CHRIS

Coastal Habitat Resources Information System

Establishment of a Coastal Habitat Resources Information System (CHRIS) for Queensland

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Department of Primary Industries

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Project 95/167

ISSN 0727-6273

Agdex 475/041

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OBJECTIVES:

- In collaboration with major users, to establish a spatial information system (GIS) to integrate existing diverse fisheries habitat and marine and relevant estuarine environmental data sets (including tidal vegetation, "critical" habitats, protected area and closed waters boundaries) with baseline cadastral and topographic / bathymetric data held by government agencies (including relevant historical coastal development site impact information) to allow monitoring of the condition and trend of coastal fisheries habitats.

- To establish appropriate data exchange links to the Queensland Fisheries Management Authority's QFISH information system (commercial and recreational catch and effort data) and to other QDPI/QDNR land resources information systems to facilitate modelling of habitat - fisheries resources interactions under various change scenarios.

- To develop appropriate user interfaces and establish appropriate network links to the system to allow rapid access Statewide and from interstate / internationally by fisheries managers, researchers, the fishing industry and the public.

SUMMARY:

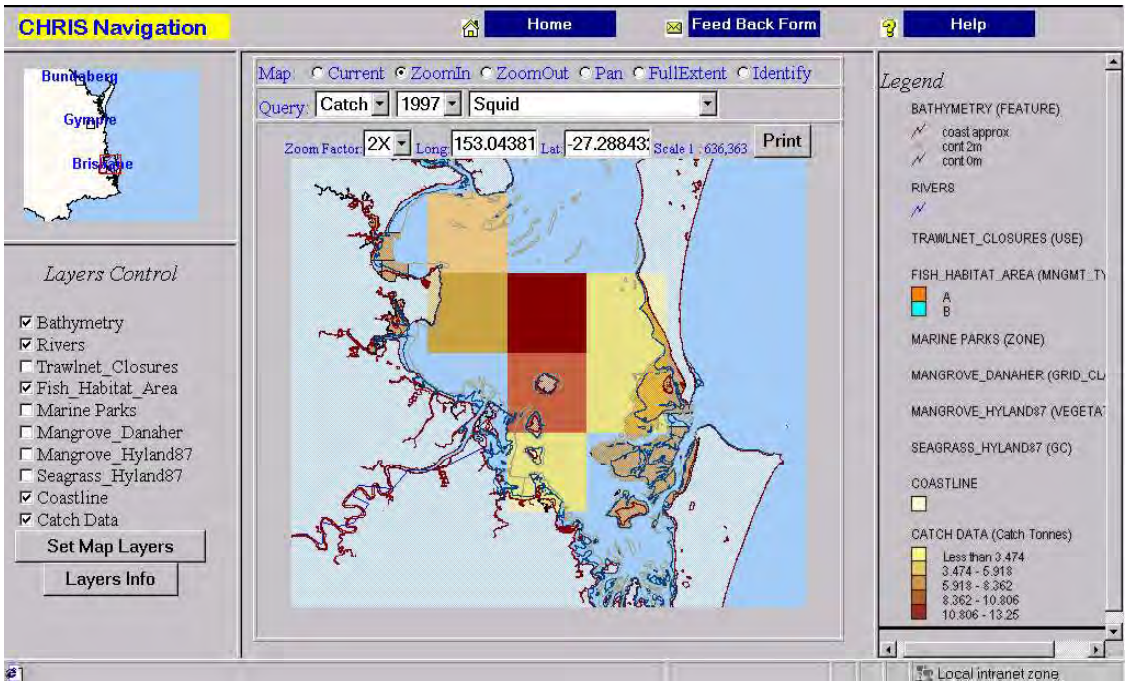
Objective 1 More than 100 key datasets relevant to coastal habitat management and for monitoring the condition and trend of fisheries habitats in Queensland have been integrated into the Coastal Habitat Resources Information System (CHRIS) during this establishment phase.

Design of this geographic information system (GIS) framework has benefited from extensive consultation with habitat and fisheries managers with legislative responsibilities and interests in the coastal zone as well as GIS professionals from Queensland and Commonwealth Government agencies. With a focus on pilot areas of the Moreton Bay region and the Wet Tropics coast in this establishment phase, CHRIS brings together mapping data from a variety of sources on coastal wetland vegetation, habitat disturbance, protected areas, and fisheries closures together with available coastal bathymetry and commercial and recreational fisheries catch and effort information. Spatial data available includes baseline habitat datasets not previously available in digital form and created

during the project (eg. Moreton Region Biological Resources Survey 1973-75; and seagrass distribution in southern Moreton Bay 1996 and Great Sandy Straits 1992-1993). Data sets are accessible in a standard GIS format (shapefiles) and associated metadata is available in Blue Pages format. Many relevant coastal datasets for which other agencies are custodians have been brought together in CHRIS. Researchers have enhanced access to basic data, facilitating modelling of interactions between fisheries productivity and habitat.

Objective 2 Catch and effort information from Queensland's commercial and, in less detail, recreational fisheries is available in CHRIS from regular downloads of data from the Queensland Fisheries Management Authority's QFISH system. Land resource information (including sugar cane assignments and agricultural land use) from the Department of Natural Resources Sugar Land Information System is also available but is not regularly updated. Modifications to DPI Fisheries marine plant disturbance and aquaculture licencing database to include geographical referencing are currently being implemented at the suggestion of the CHRIS team. Real time links to this database could be established in te future through the CHRIS web interface, subject to the needs of fisheries managers and researchers.

Objective 3 Selected data sets in CHRIS are available to Queensland fisheries habitat managers and researchers on the Department's wide area network (DPINet) through a web browser interface (developed using ESRI's MapObjects® software). Various habitat and fisheries data sets can be viewed together in a desktop window, thematic maps printed or saved and data sets accessed and downloaded for more detailed local spatial analysis by managers and researchers. Development of this interface took longer than anticipated and more extensive trialling on the DPI Intranet is being conducted during 1999. During 2000, it is proposed to make this web interface available through the DPI Internet site to allow public access to selected CHRIS data.



CHRIS represents an important resource centre for coastal fish habitat managers and fisheries researchers in Queensland. The future focus of the CHRIS beyond this establishment phase will be implementation across Queensland's fisheries agencies and broader fishing industry and community client groups, the selective inclusion of additional data sets in response to researcher's and manager's needs and the further development and enhancement of the simple analytical tools currently provided to solve identified spatial problems.

KEYWORDS: fish habitat, fisheries, coastal management, spatial information systems, GIS, web mapping.

3 Background

The genesis of the Coastal Habitat Resources Information System (CHRIS) project was a meeting of major Queensland fisheries stakeholders and technology experts in June 1990. Subsequent to this meeting, a project team reviewed and reported on existing fisheries habitat data sets, the capabilities and limitations of existing software and hardware technologies and the likely cost of implementing a major system (Dunning, 1990). Due to funding constraints and the fact that some enabling technologies were still emerging and not mature at that time, the proposal was not immediately implemented.

Fisheries Group of the Department of Primary Industries, Queensland, has an ongoing programme of Statewide fisheries habitat data collection, particularly in relation to inventories and mapping of coastal wetlands, mangrove and seagrass communities. This data collection supports the management of fish habitat undertaken by DPI as one of its responsibilities under the *Fisheries Act 1994*. Completed projects include mapping of the tidal wetlands of Great Sandy Straits (Dredge Kirkman and Potter 1977), Moreton Bay (Hyland and Butler 1989; Danaher and Luck 1990; 1991), Cape York (Danaher 1995a; Danaher and Stevens 1995), the Burdekin region (Danaher 1995b), Edgecumbe Bay (Bruinsma *et al* 1999), the Narrows (Danaher *et al.* 1999) and the Fitzroy estuary (Bruinsma and Danaher, 1999). Approximately 70% of the coastal wetland vegetation has been mapped to date and the entire Queensland coastline is planned to be completed by 2001. Intertidal and deeper water seagrass surveys in many areas of the Great Barrier Reef region and southern Queensland have also been completed (Lee Long *et al.* 1993; Coles *et al*. 1997; Hyland Courtney and Butler 1989; McLennan and Sumpton 1997).

All recent mapping (since the late 1980s) has been undertaken using methods allowing rapid incorporation of data into a spatial information system and indeed, the Cape York coastal wetland mapping data has been incorporated into the Cape York Peninsula Land Use Strategy's GIS (McColm *et al*, 1992) and information on sediment characteristics collected during Great Barrier Reef seagrass mapping by Northern Fisheries Centre scientists has been included in AUSEABED (Jenkins 1999).

Industry standard, "off the shelf" spatial information system (GIS) packages have advanced since 1990 and since the mid 1990's have incorporated capabilities required for CHRIS, i.e., they can incorporate data in a wide variety of forms (including raster based data such as remotely sensed imagery and vector based data such as cadastral [land tenure boundary] information). They have sophisticated in-built programming and modelling capabilities, integrate seamlessly with relational database management systems and have improved user interface development capabilities including the developing facility for enabling GIS through networks including the Internet (world wide web).

On the basis of these technology developments and the extensive expertise available in the Department to support spatial information system development, it was considered appropriate to seek supporting funding from the FRDC in 1995 for the establishment of a fisheries habitat information system (CHRIS) for Queensland.

4 Need

The commercial fishing industry in Queensland produces seafood valued at approximately $700 million at retail outlets annually and employs 5,700 people in the catching sector alone. It has been estimated that an additional 14,000 jobs are provided statewide in associated service and marketing sectors.

A recent survey indicated that 74.8% of Queenslanders have participated at some time in recreational fishing with 26.1% fishing during 1998 (Roy Morgan Research, 1999). It was estimated that these anglers together spent more about $400 million in this pursuit (Williams, 1997). Catches taken by recreational anglers are likely to exceed the commercial catch for some inshore fish species.

Commercial and recreational fishers recognize that most of their target species rely on the coastal zone to provide nutrient input, nursery and adult habitats. They also recognize that wise coastal management is essential to sustain these renewable fisheries resources.

Extensive but generally fragmentary information currently exists on the fisheries resources of coastal Queensland and the habitats which support fisheries production. An increasing level of usage and management information is also accumulating. These data exist in a diversity of locations and in various forms and could be more efficiently used for fisheries and fish habitat research and management if integrated.

The Department of Primary Industries is under increasing pressure from recreational and commercial fishers, from conservation groups and from other Government planning agencies (e.g., Office of State Development, Environmental Protection Agency, Department of Housing, Local Government and Planning, GBRMPA) to enhance its existing information base in relation to coastal fisheries resources and fish habitats and make this information more accessible. Managers within DPI are increasingly being challenged by the need to adequately and quantitatively assess the impacts on fisheries of coastal development proposals ranging from integrated resort proposals to municipal and agricultural drainage works in the coastal zone. The need for enhancement in the Queensland Government's delivery of many habitat management and research functions has been highlighted in the State Government Inquiry into Recreational Fishing (Anonymous, 1993). These tasks would be greatly facilitated by an easily accessible, enhanced information base.

A comprehensive, integrated spatial information system is urgently needed to accommodate existing resource and usage data and any new information resulting from ongoing coastal fisheries resource and fisheries habitat studies. The system would be used to produce map outputs on a local, regional or Statewide level of important fisheries habitat resources, allow the coordinated monitoring and reporting on a regular basis of the condition of fisheries habitats, provide managers with the information to allow assessment of known habitat values on and adjacent to proposed development sites as well as historical development approval information. In addition, the system will facilitate rapid identification and assessment of areas requiring protection through Fish Habitat Area declaration. By making data on the characteristics of fish habitats and of fish catches more readily available, CHRIS would also facilitate modelling of the impacts of habitat changes on fisheries productivity.

5 Methods

The information system has been developed using the industry and Queensland Government standard software platforms, ESRI ARC/ INFO and ArcView running on a Unix and ArcView / Avenue in the Microsoft Windows 95/NT environment on desktop PC workstations. Interface development has used ArcView / Avenue and ESRI's MapObjects together with Microsoft Visual Basic. Intranet (and in the future, Internet) read-only access to maps and information from CHRIS is provided through development of World Wide Web home pages using Hypertext Markup Language (HTML). At all stages, software development sought to comply with appropriate departmental standards for software quality management. Documentation of all design and development phases of the project was undertaken.

The project was divided into discrete components:

- Project initiation including recruitment, hardware and software familiarization.

- User needs analysis phase including workshops with key users held as soon as project staff have been familiarized with the broad project concept.

- Concept design phase including investigation of appropriate links to other relational databases and spatial information systems. This included partitioning up software development into smaller modules to facilitate quicker and more efficient testing and error checking. This phase involved close liaison with other agencies locally and interstate (e.g. QDoE, CSIRO, GBRMPA, ERIN, AIMS).

- Detailed data evaluation, acquisition and conversion phase (for non-digital and non-spatial datasets) running in parallel with the concept / detailed design phases.

- Detailed design phase including the implementation of a standard file storage format and development of a directory structure.

- Incorporating selected data from pilot study areas (Moreton Region and to a much lesser extent, the Wet Tropics Coast) into CHRIS

- Development of appropriate user interfaces to the system involving key users to facilitate on-line links to key external data sets and to CHRIS through the Internet.

- Testing of the system involving selected users.

- Development of appropriate documentation describing the key functionality of the system and describing its user interfaces for both interrogation, analysis and possible future data entry.

- Implementation throughout Queensland's fisheries agencies, initially through the DPI Intranet and progressively to a broader range of users including the fishing industry through the Internet.

6 Results

6.1 Objective 1: In collaboration with major users, to establish a spatial information system (GIS) to integrate existing diverse fisheries habitat and marine and relevant estuarine environmental data sets (including tidal vegetation, "critical" habitats, protected area and closed waters boundaries) with baseline cadastral and topographic / bathymetric data held by government agencies (including relevant historical coastal development site impact information) to allow monitoring of the condition and trend of coastal fisheries habitats.

6.1.1 CHRIS Concept Design:

In preparing the proposal to the FRDC in 1994 for the establishment phase of CHRIS and a previous proposal to develop a coastal zone information system (Dunning, 1990), a range of Queensland fisheries research, management and industry stakeholders were consulted on existing and likely future needs for improved access to a range of fish habitat and fisheries resources information. The preliminary user needs assessment formed the basis for a concept design and this was more clearly defined during the preliminary phases of this project.

CHRIS has been designed:

- To accommodate existing fisheries habitat resource and usage data and any new information resulting from ongoing coastal fisheries resource and fisheries habitat studies.
- To produce map outputs on a local, regional or Statewide level of important fisheries habitat resources and usage.
- To allow the coordinated monitoring and reporting on a regular basis of the condition of fisheries habitats.
- To provide managers with the information to make more efficient their assessment of known fisheries habitat values on and adjacent to proposed development sites as well as historical development approval information. This may include links to adjacent land use data systems (e.g. sugar and agricultural land information, Digital Cadastral DataBase for tenure, native title claim areas, marine park zones and Local Government Zoning Strategic Plans)
- To facilitate rapid identification and assessment of areas requiring protection through Fish Habitat Area declaration.
- To facilitate modelling of the impacts of habitat changes on fisheries productivity.
- To not duplicate but provide links to other coastal habitat and fisheries information sources.

Major CHRIS clients will be:

- DPI Fisheries habitat resource managers and researchers (e.g. Marine Habitat Unit and regional centres)
- DPI Fisheries Resource Condition and Trend Unit
- DPI Fisheries senior managers

- Queensland Fish Management Authority fisheries managers
- Other agencies with coastal management responsibilities and interests (e.g. EPA, GBRMPA, local governments)
- Fishing industry groups (e.g. Queensland Commercial Fishermen's Organisation and Sunfish)
- Other researchers (e.g. universities, AIMS, CSIRO, CRCs)
- General public (e.g. students and community groups)

CHRIS:

- Will act as a resource centre for a collection of individual databases, data sets and inventories
- Will provide links by appropriate methods to other databases, data sets and inventories (e.g. QFMA's (now Queensland Fisheries Service, DPI) QFISH catch and effort databases, the DPI Fisheries Marine Plant and Aquaculture Licensing DataBase System [LDBS])
- Databases will include published results of fisheries research projects (e.g. coastal fisheries resources and catchment surveys).
- Data sets will include base information - legislative and administrative boundaries (e.g. Fish Habitat Area boundaries, fisheries closures, marine park zones), natural environment (e.g. marine vegetation), human environment (e.g. boat ramps).
- Inventories will include metadata on fisheries research data and base information, fisheries research projects, relevant projects of other organisations, other fisheries related information.

6.1.2 Confirmation of user needs and refinement of the CHRIS GIS design:

6.1.2.1 DPI Fisheries staff consultations Statewide

Input to the design phase was sought from a broad range of QDPI Fisheries staff in Brisbane and regional centres (reflecting the needs of broader fishing industry clients across the State) was sought through the following specific presentations given by the CHRIS project team:

- a meeting of DPI fisheries habitat managers in Brisbane 1-2 July 1996,
- the Habitat Condition and Trend Indicators Workshop (Brisbane) on 29 January 1997,
- a visit to the Southern Fisheries Centre (Deception Bay, southern Queensland) on 13 February 1997,
- the Fish Habitat Workshop (Brisbane) on 5-6 March 1997,
- the Fisheries Staff Habitat Workshop (Maleny, southern Queensland) 9-11 April 1997,
- a visit to the Northern Fisheries Centre (Cairns) on 19-20 May 1997.

At these workshops and in other face-to-face consultations, a preliminary CHRIS Concept Design was presented to major potential users of CHRIS - officers within QDPI fisheries involved with habitat policy, management, fisheries research and enforcement / compliance and officers of other agencies involved in providing coastal planning advice or GIS support. Below is a summary of the main issues highlighted to June 1997 as responses categorized by user groups. Detailed comments provided at some of these consultations, summarized as 'Contributions to CHRIS', 'Wants from CHRIS' and 'Concerns with CHRIS' are included in Appendix 1.

DPI Fisheries habitat managers and fisheries researchers (e.g. Marine Habitat Unit in Brisbane, Habitat Management Units and researchers at Northern Fisheries Centre, Southern Fisheries Centre, Fisheries Rockhampton, Bundaberg, Mackay)

- fisheries habitat information - local, regional (e.g. vegetation type, substrate type)
- fisheries administrative boundaries (e.g. Fish Habitat Areas, closures, fishing boundaries and zones, ZAC boundaries)
- links to Licensing Data Base System (LDBS) and Document Management System
- licensing information (e.g. location of permits issued, links to grounds for refusal/permission of permits)
- Queensland Boating and Fisheries Patrol / DPI marine plant permit inspection monitoring
- DPI research information e.g. habitat mapping, fisheries resource 'mapping'
- other organisations' research information (e.g. Australian Institute of Marine Science (AIMS), CSIRO, Ports Corporation of Queensland, Port of Brisbane)
- location and status of current and proposed fisheries research
- Date and location of Environmental Impact Statements, draft Terms of Reference, Environmental Management Plans, River Improvement Trusts
- local authority development control plans and strategic plans
- lease expiry dates of vacant crown land
- links to fish stocking data base, translocation
- location of fish kills and noxious fish reports
- base information on other administrative boundaries (e.g. tenure - owner, boundary, tenure type {DCDB}, marine park zones, port land boundaries, mining leases)
- base information from the human environment (e.g. landuse, location of boat ramps, stream barriers / fishways, runnelled areas, levee banks, sand and gravel extraction, dredging, spoil disposal, sewage treatment plants, developments)
- base information from the natural environment (e.g. catchment boundaries, biogeographic zones, terrain (drainage, elevation, tidal limits), location of flood plains/freshwater habitats, acid sulphate soils)
- access to rectified colour aerial photography and satellite imagery
- facility to create maps

DPI Fisheries senior managers

- overview maps on fisheries habitat and fisheries administrative boundaries
- summary information on habitat condition and trend
- location and status of current and proposed fisheries research
- access to detail available if required

Queensland Fisheries Management Authority (QFMA) (Now QFS DPI) fisheries managers

- facility to create maps (e.g. fish catch and effort information, links to QFISH in real time via vessel tracking, administrative boundaries)
- resource information for Management Advisory Committees and Zonal Advisory Committees (MACS and ZACS) (e.g. habitats for fish, 'conservation values', inventories and changes)
- summary information on habitat condition and trend

DPI Fisheries Resource Condition and Trend Unit

- habitat information for reporting e.g. annual statistics (Condition and Trend reports), State of the Environment reports (Queensland and Commonwealth)
- detailed habitat information to link to fish abundance data to determine preferred habitats and fisheries values
- temporal habitat change information to link to climate change and disturbances of various scales (e.g. vegetation clearing, cyclones, floods, fire)
- prediction of impacts of habitat change on fisheries resources

Other government agencies with coastal management responsibilities (e.g. Environmental Protection Agency[1]), and the fishing industry (e.g. Sunfish, Queensland Commercial Fishermen's Organisation)

- fisheries habitat information at various levels of detail/interpretation
- fisheries administrative boundaries (e.g. Fish Habitat Areas, closures)
- location and status of current and proposed fisheries research

Other researchers (e.g. universities)

- habitat information - local, regional
- location and status of current and proposed fisheries research
- fisheries administrative boundaries (e.g. FHA, closures)
- DPI research information e.g. habitat mapping, fisheries resource 'mapping'
- resource information (e.g. habitats for fish, 'conservation values', inventories and changes)
- facility to create maps (e.g. fish catch and effort information, links to QFISH in real time via vessel tracking, administrative boundaries)

General public (e.g. students, conservation groups)

- habitat information - local, regional
- fisheries administrative boundaries (e.g. FHA, closures)
- summary information on habitat condition and trend
- general habitat and fisheries resource statistics.

6.1.2.2 Consultation with GIS practitioners in other agencies

Direct contact was made by the CHRIS project team with individuals representing a range of other agencies with Queensland coastal interests and responsibilities as well as GIS expertise including:

- Wet Tropics Management Authority (Terry Webb and Brian Taylor - Cairns),

[1] The Environmental Protection Agency, Queensland was formed in 1999 and may be referred to elsewhere in this document under its previous names of Department of Environment and Heritage (DEH) and Department of Environment (DOE or QDOE).

- Cape York Peninsula Land Use Strategy- CYPLUS (Les Searle - Cairns; Graham McColm - Brisbane),
- Queensland Department of Local Government and Planning (Rachel Macrae, Peter Hoffenberg - Brisbane)
- Queensland Department of Environment (Munroe Mortimer, Ben Hatton, Steve Jones, Tim Stevens – Brisbane; Mark Connell - Marine Parks, Cairns; Jon Day - Marine Parks, Townsville; Gavin Blackman and Sue Gardiner - Wetlands Unit, Townsville),
- Queensland Department of Transport, Maritime Division (Wayne Bagnell - Brisbane)
- Queensland Fisheries Management Authority (Cameron Baker, Todd Kelly, Jim Higgs, Jeff Bibby),
- Department of Natural Resources - Sugar Land Information System (Donna Smith and Mike Grundy - Resource Sciences Centre, Indooroopilly); Queensland Acid Sulphate Soils Investigation Team (QASSIT) (Bernie Powell - Indooroopilly),
- Great Barrier Reef Marine Park Authority (Jeff Shearin, Jamie Storrie - Townsville),
- Environmental Resources Information Network, Environment Australia (Steve Blake - Canberra)
- Australian Institute of Marine Science (Mike Cappo, Hugh Sweetman, William Skirving, Terry Done - Townsville),
- Bureau of Resource Sciences (Chris O'Brien, Phil Stewart - Canberra)
- CSIRO Marine Research (Tom Tarranto, Ian McLeod – Cleveland)

Details of these consultations are included in Appendix 2.

The final concept design resulting from consultations with major users and staff of other agencies is shown in Figure 6-1.

Coastal Habitat Resources Information System (CHRIS) Concept Design

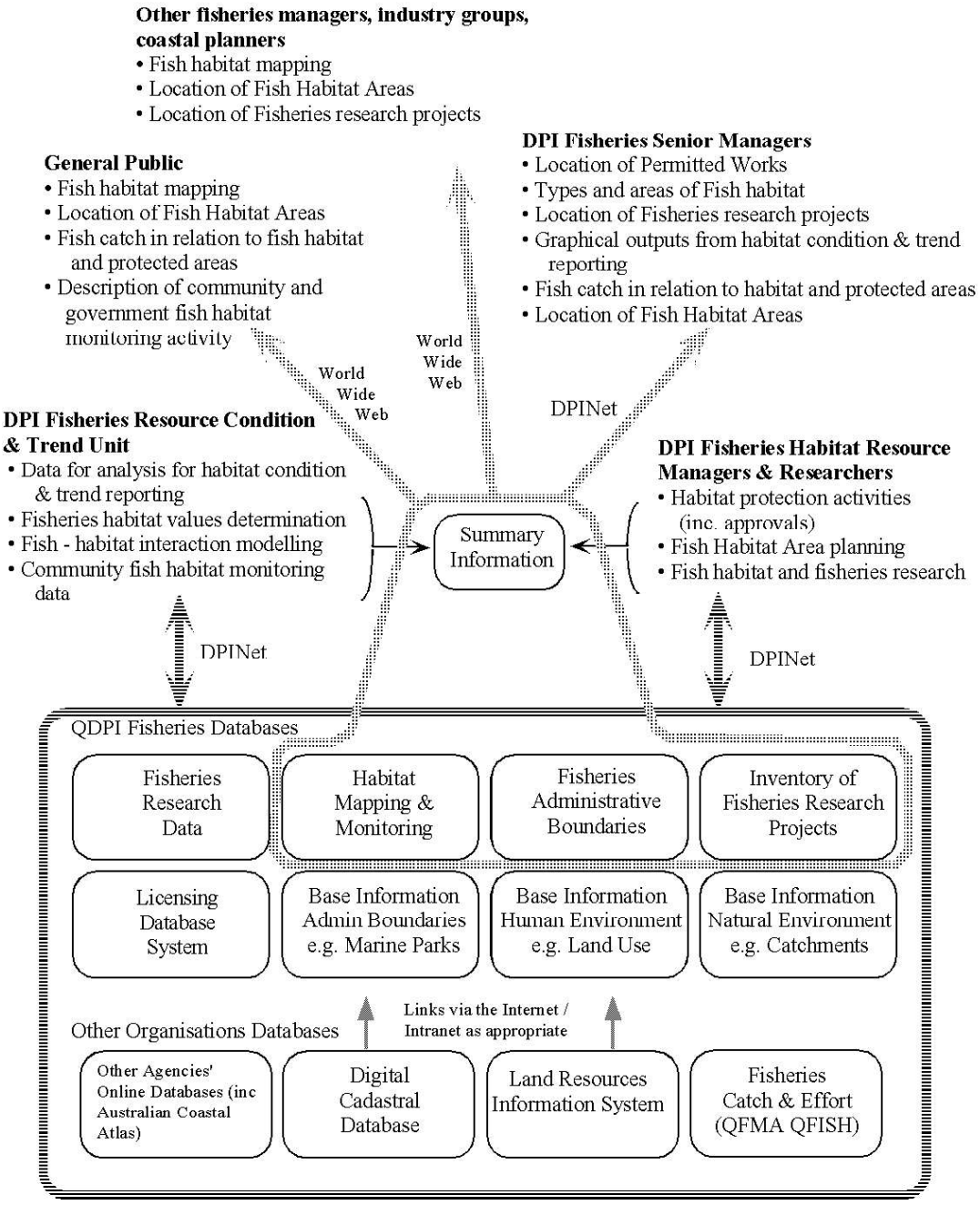


Figure 6-1 *CHRIS concept design*

6.1.3 CHRIS GIS and data management

A "GIS" can be considered as a computer-based system for the input, editting, analysis, storage and output of geographical (or spatial) information. To operateir requires computer hardware, software and specialist staff. CHRIS has been developed in the ARC/INFO and ArcView software environment and exists as a structural framework rather than a single "project" file or spatial database. Access to CHRIS is through DPINet, the Department of Primary Industries statewide TCP/IP network with future links through the Department's Internet gateway. ArcView projects have been developed for specific evaluation and demonstration purposes as part of the CHRIS establishment phase and individual users with access to desktop GIS software (such as ArcView or MapInfo) are able to readily create their own project files with selected CHRIS shapefiles or access CHRIS through the web interface (see Section 6.3).

CHRIS data are stored on a Departmental Unix file server (a Silicon Graphics Challenge S workstation - squire.dpi.qld.gov.au) in industry standard ESRI ARCINFO export format (.e00 files) and ArcView shapefiles (ESRI, 1998). "Readme" files containing additional descriptive information where appropriate are stored with the spatial data files in addition to information recorded in Blue Pages metadata. Master copies of all data sets are stored offline on CD-ROM while online data and output products from the system are routinely backed-up and archived according to standard Departmental procedures.

The basic guidelines for CHRIS data management are that:

- The CHRIS data manager is responsible for assessing and documenting the accuracy and integrity of spatial and aspatial datasets included in CHRIS;
- Each individual dataset held in CHRIS has associated metadata (information describing the data) in a standard accessible format, preferably provided by the custodian;
- Each individual database, dataset and inventory will have a clearly identified custodian to allocate access to the data by third parties;
- DPI custodians (e.g. regional researchers or managers) are likely to be the creators of the spatial data and will be responsible for the accuracy and integrity of their data and for updating data as appropriate.
- The CHRIS data manager is responsible for updating third party data when available, for negotiating access and licencing conditions and obtaining additional third party data sets requested by users.
- The CHRIS data manager will ensure that owners/custodians approval has been given for the display of any datasets publically (on the Internet) and required acknowledgement is provided through the CHRIS web interface.

The Blue Pages metadata format (Australian Oceanographic Data Centre [AODC] / Environmental Resources Information Network [ERIN] 1996; AODC 1999) has been chosen as the standard for CHRIS and is being used also in the Australian Coastal Atlas project (ERIN 1997; 1999). This standard has been promoted by the Marine Data Group of the Commonwealth Heads of Marine Agencies.

The amount of work required entering and maintaining metadata in this format is kept to a minimum while this format is still able to accommodate a wide range of data types. Users of the web interface to CHRIS are able to view and search CHRIS metadata stored in a Microsoft Access database through an html form. Many of the datasets incorporated into CHRIS have come from their custodians without compatible (or any) metadata. Where necessary, this has subsequently been created by the CHRIS team and metadata authorship noted in the appropriate Blue Pages field.

The metadata stored for datasets in CHRIS includes:

- the name of the dataset;
- the collecting agency and the person or position responsible for the dataset (custodian);
- the currency of the data (i.e. when it was collected);
- the type of data and methods used to collect it;
- the format of the digital data (file types);
- the geographical location of the dataset and the bounding rectangle coordinates (latitude and longitude);
- any restrictions on the use of the data;
- a set of search keywords that describe the dataset;
- an abstract (or comment) field where details about the data set such as any assumptions that underlie the use of the data is stored (AODC, 1999).

