document.

4.1. AS Commercial Landings System (ASCLS) to VFP: In October 1990 DMWR implemented new legislation which required first-level commercial fish purchasers to use and submit to DMWR an invoice for each purchase. This trip ticket system was to eventually replace the "Estimated Commercial Landings System" which was actually a processing subsystem based on the offshore creel survey system that had been implemented in October 1985. As with any new data-collecting system, especially those requiring industry compliance to new regulations, it took several years for the level of compliance in using the new invoices to grow to high levels. Central WPacFIN developed a DOS-based dBASE system to process the invoice data, but over the years, through several versions of the invoice forms, this system has become inefficient in handling the volume and quality control of data needed. Redesigning and reprogramming the ASCLS became the prototype development system for the Central WPacFIN Visual FoxPro Development Team. The team has worked on this system for over a year and it has been implemented in a final test mode. The new system adds considerable user-friendliness to the processing environment and it includes significant increases in quality control and editing capabilities. Because this is the first VFP system programmed for DMWR, it also includes the top level systems menu and the major subsystems for system configuration and code file maintenance. Once fully tested and implemented, it is envisioned that this system will become the basic template for developing other island agency's VFP systems. Maintaining this system will be a continuous need.

4.2. Revise vessel/fisherman coding system, integrate with vessel inventory: Over the years, updating and maintaining the coding systems for vessels and fishermen have been done with growing difficulty and confusion. Even though vessel inventories were generally conducted every 6 months, and fisherman activity was essentially monitored continuously, it was still problematic to track vessels and fishermen over time and to document changes in vessel ownership, captains, crews, fishing methods and power, and frequency of fishing. These parameters are always difficult to track in any fishery and require substantial effort by fisheries agency staffs. Until recently, the flaws in the old data systems were not overly apparent, but with increased longlining activity, federal permitting of vessels, and increasing needs to cross-link and verify data collected using different collecting methods, the flaws and inconsistencies have become a major hindrance to improving the monitoring systems. In April 1998, DMWR and Central WPacFIN staff began to study the problems and to develop plans for fixing them. Central WPacFIN staff have now designed and programmed a prototype system which will be installed at DMWR for testing in the near future. Through testing and extensive work with DMWR staff on resolving the historical vessel identification problems, the system will be

improved and cross-reference databases established that will facilitate tracking of vessels over time and greatly improve vessel identification capabilities. Once the system is fully functional, it will be used as the template to develop similar systems in Guam and the CNMI. Maintaining the vessel databases will require continuous monitoring of the fleet by DMWR staff.

4.3. Cannery system for local (and total?) landings: For many years DMWR has received monthly reports from the two canneries located across Pago Harbor from the DMWR offices. These reports have met most of the informational needs of DMWR so the data on these reports were not traditionally entered into a database. Recently, needs have changed and a database application is needed to capture at least the summary cannery data plus detailed off-loading data for the federally permitted local longline vessels. Data from this system will be used to help verify and cross-check the federal logbook and DMWR creel survey data. A preliminary design has been completed and programming begun to develop this system for DMWR.

4.4. Revise existing AS Offshore Creel Survey System (ASOCSS) for improved longline expansion (contract): Because of significant changes in the fisheries and in the creel survey sampling methodology, the current dBASE system used to process and expand the creel survey data needs to be modified to adjust for these changes so it produces more accurate estimates of the longline catch and effort. Once DMWR and Central WPacFIN agree upon the best patch for the existing system, Central WPacFIN will issue a small contract to the former employee who programmed the dBASE creel system so the changes can be implemented in the most timely and cost effective manner possible. Eventually when the entire system is redesigned and programmed in VFP, it will inherently handle the longline fishery appropriately (at least until other significant changes occur which render the underlying assumptions no longer valid).

4.5. System to compare NMFS longline logs, AS cannery, ASCLS, and ASOCSS outputs: Currently, no data processing system exists to make automatic and standard comparisons between the four data-collecting systems which obtain portions of the overall monitoring data for the growing longline fishery. This system will be developed and it will make comparisons at every level possible to obtain the best picture of the longline fishery and to, where possible, cross-check specific detailed data. For instance, the data recorded for every trip interviewed during routine creel surveys should match very closely with data reported for that trip to NMFS on the federal logbook form. Discrepancies will indicate need for improvements in one or more of the systems. Additionally, estimated total landings for each species expanded for the longline method, using the creel survey data, should compare favorably with the number of trips and fish summarized from the federal logbooks, and should be similar in number to cannery purchases from the local fleet (at least for

albacore). The differences between these numbers should be accountable through the CLS invoice data and estimates from the creel survey of the portion of the catch not sold. Because of expected discrepancies and differences in the data from each of these monitoring systems, the algorithms to appropriately make the cross-links and comparisons would become fairly complicated. However, since the ability to make 4-way comparisons and validations of data are very rare in fisheries science, it is believed that the effort to develop these applications will be worth it and will help improve all of the systems involved.

4.6. Redesign and upgrade BPT and PPT systems: Significant changes are required in the Bottomfish and Pelagics Plan Team reporting applications to incorporate new Plan Team reporting requirements and to become compliant with the new VFP processing environment and databases. The PPT modules will require the most extensive reprogramming to more accurately and comprehensively analyze and report on the longline fishery. Once the major systems' redesigning and programming are completed, modifying and maintaining the PT system will be a sporadic and long-term activity.

4.7. Tournament sampling system to VFP: The DMWR has been quite active in past years in sponsoring, cosponsoring, participating in, and providing samplers for many sport fishing tournaments. The old dBASE system used to capture and process tournament catch and effort data needs to be redesigned and reprogrammed into the standard VFP environment. In recent years, the number of tournaments being held in Samoa has declined, so this is not a high priority item, but it still needs to be accomplished to fill out DMWR's fisheries monitoring and processing capabilities.

4.8. ASOCSS to VFP: The current American Samoa Offshore Creel Survey System is the most complex application the Central WPacFIN staff developed for DMWR in dBASE. The new VFP version will be similarly complex, but will be based on modified summary and expansion algorithms to incorporated changes that have occurred in the fisheries and will reflect the effect these changes have had on the underlying assumptions and stratification upon which the survey is based. These changes should provide improved estimates for all aspects and strata in the fisheries, including (hopefully) the very small charter boat fleet (although a separate monitoring system may be required to provide adequate statistics for this still rare-event fishery in Samoa). By the time work can be done on this new VFP system, much more will be known about the stability and dynamics of the Samoan commercial and recreational fisheries.

4.9. Develop permit and licensing system: DMWR currently issues several kinds of permits and licenses, but no formalized data system has been developed to assist in this task. A system

is needed, but no resources are currently identified to work on this activity.

4.10. Enhance bottomfish SPR research project system: Several of the initial data entry/edit and simple reporting modules of a bottomfish research support processing system were written by Central WPacFIN staff for DMWR a couple of years ago, but these need to be converted to VFP and upgraded to provide better analytical and reporting capabilities. No resources are currently identified for this work.

