

Fish Habitat Management Operational Policy FHMOP 003

Departmental Procedures for Permit Applications Assessment and Approvals for Insect Pest Control in Coastal Wetlands

Compiled by

**Melissa White
John Beumer**

**Fisheries Group
Queensland Department of Primary Industries
GPO Box 3129
Brisbane QLD 4001**

*September 1996
Policy Document QDPI*

Printed By

Publishing Services

© Queensland Department of Primary Industries
GPO Box 46
Brisbane QLD 4001

National Library of Australia Cataloguing-in-publication data
Insect Pest Control Program Assessment. Bibliography
1. Mosquito and biting midge control 2. Fisheries habitats 3. Policy
ISSN 1326-6985



Executive Summary

This operational policy applies to the assessment and approval of applications concerning marine insect pest control (mosquitoes and biting midges) in coastal wetlands, for the granting of Permits under the Queensland *Fisheries Act 1994* and *Regulation 1995* only, and is not a public document.

The policy will apply to most assessment situations and has been developed from existing Fisheries management decisions and ongoing involvement of Fisheries staff with applications lodged by local authorities, specifically for marine insect pest control. Furthermore it is recognised that occasions will arise where adherence to the policy may not be possible due to peculiar circumstances surrounding the particular assessment. On these occasions, careful documentation of the justification for the granting or refusal of a permit should occur.

The policy will be reviewed within 12 months of implementation to allow for any necessary changes and additional assessment processes (e.g. approvals of biting midge habitat modification). Input and comment is sought from staff in using this document as it has been developed to assist fisheries staff in the assessment and approval process for applications concerning marine insect pest control. All comments that will improve the quality, ease of referral to and use of the document are welcome and may be directed to the General Manager (Fisheries Resource Protection Unit).

The policy discusses the background of Fisheries Group involvement with issues of marine insect pest control in Queensland, roles of government agencies and distribution of target pest species. The scope, objectives and key challenges of the policy are outlined. The policy principles have been developed in keeping with other fish habitat management operational policies (marine plants and Fish Habitat Areas). Similarly, decision making processes and implications for assessing staff are also outlined.

Appendices provided contain information on biting insect pest species; chemical, biological and physical controls; use of native fish for control; assessment of runnelling applications for mosquito control; guidelines for Strategic Local Authority Vector Eradication plans; fees for application and assessment and decision making process flow charts concerning applications.

The policy is not a legal document. For details of fisheries legislation, reference should be made to the *Fisheries Act 1994* and *Fisheries Regulation 1995*.

Staff involved in the assessment of applications for approvals for Insect Pest Control in Coastal Wetlands are required to follow the policy. Situations and circumstances may arise where a particular assessment will require variation to the stated policy. On every occasion where the policy is varied, the assessing officer should, on the relevant file, clearly document the reasons on which the decision is based and forward a copy to the Fisheries Resource Protection Division for information.

List of Abbreviations

| Abbreviation | Name in Full |
|---------------------|---|
| Bti | <i>Bacillus thuringiensis israelensis</i> |
| CEPA | Commonwealth Environment Protection Authority |
| CLAG | Contiguous Local Authority Group |
| CPRM | Carpenter Parker Runnelling Machine |
| EIS | Environmental Impact Statement |
| EMP | Environmental Management Plan |
| FHA | Fish Habitat Area |
| IGR | Insect Growth Regulator |
| NGO | Non-government Organisation |
| NRA | National Registration Authority |
| QDPI | Queensland Department of Primary Industries |
| QFMA | Queensland Fisheries Management Authority |
| QIMR | Queensland Institute of Medical Research |
| RRV | Ross River Virus |
| SEQ | South East Queensland |
| WHO | World Health Organisation |