The MS Access data entry software distributed freely by AODC has been provided to regional DPI Fisheries offices by the CHRIS team to encourage them to use this method for entering and managing metadata associated with any spatial datasets (and non-spatial) datasets they are creating. An example of metadata for one of the CHRIS datasets (Coastal Wetlands of the Fitzroy River) is shown in Appendix 3.

6.1.4 CHRIS datasets and data structure

Datasets incorporated in CHRIS primarily for the pilot areas of Moreton Bay and, to a much lesser extent, the Wet Tropics coast as at October 1999 are listed in Table 6.1 below. While many data sets have been obtained from other sources, the CHRIS team has created several key spatial data sets which were not previously available digitally (noted in the table with a #) and have been used during the establishment phase for producing outputs from the system, eg. changes in seagrass distribution in southern Moreton Bay used for condition and trend analysis; mapping of the relative distribution of recreational fishing effort by home region (Zeller 1998). Data integrated during this establishment phase include coastal vegetation mapping data, protected area and closed waters boundaries together with baseline cadastral and topographic / bathymetric data held by government agencies.

The structural arrangement of information in CHRIS is shown in Figure 6-2. This schema has been designed to accommodate the categories of data identified by potential CHRIS users as important, both in the current establishment phase and as the system is expanded in the future.

Table 6-1 ***Data sets available in CHRIS, October 1999.***

Custodian	Spatial Data
Queensland Department of Primary Industries Fisheries Resource Condition and Trend Unit	Burdekin River coastal wetland vegetation
	Cape York coastal wetland vegetation
	Cape York Peninsula coastal wetland vegetation
	Coastal Wetlands of the Fitzroy River
	Curtis Coast coastal wetland vegetation
	Deception Bay Fish Habitat Area (Outer Boundary) - FHA-013
	Fish Habitat and Wetland Reserves 1993 (since regazetted as FHAs)
	Fisheries closures in Moreton Bay (net) #
	Fisheries closures in Moreton Bay (trawl) #
	Hays Inlet - Fish Habitat Area (Outer Boundary) - FHA-012
	Kippa-ring - Fish Habitat (Outer Boundary) - FHA-014
	Mackay coastal wetland vegetation
	Mangroves and Saltmarshs - Moreton Bay 1987
	Moreton Region Biological Resource Survey 1974 #
	Condamine River vegetation and adjacent land use, 1958-91
	Commercial fisheries catch and effort data 1988-1998 by grid and site
	Moreton Banks Fish Habitat Area (Outer Boundary) - FHA-015
	Peel Island - Fish Habitat Area (Outer boundary) - FHA-010
	Pumicestone Channel - Fish Habitat Area (Outer boundary) - FHA-011
	Queensland Fisheries Management Authority (QFMA) Zonal Advisory Committee Area Boundaries #
	Repulse Bay coastal wetland vegetation
	Seagrass areas- Gold Coast Broadwater 1995 #
	Seagrass areas - Great Sandy Straits 1977 (Dredge et al 1977) #
	Seagrass areas - Great Sandy Straits 1992 (FRC) #
	Seagrass areas - Great Sandy Straits 1993 (FRC) #
	Seagrass areas - Moreton Bay 1987
	Seagrass sample sites and areas in the GBR region (JCU combined DPI-NFC data)
	Southeastern Gulf of Carpentaria coastal wetland vegetation
	Mariculture sites - oyster banks 1999 #
	Mariculture sites - pearl culture areas 1999 #
	Aquaculture facilities - prawn culture 1999 #
	Environmental Impact Study reports #
	Marine Plant Authorizations (subset Moreton - Wet Tropics)#
	Home region boundaries for the QFMA RFISH program 1997 #
	Moreton Bay coastal wetland vegetation 1991 (part)
	Location of fisheries research projects (incomplete)

Table 6.1 (Cont'd)

Custodian	Spatial Data
Queensland Department of Primary Industries Marine Plant Ecology Unit, Northern Fisheries	Deepwater seagrass Cape Weymouth to Cape Tribulation 1994
	Seagrass in Mourilyan Harbour 1993-96
	Seagrass near Karumba 1994-97
	Seagrass off Cape Flattery 1996
	Seagrass around Green Island, NQ 1936-1994
	Seagrass near Cooktown 1989
Queensland Department of Primary Industries - Forestry	Queensland Forestry Reserves
Australian Bureau of Statistics	Statistical Divisions and Subdivisions
Australian Survey and Land Information Group - AUSLIG	Adjacent Area Boundaries (Petroleum)
	Australian Exclusive Economic Zone
	Coast of Queensland
	Coast of Queensland with Islands
	Coastal Outline of Australia
	Coastal Waters - 3nm
	Contiguous Zone
	GEODATA 1:100 000 Drainage (part)
	GEODATA 1:25 000 Drainage (part)
	GEODATA 1:250 000 Topography
	Low Tide Elevation
	National Public and Aboriginal Lands
	Provisional Fisheries Surveillance
	Queensland Towns
	Seabed Boundaries
	Territorial Sea Baseline
	Territorial Seas
	Timor Box
	Torres Strait Protected Zone
	Zone of Cooperation
Bureau of Resource Sciences	Distribution of major fisheries in Queensland
	Distributions of major Queensland fisheries species
CSIRO - Marine Research	Torres Strait GIS datasets 1996
Environment Australia	Interim Marine and Coastal Regionalisation for Australia - IMCRA
	IBRA - Terrestrial Bioregions
	Offshore dredge spoil disposal sites
ERSIS Australia	1:1 000 000 Map Sheet Boundaries for Australia
	1:100 000 Map Sheet Boundaries for Australia
	1:250 000 Map Sheet Boundaries for Australia
	1:50 000 Map Sheet Boundaries for Australia

Table 6.1 (Cont'd)

Custodian	Spatial Data
Great Barrier Reef Marine Park Authority	All Areas excluded from Line Fishing in the GBRMP
	Cays in GBR Region
	Cyclone occurrence in the GBR
	Drying Reefs - GBR Region
	Foreshore - GBRMP
	Great Barrier Reef Marine Park Zones
	Islands - GBR region
	Line Fishing Areas - GBRMP
	Major coastal roads
	Mangroves - GBR World Heritage Area
	Reef cover for whole of Great Barrier Marine Park
	Reefs - GBR Region
	Rocks - GBR Region
	Sediment distribution in the GBR (%Carbonate)
	Sediment distribution in the GBR (%Mud)
	Shoalwater Bay Military Training Area Boundary
	Territorial Sea Baseline adjacent to the GBRMP
Queensland Department of Natural Resources (DNR)	Catchment Sub Basin Areas - Queensland
	Major Dams
	Dams and Weirs in Queensland
	Digital Cadastral DataBase (DCDB) 1999
	Gazeteer of Queensland placenames
	Agricultural Land Use and Sugar Cane in Queensland 1994
	Local Government area boundaries
	Mackay Landsat TM Image (July 1997)
	Major River Basins
	Maroochy River Catchment
	Princess Charlotte Bay Landsat TM Image (June 1994)
	Queensland Native Title Claims 1999
	Queensland Rivers (1:250 000)
	Sugar Mills 1994
	Townsville Landsat TM Image (May 1994)
Southern Cross University	Estuarine Inventory (Digby & Saenger-1997)
Queensland Department of Transport	Queensland rivers (1:100 000)
Queensland Department of Transport, Maritime Division	Noosa - Coolangatta 0m depth contours
	Noosa - Coolangatta 2m depth contours
	Noosa - Coolangatta Marinas
	Noosa - Coolangatta Boat Ramps
	Noosa - Coolangatta Coastline
	Noosa - Coolangatta Vessel Anchorages
	Great Sandy Strait 0m depth contour

Table 6.1 (Cont'd)

Custodian	Spatial Data
Queensland Environmental Protection Agency (EPA)	Moreton Bay Marine Park Zone Boundaries
	Queensland National Parks
	Mangrove and saltmarsh vegetation communities of Shoalwater Bay 1995
	200m depth contour for Queensland
Queensland Fisheries Management Authority (QFMA)	Queensland recreational fishing catch by home region, RFISH 1997 #
Queensland Department of Housing, Local Government and Planning	Strategic land use plans, southeast Queensland 1997
	Strategic land use plans, northeast Queensland 1998

Figure 6-2a Data structure for CHRIS

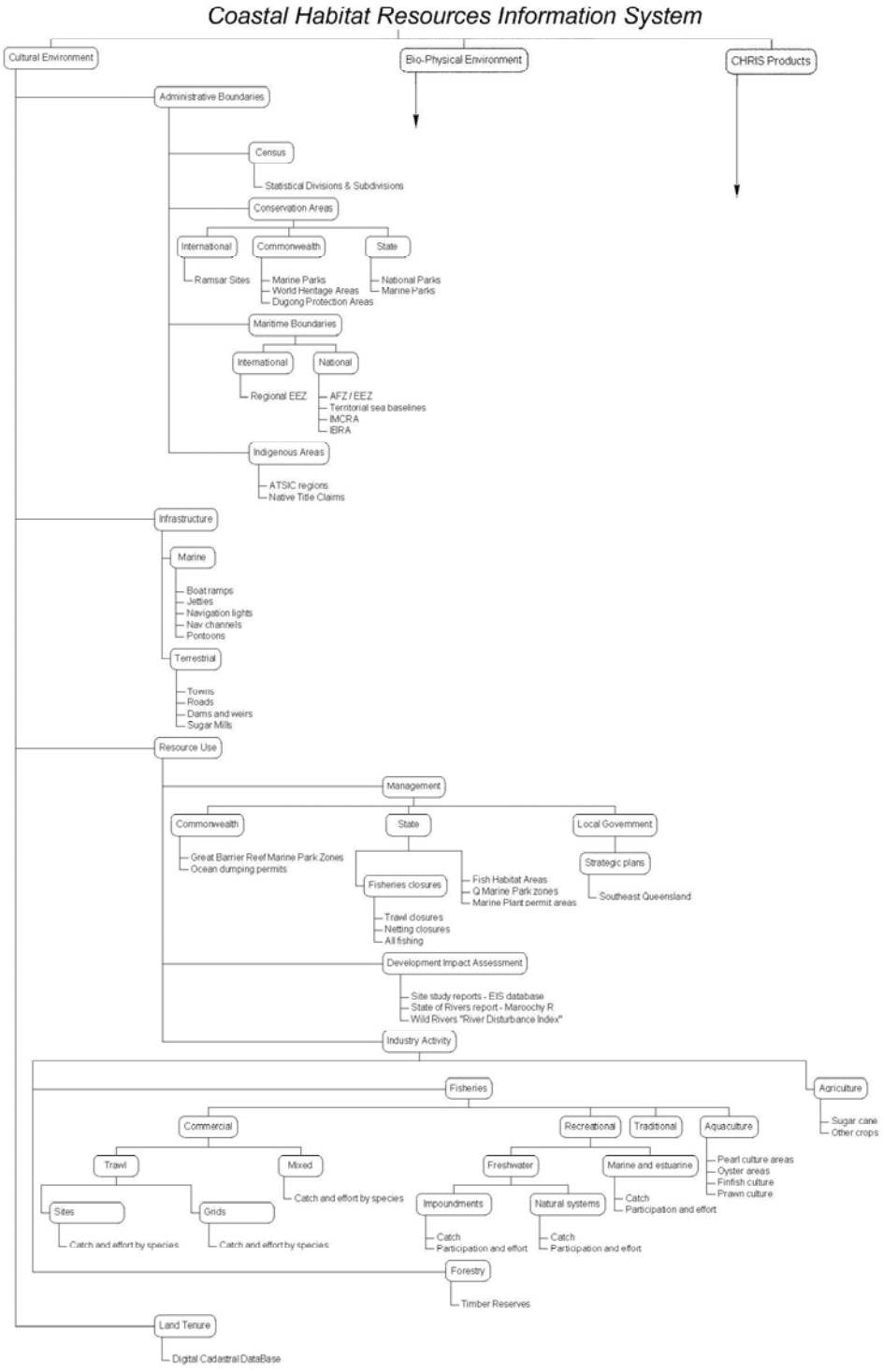
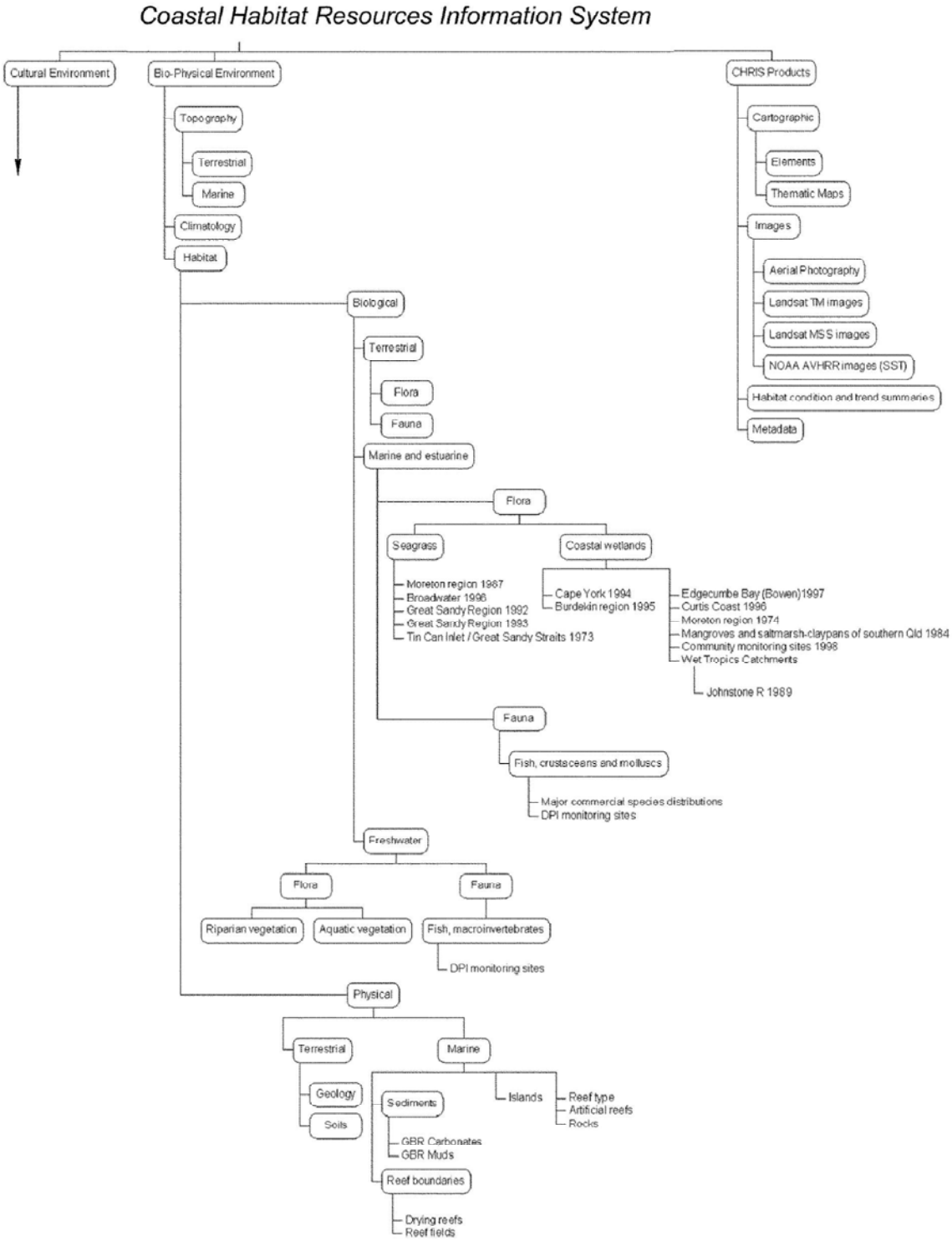


Figure 6-3b Data structure for CHRIS (continued)



6.2 Objective 2: To establish appropriate data exchange links to the Queensland Fisheries Management Authority's QFISH information system (commercial and recreational catch and effort data) and to other QDPI land resources information systems to facilitate modelling of habitat - fisheries resources interactions under various change scenarios.

6.2.1 Commercial fisheries catch and effort data:

Fisheries catch and effort data from licenced commercial fishers compulsory daily logbooks are collected by the then Queensland Fisheries Management Authority (QFMA) (now part of Queensland Fisheries Service, DPI) and stored in the QFISH information system, an Ingres relational database on a Unix platform (QFMA, 1996). Data has been entered into this system continuously since 1988.

Data from fishers is required to be submitted as daily catch by defined coded, geographical units called "grids", representing areas of 30 minutes latitude and longitude. Some fishers supply data at higher resolution, at the individual operation (eg., single haul, pot lift or net set) and for coded 'sites' (six minute latitude and longitude areas) and these data also are entered as reported in the database. Hence data at two different spatial and temporal resolutions are included in the CFISH system. These data are supplied by fishers on a monthly basis but normal delays in data submission and data entry mean that the database is generally only complete with a variable 3-6 month lag. Further, no data validation such as range checking is currently undertaken on data entry. Data confidentiality considerations mean that information for grids where less than five fishers operate is not made available.

Taking into account the current characteristics of the commercial fishery data, a real-time link to CFISH has not been established but rather, electronic transfers (downloads) of raw data are undertaken at regular intervals and the data filtered and aggregated before being made available in CHRIS. Data is 'dumped' from the CFISH Trawl and Mixed Fishery databases using standard SQL scripts, the output files transferred to DPI and filtered using a standard set of routines (Appendix 4) before being stored in a Microsoft Access database. The current CHRIS web interface provides access to annual catch and effort data by major species groups by 30 minute latitude / longitude grids (as required to be reported in logbooks) and 6 minute sites (limited data available from fishers). An example of the squid catch data for 1997 for southern Queensland for both grids and sites is shown in Figure 6-3.

It is only at the finer scale that catch data makes itself amenable to investigation in fisheries productivity-habitat interaction studies. While the current commercial (and recreational - see later) catch data is limited in this respect, the future potential exists for catch reporting through Vessel Monitoring Systems with higher spatial resolution and CHRIS has been designed to be able to store and display spatial information at various scales.

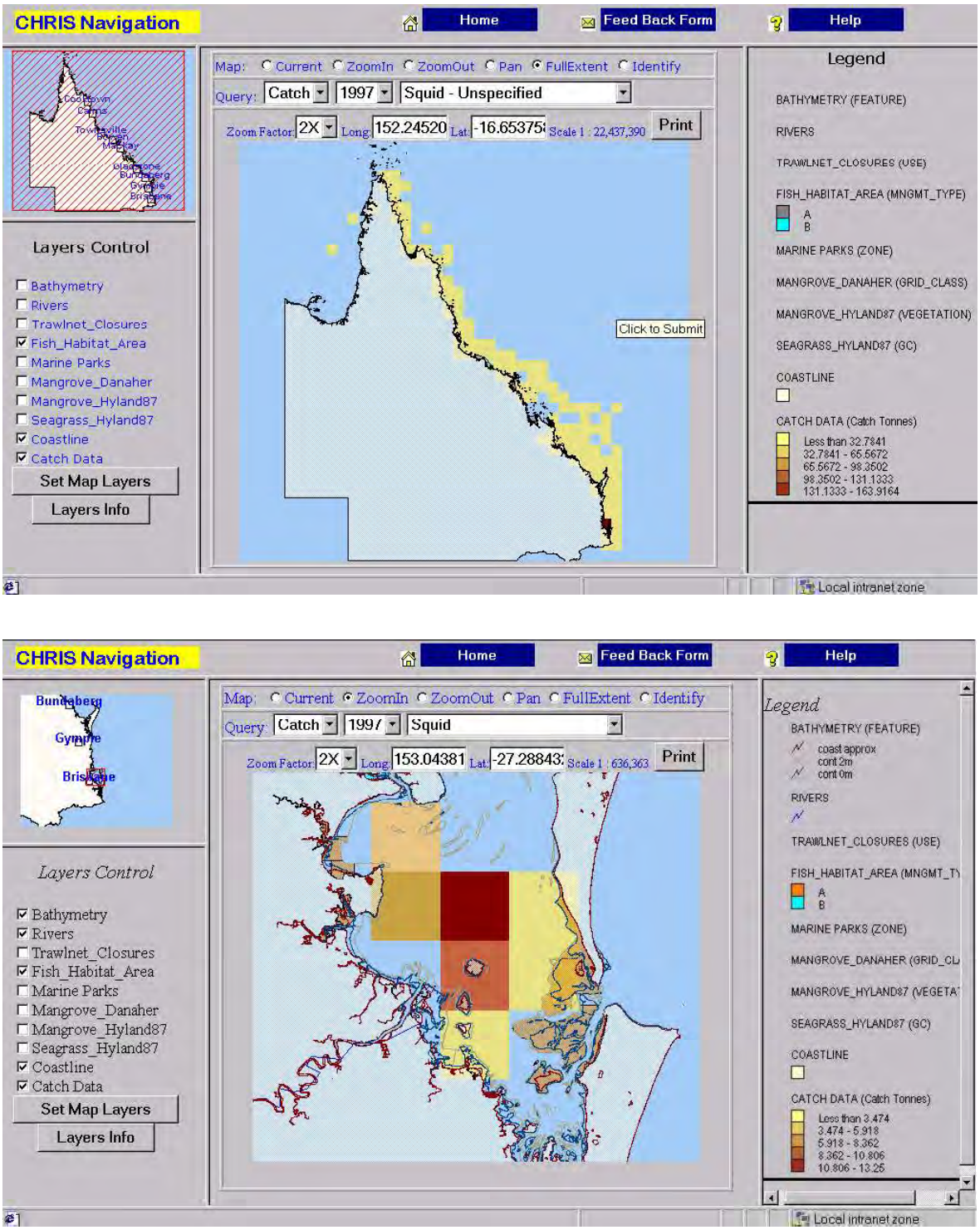


Figure 6-4 Commercial fisheries catch data by 30' grid (top) and 6' site (bottom) as displayed through the CHRIS web interface.

6.2.2 Recreational fisheries catch data:

Results from Statewide telephone surveys undertaken as part of the QFMA RFISH program in 1996 and 1998 and diary surveys in 1997 and 1999 (QFMA, 1999a,b; Roy Morgan Research, 1996, 1999) provide information on annual participation in recreational fishing and on catch by major species estimated for 15 regions. The data are stored in a Microsoft Access database at QFMA and a copy of the summary data from this database is available as part of CHRIS and can be displayed through the web interface. An example of the display of catch of flathead by fisher's home region is shown in Figure 6-4.

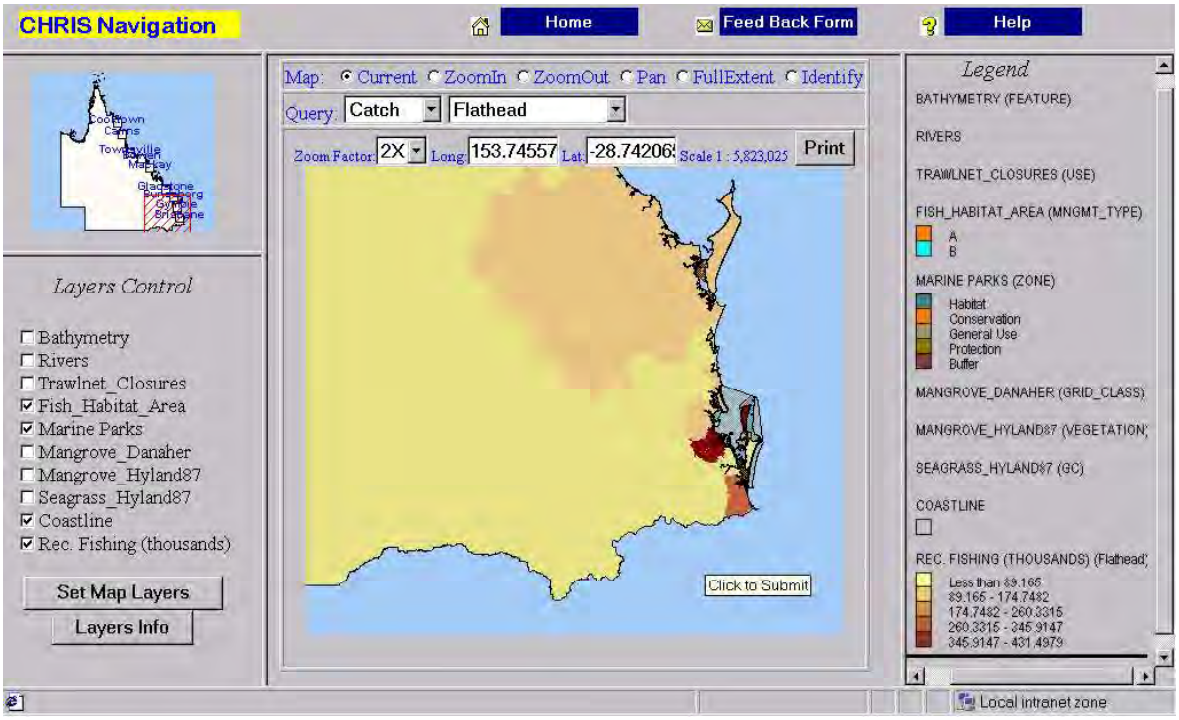


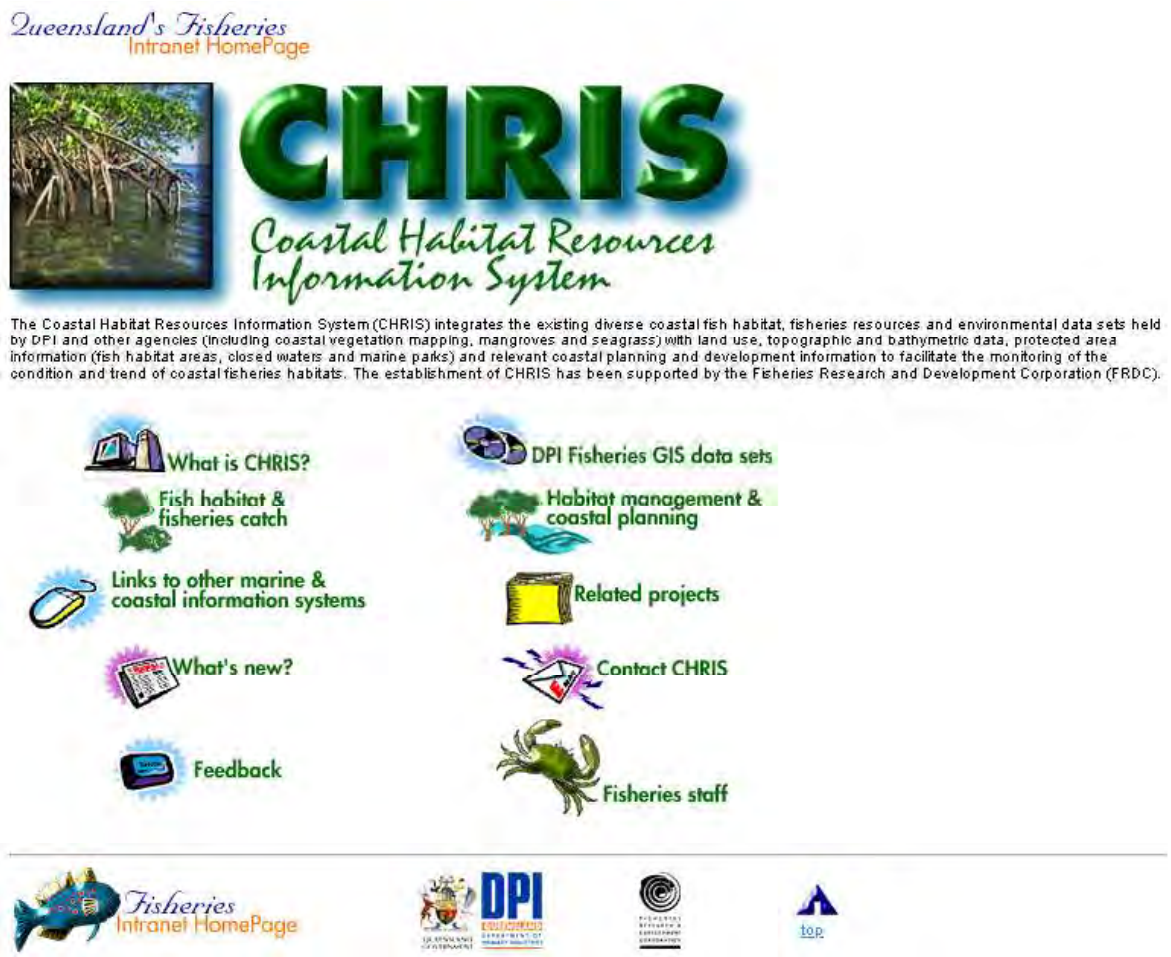
Figure 6-5 Catch of flathead by recreational fishers by home region, QFMA RFISH survey data, 1997.

6.2.3 Links to other databases

It had been proposed to provide links from CHRIS to other QDPI land resources information systems. Subsequent to the commencement of the establishment of CHRIS, the land resources components of the department were transferred to the Department of Natural Resources (DNR). The principal database of interest to CHRIS relating to Statewide coastal land use, the Sugar LIS, is no longer regularly updated by DNR. Information this system previously sought to deliver is now gathered by regional industry agencies and not made available from a single site or in a GIS format.

The CHRIS infrastructure allows for DPINet connection to other DPI databases Statewide as discussed later (Section 6.3.5) and access to specific databases could be provided through the download facility in the CHRIS web interface with appropriate programming.

6.3 *Objective 3: To develop appropriate user interfaces and establish appropriate network links to the system to allow rapid access Statewide and from interstate / internationally by fisheries managers, researchers, the fishing industry and the public.*



CHRIS DPI Intranet home page as at November 1999.

6.3.1 Development of the CHRIS web interface

The third objective of the Coastal Habitat Resources Information System (CHRIS) project is to provide through a graphical desktop interface (Figure 6.5), visualisation of spatial and non-spatial data to DPI Fisheries managers and researchers and other coastal managers assessing the condition and trend of Queensland's fish habitats and fisheries resources. Intranet and Internet users will be able to access information in CHRIS using standard web browsers from their desktop.

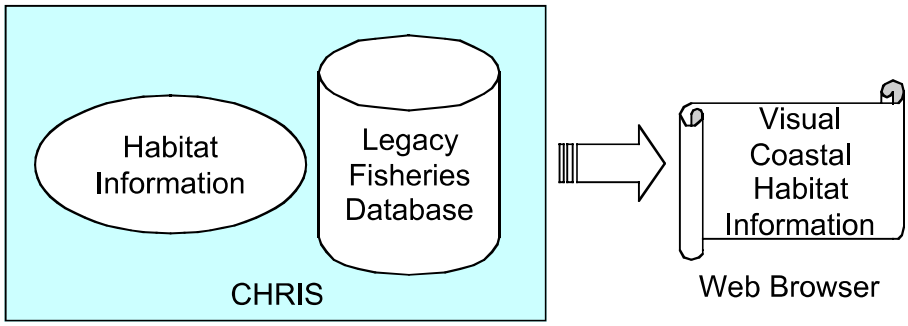


Figure 6-6 Delivery of Coastal Habitat Information through CHRIS

This phase of the CHRIS project aimed to deliver a prototype web enabled interactive Geographical Information System (GIS) to serve legacy fisheries databases (such as logbook catch data, an environmental impact study report inventory and marine plants permit records), displayed alongside descriptive habitat information such as seagrass and mangrove distributions, adjacent land use and administrative/ management boundaries such as fish habitat areas, fishing closures and marine parks.