4.11. Estimated Commercial Landings from ASOCSS: During the process of redesigning and converting ASOCSS to the VFP environment, it will need to be decided if the ASCLS system has grown robust enough to be used exclusively in calculating commercial landings, or if another processing subsystem needs to be written to use the creel survey data to produce reports of the estimated commercial landings as has been done in the past. Since the invoice system has only been implemented on Tutuila, and commercial landings also occur on the Manu'a Islands, the ASOCSS may need to include, as a minimum, modified algorithms to adjust ASCLS output with expanded estimates of commercial landings from the other islands. This is not a trivial task and could require additional sampling and data processing by DMWR staff for the other islands. However, no resources are currently identified for this task.

4.12. Tuna transshipment system: Vessel to vessel transshipment of tuna and possibly other pelagic species occurs on a regular basis in Pago Harbor. No data-collecting or processing systems currently exist to obtain, capture, and report on these activities, so if this is an important monitoring requirement DMWR will need to dedicate resources to obtain the data, and a processing system will need to be developed to computerize and report on these activities.

4.13. Shark fin monitoring system: It is known that shark fins are off-loaded from some vessels which off-load in American Samoa, but no official data-collecting system exists to obtain the data nor process the data. If this is important, systems will need to be developed.

4.14. Develop Manu'a Inshore Creel Survey System: Inshore creel survey data has been routinely collected on some of the Manu'a Islands for over 10 years, but no data processing system has ever been developed to capture and process these data. DMWR has identified this as a need, but no resources are currently identified to work on this project.

4.15. Tutuila Inshore Creel Survey System (TICSS) to VFP: If DMWR decides to reinstate their former TICSS, a new and improved VFP system will need to be developed to process the data collected. The previous dBASE inshore processing system was

quite complex and took considerable time and effort to design and program. If needed, the VFP version of a TICSS processing system will also require substantial resources which are not currently available.

4.16. Bottomfish size-frequency monitoring program: If the local bottomfish research project(s) produce sufficient information to establish the baseline parameters to calculate SPRs on a localized basis (instead of by proxy using Hawaii data), then a size-sampling, data-collecting program will need to be developed and implemented to obtain appropriate landings data to use in these calculations. A processing system will also be needed, the outputs of which would feed into the BPT reporting modules.

4.17. Inshore fisheries research systems: Over the years, DMWR biologists have undertaken many research projects on inshore resources and species, and Central WPacFIN staff have provided intermittent seat-of-the-pants technical support for some of the data processing and analyses for some of these projects, but no formal data systems have ever been developed to assist the scientists in their efforts. Much research data has, undoubtedly, been lost because of the lack of formal data processing systems and associated data archival procedures. The Director of DMWR has identified the need for inshore research support systems, but no resources are currently available or planned for this activity.

4.18. Develop Imports Monitoring System: No data collecting of processing system exists to monitor imports of fish and/or fisheries products into Samoa. Fresh fish are frequently imported from Western Samoa, Tonga, and occasionally other places and these imports are undocumented unless they are purchased by a fish dealer who reports them on a standard invoice. It is alleged that fairly substantial quantities of frozen fish leak into the local economy from vessels off-loading at the canneries, and these imports are also undocumented. DMWR management has identified a need to monitor, quantify and report on these aspects of the fisheries industries of Samoa, but no resources are available to address this need.

GUAM DAWR SYSTEMS DEVELOPMENT AND SUPPORT

The Guam Division of Aquatic and Wildlife Resources office is the main source of data and information on Guam's domestic fisheries and currently conducts three major data-collecting efforts: a voluntary commercial receipt book program; and two creel surveys, one for the offshore, boat-based fisheries, and one for the inshore fisheries. They also conduct various research and educational programs, community outreach and have a very active FAD program. Figure 5 presents the major

planned systems development activities and a few other needs not currently included within the planned work assignments. These items address Guam recommendations 4, 5, 7, 8, 9, 12, and 13 in the Data Workshop 2000 document.

5.1. Guam Offshore Creel Survey System (GOCSS): This system is the mainstay of monitoring the FMP-related fisheries for Guam and has provided estimates of total catch and effort for the major boat-based fisheries since 1981. The survey methodology has evolved over the years as the fisheries and access points have expanded and become more complex. Working in close coordination with DAWR staff, the Central WPacFIN staff have been developing a new FoxPro for Windows processing system for the offshore creel survey data for over a year. Many major modules of this system are completed and the backlog of unprocessed data from 1992 to the present is currently being entered by DAWR staff. However, some significant aspects of the data summarization and expansion modules of the system still need to be refined and tested to ensure the accuracy of the processing algorithms, and more report generators need to be developed. The majority of this work should be completed by early next year, but since this is the most significant and complex processing system WPacFIN is developing for DAWR, it will continue to evolve and needs to be maintained for the foreseeable future.

5.2. Bottomfish SPR Research: WPacFIN sponsored a pilot research project late last year which confirmed the existence of a bank 117 miles west of Guam which has a virgin stock of the shallow water Lethrinid-based bottomfish complex. This year the FDCC agreed to dedicate a portion of the PacFIN funds to a follow-up project to document parameters needed for calculating SPR for the principal species *Lethrinus rubrioperculatus*, such as the CPUE, size composition, and size at maturity. DAWR and Central WPacFIN staff have developed a research plan and forms for recording the data, and a contract has been awarded to a vessel to conduct six fishing trips. Central WPacFIN staff has completed programming the data entry, validation, and editing portions of the system that will be used to computerize and process the data, and has begun developing the data analysis and reporting portions of the system. Because of delay in the project due to vessel typhoon damage, the project completion date has been moved back. Once the project is completed, maintenance of the system will not be needed unless additional bottomfish research projects are sponsored. If SPR research projects in the CNMI come to fruition, this system may be useable by that agency with minor modifications.

5.3. Incorporate Boat Estimator Model (BEM) into GOCSS: As part of the GOCSS data-collecting methodology, participation logs are kept for various access points (ports) during survey days. These data are used primarily to document the number of trips being made for each fishing method to develop an expansion factor for the average number of trips per day. However, it is also

possible to use these boat log data as input to a BEM which predicts the unique number of vessels which participated in the fisheries during a particular time frame. The model calculates the asymptote based on the Sathiendrakumar and Tisdell threshold model. The boat log data are bootstrapped to randomly select the order of sample days for input into the model, and then run 1000 times to develop the mean number of boats and 95% non-parametric confidence intervals. In the past, Central WPacFIN staff had to perform many manual data manipulations and translations to run this model and produce outputs. An integrated module needs to be designed and programmed that will allow the user to easily select from pick-lists various parameters to be considered by the model during execution and to output the answers in a nice report format. Once developed and tested, this module will be added to the GOCSS as a menu option.

5.4. Redesign and upgrade BPT and PPT systems (using GOCSS, BEM, GCLS, GDOC, and eventually GICSS data): The Bottomfish and Pelagics Plan Teams have annual reporting requirements which require summarization and integration of data from several data-collecting and processing systems operated by DAWR. New FoxPro for Windows processing systems are needed to produce the outputs upon which the report modules are based. These new data processing systems will evolve and be programmed over an extended period of time as they will incorporate products and data from other major processing systems which are also under development. Maintenance of this software will be required indefinitely as annual reporting requirements of the Plan Teams change.