CONTENTS

| | Page |
|---|-------------|
| Executive Summary | ii |
| Abbreviations | iv |
| 1.0 Introduction | 1 |
| 1.1 History of marine insect pest control issues in Queensland | 1 |
| 1.2 Description of Queensland's fisheries | 6 |
| 1.3 Fisheries habitats: diversity and values | 7 |
| 1.4 Distribution of pest species implicated in disease transmission | 7 |
| 1.5 Coastal development pressures | 8 |
| 1.6 Fisheries Act and responsibilities | 8 |
| 2.0 Scope | 9 |
| 3.0 Objectives | 9 |
| 4.0 Key Challenges | 10 |
| 5.0 Policy Principles | 11 |
| 5.1 Ecologically sustainable development | 11 |
| 5.2 Documentation and monitoring of marine insect pest control programs | 12 |
| 5.3 Fisheries Group approval system for marine insect pest control programs | 12 |
| 5.4 Fisheries Group authorisation of Strategic Vector Eradication Plans | 14 |
| 5.5 Contingency and mitigation measures | 15 |
| 5.6 Optimum use of materials resulting from authorised disturbances | 16 |
| 5.7 Biological limitations of marine insect pest control programs | 16 |
| 5.8 Rehabilitation and regeneration of fisheries habitat | 16 |
| 6.0 Decision Making Process | 17 |

| | |
|--|-----------|
| 7.0 Implications of Policy | 18 |
| 7.1 Monitoring effectiveness of policies | 18 |
| 7.2 Implications for the assessing QDPI officer | 19 |
| 7.3 Implications for stakeholder groups | 20 |
| 8.0 Policy Definitions/ Glossary | 24 |
| 9.0 References / Suggested Reading | 26 |
| Acknowledgements | 28 |
| Appendix 1 Coastal biting insect pest reference tables (mosquitoes and biting midges) | 29 |
| Appendix 2 | 32 |
| a) chemical and biological control agents for mosquito and biting midge control | 32 |
| b) habitat modification measures | 33 |
| Appendix 3 Information regarding stocking of native fish for mosquito control. | 34 |
| Appendix 4 Habitat modification and saltmarsh mosquito control | 36 |
| (i) habitat modification options for saltmarsh mosquito control | 36 |
| (ii) guidelines for applications | 37 |
| (iii) criteria for application assessment and approval | 41 |
| Appendix 5 Strategic Local Authority Vector Eradication Plans | 43 |
| Appendix 6 Rehabilitation | 46 |
| Appendix 7 Fee and penalty unit schedule | 47 |
| Appendix 8 Decision making process flow charts | 50 |
| 8a. - mosquito control for public health benefit - chemical use | 50 |
| 8b. - biting midge control for relief from nuisance insects - chemical use | 51 |
| 8c. - mosquito control for public health benefit - habitat modification | 52 |
| 8d. - trial mosquito and biting midge control habitat modifications | 53 |

Appendix 9 Other values of fisheries habitats

54

1.0 Introduction

1.1 History of marine insect pest control issues in Queensland

This policy discusses issues of insect pest control in coastal wetlands and ramifications for Fisheries management, on a day to day basis. Control measures for brackish and saltmarsh mosquito species (disease transmission) and marine biting midges (nuisance impacts) have been identified as those practices requiring State-wide operational Fisheries Group policies, in keeping with legislative and management requirements.

Coastal insect pest control programs (mosquito and biting midge species) have been undertaken in Queensland for a number of years with the majority of work conducted by local authorities to control breeding of mosquito species capable of transmitting arboviruses to humans and animals. Major arboviruses (arthropod-borne viruses) affecting residential communities in Queensland include Ross River virus (RRV) and dengue viruses.

The control of vectors implicated in the transmission of RRV (also known as epidemic polyarthritis) and identified as being dependent on the saltmarsh environment is the primary focus of this Fisheries Group policy document. Specific control programs have been established in Queensland for RRV. These include ongoing monitoring and surveillance of pest species, particularly for the saltmarsh mosquito (*Aedes vigilax*) in saltmarsh-claypan areas, along the coast.

A secondary focus of this document is the development of Fisheries Group policies for biting midge control in intertidal areas. Ancillary programs have been conducted by some local authorities, particularly in south-east Queensland (SEQ), for the control of biting midge breeding. These programs have been implemented primarily for the provision of relief from nuisance insects to residents living adjacent to coastal wetlands or artificial waterways (e.g. canal estates). Synopses of optional forms of control for both mosquitoes and biting midges and their use in saltmarsh and mangrove zones are presented in this document. Current and proposed Fisheries approvals required for ongoing or new local authority programs are identified.