As at November 1999, data included in CHRIS is available through interfaces which offer different levels of display and analytical functionality:

1. At the simplest display level and with limited analytical functionality, a broad range of users can access some CHRIS spatial datasets from their existing PC web browser (Microsoft Internet Explorer version 4 or later) through the CHRIS web interface. This interface includes the functionality of ESRI Inc.'s ArcExplorer desktop software[2] (ESRI, 1999). CHRIS data is displayed as simple thematic maps and may be printed from the browser through a print function provided in the CHRIS web interface.

2. For higher levels of functionality, users of DPINet (which includes DPI staff statewide, QFMA staff and some fishing industry representatives) can access CHRIS shapefiles and export files using desktop GIS software such as ESRI's ArcView® and MapInfo Corporation's MapInfo® or workstation ARC/INFO® to undertake simple and more complex spatial analysis including modelling.

The first prototype web interface to the CHRIS system was developed in 1997/98 using ESRI's ArcView software (ESRI 1996a) as the map server. This prototype, while delivering proof of concept, was unable to deliver acceptable performance on existing map serving computer hardware when multiple information layers were displayed by the user. The opportunity arose in mid 1998 with supplementary funding to migrate to ESRI's MapObjects® development environment for the map serving and web serving functions. This environment offers

[2] ArcExplorer is currently only supported by the Microsoft Windows 95/98, Windows NT operating systems

considerable speed enhancement and the capacity for increased functionality in the future. All functionality of the previous prototype was migrated to the new environment in late 1998 and this is the basis for the current CHRIS web interface described below.

CHRIS spatial data are manipulated by web enabled interactive GIS applications written in Microsoft Visual Basic 6 using ESRI MapObjects (MO) (ESRI 1996b) and MapObjects Internet Map Server (MOIMS) (ESRI 1998) software. MO provides high level programming objects for data access, map layer manipulations and address matching in an ActiveX technology compatible programming language such as Microsoft Visual Basic in the Microsoft Windows environment. MOIMS extends the MO application to an Internet server mapping application (Figure 6.6). From the point of view of the user, CHRIS information is displayed as an HTML (HyperText Markup Language) document in a web browser which provides the visualisation of spatial information in the form of maps about selected habitat and fisheries resources.

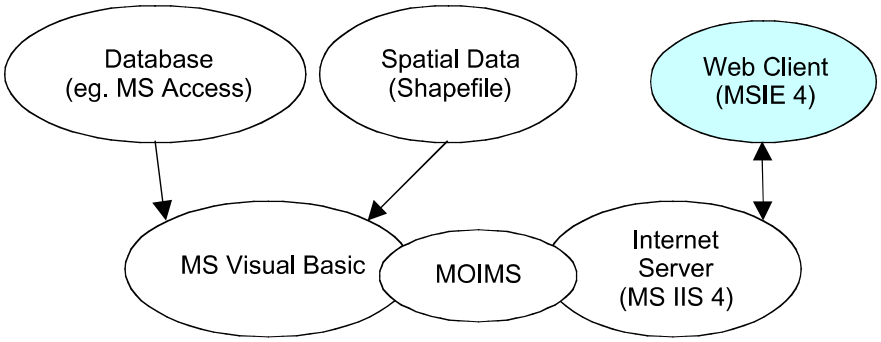


Figure 6-7 Conveying spatial data to a CHRIS user

6.3.2 Interactive GIS – Dynamic Thematic Mapping

6.3.2.1 Servers Configuration

The CHRIS interactive GIS application involves four entities namely the client, the web / Internet server, the map server and data (Figure 6.7). The client is expected to be a web browser running Microsoft Internet Explorer (MSIE) 4.0 or later software. The syntax and object model for popular web browsers, such as MSIE and Netscape Navigator / Communicator are different from each other especially in the Dynamic HTML application. The development of the prototype is based on the MSIE object model only as this is the Department of Primary Industries Queensland standard browser.

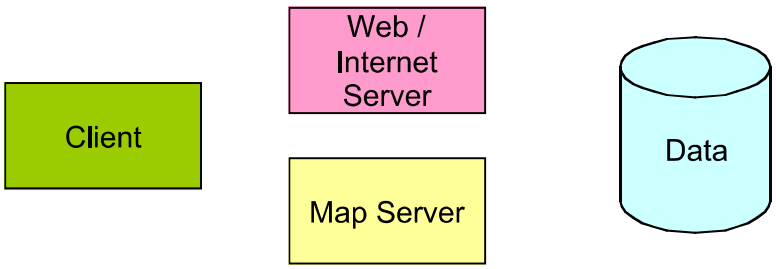


Figure 6-8 Entities in the CHRIS Interactive GIS

The map server is responsible for running MOIMS applications, which manipulate spatial data, to render visual query results. The map server needs to be running MS Windows NT Workstation / Server 4.0 or later operating system. The Internet server listens to the requests from the client, relays the requests to the map server, and generates responses back to the client. The Internet server must be running Microsoft Internet Information Server 4.0 or later software under MS Windows NT Server 4.0 or later operating system, and loaded with IMS dynamic link library and IMS Catalog service. Table 6.2 lists the configuration of software components required for the MOIMS application. The data can be spatial information stored in ESRI Shapefile format or non-spatial information stored in OLE DB compliance databases such as Microsoft Access, MS SQL Server, Oracle and Ingres.

For the current prototype of June 1999, the web / Internet server, map server and data are all physically located in a computer running Microsoft NT Server 4.0 (SP4) operating system. To enhance performance, MOIMS is capable of multiple computer configurations, that is, having a series of computers serving as map servers. In that case, the IMS Catalog service running at the Internet server maintains a registry of map servers and directs client requests to the appropriate map server. Multiple copies of the MOIMS application can be running at the same time to handle simultaneous requests for the same application, IMS Launch balances the load among the different instances of the application. IMS Admin provides a Graphical User Interface for loading / unloading MOIMS applications in connection with the IMS Launch / Catalog services.

Table 6-2 CHRIS Server Configurations

MapObjects IMS Components	Web Server Computer	Map Server Computer	Web Administration Computer
IMS Admin			✓
IMS Launch		✓	
IMS Catalog	✓		
IMS Dynamic Link Library	✓		
Map Services ActiveX Controls		✓	
MapObjects		✓	
TwistedPixel ActiveX Control		✓	

6.3.2.2 Functional Overview of the CHRIS Interactive GIS application

A MOIMS application is written for each theme of the CHRIS interactive GIS. Although it is possible to lump all themes into a single MOIMS application, overhead and efficiency would be lost at the map server. In the prototype, there are the Fish Habitat and Fish Catch (Grids) theme, Fish Habitat and Fish Catch (Sites) theme, Habitat Management and Planning theme, and Recreational Fishing theme. Each application has an independent set of data for its exclusive uses. The MOIMS applications are written in Microsoft Visual Basic (VB) 6.0 and the source code for is listed in Appendix 5. The MOIMS provides ActiveX Controls which communicate and render map display support. The MOIMS ActiveX controls and other VB ActiveX controls populate a VB form to bring interactive GIS capability into the VB application. Figure 6.8 shows a schematic break down of the software components of the CHRIS Interactive GIS applications. The following sections describe the software components utilised in the applications.

6.3.2.2.1 WebLink Control

The WebLink Control is a MOIMS ActiveX control, which provides communication between the MO application and the Internet server. Client requests are passed to the only WebLink Control procedure, the WebLink_Request subroutine, as arguments. These arguments are parsed within the subroutine and sent to appropriate Map Command subroutines to perform the specified procedures (Figure 6.9). Once the requested procedures are processed, WebLink Control is called again to return the HTML documents generated for that request. The WebLink Control has a BMP2GIF method which converts the Bitmap file exported by a Map Control to GIF image format for display. A compression algorithm software license from Unisys has been acquired by the project for the use of the proprietary LZW GIF compression in the BMP2GIF method.

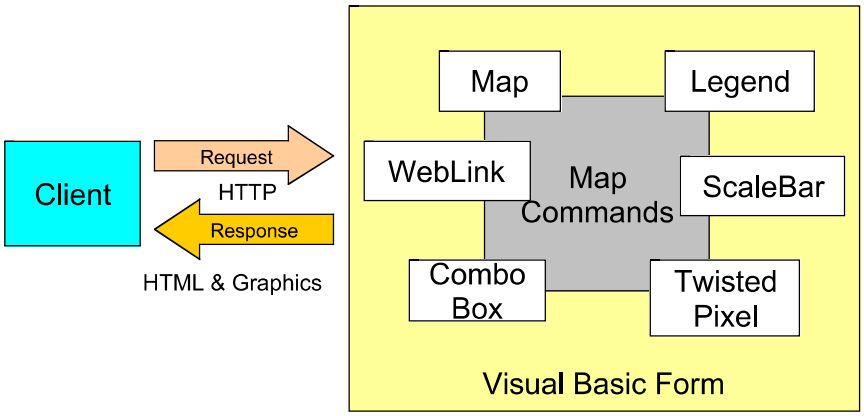


Figure 6-9 CHRIS Interactive GIS Application

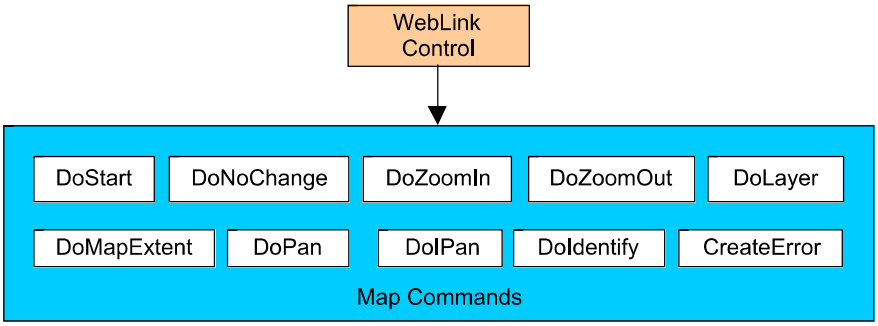


Figure 6-10 WebLink Control and Map Commands

6.3.2.2.2 Map Commands

The Map Commands are subroutines contained in the Visual Basic form module, which provide procedures to manipulate the Map Controls and to query databases. There are nine Map Commands written for the prototype with each performing a specific task. Table 6.3 gives a brief description on each of the Map Command subroutines. A VB switch statement in WebLink_Request subroutine reads the client request and activates one of the Map Commands accordingly. The CreateError Map Command is a safety net to generate an error message signifying the client request is none of the predefined Map Commands.

Table 6-3 Map Commands Description

Subroutine Name	Action
DoStart	Set default map layer visibility and produce the initial HTML interface (must be the first command to call)
DoNoChange	Keeps the current map scale and extent. Use this command for catch query.
DoZoomIn	Scale the current map extent by the reciprocal of the factor specifies in the Zoom Factor drop down menu and centre it at the click location.
DoZoomOut	Scale the current map extent by the reciprocal of the factor specifies in the Zoom Factor drop down menu and centre it at the click location.
DoLayer	Change the map layer visibility. Functionally the same as DoNoChange.
DoMapExtent	Reset the map scale to its full extent.
DoPan	Shift the centre of map extent to that of the click location.
DoIPan	Shift the centre of map extent to that of the click location (for index map requests).
DoIdentify	Return the attributes of the feature theme layer at the click location. The selected feature is also highlighted.
CreateError	Create an error message because the requested map command is none of the above.

6.3.2.2.3 Map Control

The Map Control is a MOIMS ActiveX control, and is the centre of the GIS capability of the MOIMS application. It has properties and methods for managing and displaying spatial data as

map layers. Shapefiles are loaded into the Map Control at the start of the application by the loadShape subroutine. Once loaded with map layers, the Map Control is ready to manipulate its map layers through the defined methods and properties. Two Map Controls, one for the index map and the other for the navigational map, are used in the prototype. The Map Control has an ExportMap method which exports the current image of the Control in Windows Bitmap format.

6.3.2.2.4 Legend Control

The Legend Control is an ArcExplorer ActiveX component. When associated with a Map Control, it manages a graphical legend for that Map Control. ArcExplorer ActiveX controls are provided by ESRI for registered users of MOIMS. The Legend Control has a ExportToBmp method which export the image of the Control as a Windows Bitmap file.

6.3.2.2.5 ScaleBar Control

The Control is an ArcExplorer ActiveX component. The ScaleBar Control manages a graphical scale bar for a Map Control. The ScaleBar Control has been modified to include an ExportToBmp method so as to export the image of the Control as a Windows Bitmap file. The modified and re-compiled version of this Control called ScaleBar_sam.ocx needs to be registered with the operating system before use.

6.3.2.2.6 TwistedPixel Control

The resolution of the Bitmap files generated by the Legend Control and the ScaleBar Control depends on the screen resolution of the map server. In the current Version 2.0 of MOIMS, the BMP2GIF method of the WebLink Control only works with 8 bit colour Bitmap files. Setting screen resolution to 8 bits makes the colours generated by the RampColor method of the ClassBreaksRenderer display incorrectly. A third party ActiveX control called TwistedPixel (Bananas Software Inc. 1998) is used to convert the Bitmap files exported from the Legend Control and the ScaleBar Control to Portable Network Graphics (PNG) format. The current version of TwistedPixel does not work with Bitmap to GIF conversion. The TwistedPixel ActiveX control needs to be registered with the operating system before its use.

6.3.2.2.7 ComboBox Control

The ComboBox Control is intrinsic to Visual Basic. ComboBox Control array is used as a container for the yearly unique species list associated with logbook catch data. New elements of the ComboBox Control are created at run-time for multiple catch years.

6.3.2.3 Converting Non-Spatial Data into Spatial Information

Geographical information requires a reference in space to associate with any underlying attributes. Some target databases of CHRIS are legacy fisheries databases containing no georeferencing information. Thus database modifications are necessary depending on the spatial variability of the data. For data with fixed spatial references such as regularly gridded logbook catch data, it is possible to define a limited set of spatial objects such as polygons in a separate

file to be linked to the legacy database. For data with variable spatial references such as the Environmental Impact Study (EIS) report records and Marine Plant Permit records, the direct manual addition of spatial referenced fields into the database was required to convert them into geographical information for use in CHRIS.

6.3.2.3.1 Fixed Spatially Referenced Data

For spatial data with a limited set of defined locations such as the logbook catch data and recreational fishing records, spatial objects representing the geographic locations and extent in polygons over the area of interest can be prepared in a GIS. For the catch logbook example, integrating the non-spatial records (Table 6.4) with spatial information (Table 6.5) is then a matter of relating the prepared spatial objects to the non-spatial attributes. In the logbook catch data, the grid code and/or the site code from the logbooks are used as the linking field to relate the spatial objects to the logbook records. The subroutine SpeciesQuery is responsible for linking and then querying the database as per the client request.

Table 6-4 Catch Database Fields Definitions

Field Name	Data Type	Definition
Year	Number	Year of record referring to
Month	Number	Month of record referring to
Grid	Text	Logbook grid code and/or site code
Species_na	Text	Defined species name
Species_co	Number	Defined species code
Catch Tonnes	Number	Catch in tonnes
Days	Number	Number of days on which catch was taken
Boats	Number	Number of boats

Table 6-5 Catch Spatial Reference Object Field Definitions

Field Name	Data Type	Definition
Shape	Shape	Definition of a spatial object
Grid_code	String	Logbook grid and/or site code

6.3.2.3.2 Variable Spatially Referenced Data

For databases with variable spatial locations such as the EIS report records, the spatial extent in which the record refers to must be added into the database to convert them into geographic information. The CHRIS EIS database is designed to contain spatial information fields attributed to a bounding rectangle approximating the spatial extent of the record in latitude and longitude. Spatial objects (polygons) are created from the bounding rectangle fields at the start of the application and saved into a Shapefile. This Shapefile can then loaded into the Map Control as a map layer. Table 6.6 describes the field definitions for the EIS database where the Left, Right, Top and Bottom fields are the spatial fields describing the bounding rectangle.

Table 6-6 EIS Field definitions

Field Name	Data Type	Definition
ID	AutoNumber	Access autonumber
MD Number	Text	Local file reference number
File Reference	Text	Current DPI Fisheries file reference number eg NRM/140/000(000)
Old File Reference	Text	Previous DPI file reference number eg 05X.009
Document Date	Date	The date of creation of the report eg 01/01/97
Entry Date	Date	Automatic date this record last entered/ edited
Title	Text	Report title
Author	Text	The name of the consulting company if known otherwise the author
Category	Text	One of the predefined document types
Document Location	Text	Physical location of this document
LGA	Text	Local Government Area (enter "State" for statewide, "National" for whole Aust)
Grid Code		The grid code of the 1:100,000 scale map sheet published by Sunmap (left blank for State or National)
Left	Number	The left hand side coordinate (Longitude) of a bounding box for the area of interest
Right	Number	The right hand side coordinate (Longitude) of a bounding box for the area of interest
Top	Number	The top side coordinate (Latitude) of a bounding box for the area of interest
Bottom	Number	The bottom side coordinate (Latitude) of a bounding box for the area of interest

6.3.2.4 Catering for Client Requests

Once the non-spatial records are converted to geographic information as described in the last section, the MOIMS applications are ready to serve this geographic information together with other spatial habitat information. The client selections at the HTML document front-end are passed to the WebLink Control and the subsequent Map Command subroutine for processing. Figure 6.10 shows typical procedures taken by a Map Command subroutine to generate maps and/or messages as per client requests. The CreateServerMessage subroutine called at the beginning of the WebLink_Request subroutine sends an HTML response to the client to acknowledge the request before the commencement of any Map Commands. The onLoad event of the body tag in this HTML document triggers the opening of the CHRIS Interactive GIS interface frame page prepared by the CreateFrames subroutine.

The following Subsections describe the individual processes involved in a Map Command subroutine.

6.3.2.4.1 Set Operational Variables

Operational variables are used to maintain the states of the application. One of the global boolean variables is set to true signifying a particular map command is fired by the client request. The CreateHTML procedure uses this information to pre-select check boxes and the drop-down menu in the outgoing HTML document so that the client gets back the same selections as the submitted page. The CreateFrames procedure makes use of the operational variables to determine if a

message window should be opened for the client to display search results. The Map Control also uses the operational variables to decide if a selection should be displayed to the client.

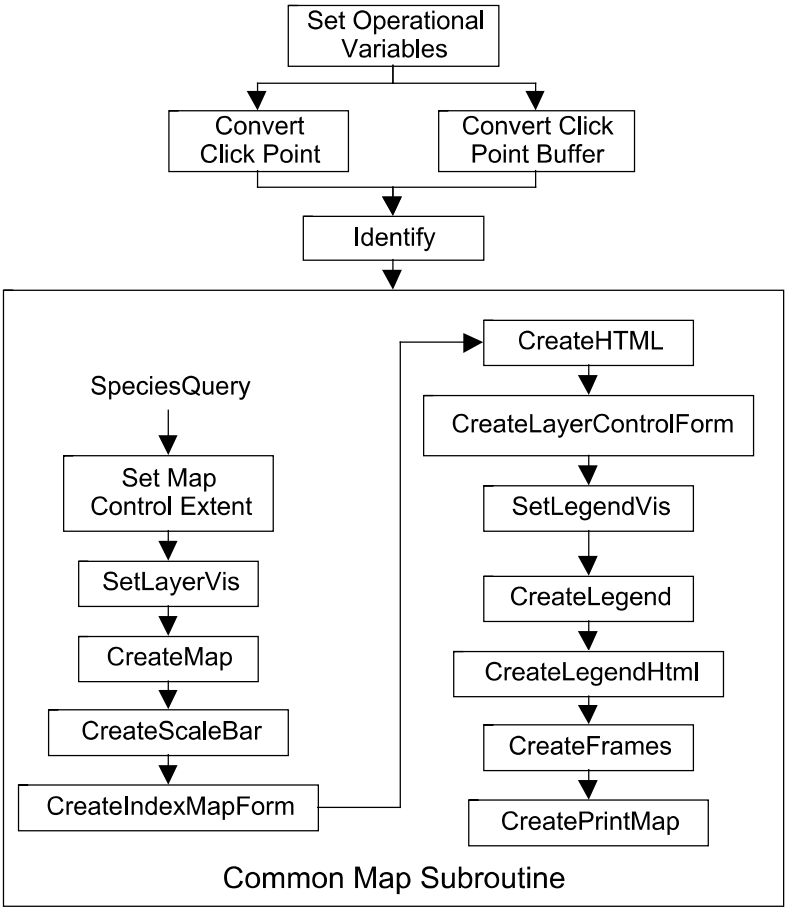


Figure 6-11 A typical Map Command Procedure

6.3.2.4.2 Convert Click Point

The client mouse click location is converted to geographical coordinates in the ConvertClick procedure. For the zoom map commands and pan map commands, this location is used as the centre of the new map extent.

6.3.2.4.3 Convert Click Point Buffer

In the ConvertClickBuf procedure, the client mouse click location is converted to a rectangle spatial object of a specified size in the map coordinates. This is used in lieu of the ConvertClick procedure to facilitate the searching of point features in a map layer. Besides the mouse click location, this procedure takes a distance argument in pixel size to buffer the point to a rectangle.

6.3.2.4.4 Identify

For the identify map command, this procedure performs a point on polygon operation to search if any of the spatial objects contains the client click point. If a spatial object is found, it is highlighted in yellow. Attributes about this location are returned to the client as an HTML document in a separate window.

6.3.2.4.5 Common Map Subroutine

To facilitate code management, procedures that are common to all map commands are grouped together in the Common Map Subroutine (Figure 6.10). These procedures range from querying a database to exporting images from various ActiveX controls. The following subsections describe each of the procedure involved.

Set Map Control Extent

The extent of the map control is set with the viewing rectangle returned as part of the client request. When zoom functions are selected, the map extent is scaled according to the client selected zoom factor. When full extent function is selected, the map returns to its full extent as defined at the loadShape procedure.

Species Query

For a logbook catch data query, the requested year and species combination is formatted as a Structured Query Language (SQL) statement. This SQL statement is executed on the database and the result is stored in a temporary table within an Access Database. The AddRelate method of the Map Control is used then to relate this shortlisted temporary table to the map layer loaded in the Map Control.

A class break renderer subroutine ClassBreakCalc is called after the map layer and the temporary table are related. ClassBreakCalc defines the number of class breaks, their limits and colour scheme for a particular field in a map layer.

SetLayerVis Subroutine

SetLayerVis sets the visibility of the map layers in the Map Control according to the parameters returned by the client. The visibility selections on the Layers Control Frame all start with the prefix “Layer_”. This subroutine appends the map layer name and looks up the corresponding value of this argument in the client request. The visibility of individual map layers is set according to the argument value which is either “on” or “off”. This subroutine should be called before the CreateMap subroutine to reflect the current visibility of map layers in the map control.

CreatMap Subroutine

This subroutine takes a file name and a MapObjects rectangle to produce images for the Map controls in the VB application. The file name used by this and other subroutines that export a file is generated in the WebLink_Request subroutine. The file name is of pseudo-random nature and is a combination of the current date and time of the request. GIF images for the navigational map and the index map are exported to a directory accessible by the client specified by the strTmpPath global constant.

CreateScaleBar Subroutine
This subroutine refreshes the ScaleBar Control with the Map Control and then exports the image of the ScaleBar Control for later use. The scale bar image shows on the printable HTML map. A numerical scale based on the ScaleBar Control is shown on the main frame.

CreateIndexMapForm Subroutine
This subroutine creates an HTML document to be used in the index map frame in a folder specified by the global constant strTmpPath. This document contains an image tag pointing to the index map generated by CreateMap. Hidden form fields in this document replicate form fields in the main frame. On submission, the Client-side JavaScript in this document set the values of hidden fields from the corresponding fields on the main frame. The effect of submitting this form is the same as carrying out a "Pan" command on the main frame.

CreateHTML Subroutine
This subroutine constructs an HTML document for the main frame, which serves both as the result display and new query submission form. The hidden form fields for layer visibility in this document get their value from that of the Layers Control frame. For the catch logbook application, the radio buttons and drop-down menus on this document form the basis for species query; the HTML and its JavaScripts are generated by iterating through the elements of the catch year array and the unique species list in the ComboBox Control.

CreateLayerControlForm Subroutine
This subroutine constructs an HTML document with an array of check boxes for the selection of map layer visibility. JavaScripts in this HTML document retrieve selected values from the Main Frame.

SetLegendVis Subroutine
The Legend Control displays all available map layers with their respective symbols regardless of whether the map layers are visible or invisible in the control. SetLegendVis sets the visibility of the map layer entries in the Legend Control explicitly so that only visible map layers have graphic symbols displayed. This subroutine should be called before the CreateLegend subroutine to reflect the current visibility of map layers in the Map Control.

CreateLegend Subroutine
Create an image of the ArcExplorer Legend control in the VB application in a folder specified by the global constant strTmpPath. A third party ActiveX control called TwistedPixel is used to convert the bitmap image to PNG format.

CreateLegendHtml Subroutine
Create an HTML document that contains the image produced by CreateLegend subroutine. The HTML document serves as a container so that the image can be placed in a frame.

CreateFrames Subroutine
Create an HTML document with frames definitions so that the documents prepared for the client appear as frames. The frameset tag and frame tag in this document formats the layout of the frames. A client-side script determines if a new window containing the search results should be opened.

CreatePrintMap Subroutine
This subroutine generates an HTML document that uses the navigation map, index map, scale bar, and legend created by the previous procedures. This HTML document serves as a printable map product for the user. A print command button on the client interface links to this HTML document.

6.3.2.5 Loading Shapefiles into the Application

Static spatial information in the form of Shapefiles can be loaded by the Map Controls via the subroutine loadShapes into a CHRIS MOIMS application. Three VB collection objects, the map1_shpFiles, map1_color, and map1_style, at the beginning of the subroutine take the file name, fill colour, and fill style respectively as parameters for loading the Shapefiles. The location of the files is specified by the global constant strDataPath. The file names are also used as the map layer names listed on the legend, and therefore descriptive names should be used for the Shapefiles for easy understanding. The module level subroutine AddShapeFile does the actual initialisation of the map layers using the defined VB collection objects. The listing order of the Shapefile parameters in the VB collection objects represents the order they get drawn on the Map Control. A value renderer subroutine ValueRendererMake is called from loadShape to classify map layers with discrete classes. The maximum view extents of the Map Controls are also defined there.

6.3.3 The Client Interface

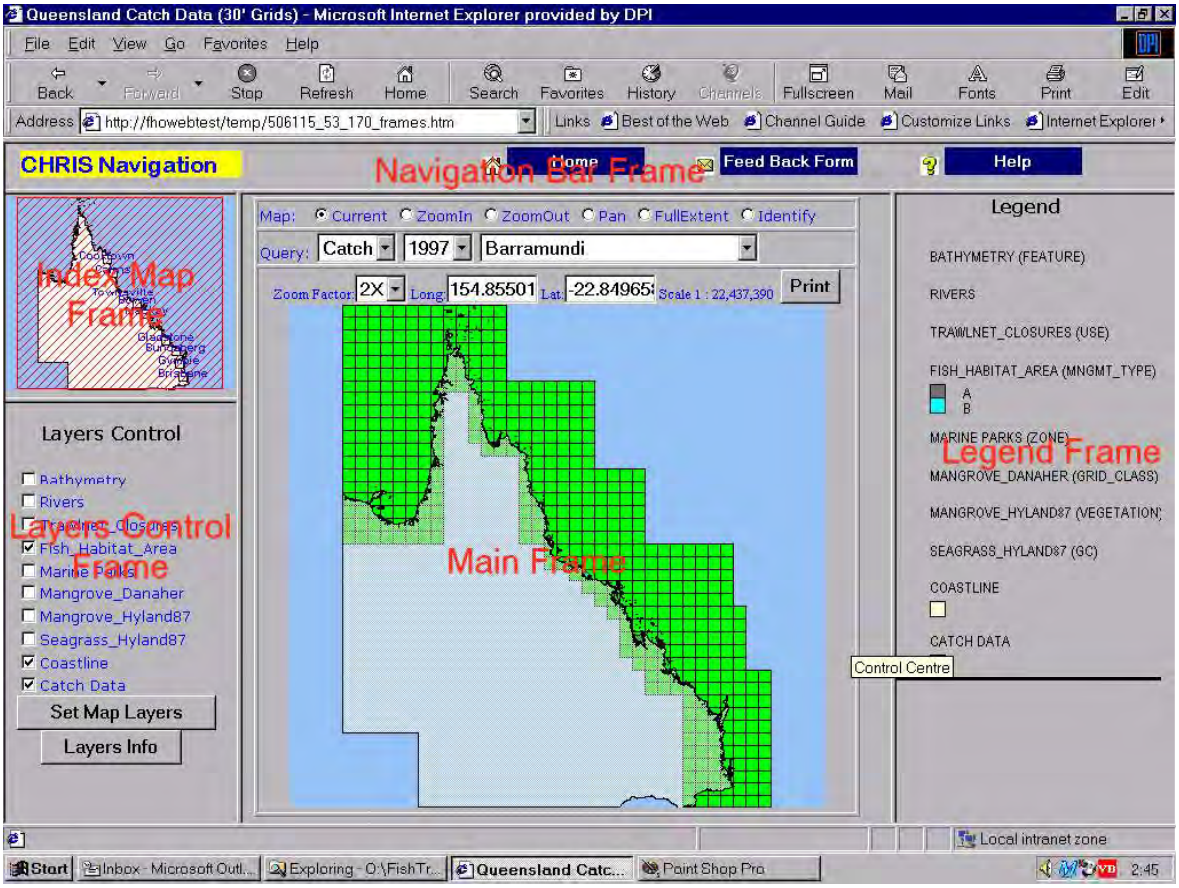


Figure 6-12 The CHRIS Fish Habitat and Fish Catch Interface

The client interfaces for CHRIS MOIMS applications are theme specific but differ only on the main frame designed to provide necessary user input for that theme. Figure 6.11 shows the layout of the HTML document composed of five frames for the Fish Habitat and Fish Catch theme. The use of frames enables modular programming in the MOIMS application with separate codes for the generation of a particular frame. The use of JavaScript in frames provides a means of accessing field information between frames. The following subsections use the CHRIS Fish Habitat and Fish Catch interface example to describe the functionality of each frame.