5.5. Reprogram Guam Commercial Landings System (GCLS) into FoxPro: The current system used by DAWR staff to process the commercial receipt book (trip ticket) data was programmed by Central WPacFIN some years ago in the dBASE IV for DOS environment and needs to be redesigned, upgraded, and reprogrammed into either the FoxPro for Windows or Visual FoxPro environments. The new system will include a considerably improved user interface and more robust data quality control, validation, editing, and invoice tracking capabilities. The databases in the new system also will be more easily used by other applications such as the Plan Team modules.

5.6. Guam Inshore Creel Survey System (GICSS): DAWR staff conduct extensive creel surveys to monitor the catch and effort of Guam's inshore fisheries and a new processing system is needed to process the data for those fisheries. Monitoring Guam's inshore fisheries is an important aspect of the work DAWR does, and it is not uncommon for these fisheries to harvest some species included under FMPs. Although there is a functional Macintosh-based system currently working to process these data, a new PC-based system is needed to incorporate many of the features of the offshore system and to simplify the integration of data between the systems. Like the offshore survey, the inshore survey is fairly complex. It is developing a new processing

system which will take considerable effort. However, experience gained in developing the GOCSS should prove very beneficial in shortening the development cycle of the GICSS, and it is hoped that major portions of the complex data summarization and expansion algorithms will also be useable within GICSS, thus reducing the amount of new programming required.

5.7. Integrate/combine outputs from GOCSS and GICSS: Because many of the same species are captured with and without the use of a boat, it is important to be able to combine the information from the offshore and inshore survey to obtain the best picture of the health and condition of some fisheries resources. Once GOCSS is essentially completed and the development of GICSS is well underway, processing and reporting modules will be developed to combine the outputs from these two systems to make more complete reports on total harvest and effort. Some of these combined outputs will feed directly into the Plan Team reporting modules.

5.8. Convert systems from Windows FP to VFP: Data processing systems are currently being developed for DAWR in the FoxPro for Windows environment and these may need to be reprogrammed into the new standard of Visual Foxpro. If it is ever decided to do this, the amount of reprogramming required will depend on how many systems need to be converted from the Windows FoxPro to the Visual environment. In the future when numerous Visual applications have been developed for other island agencies, it should be easier and faster to make the conversion. Therefore, it is appropriate and most efficient and timely to continue developing DAWR systems in the FoxPro for Windows environment for the foreseeable future. If this changes, resources will need to be allocated to this task.

5.9. Bottomfish size-frequency monitoring program: Although the creel survey programs collect some size data for the bottomfish fishery, the number of samples collected each year are insufficient to properly create reliable SPRs for major species in the shallow and deep water complexes. A specific monitoring program will be needed to target these fisheries to obtain an adequate sample size. If resources are made available to conduct the sampling to collect the data, a sampling methodology and a data processing system will need to be developed to implement the program. No resources are currently available for this task.

5.10. Tournament sampling: Until 1996 DAWR collected data for at least one fishing tournament held annually on Guam, but due to other priorities and a lack of resources, this activity was discontinued. If it is determined that tournament data need to be collected, resources will need to be made available to develop and conduct the data-collecting activities as well as to develop the data processing system needed to process the data.

5.11. Vessel Registration System (VRS) interface: A mechanism to routinely and efficiently obtain vessel registration data from the Guam agency responsible for registering vessels (Police Department?) needs to be developed. If the data are computerized, the technical aspects of implementing this interfacing system should be fairly straightforward and should include the capability for automated updates. If the data are not computerized, the job is much bigger and requires data entry, update, and quality control modules as well as the resources to routinely manually obtain the data and enter them into our computerized files. No resources are currently available to accomplish these tasks.

5.12. Update systems to cross-link with VRS: One of the main purposes of obtaining timely and accurate vessel registration information is to use these data in verification of other DAWR-collected data. All of the data processing systems that could be modified to take advantage of this improved data quality control feature would need to be modified to do so. No resources are currently available to accomplish this task.

GUAM DOC SYSTEMS DEVELOPMENT AND SUPPORT

The Guam Department of Commerce is responsible for collecting and processing data on the primarily foreign-flagged longline fleet which began operating out of Guam in the late 1980's. All of the fish from this fishery are landed fresh, not frozen, and most of them are air transshipped to the Asian market within a few hours of off-loading. Most of the lower quality or shorter shelf-life fish that are not transshipped by air are frozen for later transshipment by container vessels. A small portion remains on Guam for the value-added wholesale market. The Guam DOC staff obtain information on all fish off-loaded on Guam, regardless of its subsequent disposition. When this fishery was just beginning, WPacFIN and GDOC staff developed forms for collecting the off-loading data. Due to lack of resources in WPacFIN, GDOC accepted an offer by the South Pacific Commission (SPC) to develop the first version of the transshipment data processing system, which they implemented in the early 1990's. Since that time, Central WPacFIN has been maintaining that original dBASE system and upgrading it by adding numerous new modules to it. The system not only captures data on the overall transshipment activity, but it records the weight of every fish off-loaded, regardless of disposition. However, the system lacks many desirable quality control features and user-friendliness, so it is now time to completely revamp that system and implement a new system in the new standard Visual FoxPro Windows 95 environment.

Figure 6 identifies four significant activities required to complete this task and four other possible activities for

future consideration. These eight items address Data Workshop 2000 Guam recommendation numbers 1, 2, 5, 10, 14, and 15.

6.1. Correct all historical data using improved vessel IDs and QC procedures: About 2 years ago it was discovered that over the years, numerous errors had begun to appear in the transshipment database. Some of these were because of the lack of robustness of the programming language and design of the earliest system, while others were because of glitches in the software and the user interface. Still others were because of operator error, lack of training caused by turnover in staff and instability of funding, and in changes which occurred in the transshipment processing which the old system was not programmed to handle. Since that time, Central WPacFIN staff have been working with GDOC staff to improve the processing system to reduce the likelihood of future errors and to repair the historical files. Most of the discrepancies have involved the misidentification of vessels which has resulted in overestimating the actual number of vessels participating in the fishery. Through contacts made while at GDOC on one of the on-site visits, Central WPacFIN staff have been working with scientists at the Overseas Fisheries Development Council of the ROC (Taiwan) to resolve vessel identification problems. It has proven to be a frustrating and time-consuming task, but excellent progress is now being made, at least for the Taiwanese vessels. The process of investigating the source of the discrepancies has resulted in an improved understanding of the vessel identification problem and in a revised plan for the new system. A major breakthrough was made on the May 1998 on-site visit to GDOC that will result in developing a new vessel identification and quality control module in the new system, which will lead to building a better historical file for editing previous years' data. Once the new vessel database is created the historical data can be appropriately corrected, along with all historical reports which were based on previously unrecognized erroneous data.

6.2. Build new vessel ID and QC system: In May 1998 it was discovered for the first time that another document, the "Notice of Arrival," could be made available to GDOC staff to help improve vessel identification and tracking. A data entry module was programmed for this new data set and added to the old dBASE system as a new menu options to facilitate capturing as much historical vessel identification data as possible. Once a database is built in the old dBASE system, it will be used to complete correcting the historical data as identified above. It will also become an integral part of the new Visual FoxPro design to improve the quality of data as described in the next item.

6.3. Develop new VFP tuna transshipment and size-monitoring system: This activity began in earnest in April 1998 and is continuing. This completely new processing environment will have considerably more cross-validation and quality control features built into it, and will include a state-of-the-art GUI interface

for the data entry staff. The new vessel identification subsystem will be a major enhancement over the existing system, as will the cross-validation aspects which will verify data from the notice of arrive, main transshipment, and packing and reject size-frequency databases.