Local government authorities have the responsibility for mosquito control programs which may include areas of Unallocated State Land. Forty-three (43) shires and cities are spread along the Queensland coast. The needs of communities in those areas may result in the operation or establishment of mosquito control programs following an increase in surveillance or in the number of reported cases of RRV. Dale (1993) has summarised the incidence of RRV cases reported in Queensland for the period between September 1991 and August 1992 with 40% of the Queensland total coming from the major coastal cities of Brisbane, Townsville, Rockhampton and Cairns. RRV has been isolated from five (5) genera and many strains of Australian mosquitoes and of these, *Aedes vigilax* and *Culex annulirostris* are considered to be the most important Queensland vectors (Queensland Health, 1993). *Cx. annulirostris* relies on freshwater environments to complete its life cycle and is therefore not considered as part of this discussion paper. However, measures employed by local authorities for the control of such vectors may have an impact on freshwater wetland ecosystems.

A list of known and potential mosquito vectors of RRV and their ecological status (saltmarsh, brackish or freshwater) is included (Appendix 1). Biting midge species commonly associated with marine habitats are also documented for information.

Arbovirus Taskforce

Following an increase in the number of cases of RRV occurring in Queensland, the Arbovirus Taskforce was established in 1993, by Queensland Health, to address problems encountered with mosquito control and implications of outbreaks of arboviral disease. By seeking to establish longer term planning arrangements, for example, formulation of *Guidelines to Prevent Mosquito and Biting Midge Problems in New Development Areas*, Queensland Health has, in keeping with statutory obligations, the role as the lead State agency for issues of disease carrying and nuisance insect pests. Development of the *Guidelines*, presently in draft form, has been coordinated by Queensland Health following the formation of an inter-governmental working group with input from the Departments of Local Government and Planning, Natural Resources, Primary Industries, Environment and local government representatives.

It is anticipated that these *Guidelines* will be finalised in late 1996 and will be used in conjunction with Terms of Reference for Environmental Impact Statements (EIS), where appropriate. The *Guidelines* have been developed with regard to legislative requirements of the *Fisheries Act* and will assist with the assessment of insect pest control issues by proponents in the early stages of planning for residential or other proposed coastal developments. Likewise, the guidelines may be incorporated by local authorities during preparation of Development Control Plans and other strategic planning.

Ross River Virus

Facts about the RRV disease in Queensland may be summarised (Queensland Health, 1993) as follows:

- epidemics of RRV generally peak between December and June but may occur sporadically throughout the year
- incubation periods for RRV vary from a few days to 3 weeks, with an average of 10 days
- RRV is usually reported more commonly in females than males
- the median age of affected persons is between 35 and 40
- symptoms include arthralgia (arthritis), severe pain usually lasts 2-6 weeks
- incapacity varies from 1 to 24 weeks with an average of 6 weeks

Saltmarsh Mosquito Control

Mosquito control in Queensland has been undertaken by local authorities as a result of expanded surveillance of mosquito breeding areas and risks associated with disease transmission. Well established control programs have been formed in south east Queensland (SEQ) specifically for one major pest species (*Aedes vigilax*), which completes its life cycle in the saltmarsh environment.

Saltmarsh mosquitoes are present predominantly during summer months in saltmarsh areas. Breeding success is dependent on warm weather and high rainfall or tidal inundation (after spring tides) which provide suitable conditions for larval development. Eggs laid may remain dormant in marsh vegetation until conditions are ideal for hatching. Larvae (or 'wrigglers') develop into adult mosquitoes over about 6-8 days in SEQ with the mosquito becoming infectious some four days after biting an animal infected with RRV (Queensland Health, 1993). Animals which may be infected with RRV include fruit bats, horses, sheep and dogs, although only humans and horses show clinical signs of infection (Anon., 1994).

Gold Coast City Council (GCCC) in SEQ has conducted mosquito control within its boundaries, since 1959 (Williams, 1994). Identification of the need for a 'combined-effort' approach to mosquito control by Councils operating programs within close proximity to GCCC followed. Subsequently, various regional coordinating committees, for example the Contiguous Local Authority Group (CLAG), were established in SEQ onwards from the 1970s.