6.3.3.1 Main Frame

The Main Frame is an HTML form consisting of radio buttons, drop-down menu, text box, command button, navigation map and JavaScripts. The radio buttons give exclusive selection of one of the Map Commands (see Table 6.3 and Figure 6.9). The drop-down menus provide the selection of query parameters in data type, year, and unique species for the logbook catch data application. The species list is unique to a particular year and therefore gets reset if the year selection changes. The Zoom Factor drop-down menu allows users to select different zooming

power to be used with the ZoomIn or ZoomOut command. The navigation map is a graphic image of the Map Control running at the server. The text boxes display the current mouse location in longitude and latitude. JavaScripts contained in this frame monitor the mouse location over the image and convert the mouse position to map coordinates. The scale of the navigation map is returned by the ScaleBar Control. The Print command button invokes a JavaScript to open a new browser with URL pointers to the prepared printable map. Table 6.7 lists the various JavaScript functions used in this frame.

6.3.3.2 Layers Control Frame

The Layers Control Frame is an HTML form consisting of a check box array, two buttons and JavaScripts. Each element of the check box array represents a map layer loaded in the Map Control. The order of the check boxes is also the stacking order of the respectable map layers in the Map Control. A map layer is currently visible or invisible as signified by the attribute of the check boxes. However, changes in the map layers visibility are not reflected until the next request by clicking the Set Map Layers command button or the navigation map in the Main Frame. The attribute of the check boxes is also accessed by the form in the Map Frame just before submitting to the server, so that the map visibility settings are sent along with any Map Command and query. When the Set Map Layers command button is used instead of clicking on the navigation map, the JavaScript gets the client selected query attributes from the Map Frame before submitting the request to the server. The Map Info button opens a static HTML document containing information on the map layers. Table 6.8 lists the various JavaScript functions used in this frame.

Table 6-7 JavaScript Functions in the Main Frame

Function	Usage	Note
setSpList	Set the Species drop-down menu with the unique species for the currently selected year	The arrays of unique year-specific species are generated by the MOIMS application on start up
getLayerValue	Gets the visibility setting of a map layer in the Layers Control Frame	Returns either “on” or “off”
setLayerValues	Sets the values of the hidden input fields for the map layers	Calls getLayerValue to get the on or off value
selZoom	A pop up message is fired, if neither the ZoomIn nor the ZoomOut radio buttons is selected.	This function uses the position of the radio buttons to check if it is selected.
Map_onMouseMove	Sets the value on the text box to geographic locations.	Calls GIFXToMap and GIFYToMap commands.
GIFXToMap	Converts the mouse location to longitude	Needs the number of pixels in X direction as specified in the StandardGIFWidth variable.
GIFYToMap	Converts the mouse location to latitude	Needs the number of pixels in Y direction as specified in the StandardGIFHeight variable.
printMap	Opens a new window to display a printable map	On the MS Windows platform, a system print menu will show on the users screen if a default printer has been selected

Table 6-8 JavaScript Functions in Layers Frame

Function	Usage	Note
getSelectValue	Gets the current selected field value in the Main Frame	
loadValues	Sets the values of the hidden input fields for query	Calls getSelectValue.
getLayerValue	Gets the visibility setting of a map layer in the Layers Control Frame	Returns either on or off
setLayerValues	Sets the values of the hidden input fields for the map layers	Calls getLayerValue to get the on or off value

6.3.3.3 Index Map Frame

The Index Map Frame is again an HTML form consisting of an index map and JavaScripts. The index map here is a graphic image of the Map Control for the index map at the server. Clicking this frame shifts the centre of the area of interest to that of the mouse click location similar to the Pan map command. The JaveScript gets the select query attributes from the Map Frame and the layers visibility settings from the Layers Control Frame upon submitting the request to the server. Table 6.9 lists the various JavaScript functions used in this frame.

Table 6-9 JavaScript Functions in Index Map Frame

Function	Usage	Note
getSelectValue	Gets the current selected field value in the Main Frame	
loadValues	Sets the values of the hidden input fields for query	Calls getSelectValue.
goMeta	Opens a new browser window to display the layer information	The link is static.

6.3.3.4 Legend Frame

The Legend frame contains a graphic image of the Legend Control on the server. Only visible map layers have graphic symbols shown.

6.3.3.5 Navigation Bar Frame

The Navigation Bar is a static HTML document which contains links to the CHRIS home page, feedback form, and help on using the interactive GIS client interface. Basic context sensitive help is provided on all the CHRIS web interface pages.

6.3.4 ArcExplorer IMS Web – Static Map Display

MOIMS provides a customable way of building an interactive GIS interface for a legacy database. ArcExplorer IMS (AEIMS) web is a built-in component of MOIMS which serves

spatial data in ESRI's Shapefile format. Either an MS Windows client (Figure 6.12) or an HTML client (Figure 6.13) can be used to view, manipulate, query and download a collection of Shapefiles prepared at the Map Server. Although AEIMS is not customizable, it does provide an easy and functional alternative to convey relatively static spatial information (that is, does not change frequently with time), to Internet/Intranet clients. Any of the CHRIS datasets, which are stored as Shapefiles, can be displayed and queried using this interface. For the prototype, the Queensland Native Title Claims records are archived in Shapefile format and served using the AEIMS interface.

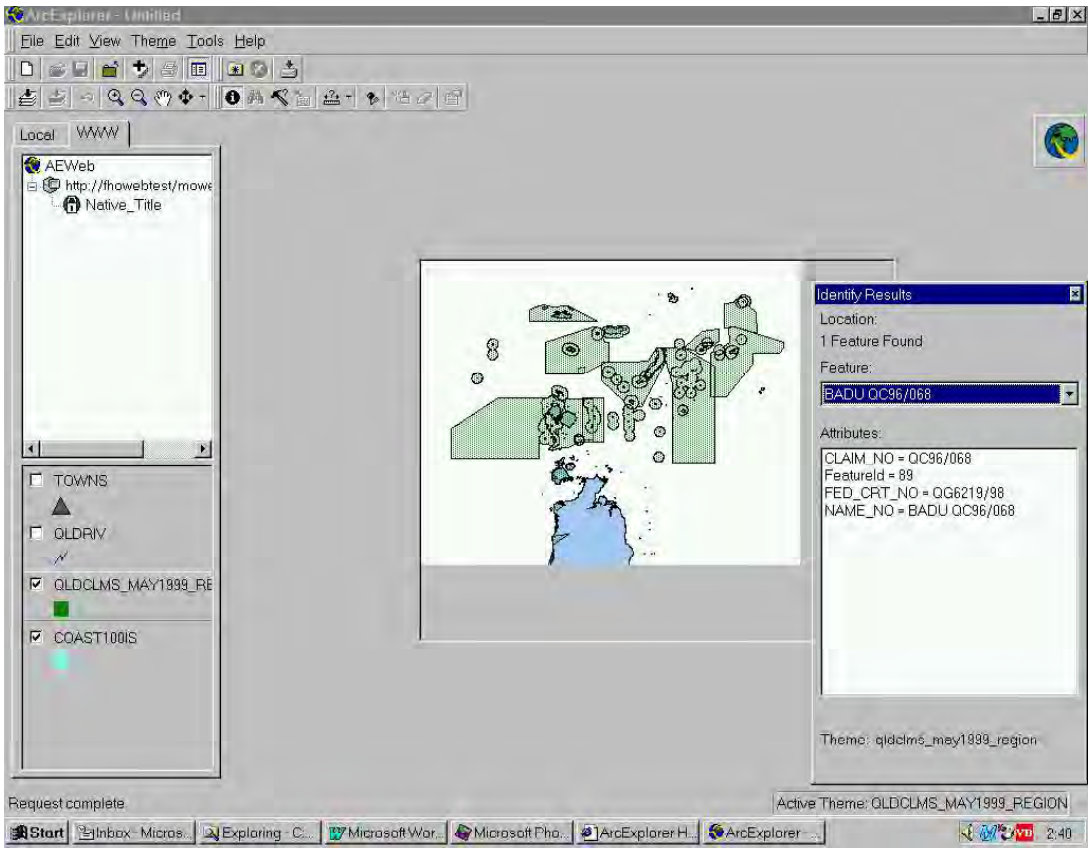


Figure 6-13 ArcExplorer IMS Windows Client

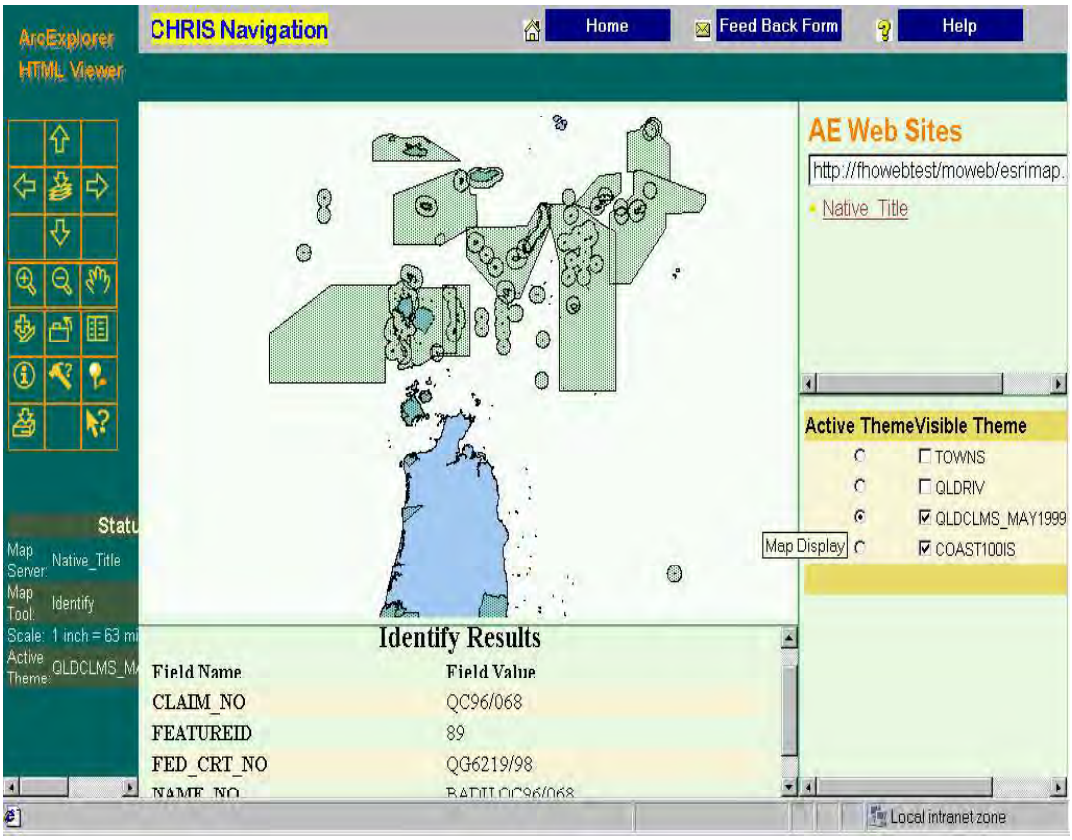


Figure 6-14 ArcExplorer IMS html Client

6.3.5 CHRIS Web-enabled Database Interface

Besides the visualisation of legacy databases in map format, the CHRIS web interface also makes legacy databases in attribute form available as an HTML document in a client browser (Figure 6.14). Online access to databases provides remote clients with the ability to search and edit the database directly from their desktop. For internal DPI Fisheries users, this would mean a centralised database shared by regional offices without complicated and expensive client software support. Two databases, the Environmental Impact Study (EIS) records and Fisheries Metadata, are web enabled in the current prototype. Figures 6.15 to 6.18 show the EIS and Metadata record listings, field listings and query form in HTML documents. The field listings of an individual record also serve as an editing interface for the respective databases.

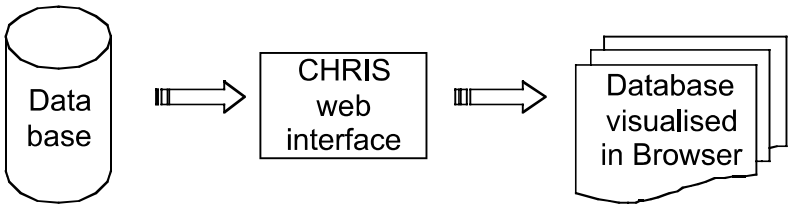


Figure 6-15 Web-enabled database concept

The development of the web-enabled database interface was assisted by Microsoft Visual InterDev (VI). VI provides high level ActiveX objects to build Active Server Pages (ASP) which establish database connections, process and generate HTML documents on request. The VI server extension must be installed in the Internet Server to establish the VI functionality.

The database connection in ASP makes use of Microsoft's Advance Data Objects (ADO) technology. ADO provides an environment for database vendors and middleware developers to provide protocol for connecting to various proprietary database formats. Thus the web-enabled database application provided in the CHRIS web interface can be extended in the future to provide access using standard Internet browsers to Relational Database Management System (RDBMS) databases in non-Windows operating system such as the DPI Fisheries Marine Plant and Aquaculture licensing database (LDBS) in Ingres.

ID	MD Number	File Reference	Old File Reference	Document Date	Title
1	4	WWW/999/999 (999)	06W.025	11/15/88	Dolphin Beach Redcliffe Preliminary Application for Investigation Lease
2	8	NRM/140/000 (109)	06W.092	7/7/88	Green Meadows, Proposed Regional Harbour and Integrated Resort Development: Pimpama, Gold Coast
3	11	NRM/140/000 (220)	06W.060	10/1/87	Report On California Creek Improvement Study
4	12	WWW/999/999 (999)	06W.067	11/1/87	MacCleay Island Resort Marina
5	17	NRM/140/000(73)	06W.003	8/1/85	Dux Creek Environmental Impact Study: Executive Summary
6	22	NRM/140/000(94)	06W.052	3/1/86	Kabaskel Model (Maroochy Woods & Waters)
7	27	NRM/030/000 (225)	14F.063	12/1/87	Lux Enterprises (Australia) Pty Ltd Proposed Aquaculture (Prawn Farm) Development
8	31	NRM/140/000(73)	06W.003	12/1/87	Environmental Survey: Dux Creek, Bribie Island
9	33	NRM/345/000(8)	09W.004	10/10/85	Sanctuary Cove Dredging Proposal
10	34	NRM/140/000(55)	04W.034	10/1/88	Sunshine Motorway Stage Two Pacific Paradise to Noosa

Figure 6-16 List of EIS records

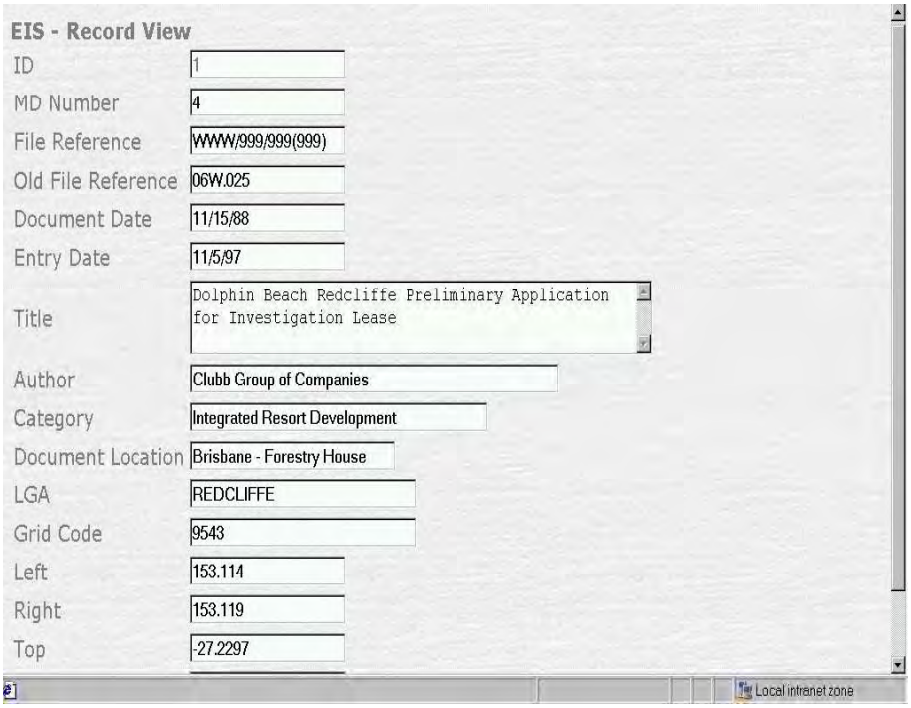


Figure 6-17 Listing of the fields of an EIS record

Figure 6-18 List of CHRIS metadata records

Figure 6-19 Listing of fields for CHRIS metadata

7 Acknowledgements

We are very grateful to Simon Fisher who provided technical support to the CHRIS establishment project from 1996-98 and to Paul Treloar for his contribution to the project during 1997. The scripts to filter the commercial fisheries data prior to its use in CHRIS have been developed by Lew Williams of the Resource Condition and Trend Unit. Thanks to Kym McKauge for the CHRIS logo and other graphics on the CHRIS home page.

We are grateful to the officers of several agencies who have assisted with the provision of data incorporated in CHRIS.

Direction and comment on the CHRIS project during this establishment phase has been received from many DPI fisheries researchers, fisheries managers and fish habitat managers, data analysts and Sunfish representatives to whom we are very grateful.

8 Benefits

The Coastal Habitat Resources Information System is at the end of its establishment phase and benefits will increase as the system becomes more widely used both by internal DPI officers and external industry clients and datasets and analytical tools available in the system become more extensive. This project has enhanced the capability of Queensland's fisheries agencies to assess spatial coastal fish habitat data in parallel with fisheries resource data. CHRIS provides

infrastructure to facilitate more efficient reporting on the condition and trends of important coastal fisheries habitats.

Significant progress has been made during the CHRIS establishment phase toward integrating and making more readily available, fisheries habitat information previously held by DPI Fisheries Group in a variety of physical locations and data formats. More than 100 datasets of direct relevance to coastal fisheries researchers and habitat managers are now available efficiently in a standard file format through the one point of access. Analysis and thematic habitat mapping outputs based on the datasets included in CHRIS can now be more readily included in the resolution of fish habitat and fisheries resource management issues by managers.

CHRIS has encouraged improved data management practices by DPI Fisheries officers and provides a framework for the long term storage of research and management data. A standard for metadata is being introduced throughout Fisheries Group as part of the implementation of CHRIS and data archiving principles are being developed.

Datasets available through CHRIS and thematic maps produced from the system have been used in the recently released report on the condition and trend of Queensland's fisheries habitats (Zeller 1998). This included use of seagrass datasets from southern Queensland, production of Statewide fish catch data effort maps and analyses using administrative boundary information. Mapping products produced through CHRIS for that report have had wide acceptance by the fishing industry and coastal community groups.

Land tenure and land use information (the DCDB and Sugar GIS data) is available to DPI Fisheries habitat and aquaculture managers statewide to enhance their efficiency in day-to-day assessment and approval processes as is Native Title Claim information, also being accessed by administrative licencing staff.

CHRIS has recently facilitated the production of thematic maps of habitat and fisheries use for incorporation in a coastal oil spill risk analysis being undertaken by officers of the Maritime Division of Queensland Transport and the Australian Maritime Safety Authority. Similarly, thematic spatial data and maps from CHRIS have been provided for consideration in the GBRMPA Representative Protected Areas program, for inclusion by the Environmental Protection Agency in Queensland’s State Coastal Management Plans and by th Queensland Herbarium in wetland habitat change analysis for southeast Queensland.

The integration of various datasets in CHRIS will facilitate modelling of habitat and environmental change on fisheries productivity and hence directly benefit all fishing sectors, coastal management agencies and coastal conservationists.

The CHRIS data structure and web interfaces may be of benefit to other states with similar hardware / software environments for habitat information systems for fisheries habitat and fisheries resource management purposes.

9 Further Developments

9.1 Availability of Intranet / Internet access to CHRIS

From late 1998, the web interface to CHRIS has been made available over the departmental Intranet to selected DPI fisheries managers and researchers as part of the testing phase of its development. To provide higher speed access over the Intranet and (and in the future the Internet), the prototype is being migrated in October 1999 to a departmental web server and the local DPI Fisheries map server upgraded to a higher speed desktop computer. Full access through DPINet to selected datasets in CHRIS is planned to be available by December 1999.

Development of this interface took longer than anticipated and more extensive trialling on the DPI Intranet is being conducted during 1999. Provision of access to CHRIS through the Internet is awaiting resolution of technical issues surrounding the departmental security firewall and the provision of different levels of data access to DPI / QFMA managers and researchers and those outside DPINet.

Recognizing that the prototype has had limited real world use to date, the CHRIS web interface with its current suite of accessible datasets will undergo further user testing through the DPI Intranet until the end of 1999. This testing will clarify which additional datasets available in the CHRIS databases users wish to be able to access through the current web interface. User feedback from intranet usage by a broader range of DPI and QFMA staff is being actively sought to confirm which of the currently available datasets should be made available over the Internet through the CHRIS web interface.

Discussions are continuing with custodians (researchers and managers) within DPI as to how best to present some datasets to avoid misinterpretation of data. This is of greatest concern where datasets are perhaps outdated or, for some mapping products, is incomplete. Some datasets are subject to confidentiality restrictions and the form in which these data can be made available to ensure the protection of such confidentiality is being clarified.

Some of the datasets obtained from other agencies for use during the establishment phase of the CHRIS system have been provided under non-commercial data use agreements. Negotiations are continuing with several agencies (including the Queensland Department of Natural Resources and the Australian Land Information Group (AUSLIG) to clarify their policies, acknowledgement requirements and likely licencing costs with respect to making images of these data (such as GIF or PNG files) available outside the Department over the Internet.

Subject to any subsequent CHRIS web interface refinement required, access will be provided once the major redevelopment of the DPI Fishweb site (where the CHRIS home page will be sited) has been completed. The redevelopment process is to be completed by the end of 1999. It is intended that public Internet access to limited CHRIS datasets through the web interface will be available in 2000.

9.2 Enhancement of CHRIS

As resources become available it is intended to extend the currently limited coverage of fisheries closures and marine plant disturbance permits. Additionally, the current database of Environmental Impact Study locations (indicative of habitat disturbance) is planned to be updated regularly.

Following continued representations from the CHRIS team, the lack of detailed location information in the DPI Fisheries Licencing DataBase System is to be rectified in early 2000. This will allow more efficient updating of the CHRIS marine plant and aquaculture databases, direct linking to LDBS through the CHRIS web interface if required by major users and make these data more readily incorporated into future spatial analyses.

It is planned that summaries of coastal habitat mapping data resulting from the recently established DPI Fisheries Long Term Monitoring project will be made available through CHRIS in the future.

Additional datasets are being created or obtained for inclusion in CHRIS - coastal aquaculture site information, link to LDBS once location field incorporated (2000), potentially Queensland outputs of the National Recreational and Indiegnous Survey when available (2001).

At the request of potential fishing industry users to whom the CHRIS web interface has been demonstrated, additional seagrass distributional data is being sought from researchers at Northern Fisheries Centre for the Great Barrier Reef region as is digital data for acid sulphate soil mapping from the Queensland Acid Sulphate Soil Investigation Team at DNR, Indooroopilly.

DPI Fisheries is collaborating with EPA Queensland in developing the Australian Coastal Atlas Queensland Node. Datasets and metadata created for CHRIS are being made available to ACA and consideration is being given to the extent to how the CHRIS web interface and the Queensland node of the ACA can be developed to complement each other into the future.

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11 List of Staff

Dr Malcolm Dunning	Principal Investigator 1996-1999
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Mr Simon Fisher	Project Technician 1996-1998
Mr Paul Treloar	Project Officer 1997 (part time)
Ms Samantha Sun	Project Officer 1997-1999 (part time)

12 Appendix 1 CHRIS user needs assessment consultations.

Input to the design of CHRIS was sought from QDPI Fisheries research and habitat management staff at the following meetings:

- the Habitat Condition and Trend Indicators Workshop (Brisbane) on 29 January 1997,
- consultation with staff at Southern Fisheries Centre (Deception Bay) by Karen Danaher and Simon Fisher on 13 February 1997,
- the Fish Habitat Areas Workshop (Brisbane) on 5-6 March 1997,
- the Fisheries Staff Habitat Workshop (Maleny) 9-11 April 1997,
- a visit to the Northern Fisheries Centre (Cairns) by Karen Danaher and Malcolm Dunning on 19-20 May 1997.

On these occasions, the preliminary CHRIS Concept Design was presented to potential major users of CHRIS - officers within QDPI fisheries involved with habitat policy development, habitat management, habitat and fisheries research and compliance. The feedback has been divided into the relevant activities relating to fisheries habitat. The 'Contributions to CHRIS', 'Wants from CHRIS' and 'Concerns with CHRIS' include all issues highlighted during the consultation period (January to June 1997).

Fisheries Habitat Policy and Management

Contributions to CHRIS

- local management plans [Anne Clarke, Louise Johns]

Wants from CHRIS

- what datasets are available (DNR's Queensland Land Information Directory [QLID] perceived as too broad) [Anne Clarke, Louise Johns]
- Water quality [Anne Clarke, Louise Johns]
- Highest Astronomical Tide boundary [Joann Resing]
- access to Herbert Resource Information Centre GIS [Joann Resing]
- location of bait resources [John Beumer]
- results of Brisbane River Waste Water Management Study [Melissa White]
- guidelines or proformas for consultants collecting habitat information for EIS's [Dan Mayer]
- remotely sensed information on catchments from satellite imagery [Peter Jackson]

Concerns with CHRIS

- -

Marine Plant, FHA Works and Aquaculture Permits (links with the Licensing Database System - LDBS)

Contributions to CHRIS

- local authority strategic plans and development control plans [Dan Mayer]

Wants from CHRIS
- DCDB [Scott McKinnon]
- digital rectified aerial photography [Scott McKinnon]
- disturbance atlas (where permits have been issued, levels of disturbance over time, details of permits, refusals or justifications [Ross Quinn]
- locations of dredging permits [Jo Masel]
- local authority information [Scott McKinnon]
- LDBS to include latitude and longitude and area for mangrove permits [Ann Clarke]

Concerns with CHRIS
- location of some mangrove permits may be difficult display as they cover a general area (e.g. all the drains in a local authority) [Ross Quinn]
- forms (for inputting into databases) cannot be created for all occassions [Scott McKinnon]
- do not want to create extra work by duplicating for CHRIS or LDBS what is already in site inspection reports [Dan Mayer]
- legal implications of providing LDBS information through CHRIS as applicants are compelled to give this information [Allison Page]

Research/Inventories of Catchment/Stream Fisheries Resources

Contributions to CHRIS
- GIS's of catchment stream habitat and fisheries resources (MapInfo) [John Russell]
- public access, adjacent landuse, mooring areas [John Russell]
- bibliographic searches for catchments for the whole Northern Region (geographic location of where research has occurred) [Sue Helmke]
- fish distributions [Sue Helmke, Rod Garrett, Chad Lunlow]

Wants from CHRIS
- water quality [John Russell, Sue Helmke]
- Digital 1:50 000 data (Army) [John Russell, Sue Helmke]
- DCDB - would like blocks less than one hectare left out (DNR do this) [John Russell]
- proforma for core dataset collection [John Russell]
- point source of gauging stations [Sue Helmke]
- National River Health Program from DNR [Sue Helmke]
- DNR Wild Rivers program [Rod Garrett]
- metadata - both the information and capacity to make metadata [Sue Helmke]

Concerns with CHRIS
- maintenance of datasets [John Russell]
- standardisation of sampling methodology is needed within QDPI fisheries resource assessment projects, e.g. John Russell's work is different to Chris Lupton's in southern Queensland [John Russell]

Fisheries Habitat Research

Contributions to CHRIS
- seagrass mapping (but with access constraints controlled by Seagrasss Ecology Group) [Warren Lee Long, Len McKenzie, Anthony Roelofs]

Wants from CHRIS
- digital rectified aerial photography [Warren Lee Long, Len McKenzie, Anthony Roelofs]
- bathymetry [Warren Lee Long, Len McKenzie, Anthony Roelofs]
- sedimentology [Warren Lee Long, Len McKenzie, Anthony Roelofs]
- catchment condition [Warren Lee Long, Len McKenzie, Anthony Roelofs]
- updates on data available [Warren Lee Long, Len McKenzie, Anthony Roelofs]
- GIS tool for buffering (like in MapInfo) [Warren Lee Long, Len McKenzie, Anthony Roelofs]
- metadata tool [Warren Lee Long, Len McKenzie, Anthony Roelofs]
- tool for keeping track of who has accessed data [Warren Lee Long, Len McKenzie, Anthony Roelofs]
- note of whether data is qualitative or quantitative [Rob Coles]
- location of fish kills (from DoE database) [Stuart Hyland]
- location of stream barriers [Stuart Hyland]
- location of ponded pastures [Stuart Hyland]

Concerns with CHRIS
- want to be able to control who has access to data for which they are custodians, including within DPI [Warren Lee Long, Len McKenzie, Anthony Roelofs]

Fisheries Research

Contributions to CHRIS
- distribution of fisheries

Wants from CHRIS
- a time series tool for data display [Clive Turnbull]

Concerns with CHRIS
- -

Fish Habitat Area Management

Contributions to CHRIS
- FHA boundaries [Rebecca Sheppard, Scott McKinnon]
- proposed FHA boundaries [Rebecca Sheppard, Scott McKinnon]

Wants from CHRIS
- usage of Fish Habitat Areas [Rebecca Sheppard]

- boat ramps [Rebecca Sheppard]
- fisheries catch information [Rebecca Sheppard]
- DCDB [Scott McKinnon]

Fisheries Habitat Management Compliance

Contributions to CHRIS
- location of habitat disturbance reported by fishcare volunteers [Clyde Andrews]

Wants from CHRIS
- location of serious fisheries offences (e.g. habitat destruction) [Clyde Andrews, Bob Koch]

Concerns with CHRIS
- speed of network to offices only connected by telephone lines [Bob Koch]

QDPI Fisheries Staff who received presentations on the CHRIS Concept Design

Fisheries Resource Protection Division (Brisbane)
- Dan Currey (General Manager)
- John Beumer (Marine Habitat Policy)
- Melissa White (Marine Habitat Policy)

Fisheries Resource Management Division (Brisbane)
- Brad Zeller (Habitat Condition and Trend Reporting)
- Peter Jackson (Inland Fisheries)

Aquaculture and Industry Development (Brisbane)
- Allison Page (Licensing)
- Nicole Turnbull (Licensing)
- Kristine Seeto (Licensing Database Administration)

Queensland Boating and Fisheries Patrol
- Clyde Andrews (Cairns)
- Bob Koch (Ingham)
- Don Garnett (Urangan)

Regional Fisheries Group officers
- Joann Resing (Townsville)
- Peter Finglas (Mackay)
- Stuart Hyland (Rockhampton)
- Chris Lupton (Bundaberg)
- Michael Heidenreich (Bundaberg)

Southern Fisheries Centre (Deception Bay)
- Ross Quinn (Habitat Management)

- Andrea Owttrim (Habitat Management)
- Dan Mayer (Marine Habitat Management)
- Scott McKinnon (Fish Habitat Area Management)
- Samantha Miller (Marine Habitat Management)
- Jo Masel (Marine Habitat Management)

Northern Fisheries Centre (Cairns)
- Sue Helmke (Research - Coastal Rivers Fisheries Resources)
- Rod Garrett (Research - Coastal Rivers Fisheries Resources)
- Chad Ludnow (Research - Coastal Rivers Fisheries Resources)
- John Russell (Research - Coastal Rivers Fisheries Resources)
- Rob Coles (Marine Habitat Research &Management)
- Anne Clarke (Habitat Management)
- Louise Johns (Habitat Management)
- Warren Lee Long (Research & Extension - Seagrass)
- Len McKenzie (Research - Seagrass)
- Anthony Roelofs (Research - Seagrass)
- Clive Turnbull (Research - Prawns, Trawl Fisheries)
- Kurt Derbyshire (Research - Prawns)
- Rebecca Sheppard (Fish Habitat Area Management)

Individual discussions with other QDPI Fisheries staff

Program Management Information System (PROMIS)
- Discussions with Bob Pearson, Fisheries Group Executive 7 July 1997
- Includes current R&D megaprojects
- Progress is slow and does not include past projects
- Geographic location is not a field

Fisheries Closures
- Discussions with Peter Tanner, QBFP 15 July 1997
- He has copied AUS charts or 1:100 000 topo maps on to A4 size paper for distribution to QBFP officers. He has not plotted the actual boundaries for many of the closures.
- Parliamentary Council has expressed the need for maps of the same format as the Fish Habitat Area maps and need to include the place names mentioned in the Regulations as well as identifying points.
- Clients would mainly be commercial and recreational fishers, QBFP, QFMA, managers (e.g. what is the area of protected water).
- New F-B (fisheries closure boundary) signs are supposed to have a GPS position recorded. Will the position of the existing ones be easy to get from QBFP?
- From the current descriptions in the *Fisheries Regulation* 1995, not all are concise or precise boundaries e.g. "Currumbin Creek and waterways joining it".