6.4. Create PPT report module system: The Pelagics Plan Team has requested that the Team member from Guam include in his annual report some summary statistics and graphic(s) from the GDOC transshipment system. The specifications for these required statistics and graphs will be developed and a processing module added to the GDOC transshipment system to easily produce the outputs by simply selecting a menu option. A method will also be developed to easily transfer these outputs to the Guam PPT member.

6.5. Shark fin monitoring project and system: Concern over the shark fin industry has grown with the expansion of the Pacific longline fleet and monitoring of its activities. It has been documented that some longline vessels off-loading fresh fish in Guam also off-load some or all of their shark fins for shipping to the Asian market. If GDOC is going to monitor this activity in the future, a data-collecting system will need to be developed to capture, summarize, and report the information. No resources are currently dedicated or planned for this activity.

6.6. Purse seine transshipment monitoring system: Some purse seiners making port calls in Guam off-load and transship at least a portion of their catch some of the time. There is no system in place to obtain or process these data, therefore, one needs to be created. No resources are currently dedicated or planned for this activity.

6.7. Local longline sales monitoring: No data-collecting or processing systems currently exist to monitor the local sales of fish that are off-loaded from the primarily foreign-flagged longline fleet that is operating out of Guam. It is known that some of the fresh fish that is off-loaded and not air transshipped enters the local economy. It has been claimed repeatedly by local fishermen that the quantities are substantial compared to local landings and that the sales of this longline fish has a negative economic impact on the domestic commercial fisheries. A monitoring system is needed to quantify and document this impact. No resources are currently dedicated or planned for this activity.

6.8. Aircraft to aircraft transshipment monitoring: Many tons of pelagic species of fish are transshipped through Guam by transferring the fish directly from one airplane to another. No monitoring system exists to collect and process these data and no resources are currently dedicated or planned for this activity.

CNMI DFW SYSTEMS DEVELOPMENT AND SUPPORT

The CNMI Division of Fish and Wildlife office is responsible for monitoring and managing the fisheries of the Northern Mariana Islands and is the only agency in the CNMI which has historically been active in WPacFIN. The main DFW database used for providing data for federal FMP management has been the commercial landings (trip ticket) system. DFW also collects and processes data on fisheries imports, vessel characteristics, tournaments, and most recently the developing northern islands bottomfish fishery, and historically also ran systems no longer in operation to conduct inshore and offshore creel surveys and monitor the Tinian tuna transshipment industry.

Figure 7 specifies six projects currently planned and four others for which resources are not being allocated. These projects at least partially address Data Workshop 2000 CNMI recommendations 1, 3, 4, 5, 8, and 9.

7.1. Commercial landings system to VFP: Since this data system is the principal source of information used in producing FMP Plan Team annual report modules, this is the highest priority project for the CNMI. Once the American Samoa prototype system is finalized it will become the template for developing the CNMI commercial landings system because the systems are so similar. Efforts will also be made to increase coverage of the dealers participating in this still voluntary system and the quality of the data recorded by the dealers. Improvements to the data coding systems that were described in the Central WPacFIN section will also improve the quality of data within the databases.

7.2. Vessel inventory system upgrade and conversion to VFP: Improvements are needed in the timeliness, efficiency, and methodology used for DFW staff to obtain accurate data from the agency responsible for registering vessels in the CNMI (Public Safety Department). These improvements need to be integrated into a new and improved version of DFW's current vessel inventory system to produce better tracking of vessels and cross-validation of various fisheries data. Until further study of the problem can be made and meetings held with the Public Safety staff, it is uncertain what methodologies and capabilities will be built into this system.

7.3. Imports system to VFP: DFW staff currently obtain airway bills on all fish imports into the CNMI and enter them into a dBASE database. To meet the new processing standards of WPacFIN, this system will need to be redesigned and reprogrammed into the VFP environment.

7.4. Tournament system to VFP: DFW staff have been collecting catch and effort data at many CNMI fishing tournaments since the

early 1990's, but most of these data were summarized manually and not entered into a database system. A new VFP system is needed to capture all historical data as well as data for future tournaments. Although the data forms used by DFW over the years have varied considerably, it is hoped that a single standard form can be developed for future use and that all historical data can be retrofitted into this form without too much trouble or loss of data. Since different tournaments DFW staff sample have different rules and reporting requirements, it may be necessary to develop and use more than one standard data-collecting form.

7.5. Redesign and upgrade BPT and PPT systems: The current dBASE processing systems used to produce outputs for the Bottomfish and Pelagics Plan Team reports need to be completely redesigned to incorporate the new species coding and reporting systems being developed and improve the outputs available to team members for producing their reports. These processing systems will be upgraded and reprogrammed in VFP to process data in the new VFP commercial landings system, and if appropriate in the future, will add modules to analyze and summarize creel survey data, possibly including a Boat Estimator Model similar to Guam's if the offshore surveys are reinstated. A module to calculate and report SPRs for certain bottomfish may also be included once the research and monitoring systems provide the appropriate data.

7.6. Northern Islands Bottomfish System (NIBS) to VFP: The current dBASE system is adequate for the time being to input and process the voluntary logbook catch/effort data and the sampling size frequency data, but once other systems are reprogrammed into the VFP system NIBS will also need to be converted. As discussed under the "General" WPacFIN "Unsupported" section 2.3., there is also a need for additional programming to support SPR research. If it happens and if appropriate, NIBS may be modified to include modules for the research data as well as the northern islands commercial fisheries monitoring data.

7.7. Offshore creel survey to VFP: If the offshore creel survey data-collecting project is reinstated in the CNMI, there will be a need to redesign and reprogram the processing system into VFP to meet the new survey methodologies and the new processing environment standards. Assumably, the Guam and/or American Samoa systems could be used as a template for much of the system, thus reducing development time. Significant improvements would be programmed into the new system, including a boat-estimator module and ability to track and report charter boat activity as a separate stratum or fishing community.

7.8. Bottomfish size-frequency monitoring program: To properly monitor the entire bottomfish fishery, another sampling and processing system may be needed in addition to NIBS, which monitors only the northern islands commercial fishery. Bottomfish resources near the main populated islands are much more stressed and heavily fished than the northern island areas

so this is where localized overfishing may be occurring. If it is important to monitor this situation, additional sampling will be required.

7.9. Tuna transshipment system: For a few years in the past there was a very active tuna transshipment industry based in the Tinian harbor and DFW monitored its activity and processed the data on a dBASE system developed by Central WPacFIN. If this industry reappears, data collecting will need to be reinstated and a new VFP processing system designed and programmed. The PPT reporting system will also need to be modified to summarize and report on the transshipment activity.

7.10. Dealer and fisherman licensing system: DFW management has identified a need to formalize data-collecting and reporting requirements within the CNMI by passing legislation to license commercial fishermen and fish dealers and to require reporting from them. If this becomes a reality, a licensing system will need to be designed and programmed. Data produced by mandatory dealer reporting assumably would fit easily into the existing voluntary dealer reporting system, but if fisherman reporting becomes a reality new processing systems would need to be developed to handle this entirely new type of data. Depending on how the data-collecting systems and forms were implemented, a considerable effort could go into cross-linking and validating data, much like the efforts being done in Hawaii. However, based on preliminary review of draft proposed legislation for CNMI, massive changes in data systems and fisheries monitoring responsibilities and capabilities may be underway that may render most of the monitoring systems described above obsolete.