In the absence of a vaccine for RRV, a range of control practices has been adopted by local authorities, with increased monitoring and surveillance of existing mosquito populations. Positive identification and reporting of the incidence of RRV within communities, by Queensland Health, have enhanced local authority knowledge of disease transmission and has enabled preventative control measures to be implemented.

Fisheries Group became involved with various aspects of program operation because certain control methods which have direct and indirect impacts on fisheries resources may require statutory approvals. These methods which include the alteration of marine habitat, through removal of vegetation and /or minor modification of intertidal wetlands, and use of chemicals (noxious substances) on larvae and/or adults to break the breeding cycle of insect pest species, have the potential to impact on non-target marine fauna. Control programs have been established for saltmarsh mosquitoes by ten (10) local authorities in SEQ, comprising three (3) regional coordinating committees.

Biting midge control

Several species of biting midge have been attributed with causing nuisance impacts on residential communities situated close to the marine environment. Of these, Reye (1982) lists seven (7) species reliant on the tidal zone, above mean tide level, and notes that each species uses its own combination of tidal plane, substrate, vegetation cover and water action (Appendix 1).

The life cycle of biting midge species generally follows a larval stage of between 6 and 16 weeks, and a pupal stage from 3 to 14 days. Times may vary due to seasonal temperature and salinity levels (Reye, 1982). Adult emergence times and dispersal vary between species. Peak times may reflect a dependence on lunar phases which affect tide levels. Reye (1982) has stated that control depends on being able to deal with these insects in their immature stages when these are less mobile and more concentrated.

Control programs, for nuisance insect pest relief, have been established by some local authorities for biting midge species in SEQ ancillary to mosquito control programs. Established as a result of residents' petitions or complaints, the chief aim of these programs is to maintain a suitable level of comfort for residents, during peak biting midge emergence times. The programs have the potential to impact upon local fisheries resources and have led to increased levels of involvement by Fisheries Group with respect to proposed and existing control measures and practices. To date, most biting midge control is undertaken in canal estates where artificial intertidal habitat (non-vegetated sandy substrates) for larval biting midge species (e.g. *Culicoides molestus*) has been created. There is an ongoing potential for accidental run off of lethal chemicals into canal estate waterways resulting in fish kills, following application adjacent to or in the intertidal zone,

Available Control Measures

a) Biological Control

Agents

Although limited in terms of actual present application rates, biological products, which are highly specific to mosquito larvae, hold some promise for effective mosquito control with low level or negligible impacts on fisheries resources. These products include Cybate and 'Vectobac G' (active ingredient *Bacillus thuringiensis israelensis* or Bti). WHO (1982) reports that some strains of Bti produce beta-exotoxins which have toxic effects on birds and mammals and at low dosage a broad spectrum effect on invertebrates when ingested.

Products, which include biological agents, require assessment and registration by the National Registration Authority (NRA) before sale for use in mosquito or biting midge control programs. *Refer to Section b) Chemical Control (below) for an outline of registration requirements.*

Fish

Interest has been shown by local authorities in stocking fish for predatory control of mosquito larvae. However fish stocking for this purpose may be more beneficial in closed or artificial freshwater impoundments. One experimental program involving stocking of Pacific blue-eye (*Pseudomugil signifer*) and empire gudgeons (*Hypseleotris* spp.) has successfully reduced target wriggler populations by 50% at Bli Bli in the Maroochy River (R. Stark, personal communication). A list of Department of Primary Industries recommended fish species for mosquito control with respect to Queensland catchments is provided in Appendix 3. Permits may be required Sections 89, 90, and 91 of the *Fisheries Act* prior to stocking being undertaken. The Queensland Fisheries Management Authority must be contacted in relation to authorisation of fish stocking programs.

b) Chemical Control

To date many of the chemical agents used in marine insect pest control programs have been registered for agricultural purposes (protection of crops and stored grain) rather than for mosquito or biting midge control. 'Abate' is an agricultural product which has been used for approximately twenty years in Australia (including Queensland) for mosquito control (CEPA, 1994). Chemical manufacturing companies are now opting for formal registration of various products in order to establish State by State directions for use.