13 Appendix 2 Summary of consultations with GIS staff of other coastal agencies

DPI Forestry

- Discussions by Simon Fisher with Michael Krause 10 July 1997
- Topographic data they have is drainage and contours for 1:25 000 and 1:100 000
- Drainage data shows linear features (river centreline arcs) except where there are lakes and large creeks, rivers and estuaries.
- Contour intervals are 100m for 1:100 000 and 10m for 1:25 000
- Permission given to link / mount to the Forestry QFGIS2 server
- Have the placenames gazetteer

DPI Animal and Plant Health - Agricultural Property System (APS)

- Visited Jeff Chapman 9 May 1997 at Indooroopilly
- Integrates all relevant data and can be used for property management and planning, animal husbandry, and disease management.
- Emphasis on animal health not cropping, limited coastal
- Clients - DPI Animal Health Staff (stock inspectors), general public
- Information - property boundaries, diseases, chemical residues, land use
- Technology - Unix and Microsoft PC's with a graphical user interface
- Serve via Unix box PIB3 with Ingres and Open Road
- For digital cadastral information use IVAS because it identifies the rate payer and has some land use as well, e.g. dairying, wheat
- Found ArcView too static - need a relational database. Drawings done in CA OpenRoad
- Current status - redeveloping the user interface but currently used by stock inspectors over low speed network connections

Queensland Department of Natural Resources

Wild Rivers Project (Resource Sciences Centre Indooroopilly)

- Visited Graeme Bell 9 May 1997
- Purpose of his project - to identify 'wild rivers' (relatively unchanged by modern development), locate data and look for gaps
- Scope - whole of Queensland
- Joint DNR and DOE project - no further funding after July 1997
- Data sets - National Forest Inventory, Wet Tropics, Murray/Darling, CYPLUS, SLATS 1991 crop cover, dams, bores, water licensing points, mines, sand extraction, logging and grazing histories
- Catchment size down to 3rd order streams
- Tying data to DCDB then generating 250m x 250m grid cells for modelling
- Using ARC/INFO with GRID
- Disturbance layer is available to CHRIS

Sugar Land Information System (Resource Sciences Centre Indooroopilly)

- Visited Donna Smith and Mike Grundy 24 July 1997
- Industry (cane growers and mills) provide a lot of support

- Preference for hard copy maps rather than GIS products although a lot of industry using MapInfo for mapping
- Focus has changed from developing a GIS to providing a bureau service for information
- Not many of industry outside of Brisbane access the Web
- Data sets available to us - presence and land suitability for sugar cane (to be revised every two years); terrain model (9 second - 250 metre grid) for Bundaberg, Proserpine and Cairns (not yet complete); cane assignment layer (shows some on tidal lands); statewide soils information
- A lot of mills fly their own aerial photography - this may be a good source for us
- Web page under http://www.dnr.qld.gov.au - describes project and products
- Use Arc/Info, ArcView/Avenue, SDE and develop own static web pages

Queensland Acid Sulphate Soils Investigation Team (QASSIT) (Resource Sciences Centre Indooroopilly)
- Visited Bernie Powell 24 July 1997
- Landex system provides metadata for their projects and data - we can get printouts
- Acid sulphate soils for NSW border to Bundaberg mapped at various scales - councils 1:25 000, sugar lands 1:50 000, remaining 1:100 000 (not all complete)
- Potential Acid Sulphate Soils mapped coarsely for FNQ2010 area (Cairns)
- Prefer hardcopy products (consider maps over the internet are too slow)

DNR Mareeba
- Discussions with Terry Webb 20 May 1997
- Do a lot of customisation with Avenue
- Project based GIS activities

Queensland Fisheries Management Authority

Standard Integrated Recreational Fisheries Information System (SIRFIS)
- Presentation 19 March 1997
- Development of a standardized information system with data entry forms to record recreational fishing catch and effort (e.g. clubs, charter vessels)
- Location types include grid reference, latitude and longitude, nearest town, reef name
- Not a central database but each agency has total control of their own clone
- Standard structure will allow immediate comparability between States
- Runs on Microsoft Windows / SqlBase only and is not spatial at this stage

Recreational Fishing Survey of Queensland (RFISH)
- Presented 19 March 1997
- Geographical areas based on statistical divisions and statistical subdivisions
- Locations for recording fish catches are closest towns or cities

Queensland Department of Environment

Marine Parks, Cairns
- Visited Mark Connell 20 May 1997
- Have a birds database - mainly islands
- Have Wildnet - flora and fauna, terrestrial and aquatic, search by area or taxon, e.g. can bring up an island and a species list, HerbRecs (Q Herbarium database) is being integrated into it
- There is a database for works in tidal waters (Section 86 of Harbours Act) (?spatial attributes) in Brisbane

GIS Unit Data Exchange Web (DEW)
- Visited 20 February 1997 in Brisbane (Ben Hatton, Steve Jones)
- A prototype to allow Q Govt interagency sharing of data over the web
- It contains the Data Storage Manager - a server which controls access to and transfer of data to clients; the Resource Discovery System - providing searchable interface to clients; and the Client Interface - through which the user navigates data indexes, selects data for transfer, and performs searches
- Contains a lot of security
- Software is available to us
- We would need - a web server, a robot that runs once a week and indexes, some data to index
- BUT agency firewalls may be a problem - we would have to go through CITEC

Fish Kills Database
- Simon Fisher visited Munroe Mortimer 21 July 1997 in Brisbane
- Supplied his draft document for his approach to recording and monitoring fish kills - would like feedback
- No database with geographic location at this stage but possible in the future

Queensland Department of Local Government and Planning (Brisbane)
- Contacted Rachel Macrae by phone 24 July 1997 and discussed CHRIS project
- Planning Information and Forecasting Unit are considering implementing MapInfo Pro Server for their intranet but the cost is $40 000
- They are currently serving static GIFs

Great Barrier Reef Marine Park Authority (Townsville)

- Visited Jeff Shearin and Jamie Storrie on 29 October 1996
- Discussed CHRIS objectives and areas of mutual interest
- Discussed GBRMPA projects, databases and available datasets and relevance to CHRIS
- Made preliminary arrangements to use some datasets in CHRIS

James Cook University of North Queensland

- Visited Nina Morisette at Tropical Environment Studies and Geography (TESAG) 28 October 1996
- Discussed CHRIS objectives and status of seagrass modelling work
- Nina provided a compiled set of DPI NFC seagrass sampling site and distributional data with some metadata

Cape York Peninsula Landuse Strategy

- Les Searle (DNR Cairns) contacted by Simon Fisher 18 July 1997
- He has supplied metadata for Natural Resources and Land Use Programs of CYPLUS

Wet Tropics Management Authority (Cairns)

- Visited Terry Web and Brian Taylor 20 May 1997
- Find Arc/Info is best package for capturing data
- Managers and most clients still want hard copy but will progress to ArcView
- Do not like MapObjects (V1) because it requires too much customisation
- Have developed a good data structure with links to many associated data sets
- Include metadata in AMLs for maps (also include a log file)
- Vegetation mapping project 1:50 000 - will include mangroves as a single community type
- Coastline comes from 1:50 000 Army topographic maps
- Get tenure from local authorities as DCDB not considered accurate enough
- Key waterways proposed - probably a desktop study at James Cook Uni - riparian vegetation, canopy cover, fish habitat
- DOE Townsville (Sue Gardiner) is doing coastal mapping from Cape Bowling Green to south of Dunk Island.

Environmental Resources Information Network, Environment Australia (Canberra)

- Visit by Steve Blake 11 April 1997 to introduce Australian Coastal Atlas 'State Nodes' Concept
- He is aware of the CHRIS project and objectives from previous discussions with Malcolm Dunning in 1994/5
- Objectives - evolution of NatMIS, make Commonwealth coastal data holdings widely and easily accessible; increase the amount of coastal managers to make their information and data available to others; provide a means of retaining and utilising information generated by coastal monitoring
- Phase 1 - displaying and basic overlaying of pre-prepared maps in a GIF or JPEG format along with the associated accompanying metadata entry using the Blue Pages and State Directories (until Feb 1998)
- Phase 2 - Inter-active GIS system whereby users custom-build their own maps via the WWW which queries a GIS session directly and produces a customised map consisting of GIF/JPEG images (mid 1999)
- Distributed network principle - participating agencies linked via the Internet using WWW software with custom-built (by ERIN) front-ends as the interface
- Agencies to maintain and update their own information

- Each state to develop a strategy and nominate an agency to lead and host the State Node WWW site (DOE for Qld)
- ERIN will provide some funding and assistance - but only enough for establishing the state node - nothing for data capture or conversion to GIFs

Bureau of Resource Sciences (Fisheries Resources Branch)

- Email and phone communication with Chris O'Brien, May 1996 and obtained report on proposed National Marine Geographic Information System
- Advised him of CHRIS project and discussed commonalities
- Objective of Nat Mar GIS to contain State and Commonwealth jurisdictional boundaries for use with fisheries, environmental protection, mineral, petroleum and other data
- ArcView interface underpinned by ARCINFO and Avenue scripts on both UNIX and PC
- Have basic geography (e.g. coastlines)
- Have got some biotic and oceanographic information (e.g. mangroves and seagrass) from CAMRIS and Coastal Resources Atlas and some bathymetry
- Have location of coastal aquaculture sites except for Queensland, locations of offshore oil fields and licensed offshore mineral exploration areas
- Have got managerial areas and boundaries (e.g. the Australian territorial baseline, state offshore jurisdictional boundary - 3 nm offshore, contiguous zones - 12 and 24 nm offshore, Australian Economic Exclusion Zone, Australian Fisheries Zone, commonwealth fisheries management zones, areas of fishing activity for pelagic fisheries, marine protected areas
- Have fisheries logbook data for the South East Fishery (1986-1995)
- Developing tools for analysing logbooks e.g. catch and effort statistics by fishery, species, catch size, month and vessel; plots of trawl trajectories where available from plotters / VMS

14 Appendix 3 CHRIS metadata example in Blue Pages format

Blue Pages Dataset Report

Thursday, 9 September 1999

Title: Coastal Wetlands of the Fitzroy River **DSIN:**10272

Custodian Queensland Department of Primary Industries Fisheries Group - Resource Condition and Trend Unit

Jurisdiction Australia

Description:

Abstract Coastal wetland mapping including mangrove communities, saltpans and saline grasslands. Region extends along the Fitzroy River, Rockhampton to Ramsay's Crossing, The Narrows and includes the western side of Curtis Island.

Search Words: Habitat, Mangroves, Saltmarshes

Geographic Extent: Queensland Coast

Bounding **North:** -23.3674

West: 150.5050 **East:** 151.0700

South: -23.7013

Data Currency:

Beginning: 01/IX/1999 **Ending:** 01/IX/1999

Dataset Status:

Progress: Complete **Maintenance Frequency:** As required

Access:

Stored Data Format: DIGITAL - ARC/INFO

Available Format DIGITAL - ARC/INFO various formats, shapefile

Access Release with the permission of the custodian

Data Quality:

Lineage: Landsat 5 TM satellite imagery processed using ERDAS Imagine. 6 bands contrast stretched using linear stretch with breakpoints to highlight intertidal regions. Water bodies and terrestrial features masked out. Remaining imagery processed using an unsupervised classification procedure (ISODATA). Resulting classes labelled according to their dominant cover type with the aid of 1:12 000 (October 1997) and 1:50 000 (July 1996) B.P.A. aerial photography. Clumps of pixels <0.5ha eliminated. Image smoothed using 3 x 3 moving kernel. Converted from raster to vector format using ARC/INFO software. Splined and polygons <0.5ha eliminated.

Positional Accuracy: Landsat scene rectified to AMG with final radiometric correction and GCP

Attribute Accuracy: Overall accuracy 91%

Logical Consistency: This dataset is logically consistent

Completeness: The dataset is complete

Contact Information:

Contact Queensland Department of Primary Industries Fisheries Group - **OIN:** 164

Contact Position: Remote Sensing Scientist

Address: 9th Floor Forestry House 160 Mary Street

Locality: Brisbane

State: QLD **Postcode:** 4001 **Country:** Australia

Telephone: (07) 3224 8112 **Facsimile:**

Email: bruinsc@dpi.qld.gov.au **WWW:**

Additional Metadata:

Date: 09/08/1999 **Person:** Christina Bruinsma

Organisation: Queensland Department of Primary Industries Fisheries Group - Resource Condition and Trend Unit

Title: Coastal Wetlands of the Fitzroy River **DSIN:**10272

:

Data Content:

:

Parameter Description:

Sampling

Sampling Intensity: 0

:

Equipment:

Habitat Description:

Taxonomic Group:

Coordinates:

Program Information:

Program Name:

Program

Program

Platform Name:

Publication

Documentation: Bruinsma, C. and Danaher, K. (1999) Coastal Wetlands of the Fitzroy River Estuary: A report to the Environmental Protection Agency. Queensland Department of Primary Industries, Brisbane.

Online Link:

Type:

Constraints:

15 Appendix 4 Routines for extracting and filtering commercial fisheries logbook data

Data extraction from QFISH using sql scripts on the Ingres Mixed and Trawl databases

Mixed database

```
SELECT vessel_seq_no,
        o.fishery_code as fishery_code,
        o.operation_date as operation_date,
        o.operation_no as operation_no,
        o.operation_latitude as operation_latitude,
        o.operation_longitude as operation_longitude,
        fishing_method_code,
        net_mesh,
        net_length,
        species_code,
        catch_wt as catch_wt,
        weight_factor,
        catch_nos,
        fishing_depth_avg,
        position_precision,
        start_grid,
        fishing_start_time,
        fishing_end_time,
        pot_nos,
        pot_lifts,
        line_nos,
        fishing_ground
    FROM operation o,
       boat_view b,
       operation_species c
    WHERE o.fishery_code = '$fishery_code'
     and operation_latitude > $min_lat
     and operation_latitude <= $max_lat
     and operation_longitude > $min_long
     and operation_longitude <= $max_long
     and o.operation_date between '$min_date' and '$max_date'
     and species_code between '$min_sp_code' and '$max_sp_code'
     and o.fishery_code = c.fishery_code
     and o.boat_record_no = c.boat_record_no
     and o.operation_date = c.operation_date
     and o.operation_no = c.operation_no
     and o.boat_record_no = b.boat_record_no
```

Trawl database

```
SELECT  vessel_seq_no,
        o.fishery_code as fishery_code,
        o.operation_date as operation_date,
        o.operation_no as operation_no,
        o.operation_latitude as operation_latitude,
        o.operation_longitude as operation_longitude,
        fishing_method_code,
        net_mesh,
        net_length,
        species_code,
        catch_wt as catch_wt,
        weight_factor,
        catch_nos,
        fishing_depth_avg,
        position_precision,
        start_grid,
        fishing_start_time,
        fishing_end_time,
        pot_nos,
        pot_lifts,
        line_nos,
        o.fishing_ground
    FROM    operation o,
        boat_view b,
        operation_species c
    WHERE   o.fishery_code = 'TRAWL' and /* for trawl DB only */
```

operation_latitude > $min_lat and operation_latitude <= $max_lat and operation_longitude >$min_long and operation_longitude <= $max_long and o.operation_date between '$min_date' and'$max_date' and species_code between '$min_sp_code' and '$max_sp_code' and o.fishery_code =c.fishery_code and o.boat_record_no = c.boat_record_no and o.operation_date = c.operation_date and o. operation_no = c.operation_no and o.boat_record_no = b.boat_record_no

Item and name	SQL or table structure				Comment
Macro: Current Importer	Name	Condition	Action	Argument	Value	*This is the macro that uses the queries listed below –*
			SetWarnings	Warnings On:	No	
			OpenQuery	Query Name:	Importeda deleter	
				View:	Datasheet	
				Data Mode:	Edit	
		Clear Table Imported				
			OpenQuery	Query Name:	FINAL11 deleter	
				View:	Datasheet	
				Data Mode:	Edit	
		Clear table FINAL				
			OpenQuery	Query Name:	Intermediatea deleter	
				View:	Datasheet	
				Data Mode:	Edit	
		Clear Intermediate Table				
		Import Mix8990.csv				
			TransferText	Transfer Type:	Import Delimited	
				Specification Name:	Importera - Import Specification	
				Table Name:	Importeda	
				File Name:	c:\data\working\Trawljb9798.txt	
				Has Field Names:	No	
		Importing the data from a CSV pull from "dump*" or "dilemna" from CFISH - incorporates "weight conversion factors" into the data and "fishing ground"				
		Suite of queries that manipulates the data into a standardised form				
			OpenQuery	Query Name:	Grid a2a T	
				View:	Datasheet	
				Data Mode:	Edit	
		Build Intermediate table				

Item and name	SQL or table structure			*Comment*
		OpenQuery	Query Name:	Importeda deleter
			View:	Datasheet
			Data Mode:	Edit
	Empty Imported table			
		OpenQuery	Query Name:	Importa - FINAL 9991
			View:	Datasheet
			Data Mode:	Edit
	Build table to export to specified database			
		CopyObject	Destination Database:	c:\data\working\Trawl0098.mdb
			New Name:	Trawl9697
			Source Object Type:	Table
			Source Object Name:	FINAL11
	Copy FINAL table from "Nuimpoter" to a database for the analysis of fisheries or species			
		OpenQuery	Query Name:	Importeda deleter
			View:	Datasheet
			Data Mode:	Edit
	Clear Table Imported			
		OpenQuery	Query Name:	FINAL11 deleter
			View:	Datasheet
			Data Mode:	Edit
	Clear table FINAL			
		OpenQuery	Query Name:	Intermediatea deleter
			View:	Datasheet
			Data Mode:	Edit
	Clear Intermediate Table			
	RunCommand		Command:	4

Item and name	SQL or table structure	*Comment*
Importeda	TABLE Fields Boat Source Date Operation Latitude Longitude Fishing code Mesh size Net length Species code Catch Weight converter Numbers Depth Precision Start grid Fishing start time Fishing end time Pot numbers Pot lifts Line Numbers Fishing ground	*Table structure for the data when first imported from "dilemma"* *The pull used at the moment does NOT use Lat's and Long's as selection criteria – the only criteria used are date and boat record (VSNo)*

Item and name	SQL or table structure	*Comment*
Importa - grouper 1	SELECT Importeda.Boat, First(Importeda.Source) AS [Log code], Importeda.Date, First(Importeda.Latitude) AS Latitude, First(Importeda.Longitude) AS Longitude, First(Importeda.[Fishing code]) AS [Fishing code], First(Importeda.[Mesh size]) AS [Mesh size], First(Importeda.[Net length]) AS [Net length], Importeda.[Species code], Sum([Importeda]![Catch]) AS [Catch Base], First(Importeda.[Weight converter]) AS [Weight converter], Sum(IIf([Importeda]![Weight Converter]=0,(([Importeda]![Catch])),([Importeda]![Catch]*[Importeda]![Weight converter]))) AS Catch, Sum(Importeda.Numbers) AS Numbers, First(Importeda.Depth) AS Depth, First(Importeda.Precision) AS Precision, First(Importeda.[Start grid]) AS [Start grid], First(Importeda.[Fishing start time]) AS [Fishing start time], Last(Importeda.[Fishing end time]) AS [Fishing end time], First(Importeda.[Pot numbers]) AS [Pot numbers], First(Importeda.[Pot lifts]) AS [Pot lifts], First(Importeda.[Line Numbers]) AS [Line Numbers], First(Importeda.[Fishing ground]) AS [Fishing ground] FROM Importeda WHERE ((([Importeda]![Catch])>=1)) OR (((Importeda.Numbers)>=1)) GROUP BY Importeda.Boat, Importeda.Date, Importeda.[Species code];	*Converts raw data to daily operations by summing catch & numbers - based on Operation*
Importa - grouper 1a	SELECT [Importa - grouper 1].*, IIf([Importa - grouper 1]![Species code]=[Old CFISH Codes]![Cfish_Code],[Old CFISH Codes]![CSIRO_No]*1,[Importa - grouper 1]![Species code]*1) AS [Spp code] FROM [Importa - grouper 1] LEFT JOIN [Old CFISH Codes] ON [Importa - grouper 1].[Species code] = [Old CFISH Codes].Cfish_Code;	*Adjusted "old" CFISH codes to the most recent version – was introduced when, for example barramundi had two codes in CFISH*

Item and name	SQL or table structure	*Comment*
Importa - fishing code 2	SELECT [Importa - grouper 1a].*, IIf([Importa - grouper 1a]![Fishing code]>=0,Right([Importa - grouper 1a]![Fishing code],1),[Importa - grouper 1a]![Fishing code]) AS [Fishing code 1], IIf(IsNull([Importa - grouper1a]![Boat]),999999,[Importa - grouper 1a]![Boat]) AS Boat1, IIf([Importa – grouper 1a]![Numbers]=0,Null,([Importa - grouper 1a]![Numbers])) AS Numbers1 FROM [Importa - grouper 1a];	*Condenses fishing code into an single digit - a simplified fishing code 1 to 7 – leaves blanks for analysis in other queries ALSO the Boat Number "999999" is inserted into blank spaces in the boat VSNo*
Importa - fishing code 3	SELECT [Importa - fishing code 2]![Boat1] AS Boat, [Importa - fishing code 2].[Log code], [Importa – fishing code 2].Date, [Importa - fishing code 2].Latitude, [Importa - fishing code 2].Longitude, [Importa - fishing code 2]![Fishing code 1] AS [Fishing code], [Importa - fishing code 2].[Mesh size], [Importa - fishing code 2].[Net length], [Importa - fishing code 2].[Spp code] AS [Species Code], [Importa - fishing code 2].Catch, [Importa - fishing code 2]![Numbers1] AS Numbers, [Importa - fishing code 2].Depth, [Importa - fishing code 2].Precision, [Importa - fishing code 2].[Start grid], [Importa - fishing code 2].[Fishing start time], [Importa - fishing code 2].[Fishing end time], [Importa - fishing code 2].[Pot numbers], [Importa - fishing code 2].[Pot lifts], [Importa - fishing code 2].[Line Numbers], [Importa - fishing code 2].[Fishing ground], [Importa - fishing code 2].[Weight converter], [Importa - fishing code 2].[Catch Base] FROM [Importa - fishing code 2];	*Fishing Method1 AND Boat with*

Item and name	SQL or table structure	*Comment*
Importa - trawl/net/line 4	SELECT [Importa - fishing code 3].*, IIf(IsNull([Importa - fishing code 3]![Fishing code]), IIf([Importa - fishing code 3]![Log code]="TRAWL",7, IIf([Importa - fishing code 3]![Log code]="LINE",1, IIf((([Importa - fishing code 3]![Mesh size]>0) Or ([Importa - fishing code 3]![Net length]>0)),4, IIf(([Importa - fishing code 3]![Pot numbers]>0 Or [Importa - fishing code 3]![Pot lifts]>0) And ([Importa - fishing code 3]![Species code]>=702000 And [Importa - fishing code 3]![Species code]<=702999),6, IIf(IsNull([Importa - fishing code 3]![Mesh size]) And IsNull([Importa - fishing code 3]![Net length]) And IsNull([Importa - fishing code 3]![Pot numbers]) And IsNull([Importa - fishing code 3]![Pot lifts]),999))))), [Importa - fishing code 3]![Fishing code]) AS [Fishing code1] FROM [Importa - fishing code 3];	*Organises fishing method (number codes) in the best way possible taking into account whether a trawl or line logbook used and whether nets or pots were used – it fills in blanks based on various criteria*
Importa - trawl/net/line 5	SELECT [Importa - trawl/net/line 4].Boat, [Importa - trawl/net/line 4].[Log code], [Importa - trawl/net/line 4].Date, [Importa - trawl/net/line 4].Latitude, [Importa - trawl/net/line 4].Longitude, [Importa - trawl/net/line 4]![Fishing code1] AS [Fishing Code], [Importa - trawl/net/line 4].[Mesh size], [Importa - trawl/net/line 4].[Net length], [Importa - trawl/net/line 4].[Species code], [Importa - trawl/net/line 4].Catch, [Importa - trawl/net/line 4].Numbers, [Importa - trawl/net/line 4].Depth, [Importa - trawl/net/line 4].Precision, [Importa - trawl/net/line 4].[Start grid], [Importa - trawl/net/line 4].[Fishing start time], [Importa - trawl/net/line 4].[Fishing end time], [Importa - trawl/net/line 4].[Pot numbers], [Importa - trawl/net/line 4].[Pot lifts], [Importa - trawl/net/line 4].[Line Numbers], [Importa - trawl/net/line 4].[Fishing ground], [Importa - trawl/net/line 4].[Weight converter], [Importa - trawl/net/line 4].[Catch Base] FROM [Importa - trawl/net/line 4];	*Converts Fishing method Code 1 to Fishing method code in Importa trawl/net/line 4*

Item and name	SQL or table structure	*Comment*
Importa - Grid/site 8	SELECT [Importa - trawl/net/line 5].*, Int(IIf([Importa - trawl/net/line 5]![Precision]=0.25,Null, IIf([Importa - trawl/net/line 5]![Precision]=0.05, (5*(Int(10*([Importa - trawl/net/line 5]![Latitude]-Int([Importa - trawl/net/line 5]![Latitude]))) Mod 5))+1+(Int(10*([Importa - trawl/net/line 5]![Longitude]-Int([Importa - trawl/net/line 5]![Longitude]))) Mod 5), IIf([Importa - trawl/net/line 5]![Precision]=0.008, IIf(((([Importa - trawl/net/line 5]![Latitude]-Int([Importa - trawl/net/line 5]![Latitude])=0.25) Or ([Importa - trawl/net/line 5]![Latitude]-Int([Importa - trawl/net/line 5]![Latitude])=0.75)) And (((([Importa - trawl/net/line 5]![Longitude]-Int([Importa - trawl/net/line 5]![Longitude])=0.25) Or (([Importa - trawl/net/line 5]![Longitude]-Int([Importa - trawl/net/line 5]![Longitude])=0.75))))),Null, (5*(Int(10*([Importa - trawl/net/line 5]![Latitude]-Int([Importa - trawl/net/line 5]![Latitude]))) Mod 5))+1+(Int(10*([Importa - trawl/net/line 5]![Longitude]-Int([Importa - trawl/net/line 5]![Longitude]))) Mod 5)))))) AS Site, IIf(IsNull([Importa - trawl/net/line 5]![Latitude]),Null, IIf([Importa - trawl/net/line 5]![Latitude]=0,Null, IIf([Importa - trawl/net/line 5]![Longitude]<142,"A" & Chr(349-Int([Importa - trawl/net/line 5]![Longitude]*2)) & (Int([Importa - trawl/net/line 5]![Latitude]*2)-17), Chr(Int([Importa - trawl/net/line 5]![Longitude]*2)-219) & (Int([Importa - trawl/net/line 5]![Latitude]*2)-17)))) AS Grid FROM [Importa - trawl/net/line 5];	*First attempt to fill in Grid and Site when only Lats and Longs are available - see scripts later that really interrogate grid and site*
Importa -W88 10	SELECT [Importa - Grid/site 8].*, IIf((Right([Importa - Grid/site 8]![Start grid],3))="W88","W88",[Importa - Grid/site 8]![Grid]) AS Grid1 FROM [Importa - Grid/site 8];	*Searches Start Grid to check if*

Item and name	SQL or table structure	*Comment*
Importa - W88 11	SELECT [Importa - W88 10].Boat, [Importa - W88 10].Date, [Importa - W88 10].[Species code], [Importa - W88 10].Catch, [Importa - W88 10].Numbers, [Importa - W88 10].Latitude, [Importa - W88 10].Longitude, [Importa - W88 10]![Grid1] AS Grid, [Importa - W88 10].Site, [Importa - W88 10].Precision, [Importa - W88 10].[Start grid], [Importa - W88 10].[Fishing ground], [Importa - W88 10].[Log code], [Importa - W88 10].[Fishing Code], [Importa - W88 10].[Mesh size], [Importa - W88 10].[Net length], [Importa - W88 10].[Pot numbers], [Importa - W88 10].[Pot lifts], [Importa - W88 10].[Line Numbers], [Importa - W88 10].Depth, [Importa - W88 10].[Fishing start time], [Importa - W88 10].[Fishing end time], [Importa - W88 10].[Weight converter], [Importa - W88 10].[Catch Base] FROM [Importa - W88 10];	*Converts Grid1 to Grid field*