WPACFIN SYSTEM SUPPORT STAFFING SUMMARY

Figure 8 shows the staffing requirements of WPacFIN given the estimated time lines established in Figures 1-7. Each wide line represents one full-time person and each thin line is labeled with the fraction of a person expected to continue activities after major development efforts subside. It is important to note that these staffing levels do not include specific resources to work on about forty of the other known or expected needs for data-collecting and processing systems in the island agencies. Additionally, the time lines established in earlier figures are based on a centralized personnel pool located at the Central WPacFIN office to facilitate supervision, system design, coordination, standardization, and flexibility to adjust for changes in priorities and critical issues. It is also assumed that sufficient funds will be available for equipment, supplies, contracting, and travel to efficiently execute the planned projects identified in Figures 1-7, and that all participating agencies will continue to work with the Central WPacFIN staff in a concentrated, timely, and effective manner to

accomplish the goals of these many projects. As has been the case on many similar projects for the past 17 years, all participating agencies must continue to be willing and able to dedicate the needed staff to these projects and to work closely with the Central WPacFIN staff to implement appropriate data systems changes when needed. The track record of cooperation among participating WPacFIN agencies is excellent. It is believed that once all the major systems are developed and fully implemented, some of these positions could be moved to the island agencies to provide continuous on-site maintenance level programming support. If this happens, the FDCC Technical Subcommittee would need to be reestablished and begin having regular meetings to ensure proper coordination and standardization of data systems among the agencies, and these individuals, as a minimum, would become required members.

8.1. Central Operations, Coordination, Technical Support, and Data Management: Three of these four FTEs are the only NMFS permanent staff in the Central WPacFIN office. These positions have historically been funded by NMFS base funds and include the Program Manager (David Hamm), Senior Programmer (Michael Quach), and Fisheries Biologist (Bert Kikkawa). The major coordinating and support functions performed by these staff were described in various sections under Figure 1. The other FTE in this group is a JIMAR data processing clerk position to help with a very wide array of data management and support activities in the central office including everything from entering data and filling data requests to helping to produce volumes of FSWP. All of these positions are critical to the WPacFIN mission.

8.2. Website: One JIMAR programmer position is dedicated to developing the WPacFIN website which includes thousands of pages of information, fisheries statistics and graphs for all of the WPacFIN agencies. This website is becoming a vital part of providing on-line data access and documentation on data systems in Pacific island areas and it will continue to grow and meet data needs as long as fisheries management needs exist and this technology remains appropriate.

8.3. HL Data Management/Oracle, Data Entry/Processing: About 1.5 WPacFIN FTEs are involved with assisting in a wide variety of data processing and support functions for WPacFIN and the Laboratory as a whole. These include a data processing clerk and three student part-time data entry clerks. Support activities include data coding, quality control, and entry, file backups and management, maintaining file formats and documentation, xeroxing, faxing, scanning, flowcharting, developing schematics such as Figures 1-8 in this document, assisting with developing and formatting website graphics, helping Oracle teams with schematics, documentation, and simple table loading programs, and other miscellaneous jobs. These positions are essential for the Central WPacFIN staff and for most other HL investigations which produce, obtain, or use data.

8.4. Island Systems Support: This category includes all of the JIMAR programming staff working on data processing systems for island agencies. Essentially, 100% of their time is spent developing applications for island agency staff use in processing fisheries data they collect and submit to the Central WPacFIN system for archival and access. For HDAR, this includes two existing JIMAR programmers currently funded from the Central WPacFIN grants to UH, and one new programmer currently being hired by HDAR through RCUH to work with the Central WPacFIN staff. This new programmer is being hired using one-time internal HDAR funds to jump-start the Dealer Reporting System project as no WPacFIN resources were available to get this high priority project moving. Funds to cover this programmer's salary and expenses will be required from future WPacFIN allocations, either through HDAR to RCUH, or through Central WPacFIN to JIMAR. It is believed that once the major planned systems development efforts are completed, two full-time programmers will be needed indefinitely to support HDAR's needs. For DMWR and DAWR, currently planned projects require a minimum of one programmer for each agency for about the next 3 years, after which one programmer may be able to handle the maintenance and new project requirements for both agencies, depending, of course, on how these requirements change over time. The last existing Central WPacFIN programmer is being divided between the Guam DOC and CNMI DFW applications development requirements. Because of the current critical need at GDOC for an improved data system and the status of activities at DFW, this programmer is working on GDOC applications first. Since GDOC has only one major system to develop and they are currently functioning with a full complement of data processing staff, it seems prudent to dedicate this last existing programmer to developing the new Visual FoxPro processing system for GDOC before devoting resources to DFW's more numerous reprogramming projects.

SUMMARY REMARKS

This document describes the current status and needs of WPacFIN member agencies from the perspective of Central WPacFIN's responsibility to provide adequate technical support to develop and implement appropriate data-collecting and processing systems for each of the agencies. Our ability to properly manage local and federal fisheries in the Pacific Islands is highly dependent on our ability to properly monitor those fisheries, and our ability to properly monitor those fisheries is absolutely dependent on the quality of our data-collecting and processing systems which provide the needed information from which management decisions are made. It continues to be the principal goal of the Central WPacFIN program office to help island agencies develop, implement, and operate the best data-collecting and processing systems possible, given the resources available. All island nodes of the Western Pacific Fishery Information

Network are in the middle of a major reprogramming and upgrading project designed to improve their fisheries monitoring and managing capabilities to carry us successfully into the new century. This document has identified many upgrades and modifications which are planned and currently being worked on by the Central WPacFIN and island agencies, and it has also identified many other needs for which no resources are currently available. If we are going to meet our ever growing fishery management needs, it is critical that all WPacFIN member agencies continue to efficiently and effectively work together in a cooperative effort to enhance our fishery data-collecting and processing systems in the Pacific.