The National Registration Authority (NRA) is currently undertaking the registration of products, formulations and labelling instructions for use specifically for mosquito or biting midge control, in accordance with the provisions of the *Commonwealth Agricultural and Veterinary Chemicals Code Act 1994* and *Regulations*. Products used for the control of mosquitoes and biting midges in coastal wetlands come within the definition of 'agricultural chemical products' and are therefore included within the Commonwealth legislation.

Where registration of a particular product may not extend to use of the product for chemical or biological control of mosquitoes or biting midges, a permit must be issued to the manufacturer by the NRA in lieu of full product registration. This approach allows manufactures to lodge applications for registration of products which have previously had 'off-label' uses including control of aquatic pests in saltmarsh areas, in addition to control in closed/contained environments. The NRA can issue the following types of Permits :

- **trial** - to obtain efficacy and safety data prior to registration
- **off-label** (minor or emergency uses) - to allow chemicals to be used for the control of minor pests or major pests in minor crops/situations.
- **compliance permits** - to allow manufacturers to supply unregistered chemicals until such time as they become registered with the NRA. Compliance Permits are only issued for those products that did not require registration under the State system prior to 15 March 1995 (e.g. mosquito or biting midge control products)

The control of the use of products registered for the purpose of mosquito/biting midge control is a State responsibility under the *Chemical Usage (Agricultural and Veterinary) Control Act 1988* and *Regulation* and is administered by QDPI Animal and Plant Health Service (Chemical Services). Under this legislation only those products that are registered with, or allowed under Permit issued by the NRA, may be used or recommended for use. Product use must also be in accordance with the registered label or permit. Further, QDPI Fisheries Group has input to NRA assessment of product registration applications, coordinated throughout the State by Animal and Plant Health Services.

Products (chemical and biological) which have recently been used or may have been considered for use by local authorities for mosquito and biting midge control are provided in Appendix 2. The most commonly used products include organophosphorus compounds such as Abate (active ingredient temephos). Concerns regarding impacts of the use of chemicals in the marine environment include the possibility of increased resistance to certain products by target species and the subsequent need for higher dose rates to combat species, thereby increasing the likelihood of possible deleterious impacts on non-target marine

fauna. Another concern is the potential for bioaccumulation of chemicals over time which may impact on populations of non-target species.

Other products used in mosquito control programs include the use of insect growth regulators or 'IGRs'. Altosid /altosand (active ingredient s-methoprene) is an analogue of insect juvenile hormone and disrupts the normal pattern of growth of insects. Other compounds are chitin synthesis inhibitors which also affect moulting/ metamorphosis of larval stages (Hughes, 1994).

c) Physical Control

Acceptable habitat or landform modification involves minor physical alteration of known mosquito breeding areas in saltmarsh-claypan and mangrove areas to enhance predation on mosquito larvae by naturally occurring fish populations. Examples include habitat or landform modification such as runnelling, trialled in Australia and overseas. Large scale modification methods such as open marsh water management (OMWM) and water impoundment of pest species habitat require further consideration by Fisheries Group

In the early 1980's, Fisheries Group participated with experimental runnelling programs undertaken at Coomera, south-east Queensland, in conjunction with staff of the former Albert Shire Council and researchers from the Queensland Institute of Medical Research (QIMR) and Griffith University. Methods included in habitat modification programs are outlined with regard to current or proposed practices and their impacts (Appendix 2).

Landform modification of biting midge breeding areas to prevent larval midge development and associated impacts on the marine environment have not been fully investigated to date. However proposed methods include alteration of substrates below high water mark by filling, using gravel or concrete, or inducing hydrological changes, by periodically flooding intertidal areas using bund walls and flood gates. Another method of physical control for species found in sandy beaches of canal estates is under trial by Tweed Shire Council (NSW and Qld border) and Gold Coast City Council. The method involves regular disturbance of the upper most layers of sand (where larval biting midge develop) by undertaking beach-raking. The exposed larvae are susceptible to desiccation once brought to the surface. Appendix 2 addresses aspects of these control options.

It should be noted that the removal of marine plants specifically for *adult* pest control of biting midges *and* mosquitoes is **not** supported by Fisheries Group. In this instance, applicants may seek to alter or remove fringing marine vegetation used by adult pests as resting or shelter sites (in foliage or canopies) adjacent to residential, industrial or tourism zones.