Item and name	SQL or table structure	*Comment*
Importa - weight converter 13	SELECT [Importa - W88 11].Boat, [Importa - W88 11].Date, [Importa - W88 11].[Species code], IIf([Importa - W88 11]![Catch]>=1,[Importa - W88 11]![Catch], IIf([Importa - W88 11]![Species Code]=702001,[Importa - W88 11]![Numbers]*0.9, IIf([Importa - W88 11]![Species Code]=702901,[Importa - W88 11]![Numbers]*0.4, IIf([Importa - W88 11]![Species Code]=702002,[Importa - W88 11]![Numbers]*0.5, IIf([Importa - W88 11]![Species Code]=601002,[Importa - W88 11]![Numbers]*3.5, IIf([Importa - W88 11]![Species Code]=310006,[Importa - W88 11]![Numbers]*3.5, IIf([Importa - W88 11]![Species Code]=900204,[Importa - W88 11]![Numbers]*6.5, IIf([Importa - W88 11]![Species Code]=900205,[Importa - W88 11]![Numbers]*4.5, IIf([Importa - W88 11]![Species Code]=900200,[Importa - W88 11]![Numbers]*6,0))))))))) AS Catch, [Importa - W88 11].Latitude, [Importa - W88 11].Longitude, [Importa - W88 11].Grid, [Importa - W88 11].Site, [Importa - W88 11].Precision, [Importa - W88 11].[Start grid], [Importa - W88 11].[Fishing ground], [Importa - W88 11].[Log code], [Importa - W88 11].[Fishing Code], [Importa - W88 11].Numbers, [Importa - W88 11].[Mesh size], [Importa - W88 11].[Net length], [Importa - W88 11].[Pot numbers], [Importa - W88 11].[Pot lifts], [Importa - W88 11].[Line Numbers], [Importa - W88 11].[Weight converter], [Importa - W88 11].[Catch Base], [Importa - W88 11].[Fishing start time], [Importa - W88 11].[Fishing end time], [Importa - W88 11].Depth FROM [Importa - W88 11];	
Grid a1	SELECT [Importa - weight converter 13].*, IIf(IsNull([Importa - weight converter 13]![Fishing ground]), Null, [Importa - weight converter 13]![Fishing ground]) AS [Grid 1A] FROM [Importa - weight converter 13];	
Grid a2	SELECT [Grid a1].*, IIf(IsNull([Grid a1]![Grid 1A]), MajorGrids([Start grid]), ([Grid a1]![Grid 1A])) AS [Grid 2a]	
Grid a2a T	SELECT [Grid a2].*, IIf(IsNull([Grid a2]![Grid 2a]),[Grid a2]![Grid],[Grid a2]![Grid 2a]) AS [Grid a2a] INTO Intermediate FROM [Grid a2];	
Grid a3	SELECT intermediate.*,	

Item and name	SQL or table structure	*Comment*
	IIf([QFISH Grids]![Grid]=[intermediate]![Grid a2a],[intermediate]![Grid a2a],"ZZ99") AS [Grid a3] FROM intermediate LEFT JOIN [QFISH Grids] ON intermediate.[Grid a2a] = [QFISH rids].Grid;	
Grid a3 s1	SELECT [Grid a3a].*, IIf(IsNumeric(Left([Grid a3a]![Start grid],1)),Left([Grid a3a]![Start grid],1)) AS Siter1, IIf(IsNumeric(Left([Grid a3a]![Start grid],2)),Left([Grid a3a]![Start grid],2)) AS Siter2	
Grid a3 s2	SELECT [Grid a3 s1].*, IIf(IsNull([Grid a3 s1]![Siter2]),([Grid a3 s1]![Siter1]*1),([Grid a3s1]![Siter2]*1)) AS Siter3 FROM [Grid a3 s1];	
Grid a3 s3	SELECT [Grid a3 s2].*, IIf([Grid a3 s2]![Grid]=[Grid a3 s2]![Grid a3] And IsNull([Grid a3 s2]![Siter3]),[Grid a3 s2]![Site],[Grid a3 s2]![Siter3]) AS Siter4	
Grid a3 s4	SELECT [Grid a3 s3].*, IIf(IsNull([Grid a3 s3]![Siter4]) And (([Grid a3 s3]![Precision])=0.008 And (([Grid a3 s3]![Grid a3])<>"ZZ99") And ((((([Grid a3 s3]![Latitude])-Int([Grid a3 s3]![Latitude]))<>0.25) Or (([Grid a3 s3]![Latitude])-Int([Grid a3 s3]![Latitude]))<>0.75)) And ((((([Grid a3 s3]![Longitude])-Int([Grid a3 s3]![Longitude]))<>0.25) Or (([Grid a3 s3]![Longitude])-Int([Grid a3 s3]![Longitude]))<>0.75)),([Grid a3 s3]![Site]),([Grid a3 s3]![Siter4])) AS Siter5 FROM [Grid a3 s3];	
Grid a3 s5	SELECT [Grid a3 s4].*, IIf(IsNull([Grid a3 s4]![Siter5]) And IsNull([Grid a3 s4]![Precision]) And [Grid a3 s4]![Grid a31]<>"ZZ99" And [Grid a3 s4]![Latitude]>1 And [Grid a3 s4]![Longitude]>1, (5*(Int(10*([Grid a3 s4]![Latitude]-Int([Grid a3 s4]![Latitude]))) Mod5))+1+(Int(10*([Grid a3 s4]![Longitude]-Int([Grid a3 s4]![Longitude]))) Mod 5),[Grid a3 s4]![Siter5]) AS Siter6 FROM [Grid a3 s4];	
Grid a3 s6	SELECT [Grid a3 s5].*, IIf([Grid a3 s5]![Siter6]>25,Null,Int([Grid a3 s5]![Siter6]*1)) AS Siter7 FROM [Grid a3 s5];	
Grid a3 s7	SELECT [Grid a3 s6].*, [Grid a3 s6]![Grid] AS [Grid base], [Grid a3 s6]![Site] AS [Site base] FROM [Grid a3 s6];	

Item and name	SQL or table structure	*Comment*
FINAL 9991	SELECT [Grid a3 s7].Boat, [Grid a3 s7].Date, [Grid a3 s7].[Species code], [Grid a3 s7].Catch, [Grid a3 s7].Numbers, [Grid a3 s7]![Grid a31] AS Grid, [Grid a3 s7]![Siter7] AS Site, [Grid a3 s7].[Mesh size], [Grid a3 s7].[Net length], [Grid a3 s7].[Pot numbers], [Grid a3 s7].[Pot lifts], [Grid a3 s7].[Line Numbers], [Grid a3 s7].[Longtitude Centroid Dec], [Grid a3 s7].[Latitude Centroid Dec], [Grid a3 s7].Latitude AS [Latitude base], [Grid a3 s7].Longitude AS [Longitude base], [Grid a3 s7].[Grid base], [Grid a3 s7].[Site base], [Grid a3 s7].Precision, [Grid a3 s7].[Fishing ground], [Grid a3 s7].[Start grid], [Grid a3 s7].[Log code], [Grid a3 s7].[Fishing Code], [Grid a3 s7].[Weight converter], [Grid a3 s7].[Catch Base], [Grid a3 s7].[Fishing start time], [Grid a3 s7].[Fishing end time], [Grid a3 s7].Depth INTO FINAL11 FROM [Grid a3 s7];	

Item and name	SQL or table structure			*Comment*
FINAL11	Name	Type	Size	*This is the table copied into another database – it is renamed in the COPY statement in the macro called "CURRENT IMPORTER"*
	Boat	Number (Long)	4	
	Date	Date/Time	8	
	Species code	Number (Double)	8	
	Catch	Number (Double)	8	
	Numbers	Text	255	
	Grid	Text	255	
	Site	Text	255	
	Mesh size	Number (Double)	8	
	Net length	Number (Double)	8	
	Pot numbers	Number (Long)	4	
	Pot lifts	Number (Long)	4	
	Line Numbers	Number (Integer)	2	
	Longtitude Centroid Dec	Number (Double)	8	
	Latitude Centroid Dec	Number (Double)	8	
	Latitude base	Number (Double)	8	
	Longitude base	Number (Double)	8	
	Grid base	Text	255	
	Site base	Number (Double)	8	
	Precision	Number (Double)	8	
	Fishing ground	Text	255	
	Start grid	Text	255	
	Log code	Text	255	
	Fishing Code	Text	255	
	Weight converter	Number (Long)	4	
	Catch Base	Number (Double)	8	
	Fishing start time	Text	255	
	Fishing end time	Text	255	
	Depth	Number (Long)	4	

Item and name	SQL or table structure					*Comment*
Macro: ZZ99 corrections	Name	Condition	Action	Argument	Value	This additional macro is run to correct for ZZ99 in the tables in the TRAWL and MIXED databases.
		Rename Object Type: Old Name:	New Name: Table Trawl9898	Corrected		
		OpenQuery View: Data Mode:	Query Name: Datasheet Edit	ZZ99 Corrector3		
		Rename Object Type: Old Name:	New Name: Table Corrected Final	Trawl9898		
		DeleteObject Object Name:	Object Type: Corrected	Table		
ZZ99 coooector	SELECT Corrected.*, IIf(([Corrected]![Grid base]=[QFISH Grids]![Grid] And [Corrected]![Grid]="ZZ99"),[Corrected]![Grid base],[Corrected]![Grid]) AS GRidd FROM [QFISH Grids] RIGHT JOIN Corrected ON [QFISH Grids].Grid = Corrected.[Grid base];					
ZZ99 Coooector No 2	SELECT [ZZ99 coooector].*, IIf(([Corrected]![Grid base]=[QFISH Grids]![Grid] And [Corrected]![Grid]="ZZ99"),[QFISH Grids]![Latitude Centroid Dec],[ZZ99 coooector]![Latitude Centroid Dec]) AS LLLat, Iif(([Corrected]![Grid base]=[QFISH Grids]![Grid] And [Corrected]![Grid]="ZZ99"),[QFISH Grids]![Longtitude Centroid Dec],[ZZ99 coooector]![Longtitude Centroid Dec]) AS LLLong FROM [ZZ99 coooector] LEFT JOIN [QFISH Grids] ON [ZZ99 coooector].[Grid base] = [QFISH Grids].Grid;					

Item and name	SQL or table structure	*Comment*
ZZ99 Corrector3	SELECT [ZZ99 Coooector No 2].Boat, [ZZ99 Coooector No 2].Date, [ZZ99 Coooector No 2].[Species code], [ZZ99 Coooector No 2].Catch, [ZZ99 Coooector No 2].Numbers, [ZZ99 Coooector No 2].GRidd AS Grid, [ZZ99 Coooector No 2].Site, [ZZ99 Coooector No 2].[Mesh size], [ZZ99 Coooector No 2].[Net length], [ZZ99 Coooector No 2].[Pot numbers], [ZZ99 Coooector No 2].[Pot lifts], [ZZ99 Coooector No 2].[Line Numbers], [ZZ99 Coooector No 2]![LLLong] AS [Longtitude Centroid Dec], [ZZ99 Coooector No 2]![LLLat] AS [Latitude Centroid Dec], [ZZ99 Coooector No 2].[Latitude base], [ZZ99 Coooector No 2].[Longitude base], [ZZ99 Coooector No 2].[Grid base], [ZZ99 Coooector No 2].[Site base], [ZZ99 Coooector No 2].Precision, [ZZ99 Coooector No 2].[Fishing ground], [ZZ99 Coooector No 2].[Start grid], [ZZ99 Coooector No 2].[Log code], [ZZ99 Coooector No 2].[Fishing Code], [ZZ99 Coooector No 2].[Weight converter], [ZZ99 Coooector No 2].[Catch Base], [ZZ99 Coooector No 2].[Fishing start time], [ZZ99 Coooector No 2].[Fishing end time], [ZZ99 Coooector No 2].Depth INTO [Corrected Final] FROM [ZZ99 Coooector No 2];	

16 Appendix 5 Source code for the CHRIS Interactive GIS

The Visual Basic source code for the Fish Habitat and Fish Catch interactive GIS is listed in this Appendix. Source code for other themes is included on the CD ROM included with this report. As pointed out in Section 7.2.2, various ActiveX objects from MapObjects and other sources have been used to build each interactive GIS application. The source code for some ActiveX objects is proprietary to ESRI and is not shipped with the software.

The MOIMS application source code has three parts: the form module, the standard module and the class module. The form module functionalities are covered in section 7.2.2. The code in the standard module provides a function to open spatial data for a Map Control. The class module provides a utility for the development of MOIMS without IMSCatalog and IMSLaunch.

[NBB. This source code reflects the CHRIS system as at November 1999. The system has been further developed (and code modified) since that time.]