Figure 1

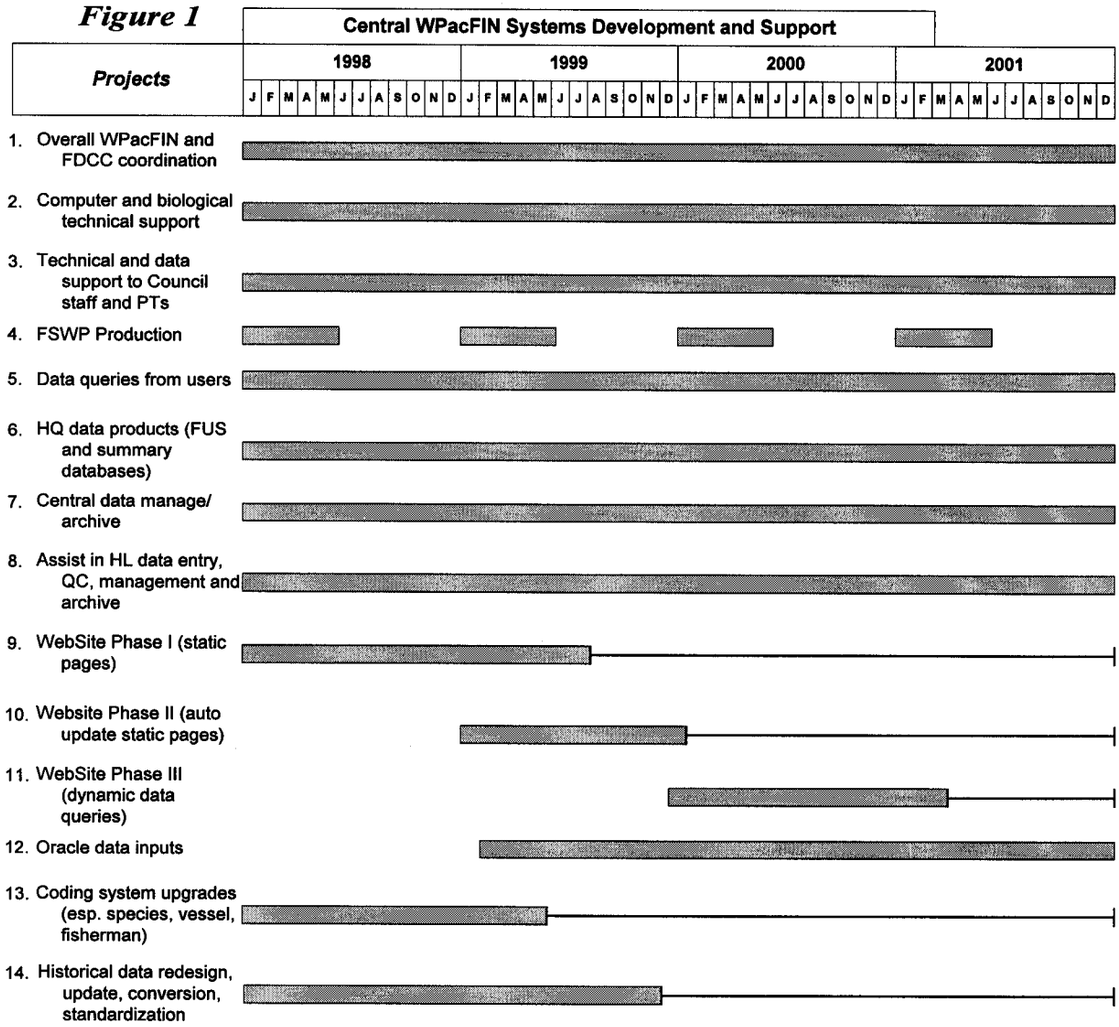
Central WPacFIN Systems Development and Support
Projects
1998
1999
2000
2001
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1. Overall WPacFIN and FDCC coordination
2. Computer and biological technical support
3. Technical and data support to Council staff and PTs
4. FSWP Production
5. Data queries from users
6. HQ data products (FUS and summary databases)
7. Central data manage/ archive
8. Assist in HL data entry, QC, management and archive
9. WebSite Phase I (static pages)
10. Website Phase II (auto update static pages)
11. WebSite Phase III (dynamic data queries)
12. Oracle data inputs
13. Coding system upgrades (esp. species, vessel, fisherman)
14. Historical data redesign, update, conversion, standardization

Figure 2

WPacFIN Possible but Unsupported Projects

Projects	**12 Months**												**12 Months**												**12 Months**											
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12

General (all or multiple island areas)

1. Coral Reef FMP Support Systems
2. PIAFA Support Systems
3. Bycatch, SPR Research Systems
4. Charter Boat Monitoring Systems
5. Expand to other Pacific Islands
   (e.g. Palmyra, military controlled, M.I., FSM, Palau)

HDAR

- BPT and PPT Reporting Modules
- Bottomfish Size Monitoring System
- Tournament Sampling System
- Recreational Survey Systems

DMWR

- Permit and Licensing System
- Estimated Commercial Landings from ASOCSS
- Tuna Transshipment System
- Shark Fin Monitoring System
- Manu'a Inshore Creel Survey System
- Tutuila Inshore Creel Survey System
- Bottomfish Size Monitoring System

DAWR

- Bottomfish Size Monitoring System
- Tournament Sampling System
- Convert Windows FP Systems to VFP
- Vessel Registration System

GDOC

- Shark Fin Monitoring System
- Purse seine monitoring
- Air to Air Transshipment

DFW

- Offshore Creel Survey System
- Bottomfish Size Monitoring System
- Tuna Transshipment System

Figure 3

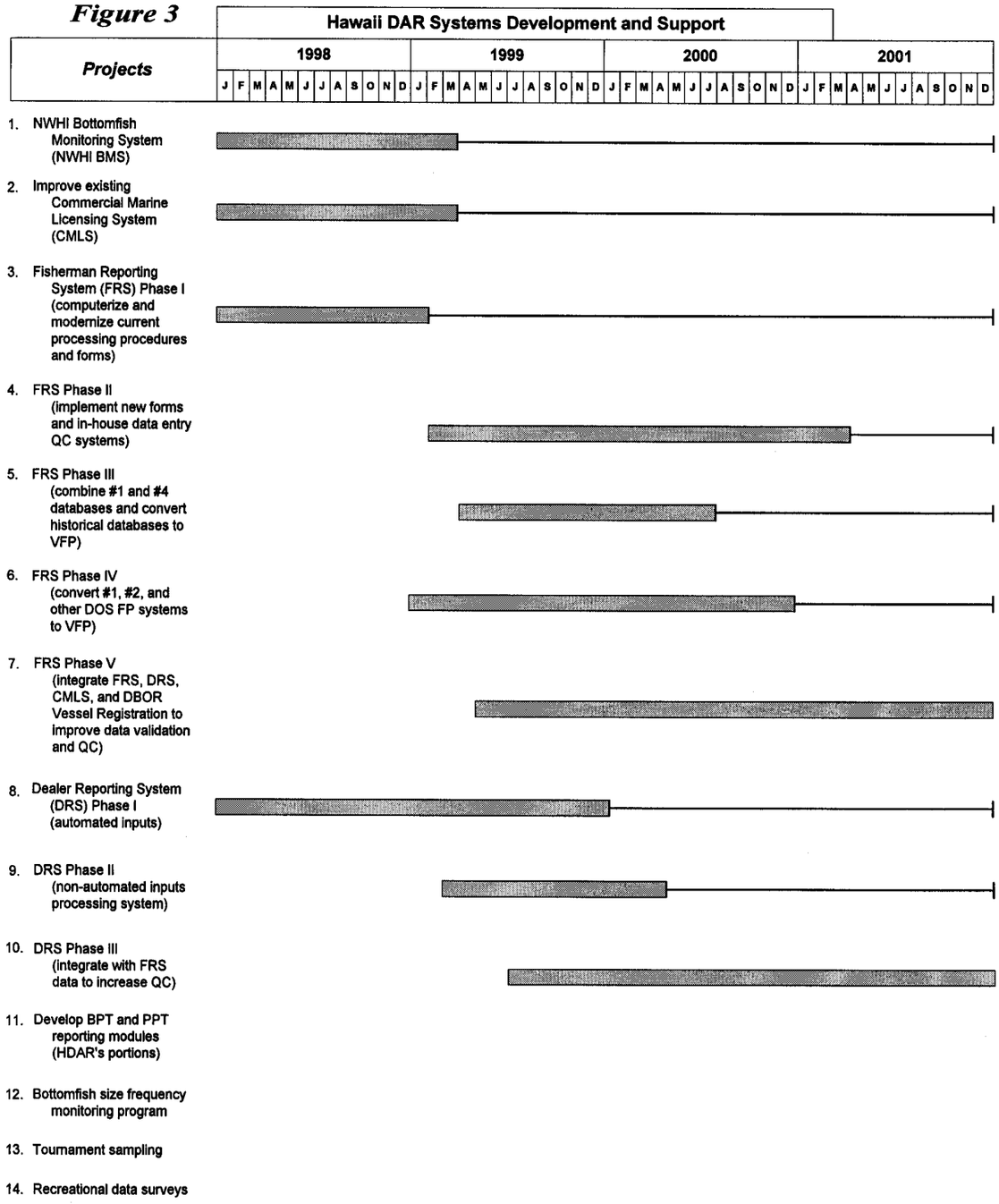
Hawaii DAR Systems Development and Support
Projects
1998
1999
2000
2001
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1. NWHI Bottomfish Monitoring System (NWHI BMS)
2. Improve existing Commercial Marine Licensing System (CMLS)
3. Fisherman Reporting System (FRS) Phase I (computerize and modernize current processing procedures and forms)
4. FRS Phase II (implement new forms and in-house data entry QC systems)
5. FRS Phase III (combine #1 and #4 databases and convert historical databases to VFP)
6. FRS Phase IV (convert #1, #2, and other DOS FP systems to VFP)
7. FRS Phase V (integrate FRS, DRS, CMLS, and DBOR Vessel Registration to improve data validation and QC)
8. Dealer Reporting System (DRS) Phase I (automated inputs)
9. DRS Phase II (non-automated inputs processing system)
10. DRS Phase III (integrate with FRS data to increase QC)
11. Develop BPT and PPT reporting modules (HDAR's portions)
12. Bottomfish size frequency monitoring program
13. Tournament sampling
14. Recreational data surveys