1.2 Description of Queensland's Fisheries

Queensland's large geographic size and associated habitat diversity stretching across temperate, sub-tropical and tropical regions generates fisheries resources which are characterised by a great diversity of species. There are over 3000 species of freshwater and marine fish, molluscs and crustaceans many of

which have traditional, recreational and commercial importance. However due to the relatively low nutrient levels in coastal waters the abundance of some species is low when compared with world wide fisheries stocks. In many cases the harvesting of fish stocks in Queensland is based on targeting spawning, migration or feeding aggregations.

It is estimated that approximately 75% by weight of all seafood commercially landed in Queensland is of a species which is estuarine dependent (Quinn, 1992). The landed product value of Queensland's commercial fishing industry in 1994/95 was \$237.55 million (line fishery \$40M, net fishery \$35M, trawl fishery \$111.5M, crab fishery \$22.4M and Torres Strait fishery).

The target species of the recreational fishing sector are also dependent on marine plants and habitats as most species spend at least part of their lifecycle within marine plant ecosystems. In 1984 the Australian Recreational Fishing Council survey estimated that the national recreational fishery was worth \$2.2 billion annually and that 4.5 million Australians go fishing every year. In Queensland approximately 600,000 people go fishing annually (1985 Australian Bureau of Statistics Survey).

1.3 Fisheries habitats: diversity and values

The coastal resources most familiar to many as having an important role in fisheries production include tidal lands supporting mangrove and seagrass communities. However all tidal lands including those not supporting vegetation are important in providing diverse habitats that maintain high biodiversity in marine and estuarine ecosystems. Intertidal flats, sand bars, river banks and tidal channels contribute to ecosystem complexity and provide many species of fisheries resources with important landforms which provide optimal environmental conditions to complete their life cycle (e.g., whiting spawning on sandbars and adult mud crabs feeding in subtidal channels).

The importance of saltmarsh/claypan communities to local fisheries resources has been reviewed by researchers in SEQ (Hyland and Butler, 1987; Morton *et al*, 1987 and 1988). Morton *et al* (1987) sampled fish inhabiting a tidal inlet of saltmarsh in Moreton Bay, SEQ, finding 19 species of fish (mainly juvenile) of which 11 were estuarine species of economic (commercial and recreational) importance. Conclusions from their study suggested that management of saltmarsh areas should include protection and maintenance of tidal inlets wherever possible to retain areas important for economically valuable fish species. Issues of fisheries habitat protection in saltmarsh areas must be addressed where insect pest control methods may be adopted from a suite of available control options.

1.4 Distribution of pest species implicated in disease transmission

A summary of marine insect pest species, mosquitoes and biting midges, and their Australian and Queensland distribution is provided in Appendix 1. The list also includes certain freshwater mosquito species which should be referred to in the context of local Regional Fisheries issues and any proposed control programs. More specifically, priorities for mosquito eradication/control are likely to differ in each Region and programs adopted may therefore vary. For example, in northern Queensland, vectors of

dengue or malaria may be targeted in preference to those of RRV, given the implications of disease outbreak and different levels of impact on the community.

1.5 Coastal Development Pressures

Development in and adjacent to coastal wetlands increases pressures on the marine ecosystem resulting in a decrease in fisheries productivity, through loss of fisheries habitat and a reduction in water quality. The progression of development at an ecologically sustainable level with respect to the marine environment is the major management consideration of Fisheries assessment of proposed habitat disturbance. Controlled coastal development, in accordance with the principles of ecologically sustainable development (ESD), has the potential to minimise or alleviate coastal impacts, associated with proposed developments of an economic, residential, tourism, recreational, agricultural, or shipping nature.

Pressures such as the alteration of foreshore and tidal areas associated with developments, through modification of local hydrological conditions (e.g. reclamation and spoil placement) may cause loss of marine plants, saltmarsh-claypan areas, tidal flats and estuarine fish nurseries. Impacts on fisheries resources may occur in the short or long term and result in a loss to the community of a shared resource.