The Form Module Source Code

```
Option Explicit
' define an instance of the cIMSReg class (development mode only)
Private oReg As cIMSReg
Public prjName As String

' system folder for temp files, unique file name
Private Const strTmpPath As String = "c:\inetpub\temp\"     ' local temp folder for HTML
files
Private Const httpTmpPath As String = "http://fho104738/temp/"  ' url for html folder
Private Const strDataPath As String = "c:\projects\qldcatchgrid\data"   ' local shape file folder
Private longOutputCounter As Long ' counter for output files
Private Const StdGIFWidth As Integer = 469 ' width of the navigational map in Pixels
Private Const StdGIFHeight As Integer = 439 ' height of the navigational map in Pixels

'Boolean variables to keep tracking of what operation the user requested
Private f_bNoChangeSelected As Boolean
Private f_bZoomInSelected As Boolean
Private f_bZoomOutSelected As Boolean
Private f_bPanSelected As Boolean
Private f_bFullExtSelected As Boolean
Private f_bIdentifySelected As Boolean
Private f_bHyperlinkSelected As Boolean

' to store idenify features
Private rsIdentified As MapObjects.Recordset

' define catch year array
' attention: dimension this array to one less than the number of years
Private arrCatchYear() As String
Private Const STARTYEAR As Integer = 1988   'Starting year in data
Private Const ENDYEAR As Integer = 1997     'Ending year in data

Private Sub Form_Load()
```

```
    ' project name
    prjName = "QldCatchGrid"

    ' define catch years
    ' **lower bound should be the most recent year
Dim nYear As Integer
    ReDim arrCatchYear(ENDYEAR - STARTYEAR)
    For nYear = STARTYEAR To ENDYEAR
       arrCatchYear(nYear - STARTYEAR) = STARTYEAR + ENDYEAR - nYear
    Next

    ' Set Weblink properties and start
    ' make sure the MapPort is not being assigned to another application
    WebLink.MapPort = "5061"
    If Not WebLink.Start Then
      MsgBox "Can not start Weblink control, unloading form..."
      Exit Sub
    End If

    ' set form window caption
    frmMain.Caption = prjName & "_" & WebLink.MapPort

    ' load shape files into Map Layers
    LoadShapes

    ' load the legend
    legend1.setMapSource MapMain
    legend1.LoadLegend (True)

    ' load scalebar
    Call RefreshScale(sbScaleBar1, MapMain)

    'set default to zoom function
    f_bNoChangeSelected = True

    ' enable gif
    WebLink.EnableGIF "UM97414787"

    ' envoke IMSUtil here (development mode only)
    ' *** COMMENT OUT THE NEXT TWO LINES FOR PRODUCTION ***
    Set oReg = New cIMSReg
    oReg.Add

    ' open a database object for the catch data
    Dim UniqueSp As ADODB.Recordset   ' unique species records
    Dim dataConnection As ADODB.Connection
    Dim year As Variant
    Dim pos As Integer
    Dim sqlString As String
    Dim connString As String
```

```
' Handle ADO related error
   On Error GoTo AdoError

   connString = "Provider=Microsoft.Jet.OLEDB.3.51;" & _
            "Data Source=" & App.Path & "\data\Qld grids 8897.mdb"
   sqlString = "SELECT DISTINCT [Years 8897].[species name] " & _
            "FROM [Years 8897] " & _
            "WHERE [LOG CODE] = 'TRAWL'" & _
            "AND year = "

   Set UniqueSp = New ADODB.Recordset
   Set dataConnection = New ADODB.Connection
   dataConnection.Open connString

    pos = 0
    For Each year In arrCatchYear
      UniqueSp.Open sqlString & year, dataConnection

      ' load unique species list to combo box
      Do While Not UniqueSp.EOF
         spCbx(pos).AddItem UniqueSp.Fields("Species name").value
         UniqueSp.MoveNext
      Loop
      pos = pos + 1
      ' make combobox at run time
      If pos <= UBound(arrCatchYear) Then
         Load spCbx(pos)
      End If
      UniqueSp.Close
   Next
   ' close database connection
   dataConnection.Close
Exit Sub

AdoError:
   Dim errorCollection As Variant
   Dim errLoop As Error
   Dim strError As String
   Dim iCounter As Integer

   On Error Resume Next

   iCounter = 1

   strError = ""
   Set errorCollection = dataConnection.Errors
   For Each errLoop In errorCollection
      With errLoop
         strError = "Error #" & iCounter & vbCrLf & _
         " ADO Error #" & .Number & vbCrLf & _
         " Description   " & .Description & vbCrLf & _
         " Source        " & .Source & vbCrLf
```

```
      End With
      MsgBox strError, vbCritical, "ADO Error in Form_load"
      iCounter = iCounter + 1
    Next

End Sub

Private Sub Form_Unload(Cancel As Integer)
  WebLink.Stop
  ' *** remove reference from ESRIMap.dll (development mode only)
  oReg.Remove
  Set oReg = Nothing
Set rsIdentified = Nothing
  Set frmMain = Nothing
End Sub

Private Sub legend1_AfterSetLayerVisible(Index As Integer, isVisible As Boolean)
MapMain.Refresh

End Sub

Private Sub MapIndex_AfterTrackingLayerDraw(ByVal hDC As Stdole.OLE_HANDLE)
    Dim sym As New Symbol
    Dim aPt As MapObjects.Point

    ' check the current map scale to decide if a polygon or a symbol
    ' be drawn
       ' load the scalebar
    Call RefreshScale(sbScaleBar1, MapMain)

    If (sbScaleBar1.RFScale < 500000) Then
       ' draw a symbol at the center of the current map extent
       sym.SymbolType = moPointSymbol
       sym.Style = moCrossMarker
       sym.color = moRed
       Set aPt = New MapObjects.Point
       aPt.X = MapMain.Extent.Center.X
       aPt.y = MapMain.Extent.Center.y
       MapIndex.DrawShape aPt, sym
    Else
       ' draw a rectangle indicating the current extent of Map
       sym.SymbolType = moFillSymbol
       sym.OutlineColor = moRed
       sym.color = moRed
       sym.Style = moDownwardDiagonalFill
       MapIndex.DrawShape MapMain.Extent, sym
    End If

    Set aPt = Nothing
    Set sym = Nothing
 End Sub
```

```
Private Sub WebLink_Request(ByVal arguments As Object, ByVal values As Object)
  Dim oExt As New MapObjects.Rectangle
  Dim strCMD As String
  Dim strTmp As String
  Dim lClickX As Long
  Dim lClickY As Long
  Dim dataSrc As String
  Dim spSelected As String
  Dim catchYear As String
  Dim dblZoomFactor As Double
  Dim errMsg As String

  ' generate random file name for this request
  Dim strFile As String
  strFile = WebLink.MapPort & Format(Now, "h_m_s") & longOutputCounter
  longOutputCounter = longOutputCounter + 1  ' increment the counter for the next request

  ' send a please wait message
  CreateServerMessage strFile

  ' reset the renderer of catch data
  Set MapMain.Layers("catch data").Renderer = Nothing
'   Set spRecs = Nothing 'reset lga features
  Set rsIdentified = Nothing ' reset identify
  legend1.RemoveAll   ' clear legend

  ' extract the extent paramters from the strings collections
  strTmp = FindArgValue("Left", arguments, values)
  If Len(strTmp) Then
    With oExt
      .Left = Val(strTmp)
      .Bottom = Val(FindArgValue("bottom", arguments, values))
      .Right = Val(FindArgValue("Right", arguments, values))
      .Top = Val(FindArgValue("Top", arguments, values))
    End With
  Else
    ' use the full extent by default
    Set oExt = MapMain.FullExtent

  End If

  ' find values of clickX and clickY, zoom, identify and hyperlink requests
  ' all pass clickx and clicky
  lClickX = Val(FindArgValue("Click.X", arguments, values))
  lClickY = Val(FindArgValue("Click.Y", arguments, values))
  dataSrc = FindArgValue("dataSrc", arguments, values)
  spSelected = FindArgValue("spName", arguments, values)
  catchYear = FindArgValue("Year", arguments, values)
  dblZoomFactor = Val(FindArgValue("zoomFactor", arguments, values))

  ' set default data src if none set
```

```
  If (Len(dataSrc) = 0) Then
     dataSrc = "Catch"
  End If

  ' set default catch year if none set
  If (Len(catchYear) = 0) Then
     catchYear = arrCatchYear(LBound(arrCatchYear)) '"1997"
  End If

  ' find cmd value
  strCMD = UCase$(FindArgValue("cmd", arguments, values))
  If Len(strCMD) = 0 Then
     CreateError "Invalid argument."
     Exit Sub
  End If

  ' check if species is nil
  If (Len(spSelected) = 0 And strCMD <> "START") Then
     errMsg = "<p><h1>No species was selected, please go back" & _
           " to make a selection</h1></p>"
     GoTo ErrorHandler
  End If

  ' MSFlexiGrid settings for dubug
  Dim i As Integer
  Dim Entry As String
  If MSFlexGrid1.Rows > 1 Then
     MSFlexGrid1.Rows = 1
  End If

  For i = 0 To arguments.Count - 1
     Entry = arguments(i) & vbTab & values(i)   ' Create entry.
     MSFlexGrid1.AddItem Entry       ' Add entry.
  Next i

 ' based on command value, take proper action
  Select Case strCMD
     Case "START":
        DoStart oExt, dblZoomFactor, spSelected, dataSrc, catchYear, strFile
     Case "FULLEXT":
        DoMapExtent arguments, values, dataSrc, spSelected, catchYear, strFile
     Case "NOCHANGE":
        DoNoChange arguments, values, oExt, spSelected, dataSrc, catchYear, strFile
     Case "ZOOMIN":
        DoZoomIn arguments, values, oExt, lClickX, lClickY, dblZoomFactor, dataSrc,
spSelected, catchYear, strFile
     Case "ZOOMOUT":
        DoZoomOut arguments, values, oExt, lClickX, lClickY, dblZoomFactor, dataSrc,
spSelected, catchYear, strFile
     Case "PAN":
```

```
        DoPan arguments, values, oExt, lClickX, lClickY, dataSrc, spSelected, catchYear,
strFile
      Case "IPAN":
        DoIPan arguments, values, oExt, lClickX, lClickY, dataSrc, spSelected, catchYear,
strFile
      Case "IDENTIFY":
        DoIdentify arguments, values, oExt, lClickX, lClickY, dataSrc, catchYear,
spSelected, strFile
'      Case "HYPERLINK":
'        DoHyperlink oExt, lClickX, lClickY
      Case "LAYER":
        DoLayer arguments, values, oExt, dataSrc, spSelected, catchYear, strFile
      Case Else:
        CreateError "Invalid Cmd value."
   End Select

   Set rsIdentified = Nothing '  ensure server is stateless
   Exit Sub

ErrorHandler:
   CreateError errMsg
End Sub

Private Sub CreateHTML(ext As MapObjects.Rectangle, dblZoomFactor As Double, _
      strFile As String, dataSrc As String, catchYear As String, _
      spSelected As String)

   Dim strHtmlFile As String
   Dim strImageFile As String

   ' create output filenames
   strHtmlFile = strTmpPath & strFile & "_main.htm"      ' for HTML
   strImageFile = httpTmpPath & strFile & ".gif"        ' for Gif

   ' create a Html file
   Dim iFileNum As Integer
   iFileNum = FreeFile()
   Open strHtmlFile For Output As #iFileNum

  ' write out an HTML document
   Dim mItem As Integer

   ' specify what type of data we are going to send to the browser
'   Print #iFileNum, "Content-type: text/html"
   Print #iFileNum, "<HTML><HEAD>"
   Print #iFileNum, "<TITLE>CHRIS MO Server</TITLE>"

   ' JScript Section
   Print #iFileNum, "<script lang=JavaScript>"
   Print #iFileNum, "<!--" ' start comment

   Print #iFileNum, "function setSpList() {"
```

```
    Print #iFileNum, "var curYear = document.ctlPanel.Year.value;"
    Print #iFileNum, "var spSelect = document.ctlPanel.spName;"

    ' start loading the spcies list for each catch year
    Print #iFileNum, "switch (curYear) {"
    Dim countCbx As Integer
    Dim year As Variant
    countCbx = 0
    For Each year In arrCatchYear
       Print #iFileNum, "case '" & year & "':"
    '   Print #iFileNum, "var spNewList = new Array('1998_tommy', '1998_two',
'1998_three');"
       Print #iFileNum, "var spNewList = new Array(" & (spCbx(countCbx).ListCount - 1) &
");"

       For mItem = 0 To spCbx(countCbx).ListCount - 1
          Print #iFileNum, "spNewList[" & mItem & "] = '" & spCbx(countCbx).List(mItem) &
"';"
       Next
       Print #iFileNum, "break;"
       countCbx = countCbx + 1
    Next

    Print #iFileNum, "}"

'   Print #iFileNum, "// remove all options first"
    Print #iFileNum, "while (spSelect.length > 0) {"
    Print #iFileNum, "spSelect.remove(0);"
    Print #iFileNum, "}"

    Print #iFileNum, "for (sp in spNewList) {"
    Print #iFileNum, "var newSp = document.createElement('OPTION');"
'   Print #iFileNum, "var newSp = new Option(spNewList[sp], spNewList[sp]);"
    Print #iFileNum, "newSp.text = spNewList[sp];"
    Print #iFileNum, "newSp.value = spNewList[sp];"
    Print #iFileNum, "if(spNewList[sp] == '" & spSelected & "'){"
'   Print #iFileNum, "var newSp = new Option(spNewList[sp], spNewList[sp], true, true);"
    Print #iFileNum, "newSp.defaultSelected = true;"
    Print #iFileNum, "newSp.selected = true;"
    Print #iFileNum, "}"
'   Print #iFileNum, "} else"
'   Print #iFileNum, "var newSp = new Option(spNewList[sp], spNewList[sp], false, false);"
    Print #iFileNum, "spSelect.add(newSp);"
    Print #iFileNum, "}"

    Print #iFileNum, "}"

'// get the layer status from the checkboxes in frame_layer
    Print #iFileNum, "function getLayerValue(aMenu) {"
    Print #iFileNum,
"if(window.parent.frame_layer.document.forms[0].elements[aMenu].checked){"
```

```
    Print #iFileNum, "    return 'on';"
    Print #iFileNum, "} else {"
    Print #iFileNum, "    return 'off';"
    Print #iFileNum, "}"
    Print #iFileNum, "}"

    ' layer parameters
    Dim myLayer As MapObjects.MapLayer

    Print #iFileNum, "function formCheck() {"
    ' check if a species is selected
    Print #iFileNum, "if (document.ctlPanel.spName.value == '') {"
    Print #iFileNum, "window.alert('Please select a species');"
    Print #iFileNum, "return(false);"
    Print #iFileNum, "} else {"
    Print #iFileNum, "setLayerValues();"
    Print #iFileNum, "return(true);"
    Print #iFileNum, "}"
    Print #iFileNum, "}"

    Print #iFileNum, "function setLayerValues() {"
    For Each myLayer In MapMain.Layers
       Print #iFileNum, "    document.ctlPanel.elements['Layer_" & myLayer.Name & _
          "'].value = getLayerValue('Layer_" & myLayer.Name & "');"
    Next
    Print #iFileNum, "}"

    Print #iFileNum, "function selZoom() {"
    Print #iFileNum, "if (!(document.ctlPanel.Cmd[1].checked) && " & _
       "!(document.ctlPanel.elements.Cmd[2].checked)){"
    Print #iFileNum, "window.alert('Please select zoomin or zoomout');"
'   Print #iFileNum, "window.alert(document.ctlPanel.Cmd[1].checked);"
    Print #iFileNum, "}"
    Print #iFileNum, "}"

Print #iFileNum, "var StandardGIFWidth = " & StdGIFWidth & ";"
Print #iFileNum, "var StandardGIFHeight= " & StdGIFHeight & ";"
Print #iFileNum, "function Map_onMouseMove(){"
Print #iFileNum, "    var GIFX = window.event.offsetX;"
Print #iFileNum, "    var GIFY = window.event.offsetY;"
Print #iFileNum, "    ctlPanel.txtX.value = GifXToMap(GIFX);"
Print #iFileNum, "    ctlPanel.txtY.value = GifYToMap(GIFY);"
Print #iFileNum, "}"

Print #iFileNum, "function GifXToMap(Coord){"
Print #iFileNum, "    var DistancePerPixel;"
Print #iFileNum, "    var MapX;"
Print #iFileNum, "    DistancePerPixel = " & ext.Width & " / StandardGIFWidth;"
Print #iFileNum, "    MapX = DistancePerPixel * Coord;"
Print #iFileNum, "    return " & ext.Left & " + MapX;"
Print #iFileNum, "}"
```

```
Print #iFileNum, "function GifYToMap(Coord){"
Print #iFileNum, "    var DistancePerPixel;"
Print #iFileNum, "    var MapY;"
Print #iFileNum, "    DistancePerPixel = " & ext.Height & " / StandardGIFHeight;"
Print #iFileNum, "    MapY = DistancePerPixel * Coord;"
Print #iFileNum, "    return " & ext.Top & " - MapY;"
Print #iFileNum, "}"

Print #iFileNum, "function printMap(){"
Print #iFileNum, "var newWin = top.window.open(" & " '" & httpTmpPath & strFile &
"_out.htm', " & _
   "null, 'scrollbars=1, status=1 resizable=1');"
Print #iFileNum, "newWin.status = 'CHRIS Query Result';"
Print #iFileNum, "}"

   Print #iFileNum, "-->" ' stop comment
   Print #iFileNum, "</script>"
   Print #iFileNum, "</head>"
   Print #iFileNum, "<BODY BGCOLOR=#C0C0C0 topmargin=3>"
'   Print #iFileNum, "<H2>Coastal Habitat Resources Information System</H2> <P>"
   Print #iFileNum, "<table border=1>"
'   Print #iFileNum, "<caption>Coastal Habitat Resources Information System</caption>"
   Print #iFileNum, "<tr><td>"
   ' add an HTML FORM here
   Print #iFileNum, "<FORM method=post " & _
         "name=ctlPanel target='_top' " & _
         "title='Control Centre' " & _
         "ACTION=http://fho104738/moweb/esrimap.dll " & _
         "onsubmit='return(formCheck())'>"
   Print #iFileNum, "<font color=#0000FF size=1 FACE='Verdana,Arial,Helvetica'>"
   Print #iFileNum, "Map:"
   Print #iFileNum, "<INPUT TYPE=hidden NAME=name Value=" & prjName & ">"

   ' add radios
   Print #iFileNum, "<INPUT TYPE=RADIO NAME=Cmd VALUE=noChange " & _
            IIf(f_bNoChangeSelected, "CHECKED", "") & ">Current"
   Print #iFileNum, "<INPUT TYPE=RADIO NAME=Cmd VALUE=ZoomIn " & _
            IIf(f_bZoomInSelected, "CHECKED", "") & ">ZoomIn"
   Print #iFileNum, "<INPUT TYPE=RADIO NAME=Cmd VALUE=ZoomOut " & _
            IIf(f_bZoomOutSelected, "CHECKED", "") & ">ZoomOut"
   Print #iFileNum, "<INPUT TYPE=RADIO NAME=Cmd VALUE=Pan " & _
            IIf(f_bPanSelected, "CHECKED", "") & ">Pan"
   Print #iFileNum, "<INPUT TYPE=RADIO NAME=Cmd VALUE=fullExt " & _
            IIf(f_bFullExtSelected, "CHECKED", "") & ">FullExtent"
   Print #iFileNum, "<INPUT TYPE=RADIO NAME=Cmd VALUE=Identify " & _
            IIf(f_bIdentifySelected, "CHECKED", "") & ">Identify"
'   Print #iFileNum, "<INPUT TYPE=RADIO NAME=Cmd VALUE=Hyperlink " & _
'            IIf(f_bHyperlinkSelected, "CHECKED", "") & "> Hyperlink"
   Print #iFileNum, "</font>"

   ' catch Year
```

```
    Print #iFileNum, "<tr><td>"
    Print #iFileNum, "<font color=#0000FF size=1 FACE='Verdana,Arial,Helvetica'>"
    Print #iFileNum, "Query: "
    Print #iFileNum, "<select name=dataSrc size=1>"
    Print #iFileNum, "<option value='catch tonnes' " & _
            IIf(StrComp(UCase$(dataSrc), "CATCH Tonnes") = 0, "SELECTED", "") &
">Catch</option>"
    Print #iFileNum, "<option value=days " & _
            IIf(StrComp(UCase$(dataSrc), "DAYS") = 0, "SELECTED", "") &
">Days</option>"
    Print #iFileNum, "<option value=boats " & _
            IIf(StrComp(UCase$(dataSrc), "BOATS") = 0, "SELECTED", "") &
">Boats</option>"
    Print #iFileNum, "</select>"

    Print #iFileNum, "<select name=Year size=1 onchange=setSpList()>"
    For Each year In arrCatchYear
    Print #iFileNum, "<option value=" & year & " " & _
            IIf(catchYear = year, "SELECTED", "") & ">" & year & "</option>"
'   Print #iFileNum, "<option value=1997 " & _
'            IIf(Val(catchYear) = 1997, "SELECTED", "") & ">1997</option>"
'   Print #iFileNum, "<option value=1998 " & _
'            IIf(Val(catchYear) = 1998, "SELECTED", "") & ">1998</option>"
    Next
    Print #iFileNum, "</select>"

    ' create list of Species as dropdown list
'   Print #iFileNum, "<br>"
    Print #iFileNum, "<select name=spName size=1>"

    If Len(spSelected) > 0 Then
    Print #iFileNum, "<option value='" & spSelected & "' Selected>" & _
    spSelected & "</option>"
    End If

    ' start loading the INITIAL species list
    Dim tmpIndex As Integer
    tmpIndex = arrCatchYear(LBound(arrCatchYear)) - Val(catchYear)
    For mItem = 0 To spCbx(tmpIndex).ListCount - 1
      If Not (StrComp(spCbx(tmpIndex).List(mItem), spSelected) = 0) Then
        Print #iFileNum, "<option value='" & spCbx(tmpIndex).List(mItem) & "'>" & _
        spCbx(tmpIndex).List(mItem) & "</option>"
      End If
    Next

    Print #iFileNum, "</select>"

    ' add extent parameters
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Left Value=" & ext.Left & ">"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Bottom Value=" & ext.Bottom & ">"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Right Value=" & ext.Right & ">"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Top Value=" & ext.Top & ">"
```

```
    ' layer parameters
'   Dim myLayer As MapObjects.MapLayer
    For Each myLayer In MapMain.Layers
      Print #iFileNum, "<INPUT TYPE=hidden NAME='Layer_" & myLayer.Name & "'>"
    Next
    Print #iFileNum, "</font>"

    Print #iFileNum, "<tr><td>"
    Print #iFileNum, "<font color=#0000FF size=1 FACE='Times New Roman'>"
    ' add image reference string
    Print #iFileNum, "<center>"
    Print #iFileNum, "Zoom Factor:<select name=zoomFactor size=1 onclick=selZoom()>"
'   Print #iFileNum, "<option value=0.5 SELECTED>2X</option>"
'   Print #iFileNum, "<option value=0.25>4X</option>"
'   Print #iFileNum, "<option value=0.125>8X</option>"
    Print #iFileNum, "<option value=0.5" & " " & _
            IIf(dblZoomFactor = 0.5, "SELECTED", "") & ">2X</option>"
    Print #iFileNum, "<option value=0.25" & " " & _
            IIf(dblZoomFactor = 0.25, "SELECTED", "") & ">4X</option>"
    Print #iFileNum, "<option value=0.125" & " " & _
            IIf(dblZoomFactor = 0.125, "SELECTED", "") & ">8X</option>"
    Print #iFileNum, "</select>"
    Print #iFileNum, "Long:<input type=Text name=txtX size=8>"
    Print #iFileNum, "Lat:<input type=Text name=txtY size=8>"
    Print #iFileNum, "Scale 1 : " & _
            Format$(sbScaleBar1.RFScale, "###,###,###,###,###")
    Print #iFileNum, " "
    Print #iFileNum, "<button type=Button onClick=printMap()>Print</button>"
    Print #iFileNum, "<INPUT TYPE=image NAME=click title='Click to Submit' " & _
       "SRC=" & strImageFile & " onMouseMove=Map_onMouseMove()>"
    Print #iFileNum, "</center>"
    Print #iFileNum, "</font>"
    Print #iFileNum, "</table>"
    Print #iFileNum, "</FORM>"
    Print #iFileNum, "</BODY>"
    Print #iFileNum, "</HTML>"

    Close #iFileNum

End Sub

Private Sub CreatePrintMap(strFile As String, _
      dataSrc As String, catchYear As String, spSelected As String)

    Dim strHtmlFile As String
    Dim strImageFile As String

    ' create output filenames
    strHtmlFile = strTmpPath & strFile & "_out.htm"      ' for HTML
'   strImageFile = httpTmpPath & strFile & ".gif"        ' for Gif
```

```
  ' create a Html file
  Dim iFileNum As Integer
  iFileNum = FreeFile()
  Open strHtmlFile For Output As #iFileNum

' write out an HTML document

  ' specify what type of data we are going to send to the browser
'  Print #iFileNum, "Content-type: text/html"
  Print #iFileNum, "<HTML><HEAD>"
  Print #iFileNum, "<TITLE>CHRIS Map</TITLE>"
  Print #iFileNum, "<SCRIPT LANGUAGE=VBScript>"
  Print #iFileNum, "<!--"
  Print #iFileNum, "Sub print"
  Print #iFileNum, "    olecmd = 6     ' Print Command"
  Print #iFileNum, "    oleparam = 1"
  Print #iFileNum, "    On Error Resume Next"
  Print #iFileNum, "    WB.ExecWB olecmd, oleparam"
  Print #iFileNum, "    If Err.Number <> 0 Then"
  Print #iFileNum, "       If DA Then ' ie4 - user probably cancelled"
  Print #iFileNum, "          alert 'Nothing was printed.'"
  Print #iFileNum, "       Else  ' ie3 - give other instructions"
  Print #iFileNum, "          handle_error"
  Print #iFileNum, "       End If"
  Print #iFileNum, "    End If"
  Print #iFileNum, "End Sub"
  Print #iFileNum, "//-->"
  Print #iFileNum, "</SCRIPT>"
  Print #iFileNum, "</head>"
  Print #iFileNum, "<body onload=window.print()>"

  Print #iFileNum, "<table border=1 width=100% bgcolor=#C0C0C0>"
  Print #iFileNum, "  <tr>"
  Print #iFileNum, "    <td width=65% align=center><font color=#0000FF>"
  Print #iFileNum, "      <img src=http://fho104738/avmap/dpilogo2.gif>"
  Print #iFileNum, "      <img src=http://fho104738//avmap/Frdc1_s.gif width=53
height=93>"
  Print #iFileNum, "      <br><big>Coastal Habitat Resources Information
System</big></font>"
  Print #iFileNum, "      <br><font color=#0000FF><big>"
  Print #iFileNum, catchYear & " " & spSelected & " (" & dataSrc & ")</big></font>"
  Print #iFileNum, "    </td>"
  Print #iFileNum, "    <td width=40% align=center><img src=" & httpTmpPath & strFile &
"i.gif>"
  Print #iFileNum, "    </td>"
  Print #iFileNum, "  </tr>"
  Print #iFileNum, "  <tr>"
  Print #iFileNum, "    <td width=65% align=center><img src=" & httpTmpPath & strFile &
".gif>"
  Print #iFileNum, "    <img src=" & httpTmpPath & strFile & "_sb.png>"
```

```
    Print #iFileNum, "    <p><small><i>©The State of Queensland, Department of Primary
Industries 1999</i></small>"
    Print #iFileNum, "    </td>"
    Print #iFileNum, "    <td width=40% align=center><img src=" & httpTmpPath & strFile &
"_lgd.png>"
    Print #iFileNum, "    </td>"
    Print #iFileNum, "  </tr>"
    Print #iFileNum, "</table>"
    Print #iFileNum, "<OBJECT ID=WB WIDTH=0 HEIGHT=0
CLASSID='CLSID:8856F961-340A-11D0-A96B-00C04FD705A2'></OBJECT>"
    Print #iFileNum, "</body>"
    Print #iFileNum, "</html>"

    Close #iFileNum

End Sub


Private Sub CreateIndexMapForm(ext As MapObjects.Rectangle, strFile As String, _
        dataSrc As String)
' open a random file
    Dim strHtmlFile As String
    Dim strImageFile As String

    ' create output filenames
    strHtmlFile = strTmpPath & strFile & "_iform.htm"      ' for HTML
    strImageFile = httpTmpPath & strFile & "i.gif"        ' for Image

    ' create a Html file
    Dim iFileNum As Integer
    iFileNum = FreeFile()
    Open strHtmlFile For Output As #iFileNum

  ' write out an HTML document
    Dim mItem As Integer

    ' specify what type of data we are going to send to the browser
'    Print #iFileNum, "Content-type: text/html"
    Print #iFileNum, "<HTML><HEAD>"
    Print #iFileNum, "<TITLE>CHRIS MO Server</TITLE>"

    ' JScript Section
    Print #iFileNum, "<script language=JavaScript>"
    Print #iFileNum, "<!--" ' start comment

    Print #iFileNum, "function loadValues() {"
    Print #iFileNum, "    document.forms[0].elements['dataSrc'].value =
 getSelectValue('dataSrc');"
    Print #iFileNum, "    document.forms[0].elements['Year'].value = getSelectValue('Year');"
    Print #iFileNum, "    document.forms[0].elements['spName'].value =
 getSelectValue('spName');"
```

```
    Print #iFileNum, "    setLayerValues();"
    Print #iFileNum, "}"

'// get the current selected value of the drop down menu in frame_top
    Print #iFileNum, "function getSelectValue(aMenu) {"
'    Print #iFileNum, "    return '""' + " &
"top.frame_top.document.ctlPanel.elements[aMenu].value" & " + '"';"
    Print #iFileNum, "    return
window.parent.frame_main.document.ctlPanel.elements[aMenu].value;"
    Print #iFileNum, "}"

'// get the layer status from the checkboxes in frame_layer
    Print #iFileNum, "function getLayerValue(aMenu) {"
    Print #iFileNum,
"if(window.parent.frame_layer.document.forms[0].elements[aMenu].checked){"
    Print #iFileNum, "    return 'on';"
    Print #iFileNum, "} else {"
    Print #iFileNum, "    return 'off';"
    Print #iFileNum, "}"
    Print #iFileNum, "}"

    ' layer parameters
    Dim myLayer As MapObjects.MapLayer

    Print #iFileNum, "function setLayerValues() {"
    For Each myLayer In MapMain.Layers
       Print #iFileNum, "    document.forms[0].elements['Layer_" & myLayer.Name & _
          "'].value = getLayerValue('Layer_" & myLayer.Name & "');"
    Next
    Print #iFileNum, "}"


    Print #iFileNum, "-->" ' stop comment
    Print #iFileNum, "</script>"
    Print #iFileNum, "</head>"
    Print #iFileNum, "<BODY BGCOLOR=#c0c0c0>"
'    Print #iFileNum, "<i>Area of Interest</i>"

    ' add an HTML FORM here
    Print #iFileNum, "<FORM method=post onSubmit='loadValues()' target='_top'
ACTION=http://fho104738/moweb/esrimap.dll>"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=name Value=" & prjName & ">"

    Print #iFileNum, "<INPUT TYPE=hidden NAME=Cmd value=ipan>"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=dataSrc>"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Year>"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=spName>"

    ' add extent parameters
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Left Value=" & ext.Left & ">"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Bottom Value=" & ext.Bottom & ">"
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Right Value=" & ext.Right & ">"
```

```
    Print #iFileNum, "<INPUT TYPE=hidden NAME=Top Value=" & ext.Top & ">"

    ' layer parameters
'   Dim myLayer As MapObjects.MapLayer
    For Each myLayer In MapMain.Layers
      Print #iFileNum, "<INPUT TYPE=hidden NAME='Layer_" & myLayer.Name & "'>"
    Next

    Print #iFileNum, "<CENTER>"

    ' add image reference string
    Print #iFileNum, "<INPUT TYPE=image title='Click to shift area of interest' " & _
          "NAME=click SRC=" & strImageFile & "><BR>"
    Print #iFileNum, "</CENTER>"

    Print #iFileNum, "</FORM>"
    Print #iFileNum, "</BODY>"
    Print #iFileNum, "</HTML>"

    Close #iFileNum

End Sub

Private Sub CreateLayerControlForm(ext As MapObjects.Rectangle, strFile As String)
    Dim myMap As MapObjects.MapLayer

' open a random file
    Dim strHtmlFile As String
'   Dim strImageFile As String

    ' create output filenames
    strHtmlFile = strTmpPath & strFile & "_layer.htm"      ' for HTML
'   strImageFile = strTmpPath & strFile & "i.jpg"        ' for Image

    ' create a Html file
    Dim iFileNum As Integer
    iFileNum = FreeFile()
    Open strHtmlFile For Output As #iFileNum

  ' write out an HTML document
    Dim mItem As Integer

    ' specify what type of data we are going to send to the browser
'   Print #iFileNum, "Content-type: text/html"
    Print #iFileNum, "<HTML><HEAD>"
    Print #iFileNum, "<TITLE>CHRIS MO Server</TITLE>"

    ' JScript Section
    Print #iFileNum, "<script language=JavaScript>"
    Print #iFileNum, "<!--" ' start comment
```

```
   Print #iFileNum, "function loadValues() {"
   Print #iFileNum, "    document.forms[0].elements['dataSrc'].value =
getSelectValue('dataSrc');"
   Print #iFileNum, "    document.forms[0].elements['Year'].value = getSelectValue('Year');"
   Print #iFileNum, "    document.forms[0].elements['spName'].value =
getSelectValue('spName');"
   Print #iFileNum, "}"

'// get the current selected value of the drop down menu in frame_top
   Print #iFileNum, "function getSelectValue(aMenu) {"
   Print #iFileNum, "    return
window.parent.frame_main.document.ctlPanel.elements[aMenu].value;"
   Print #iFileNum, "}"

   Print #iFileNum, "function goMeta(){"
   Print #iFileNum, "var newWin = top.window.open('http://fhowebtest/avmap/metadata
gis.htm', " & _
      "null, 'scrollbars=1, toolbar=1, status=1 resizable=1');"
   Print #iFileNum, "newWin.status = 'MetaData';"
   Print #iFileNum, "}"

   Print #iFileNum, "--> " ' stop comment
   Print #iFileNum, "</script>"
   Print #iFileNum, "</head>"
   Print #iFileNum, "<BODY BGCOLOR=#c0c0c0>"
'   Print #iFileNum, "<H2>Coastal Habitat Resources Information System</H2> <P>"

   ' add an HTML FORM here
   Print #iFileNum, "<FORM method=post onSubmit='loadValues()' target='_top'
ACTION=http://fho104738/moweb/esrimap.dll>"
   Print #iFileNum, "<INPUT TYPE=hidden NAME=name Value=" & prjName & ">"

   Print #iFileNum, "<INPUT TYPE=hidden NAME=Cmd value=layer>"
   Print #iFileNum, "<INPUT TYPE=hidden NAME=dataSrc>"
   Print #iFileNum, "<INPUT TYPE=hidden NAME=Year>"
   Print #iFileNum, "<INPUT TYPE=hidden NAME=spName>"

   ' add extent parameters
   Print #iFileNum, "<INPUT TYPE=hidden NAME=Left Value=" & ext.Left & ">"
   Print #iFileNum, "<INPUT TYPE=hidden NAME=Bottom Value=" & ext.Bottom & ">"
   Print #iFileNum, "<INPUT TYPE=hidden NAME=Right Value=" & ext.Right & ">"
   Print #iFileNum, "<INPUT TYPE=hidden NAME=Top Value=" & ext.Top & ">"

   ' add layer parameters
   Print #iFileNum, "<font size=2 FACE='Verdana,Arial,Helvetica'>"
   Print #iFileNum, "<center>Layers Control</center><br>"
   Print #iFileNum, "</font>"
   Print #iFileNum, "<font color=#0000FF size=1 FACE='Verdana,Arial,Helvetica'>"
   For Each myMap In MapMain.Layers
   Print #iFileNum, "<input type='checkbox' name='Layer_" & myMap.Name & "' " & _
      IIf(myMap.Visible, "checked", "") & ">" & myMap.Name
   Print #iFileNum, "<br>"
```

```
    Next

    Print #iFileNum, "</font>"
    Print #iFileNum, "<center>"
    Print #iFileNum, "<INPUT TYPE=submit Value='Set Map Layers'>"
    Print #iFileNum, "<button type=Button onClick=goMeta()>Layers Info</button>"
    Print #iFileNum, "</center>"
    Print #iFileNum, "</FORM>"
    Print #iFileNum, "</BODY>"
    Print #iFileNum, "</HTML>"

    Close #iFileNum

End Sub

Private Sub CreateError(message As String)
' specify what type of data we are going to send
  With WebLink
    .WriteResponseHeader "Content-type: text/plain" & vbCrLf & vbCrLf
    .WriteString "QldCatchGrid ERROR: " & message
  End With
End Sub

Private Sub CreateServerMessage(strFile As String)
    Dim strHtmlFile As String

    ' create output HTTP link
    strHtmlFile = httpTmpPath & strFile & "_frames.htm"      ' for HTML

' specify what type of data we are going to send
  With WebLink
    .WriteResponseHeader "Content-type: text/html" + vbCrLf + vbCrLf
    .WriteString "<HTML><HEAD>" & vbCrLf
    .WriteString "<TITLE>CHRIS Server Message</TITLE>" & vbCrLf
    .WriteString "</head>" & vbCrLf
    .WriteString "<body bgcolor=vbGreen onload=window.navigate('" & _
          strHtmlFile & "');>" & vbCrLf
    .WriteString "<font color=blue size=5>Your request at " & Time & _
       " is being process, please wait...</font>" & vbCrLf
    .WriteString "</body>" & vbCrLf
    .WriteString "</HTML>" & vbCrLf
  End With
End Sub

Public Function CreateMap(ext As Rectangle, strFile As String)
  Dim strBmpFile As String
  Dim strBmpIndexFile As String

  ' create output path and unique filename for bmp and jpeg image
  strBmpFile = strTmpPath & strFile & ".bmp"
  strBmpIndexFile = strTmpPath & strFile & "i.bmp"
```

```
' set map extent
Set MapMain.Extent = ext

' create a BMP file, covert to GIF, delete bmp
' navigational map
MapMain.ExportMap moExportBMP, strBmpFile, 1
WebLink.BMP2GIF strBmpFile, True
Kill strBmpFile
' index map
MapIndex.ExportMap moExportBMP, strBmpIndexFile, 1
WebLink.BMP2GIF strBmpIndexFile, True
Kill strBmpIndexFile

End Function

Public Sub CreateMessage(recSet As ADODB.Recordset, strFile As String, gCode As String)
  Dim strHtmFile As String

  ' create HTML for the identified record(s)
  Dim tmpStr As String
  Dim fld As ADODB.Field

  tmpStr = "<html>" & vbCrLf
  tmpStr = tmpStr + "<title>Query Result</title>" & vbCrLf
  tmpStr = tmpStr + "<body bgcolor=#c0c0c0>" & vbCrLf
  tmpStr = tmpStr + "<i>Search Result</i><p>" & vbCrLf

  If recSet.BOF Then 'check if there are records in the RS
    tmpStr = tmpStr + "There are " & _
      "No records found at " & gCode & vbCrLf
  Else

    recSet.MoveLast
    tmpStr = tmpStr + "There are " & recSet.RecordCount & _
      " record(s) found at " & gCode & vbCrLf
    recSet.MoveFirst

    With recSet
    Do While Not .EOF
    tmpStr = tmpStr + "<table border=1>" & vbCrLf
      For Each fld In .Fields
        tmpStr = tmpStr + "<tr>" & vbCrLf
        tmpStr = tmpStr + "<td>" & fld.Name & vbCrLf
        tmpStr = tmpStr + "<td>" & fld.value & vbCrLf
        tmpStr = tmpStr + "</tr>" & vbCrLf
      Next
      tmpStr = tmpStr + "</table><hr>" & vbCrLf
      .MoveNext
    Loop
    End With
```

```
    End If

    tmpStr = tmpStr + "</body></html>"

    ' create output path
    strHtmFile = strTmpPath & strFile & "_message.htm"

    ' create a Html file
    Dim iFileNum As Integer
    iFileNum = FreeFile()
    Open strHtmFile For Output As #iFileNum
    Print #iFileNum, tmpStr
    Close #iFileNum

End Sub

Public Sub SetLayerVis(ByVal arguments As Object, ByVal values As Object)
    ' parse layer parameters
    Dim myLayer As MapObjects.MapLayer
    Dim strLayerVisible As String

    For Each myLayer In MapMain.Layers
        strLayerVisible = FindArgValue("Layer_" & myLayer.Name, arguments, values)
        If ((Len(strLayerVisible) > 0) And (UCase$(strLayerVisible) = "ON")) Then
            myLayer.Visible = True
        Else
            myLayer.Visible = False
        End If
    Next

    MapMain.Refresh

End Sub

Public Sub SetLegendVis()
    ' parse layer parameters
    Dim myLayer As MapObjects.MapLayer
    Dim lyrIndex As Integer

    lyrIndex = 0

    For Each myLayer In MapMain.Layers
        If (myLayer.Visible = True) Then
            legend1.ShowLegend(lyrIndex) = True
        Else
            legend1.ShowLegend(lyrIndex) = False
        End If
        lyrIndex = lyrIndex + 1
    Next

    MapMain.Refresh
```

```
End Sub


Public Sub CreateLegend(strFile As String)
'On Error GoTo Error_legend
   Dim strBmpFile As String
   Dim strImageFile As String

   ' create output path and unique filename for bmp and jpeg image
   strBmpFile = strTmpPath & strFile & "_lgd.bmp"
   strImageFile = strTmpPath & strFile & "_lgd.png"

   ' load the legend
'  legend1.setMapSource MapMain
   legend1.LoadLegend (True)

   ' create a BMP file, covert to Jpeg, delete bmp
   legend1.ExportToBmp strBmpFile
'  WebLink.BMP2JPEG strBmpFile, 90
   TwistedPixel1.Load strBmpFile, 1
   TwistedPixel1.Save strImageFile, 10

'  bmp2gif strBmpFile, strGifFile
   Kill strBmpFile


End Sub

Public Sub CreateScaleBar(strFile As String)
'On Error GoTo Error_legend
   Dim strBmpFile As String
   Dim strImageFile As String

   ' create output path and unique filename for bmp and jpeg image
   strBmpFile = strTmpPath & strFile & "_sb.bmp"
   strImageFile = strTmpPath & strFile & "_sb.png"

   ' load the scalebar
   Call RefreshScale(sbScaleBar1, MapMain)

   ' create a BMP file, covert to GIF, delete bmp
   sbScaleBar1.ExportToBmp strBmpFile
   TwistedPixel1.Load strBmpFile, 1
   TwistedPixel1.Save strImageFile, 10

   Kill strBmpFile

End Sub

Public Sub CreateFrames(strFile As String)
   Dim strHtmlFile As String
```

```
    ' create output filenames
    strHtmlFile = strTmpPath & strFile & "_frames.htm"      ' for HTML

    ' create a Html file
    Dim iFileNum As Integer
    iFileNum = FreeFile()
    Open strHtmlFile For Output As #iFileNum

    Print #iFileNum, "<HTML><HEAD>" & vbCrLf
    Print #iFileNum, "<TITLE>Queensland Catch Data (30' Grids)</TITLE>" & vbCrLf

    If f_bIdentifySelected Then
    Print #iFileNum, "<script lang=JScript>" & vbCrLf
'   Print #iFileNum, "function loadMessage() {" & vbCrLf
    Print #iFileNum, "var newWin = window.open(" & " '" & httpTmpPath & strFile &
"_message.htm', " & _
    "null, 'height=300, width=200, scrollbars=1, status=1 resizable=1');" & vbCrLf
    Print #iFileNum, "newWin.status = 'CHRIS Query Result';" & vbCrLf
'   Print #iFileNum, "}" & vbCrLf
    Print #iFileNum, "</script>" & vbCrLf
    End If

    Print #iFileNum, "</head>" & vbCrLf
    Print #iFileNum, "<frameset rows='40,*'>" & vbCrLf
       ' Navigation Bar
       Print #iFileNum, "<frame name='nav_bar' src='http://fho104738/avmap/chris navigation
bar.htm'>" & vbCrLf

    Print #iFileNum, "<frameset cols='20%,56%,*'>" & vbCrLf
    Print #iFileNum, "<frameset rows='33%,*'>" & vbCrLf
       ' Index Map
       Print #iFileNum, "<frame name='frame_imap' SCROLLING=NO MARGINHEIGHT=3
src='" & _
              httpTmpPath & strFile & "_iform.htm'>" & vbCrLf
       ' Layer control
       Print #iFileNum, "<frame name='frame_layer' src='" & _
              httpTmpPath & strFile & "_layer.htm'>" & vbCrLf
    Print #iFileNum, "</frameset>" & vbCrLf

    ' Main
    Print #iFileNum, "<frame name='frame_main' src='" & _
           httpTmpPath & strFile & "_main.htm'>" & vbCrLf
    ' Legend
    Print #iFileNum, "<frame name='frame_legend' MARGINWIDTH=0 src='" & _
           httpTmpPath & strFile & "_lgd.htm'>" & vbCrLf

    Print #iFileNum, "</frameset>" & vbCrLf
    Print #iFileNum, "</frameset>" & vbCrLf
    Print #iFileNum, "<noframes>" & vbCrLf
    Print #iFileNum, "<body>" & vbCrLf
```

```
   Print #iFileNum, "<p>This page uses frames, but your browser doesn't support them.</p>"
& vbCrLf
   Print #iFileNum, "</body>" & vbCrLf
   Print #iFileNum, "</noframes>" & vbCrLf
   Print #iFileNum, "</frameset>" & vbCrLf
   Print #iFileNum, "</HTML>" & vbCrLf
   Close #iFileNum

End Sub

Public Sub CreateFramesOld(strFile As String)
  ' write out an HTML document
  With WebLink
    ' specify what type of data we are going to send to the browser
    .WriteResponseHeader "Content-type: text/html" + vbCrLf + vbCrLf
    .WriteString "<HTML><HEAD>" & vbCrLf
    .WriteString "<TITLE>South Queensland Catch Data (Grids)</TITLE>" & vbCrLf

    If f_bIdentifySelected Then
    .WriteString "<script lang=JScript>" & vbCrLf
'    .WriteString "function loadMessage() {" & vbCrLf
    .WriteString "var newWin = window.open(" & " '" & httpTmpPath & strFile &
"_message.htm', " & _
    "null, 'height=300, width=200, scrollbars=1, status=1 resizable=1');" & vbCrLf
    .WriteString "newWin.status = 'CHRIS Query Result';" & vbCrLf
'    .WriteString "}" & vbCrLf
    .WriteString "</script>" & vbCrLf
    End If

    .WriteString "</head>" & vbCrLf
    .WriteString "<frameset rows='40,*'>" & vbCrLf
       ' Navigation Bar
       .WriteString "<frame name='nav_bar' src='http://fho104738/avmap/chris navigation
bar.htm'>" & vbCrLf

    .WriteString "<frameset cols='21%,57%,*'>" & vbCrLf
    .WriteString "<frameset rows='30%,*'>" & vbCrLf
       ' Index Map
       .WriteString "<frame name='frame_imap' src='" & _
              httpTmpPath & strFile & "_iform.htm'>" & vbCrLf
       ' Message
       .WriteString "<frame name='frame_layer' src='" & _
              httpTmpPath & strFile & "_layer.htm'>" & vbCrLf
    .WriteString "</frameset>" & vbCrLf

    ' Main
    .WriteString "<frame name='frame_main' src='" & _
           httpTmpPath & strFile & "_main.htm'>" & vbCrLf
    ' Legend
    .WriteString "<frame name='frame_legend' src='" & _
           httpTmpPath & strFile & "_lgd.htm'>" & vbCrLf
```

```
    .WriteString "</frameset>" & vbCrLf
    .WriteString "</frameset>" & vbCrLf
    .WriteString "<noframes>" & vbCrLf
    .WriteString "<body>" & vbCrLf
    .WriteString "<p>This page uses frames, but your browser doesn't support them.</p>" &
vbCrLf
    .WriteString "</body>" & vbCrLf
    .WriteString "</noframes>" & vbCrLf
    .WriteString "</frameset>" & vbCrLf
    .WriteString "</HTML>" & vbCrLf
  End With

End Sub

Private Sub DoMapExtent(ByVal arguments As Object, ByVal values As Object, _
          dataSrc As String, spSelected As String, _
          catchYear As String, strFile As String)
    ' set operation variables
    f_bNoChangeSelected = False
    f_bZoomInSelected = False
    f_bZoomOutSelected = False
    f_bPanSelected = False
    f_bFullExtSelected = True
    f_bIdentifySelected = False
    f_bHyperlinkSelected = False

    ' call the map generation routine
    DoMapCommon arguments, values, MapMain.FullExtent, dataSrc, spSelected, catchYear,
strFile

End Sub

Private Sub DoStart(ext As MapObjects.Rectangle, dblZoomFactor As Double, _
    spSelected As String, dataSrc As String, catchYear As String, _
    strFile As String)

    ' set operation variables
    f_bNoChangeSelected = True
    f_bZoomInSelected = False
    f_bZoomOutSelected = False
    f_bPanSelected = False
    f_bFullExtSelected = False
    f_bIdentifySelected = False
    f_bHyperlinkSelected = False

    ' turn on all layers at start
    Dim myLayer As MapObjects.MapLayer
    Dim strLayerVisible As String
    For Each myLayer In MapMain.Layers
      myLayer.Visible = True
    Next
```

```
    ' turn off a few layers by default
    MapMain.Layers("Marine Parks").Visible = False
    MapMain.Layers("Bathymetry").Visible = False
    MapMain.Layers("Rivers").Visible = False
    MapMain.Layers("Mangrove_hyland87").Visible = False
    MapMain.Layers("Mangrove_danaher").Visible = False
    MapMain.Layers("Seagrass_hyland87").Visible = False
    MapMain.Layers("Trawlnet_closures").Visible = False
    MapMain.Refresh

    ' create maps
    CreateMap ext, strFile
    ' create scalebar
    CreateScaleBar strFile
    ' create index map html
    CreateIndexMapForm ext, strFile, dataSrc
    ' create main form html
    CreateHTML ext, dblZoomFactor, strFile, dataSrc, catchYear, spSelected
    ' create layer control html
    CreateLayerControlForm ext, strFile
    ' set the visibility of legend entries
    SetLegendVis
    ' create legend
    CreateLegend strFile
    ' create legend Html
    CreateLegendHtml strFile
    ' create the frame layout and send to client
    CreateFrames strFile
    ' create a printable map
    CreatePrintMap strFile, dataSrc, catchYear, spSelected

End Sub

Private Sub DoNoChange(ByVal arguments As Object, ByVal values As Object, _
                ext As MapObjects.Rectangle, spSelected As String, _
                dataSrc As String, catchYear As String, strFile As String)

    ' set operation variables
    f_bNoChangeSelected = True
    f_bZoomInSelected = False
    f_bZoomOutSelected = False
    f_bPanSelected = False
    f_bFullExtSelected = False
    f_bIdentifySelected = False
    f_bHyperlinkSelected = False

    ' call the map generation routine
    DoMapCommon arguments, values, ext, dataSrc, spSelected, catchYear, strFile

End Sub
```

```
Private Sub DoLayer(ByVal arguments As Object, ByVal values As Object, _
   ext As MapObjects.Rectangle, dataSrc As String, spSelected As String, _
   catchYear As String, strFile As String)

   ' set operation variables
   f_bNoChangeSelected = True
   f_bZoomInSelected = False
   f_bZoomOutSelected = False
   f_bPanSelected = False
   f_bFullExtSelected = False
   f_bIdentifySelected = False
   f_bHyperlinkSelected = False

   ' call the map generation routine
   DoMapCommon arguments, values, ext, dataSrc, spSelected, catchYear, strFile

End Sub

Private Sub DoZoomIn(ByVal arguments As Object, ByVal values As Object, _
   ext As Rectangle, X As Long, y As Long, dblZoomFactor As Double, _
   dataSrc As String, spSelected As String, catchYear As String, strFile As String)

   Dim oPt As MapObjects.Point
   Dim oCtr As MapObjects.Point

   ' set operation variables
   f_bNoChangeSelected = False
   f_bZoomInSelected = True
   f_bZoomOutSelected = False
   f_bPanSelected = False
   f_bFullExtSelected = False
   f_bIdentifySelected = False
   f_bHyperlinkSelected = False

   Set oPt = ConvertClick(ext, X, y)

   ' shrink the extent and center it on the click location
   Set oCtr = ext.Center
   ext.ScaleRectangle dblZoomFactor '0.5
   ext.Offset oPt.X - oCtr.X, oPt.y - oCtr.y

   ' call the map generation routine
   DoMapCommon arguments, values, ext, dataSrc, spSelected, catchYear, strFile,
dblZoomFactor

   Set oPt = Nothing
   Set oCtr = Nothing
End Sub

Private Sub DoZoomOut(ByVal arguments As Object, ByVal values As Object, _
   ext As Rectangle, X As Long, y As Long, dblZoomFactor As Double, _
```

```
    dataSrc As String, spSelected As String, catchYear As String, strFile As String)
    Dim oPt As MapObjects.Point
    Dim oCtr As MapObjects.Point

    ' set operation variables
    f_bNoChangeSelected = False
    f_bZoomInSelected = False
    f_bZoomOutSelected = True
    f_bPanSelected = False
    f_bFullExtSelected = False
    f_bIdentifySelected = False
    f_bHyperlinkSelected = False

    Set oPt = ConvertClick(ext, X, y)

    ' shrink the extent and center it on the click location
    Set oCtr = ext.Center
    ext.ScaleRectangle 1 / dblZoomFactor '2
    ' check if zoom out more than the full extent
    If ext.Height > MapMain.FullExtent.Height Then
        ext.Left = MapMain.FullExtent.Left
        ext.Right = MapMain.FullExtent.Right
        ext.Top = MapMain.FullExtent.Top
        ext.Bottom = MapMain.FullExtent.Bottom
    End If
    ext.Offset oPt.X - oCtr.X, oPt.y - oCtr.y

    ' call the map generation routine
    DoMapCommon arguments, values, ext, dataSrc, spSelected, catchYear, strFile,
dblZoomFactor

    Set oPt = Nothing
    Set oCtr = Nothing

End Sub

Private Sub DoPan(ByVal arguments As Object, ByVal values As Object, _
    ext As Rectangle, X As Long, y As Long, _
    dataSrc As String, spSelected As String, catchYear As String, strFile As String)
    Dim oPt As MapObjects.Point
    Dim oCtr As MapObjects.Point

    ' set operation variables
    f_bNoChangeSelected = False
    f_bZoomInSelected = False
    f_bZoomOutSelected = False
    f_bPanSelected = True
    f_bFullExtSelected = False
    f_bIdentifySelected = False
    f_bHyperlinkSelected = False

    Set oPt = ConvertClick(ext, X, y)
```

```
    ' Center map to the click location
    Set oCtr = ext.Center
    ext.Offset oPt.X - oCtr.X, oPt.y - oCtr.y

    ' call the map generation routine
    DoMapCommon arguments, values, ext, dataSrc, spSelected, catchYear, strFile

    Set oPt = Nothing
    Set oCtr = Nothing
End Sub

Private Sub DoIPan(ByVal arguments As Object, ByVal values As Object, _
    ext As Rectangle, X As Long, y As Long, _
    dataSrc As String, spSelected As String, catchYear As String, strFile As String)

    Dim oPt As MapObjects.Point
    Dim oCtr As MapObjects.Point

    ' set operation variables
    f_bNoChangeSelected = False
    f_bZoomInSelected = False
    f_bZoomOutSelected = False
    f_bPanSelected = True
    f_bFullExtSelected = False
    f_bIdentifySelected = False
    f_bHyperlinkSelected = False

    Set oPt = ConvertClickIMap(ext, X, y)

    ' Center map to the click location
    Set oCtr = ext.Center
    ext.Offset oPt.X - oCtr.X, oPt.y - oCtr.y

    ' call the map generation routine
    DoMapCommon arguments, values, ext, dataSrc, spSelected, catchYear, strFile

    Set oPt = Nothing
    Set oCtr = Nothing
End Sub

Private Sub DoIdentify(ByVal arguments As Object, ByVal values As Object, _
    ext As MapObjects.Rectangle, X As Long, y As Long, _
    dataSrc As String, catchYear As String, spSelected As String, strFile As String)

    Dim oPt As MapObjects.Point

    ' set operation variables
    f_bNoChangeSelected = False
    f_bZoomInSelected = False
    f_bZoomOutSelected = False
```

```
    f_bPanSelected = False
    f_bFullExtSelected = False
    f_bIdentifySelected = True
    f_bHyperlinkSelected = False

    Set oPt = ConvertClick(ext, X, y)

    ' search for the grid code at that location
    Dim gCode As String
    Set rsIdentified = MapMain.Layers("catch data").SearchShape(oPt, moPointInPolygon, "")
    gCode = rsIdentified.Fields("GRID_CODE").value
'   Debug.Print gCode & vbTab & rsIdentified.Count

    Dim rstSpecies As ADODB.Recordset
    Dim spConnString As String
    Dim spConn As ADODB.Connection

    On Error GoTo AdoError

    spConnString = "Provider=Microsoft.Jet.OLEDB.3.51;" & _
            "Data Source=" & App.Path & "\data\Qld grids 8897.mdb"

    Set rstSpecies = New ADODB.Recordset
    Set spConn = New ADODB.Connection

    spConn.Open spConnString

    ' create a recordset for the required location
    rstSpecies.Open _
    "Select [Years 8897].* From [Years 8897] " & _
    "WHERE Year = " & catchYear & _
    " AND GRID = '" & gCode & "'" & _
    " AND [LOG CODE] = 'TRAWL'" & _
    " AND [Species name] = '" & spSelected & "'", _
       spConn, adOpenDynamic, adLockReadOnly

    ' create html record table
    CreateMessage rstSpecies, strFile, gCode

    ' call the map generation routine
    DoMapCommon arguments, values, ext, dataSrc, spSelected, catchYear, strFile

    ' close databases
    rstSpecies.Close
    spConn.Close

    Set oPt = Nothing
    Exit Sub

AdoError:
    Dim errorCollection As Variant
    Dim errLoop As Error
```

```
    Dim strError As String
    Dim iCounter As Integer

    On Error Resume Next

    iCounter = 1

    strError = ""
    Set errorCollection = spConn.Errors
    For Each errLoop In errorCollection
      With errLoop
        strError = "Error #" & iCounter & vbCrLf & _
        " ADO Error #" & .Number & vbCrLf & _
        " Description   " & .Description & vbCrLf & _
        " Source       " & .Source & vbCrLf
      End With
      iCounter = iCounter + 1
    Next
    CreateError "DoIdentify" & vbCrLf & strError
End Sub


Private Function ConvertClick(ext As Rectangle, X As Long, y As Long) _
                    As MapObjects.Point
  ' update the extent
  MapMain.Extent = ext

  ' convert the click location to control coordinates
  X = ScaleX(X, vbPixels, vbTwips)
  y = ScaleY(y, vbPixels, vbTwips)

  ' convert the control coordinates to map coordinates
  Set ConvertClick = MapMain.ToMapPoint(X, y)

End Function

Private Function ConvertClickIMap(ext As Rectangle, X As Long, y As Long) _
                    As MapObjects.Point
  ' update the extent
  MapMain.Extent = ext

  ' convert the click location to control coordinates
  X = ScaleX(X, vbPixels, vbTwips)
  y = ScaleY(y, vbPixels, vbTwips)

  ' convert the control coordinates to map coordinates
  Set ConvertClickIMap = MapIndex.ToMapPoint(X, y)

End Function
```

```
Private Function ConvertClickBuffer(ext As Rectangle, X As Long, y As Long, buf As
Long) _
                    As MapObjects.Rectangle
 ' update the extent
 MapMain.Extent = ext

 ' define a buffered rectangle
 Dim bufRect As New MapObjects.Rectangle
 Dim topRight As MapObjects.Point
 Dim lowerLeft As MapObjects.Point
 Dim tmpX As Long
 Dim tmpY As Long

 ' convert the click location to control coordinates
 tmpX = ScaleX(X + buf, vbPixels, vbTwips)
 tmpY = ScaleY(y - buf, vbPixels, vbTwips)
 Set topRight = MapMain.ToMapPoint(tmpX, tmpY)
 tmpX = ScaleX(X - buf, vbPixels, vbTwips)
 tmpY = ScaleY(y + buf, vbPixels, vbTwips)
 Set lowerLeft = MapMain.ToMapPoint(tmpX, tmpY)

 bufRect.Top = topRight.y
 bufRect.Bottom = lowerLeft.y
 bufRect.Left = lowerLeft.X
 bufRect.Right = topRight.X

 Set topRight = Nothing
 Set lowerLeft = Nothing
 ' convert the control coordinates to map coordinates
 Set ConvertClickBuffer = bufRect
End Function

Public Function FindArgValue(str As String, args As Object, values As Object) As String
 Dim i As Integer
 Dim value As Integer
 Dim icount As Integer

 value = -1
 FindArgValue = ""
 icount = args.Count - 1
 For i = 0 To icount
  If UCase$(args(i)) = UCase$(str) Then
   value = i
   Exit For
  End If
 Next
 If value > -1 Then
  FindArgValue = values(value)
 End If
End Function

Private Sub MapMain_AfterTrackingLayerDraw(ByVal hDC As Stdole.OLE_HANDLE)
```

```
   ' if idenify has selected records
If (Not rsIdentified Is Nothing) Then
   If (rsIdentified.Count > 0) Then
Dim sym As New MapObjects.Symbol
   sym.color = moYellow

'   Dim f As New StdFont
'   f.Name = "courier"
'   f.Bold = True

   rsIdentified.MoveFirst
MapMain.DrawShape rsIdentified, sym
End If
End If

   ' update the index map
'   MapIndex.TrackingLayer.Refresh True

End Sub

Private Sub ClassBreakCalc(curLayer As MapObjects.MapLayer, _
      theFldName As String, numBreaks As Long)
   ' Get the min and max range of the recordset associated with the layer
   Dim stats As Statistics
   Dim minValue As Double, maxValue As Double
   Set stats = curLayer.Records.CalculateStatistics(theFldName)
   minValue = stats.Min
   maxValue = stats.Max

   Dim Range As Double
   Range = maxValue - minValue

   ' create and attach class breaks renderer to map layer
   Dim rc As New ClassBreaksRenderer
   Set curLayer.Renderer = rc
   rc.BreakCount = numBreaks
   rc.Field = theFldName

   ' calculate breaks based on equal ranges
   Dim rangeDivision As Double
   rangeDivision = 0
   If numBreaks > 0 Then rangeDivision = Range / (numBreaks)

   ' Set symbol style
   Dim i As Long
   Dim curBreak As Double
   For i = 0 To rc.BreakCount
      If curLayer.shapeType = moPoint Then
         rc.Symbol(i).Style = moSquareMarker
      ElseIf curLayer.shapeType = moLine Then
         rc.Symbol(i).Style = moSolidLine
```

```
      ElseIf curLayer.shapeType = moPolygon Then
        rc.Symbol(i).Style = moSolidFill
        rc.Symbol(i).Outline = False
      End If
    Next i

' ramp the colors here
    rc.RampColors moLightYellow, moMaroon

For i = 0 To (rc.BreakCount - 1)
      curBreak = (minValue + (i + 1) * rangeDivision)
      rc.Break(i) = curBreak
    Next i

    Set stats = Nothing

End Sub

Private Sub LoadShapes()
    ' specify the shapefile names for map1
    ' first data set goes to the back of the MapLayers
    Dim map1_shpFiles As New Collection
    With map1_shpFiles
      .Add "Catch Data"
      .Add "Coastline"
      .Add "Seagrass_Hyland87"
      .Add "Mangrove_Hyland87"
      .Add "Mangrove_Danaher"
      .Add "Marine Parks"
      .Add "Fish_Habitat_Area"
      .Add "Trawlnet_Closures"
      .Add "Rivers"
      .Add "Bathymetry"
    End With

    ' specify the layer color for map1
    Dim map1_color As New Collection
      With map1_color
      .Add moGreen
      .Add moPaleYellow
      .Add moLimeGreen
      .Add moDarkGreen
      .Add moPurple
      .Add moOlive
      .Add moPurple
      .Add moKhaki
      .Add moBlue
      .Add moGray
    End With

    ' specify the layer style for map1
    Dim map1_style As New Collection
```

```
    With map1_style
    .Add moSolidFill
    .Add moGrayFill
    .Add moGrayFill
    .Add moGrayFill
    .Add moGrayFill
    .Add moGrayFill
    .Add moGrayFill
    .Add moGrayFill
    .Add moSolidLine
    .Add moDashDotDotLine
  End With

  ' load shape files into Map Layers
  ' module modMain required
  Dim oLayer As MapObjects.MapLayer
  Dim pos As Integer
  For pos = 1 To map1_shpFiles.Count
    Set oLayer = New MapObjects.MapLayer
    Set oLayer = AddShapeFile(MapMain, strDataPath, map1_shpFiles(pos),
map1_color(pos), map1_style(pos))
    If oLayer Is Nothing Then
      MsgBox "Map layer " & map1_shpFiles(pos) & " does not exist in " & strDataPath &
".", vbCritical
    End If
    Set oLayer = Nothing ' tmp map layer no longer use
  Next

  Set map1_shpFiles = Nothing
  Set map1_color = Nothing
  Set map1_style = Nothing

  ' load shape file into Index Map
  Set oLayer = New MapObjects.MapLayer
  Set oLayer = AddShapeFile(MapIndex, strDataPath, "coastline", moPaleYellow)
  If oLayer Is Nothing Then
    MsgBox "MapIndex layer coastline does not exist in " & strDataPath & ".", vbCritical
    End
  End If
  Set oLayer = Nothing ' tmp map layer no longer use

  Set oLayer = New MapObjects.MapLayer
  Set oLayer = AddShapeFile(MapIndex, strDataPath, "major towns", moPaleYellow)
  If oLayer Is Nothing Then
    MsgBox "MapIndex layer Major Towns does not exist in " & strDataPath & ".",
vbCritical
    End
  End If
  Set oLayer = Nothing ' tmp map layer no longer use

  ' make labels on major towns for Index Map
```

```
' set up a text renderer
Dim r1 As New MapObjects.LabelRenderer
MapIndex.Layers("major towns").Renderer = r1
r1.Field = "town"
Dim lc As Integer
r1.Symbol(0).color = moBlue
r1.Symbol(0).Font.Size = 6

' classify FHA
ValueRendererMake MapMain.Layers("Fish_Habitat_Area"), "Mngmt_type", _
moGray, moCyan

' classify Trawl Clousure
ValueRendererMake MapMain.Layers("Trawlnet_Closures"), "Use", _
moRed, moKhaki

' classify seagrass
ValueRendererMake MapMain.Layers("seagrass_hyland87"), "gc", _
moPaleYellow, moGray, moRed, moKhaki, moCyan

' classify marine park layer
ValueRendererMake MapMain.Layers("marine parks"), "Zone", _
moTeal, moGray, moKhaki, moOlive, moBrown

' classify mangroves
ValueRendererMake MapMain.Layers("mangrove_hyland87"), "Vegetation", _
moRed, moGreen, moBlue

' classify mangroves(danaher)
ValueRendererMake MapMain.Layers("mangrove_danaher"), "Grid_class", _
moTeal, moGray, moKhaki, moOlive, moBrown, moNavy

' classify bathymetry
ValueRendererMake MapMain.Layers("bathymetry"), "Feature", _
moMaroon, moKhaki, moNavy

' initialize map background symbol
MapMain.BackColor = 16761220
MapIndex.BackColor = 16761220

' set initial map extent
' the fullextent of the maps are set to the area of interest
MapMain.FullExtent = MapMain.Layers.Item("catch data").Extent
MapMain.Extent = MapMain.FullExtent
MapIndex.FullExtent = MapMain.Layers("catch data").Extent
MapIndex.Extent = MapIndex.FullExtent

End Sub

Private Sub SpeciesQuery(dataSrc As String, spSelected As String, catchYear As String)
' link the catch attributes to the map layer (catch data)and
'   create a classbreakrenderer for it
```

```
On Error GoTo AdoError

Dim rstSpecies As ADODB.Recordset
Dim rstRel As ADODB.Recordset
Dim spConnString As String
Dim spConn As ADODB.Connection

spConnString = "Provider=Microsoft.Jet.OLEDB.3.51;" & _
        "Data Source=" & App.Path & "\data\Qld grids 8897.mdb"

Set rstSpecies = New ADODB.Recordset
Set rstRel = New ADODB.Recordset
Set spConn = New ADODB.Connection

spConn.Open spConnString

'   ' open the database
'   Set dbsCatch = OpenDatabase(App.Path & "\data\Qld grids 8897.mdb")

' create a recordset for the required species

rstSpecies.Open _
   "Select [Years 8897].* From [Years 8897] " & _
   "WHERE Year = " & catchYear & _
   " AND [LOG CODE] = 'TRAWL'" & _
   " AND [Species name] = '" & spSelected & "'", _
   spConn, adOpenDynamic, adLockReadOnly

' create a recordset for the related table
rstRel.Open _
   "SELECT Reltable.* FROM Reltable", _
   spConn, adOpenDynamic, adLockOptimistic

spConn.BeginTrans

' remove all records from the related table for new data
Do While Not rstRel.EOF
   rstRel.Delete
   rstRel.MoveNext
Loop

' write new records to the related table
Do While Not rstSpecies.EOF
      With rstRel
      .AddNew
      !Grid = rstSpecies!Grid
      ![Catch Tonnes] = rstSpecies![Catch Tonnes]
      !Days = rstSpecies!Days
      !Boats = rstSpecies!Boats
      ![Species name] = rstSpecies![Species name]
```

```
            .Update
'           .Bookmark = .LastModified
        End With
        rstSpecies.MoveNext
    Loop

'   rstRel.UpdateBatch
    spConn.CommitTrans

    ' close databases
    rstRel.Close
    rstSpecies.Close
    spConn.Close

    On Error Resume Next

    ' make sure the old addrelate is cancelled
    MapMain.Layers("catch data").RemoveRelates

    ' Open the MO table object
    Dim relTable As New MapObjects.Table
    relTable.Database = App.Path & "\data\Qld grids 8897.mdb"
    relTable.Name = "RelTable"
    Dim related As Boolean
    related = MapMain.Layers("catch data").AddRelate("GRID_CODE", relTable, "GRID")
    If Not related Then
        MsgBox "AddRelate to Access Table failed"
    End If

    ' set up a text renderer
'   Dim r1 As New MapObjects.LabelRenderer
'   MapMain.Layers("catch data").Renderer = r1
'   r1.Field = dataSrc
    ' set up classbreak renderer
    ClassBreakCalc MapMain.Layers("catch data"), dataSrc, 5

    Set relTable = Nothing      ' no more use for relTable
    MapMain.Refresh             ' display changes
    Exit Sub

AdoError:
    Dim errorCollection As Variant
    Dim errLoop As Error
    Dim strError As String
    Dim iCounter As Integer

    On Error Resume Next

    iCounter = 1

    strError = ""
    Set errorCollection = spConn.Errors
```

```
    For Each errLoop In errorCollection
        With errLoop
            strError = "Error #" & iCounter & vbCrLf & _
            " ADO Error #" & .Number & vbCrLf & _
            " Description   " & .Description & vbCrLf & _
            " Source        " & .Source & vbCrLf
        End With
        iCounter = iCounter + 1
    Next
    CreateError "Species Query" & vbCrLf & strError

End Sub

Public Sub ValueRendererMake(curLayer As MapObjects.MapLayer, _
        theFldName As String, ParamArray lColor())
'       Optional color2 As Long, Optional color3 As Long, _
'       Optional color4 As Long, Optional color5 As Long)
Dim recSet As MapObjects.Recordset
Dim uList As New MapObjects.Strings

Set recSet = curLayer.Records
recSet.MoveFirst
Do While Not recSet.EOF
    uList.Add recSet.Fields(theFldName).ValueAsString
    recSet.MoveNext
Loop

' populate a ValueMapRenderer
Dim rv As New MapObjects.ValueMapRenderer
Set curLayer.Renderer = rv
curLayer.Renderer.ValueCount = uList.Count
curLayer.Renderer.Field = theFldName

If curLayer.shapeType = moPoint Then
    rv.SymbolType = moPointSymbol
ElseIf curLayer.shapeType = moLine Then
    rv.SymbolType = moLineSymbol
ElseIf curLayer.shapeType = moPolygon Then
    rv.SymbolType = moFillSymbol
End If

Dim j As Integer
Dim lc As Variant
j = 0
' assign color to each symbol
For Each lc In lColor
    rv.Symbol(j).color = lc
    If curLayer.shapeType = moPolygon Then
        rv.Symbol(j).Style = moGrayFill
    End If
    j = j + 1
```

```
Next

Dim i As Integer
For i = 0 To uList.Count - 1
   curLayer.Renderer.value(i) = uList(i)
Next i

Set recSet = Nothing
Set uList = Nothing
End Sub

Public Sub CreateLegendHtml(strFile As String)
' open a random file
   Dim strHtmlFile As String
   Dim strImageFile As String

   ' create output filenames
   strHtmlFile = strTmpPath & strFile & "_lgd.htm"      ' for HTML
   strImageFile = httpTmpPath & strFile & "_lgd.png"       ' for Image

   ' create a Html file
   Dim iFileNum As Integer
   iFileNum = FreeFile()
   Open strHtmlFile For Output As #iFileNum

 ' write out an HTML document
   Dim mItem As Integer

   ' specify what type of data we are going to send to the browser
'   Print #iFileNum, "Content-type: text/html"
   Print #iFileNum, "<HTML><HEAD>" & vbCrLf
   Print #iFileNum, "<TITLE>Legend</TITLE>" & vbCrLf

   Print #iFileNum, "</head>" & vbCrLf
   Print #iFileNum, "<BODY BGCOLOR=#c0c0c0>" & vbCrLf

   ' show legend
   Print #iFileNum, "<font size=2 FACE='Verdana,Arial,Helvetica'>" & vbCrLf
   Print #iFileNum, "<center>Legend</center><br>" & vbCrLf
   Print #iFileNum, "</font>" & vbCrLf
   Print #iFileNum, "<img title='Legend' src=" & strImageFile & ">" & vbCrLf
   Print #iFileNum, "</BODY>" & vbCrLf
   Print #iFileNum, "</HTML>"

   Close #iFileNum

End Sub

Private Function getMapScale(aMap As MapObjects.Map) As String

 'This procedure updates the scale dislay in the status bar.
 Dim mapScreenWidth As Double
```

```
 Dim mapExtentWidth As Double
 Dim mapScale As Double

 'Get width of screen and convert twips to inches.
 mapScreenWidth = aMap.Width / 1440
 'Get map width
 mapExtentWidth = aMap.Extent.Width
 'Calculate scale and update text of status bar
 mapScale = Round(mapExtentWidth / mapScreenWidth, 5)
 getMapScale = "Scale 1"":" & mapScale
End Function

Public Sub RefreshScale(AEScaleBar As ScaleBar.sbScaleBar, moMap As Map)

 Dim MapExt As sbExtent
 Dim Pageext As sbExtent
 On Error Resume Next
 Set MapExt = AEScaleBar.MapExtent
 Set Pageext = AEScaleBar.PageExtent

 MapExt.MinX = moMap.Extent.Left
 MapExt.MinY = moMap.Extent.Bottom
 MapExt.MaxX = moMap.Extent.Right
 MapExt.MaxY = moMap.Extent.Top

Pageext.MinX = moMap.Left / Screen.TwipsPerPixelX
 Pageext.MinY = moMap.Top / Screen.TwipsPerPixelY
 Pageext.MaxX = (moMap.Left + moMap.Width) / Screen.TwipsPerPixelX
 Pageext.MaxY = (moMap.Top + moMap.Height) / Screen.TwipsPerPixelY

 AEScaleBar.ScaleBarUnits = suKM
 AEScaleBar.ScaleText = RepresentativeFraction
 AEScaleBar.Refresh
 'Label6.Caption = "RF Scale is 1 : " & sbScaleBar1.RFScale

End Sub

' provide common map generation procedure
Private Sub DoMapCommon(ByVal arguments As Object, ByVal values As Object, _
   ext As Rectangle, dataSrc As String, spSelected As String, _
   catchYear As String, strFile As String, Optional dblZoomFactor = 0.5)

   ' do the species query
   If Len(spSelected) > 0 Then
      SpeciesQuery dataSrc, spSelected, catchYear
   End If

   ' set control to the user extent
   Set MapMain.Extent = ext

   ' set layer visibility
```

```
  SetLayerVis arguments, values
  MapMain.Refresh

  ' create maps
  CreateMap ext, strFile

  ' create scalebar
  CreateScaleBar strFile

  ' create index map html
  CreateIndexMapForm ext, strFile, dataSrc

  ' create layer control html
  CreateLayerControlForm ext, strFile

  ' set the visibility of legend entries
  SetLegendVis

  ' create legend
  CreateLegend strFile

  ' create legend Html
  CreateLegendHtml strFile

  ' create main form
  CreateHTML ext, CDbl(dblZoomFactor), strFile, dataSrc, catchYear, spSelected

  ' send result to client
  CreateFrames strFile

  ' create a printable map
  CreatePrintMap strFile, dataSrc, catchYear, spSelected

End Sub
```