Figure 4

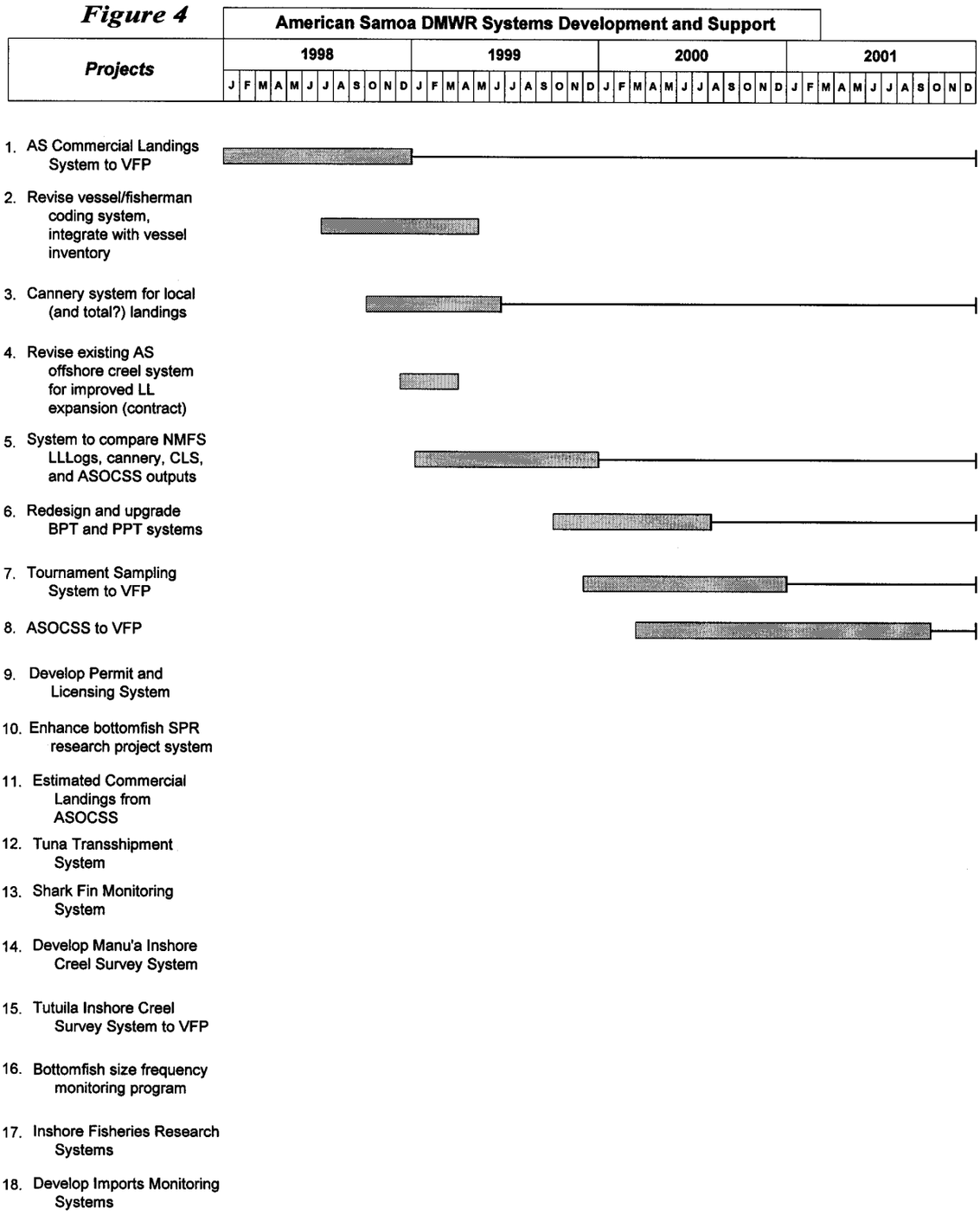
American Samoa DMWR Systems Development and Support
Projects
1998
1999
2000
2001
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1. AS Commercial Landings System to VFP
2. Revise vessel/fisherman coding system, integrate with vessel inventory
3. Cannery system for local (and total?) landings
4. Revise existing AS offshore creel system for improved LL expansion (contract)
5. System to compare NMFS LLLogs, cannery, CLS, and ASOCSS outputs
6. Redesign and upgrade BPT and PPT systems
7. Tournament Sampling System to VFP
8. ASOCSS to VFP
9. Develop Permit and Licensing System
10. Enhance bottomfish SPR research project system
11. Estimated Commercial Landings from ASOCSS
12. Tuna Transshipment System
13. Shark Fin Monitoring System
14. Develop Manu'a Inshore Creel Survey System
15. Tutuila Inshore Creel Survey System to VFP
16. Bottomfish size frequency monitoring program
17. Inshore Fisheries Research Systems
18. Develop Imports Monitoring Systems