The Standard Module Source Code

```
Option Explicit

Public Function AddShapeFile(moMap As Map, basepath As String, _
   ShapeFile As String, Optional color As Long = -1, _
   Optional fillStyle As Long = -1) As MapObjects.MapLayer
  'This procedure validates and adds a shape file to
  'the Layers collection.
  ' Note:  ShapeFile is assumed to not have an extension
  '    ShapeFile = GetFirstToken(ShapeFile, ".")   'Extract suffix of shpfile string
  Dim oDC As New dataConnection
  Dim oGS As GeoDataset
  Dim oLayer As New MapLayer
  Set AddShapeFile = Nothing
  'Set Database property of DataConnection
```

```
 oDC.Database = basepath
 If oDC.Connect Then
  'Find shapefile as GeoDataset in DataConnection
  Set oGS = oDC.FindGeoDataset(ShapeFile)
  If oGS Is Nothing Then
   Set AddShapeFile = Nothing 'False
   Exit Function
  End If
  'Set GeoDataset property of new MapLayer
  oLayer.GeoDataset = oGS
  ' assign style if available
  If fillStyle >= 0 Then oLayer.Symbol.Style = fillStyle
  ' assign color if available
  If color >= 0 Then oLayer.Symbol.color = color
  'Add MapLayer to Layers collection
  moMap.Layers.Add oLayer
  Set AddShapeFile = oLayer
  oDC.Disconnect
 End If
 ' clean up
 Set oLayer = Nothing
 Set oGS = Nothing
 Set oDC = Nothing
End Function
```

The Class Module Source Code (for development only)

```
Option Explicit

Private oReg As New IMSUtil.RegParams
Private oWeb As New IMSUtil.WebFuncs

Public Function Add()
 If Not oWeb.RegisterServer(oReg) Then
  MsgBox "Nope"
 End If
End Function

Public Function Remove()
 oWeb.UNRegisterServer oReg
End Function

Private Sub Class_Initialize()
With oReg
 .HostURL = "http://fho104738/moweb/esrimap.dll"
 .Machine = "fho104738"
 .MaxPending = 5
 .Timeout = 20
 .Retry = 5
 .Port = "5061"
```

```
  .Name = frmMain.prjName
End With

End Sub

Private Sub Class_Terminate()
Set oReg = Nothing
Set oWeb = Nothing
End Sub
```

17 Appendix 6 Contents of the CD-ROM

Blue Pages metadata for all DPI datasets displayed through the CHRIS web interface, September 1999

Visual Basic source code for the Habitat Management and Planning theme, and Recreational Fishing theme

[NBB. Source code reflects the CHRIS modules as at November 1999. The system continues to be developed and has been modified (including the code) since that time].

Contents of CD-ROM available from FRDC library on request.