Figure 5

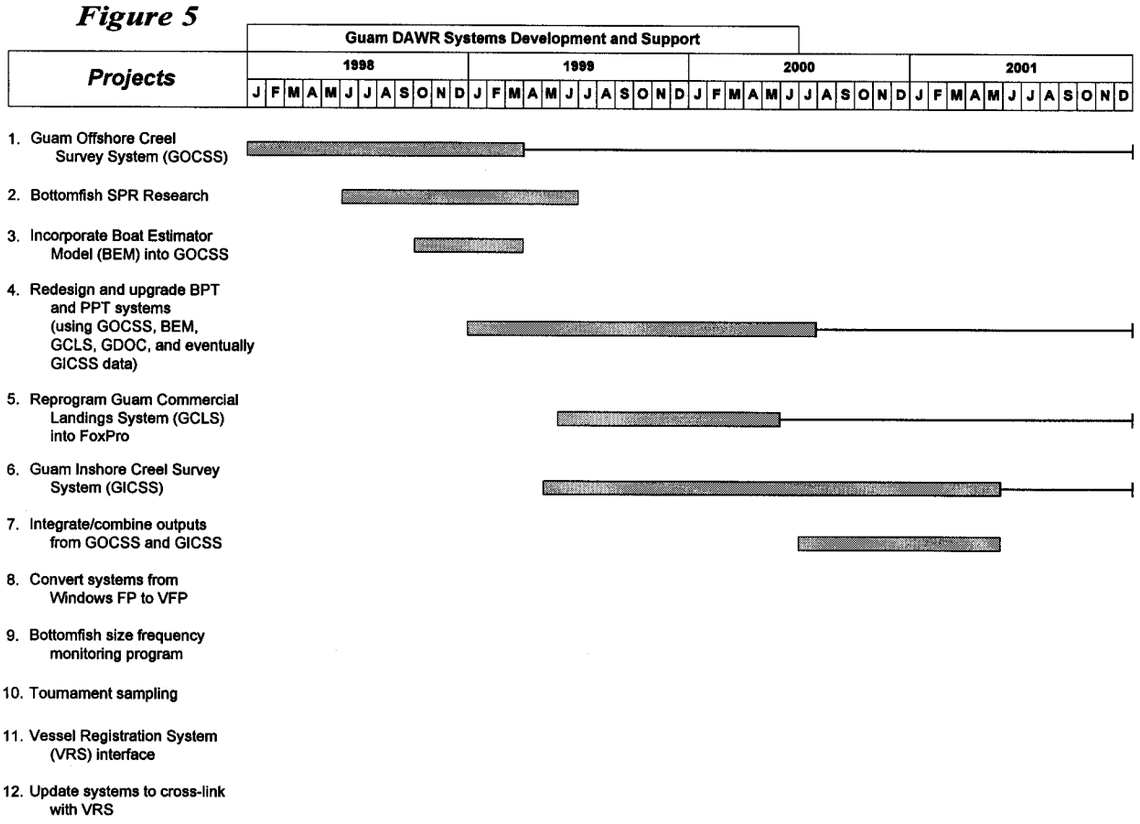

Figure 6

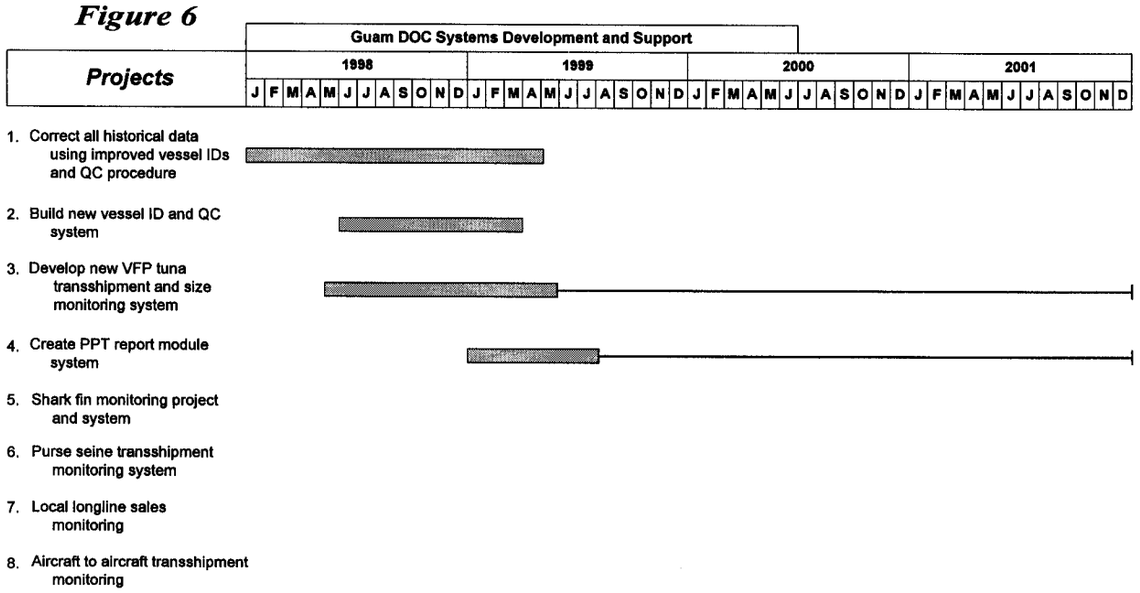

Figure 7

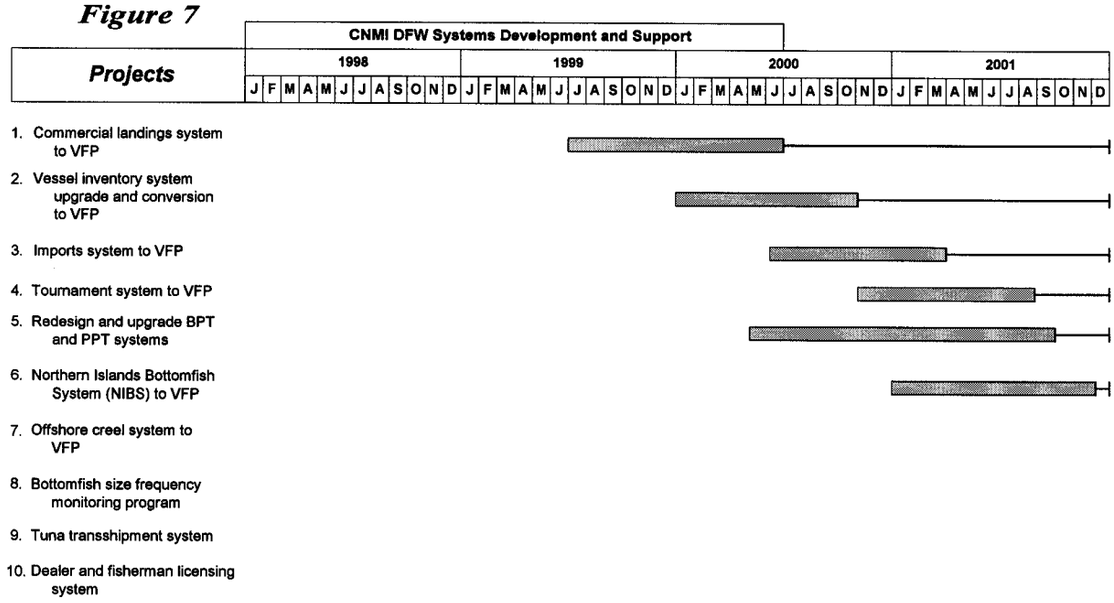

Figure 8