Similarly, poor catchment management can also increase pressures leading to greatly reduced water quality and therefore impact upon the sustainability of fisheries resources. The expansion of residential communities along the coast ultimately increases the demand for community services such as sewage treatment plants (STPs) resulting in elevated effluent production. Insect pest control programs which rely on pesticide application also increase as a result of expansion of coastal communities. Pesticide or herbicide use associated with agricultural land management practices and problems with erosion (resulting in sedimentation) and run off from acid sulfate soils are ongoing pressures which have the potential to degrade the quality of local and downstream fisheries resources.

1.6 Fisheries Act and Responsibilities

Fisheries legislation

The Queensland *Fisheries Act 1994* and its *Regulation 1995* provides for the proper management of the fisheries and interdependent habitat resources within Queensland waters, including marine, estuarine and freshwaters. Fisheries legislation is structured to allow separate responsibilities for management of wild fisheries stocks by the QFMA and for the management of fisheries habitat and aquaculture by the QDPI. All management is undertaken subject to ecologically sustainable development.

Fisheries habitat is managed under the provisions for the protection of marine plants, the gazettal of fish habitat areas and the restoration for damaged or destroyed habitats of importance to fisheries stocks. The legislation provides for the granting of certain 'habitat' approvals to allow works to be undertaken within intertidal areas, provided the impacts of such works are minimal, are for fisheries purposes and/or

community benefit and appropriate mitigation measures are carried out to counter any authorised loss of fisheries habitat.

In accordance with these legislation arrangements, marine plants and fish associated with tidal marshes are under the jurisdiction of the *Fisheries Act*. Any proposed disturbance of fisheries resources requires prior approval from a delegated fisheries officer. Some insect pest control programs include physical alteration of saltmarsh or mangrove habitat in known breeding areas. Approvals required include the issue of Permits for disturbance to saltmarsh-claypan plants such as saltwater couch (*Sporobolus virginicus*), samphires (*Suaeda* spp. and *Sarcocornia* spp.) and various mangrove species. Approval is required for removal of any portion of marine vegetation for example, removal of pneumatophores or lopping of foliage, by hand.

Provision has been made under the new *Fisheries Act* for authorisation of the application of agents of a chemical or biological nature for adulticiding or larviciding of mosquitoes or biting midges. This applies to the application of chemicals within Fish Habitat Areas (refer to Section 51(1)(d), *Fisheries Act* and Section 38(2)(f), *Fisheries Regulation*). Fisheries Group may also consider approvals for product use elsewhere in the marine environment (Section 81, *Fisheries Act* and Section 35(2), *Fisheries Regulation*). Refer to Section 5.3 of this document for an outline of the current Fisheries approval system.

Another provision of the *Act* relates to the application of products for marine insect pest control (for example biting midge control within canal estates) which may result in fish kills following run off of chemicals from areas above high water mark. In this instance, a 'Notice to restore fish habitat' under Sections 124 and 125 of the *Fisheries Act* may be issued to an operator, if a noxious substance has been released into the environment, to undertake nominated rehabilitation measures. Furthermore, the use of specific chemical products which may be prescribed (by a regulation or management plan) to be 'noxious substances' under the *Fisheries Act*, may be prohibited in the intertidal zone.

2.0 Scope

This policy covers the operational and assessment requirements for the specific issues of control of marine or brackish mosquito and biting midge species. The control of mosquitoes or biting midges which occur in freshwater is not covered. This Fisheries policy is applicable to all lands, irrespective of tenure and includes Federal, State and Local Government lands.

3.0 Objectives

Fisheries policy development, in relation to the ongoing authorisation of mosquito and biting midge control programs, must follow the objectives outlined in the *Fisheries Act 1994*:

- (a) to ensure fisheries resources are used in an ecologically sustainable way and

- (b) to achieve the optimum community, economic and other benefits obtainable from fisheries resources and fish habitats; and
- (c) to ensure access to fisheries resources is fair.

As such, the objective of operational policy should include goals and strategies that address these key objectives, including:

- the documentation of decision-making processes to assist Departmental staff;
- to articulate the administrative role(s) of staff involved with the assessment and approval system for insect pest control in coastal wetlands; and
- to provide managerial, administrative and legislative consistency throughout the Fisheries Group, specifically for fish habitats, Fish Habitat Areas and marine plants.

4.0 Key Challenges

The development and implementation of an operational policy for assessment of applications for approvals to control marine pest species in coastal wetlands presents a number of key challenges to Government and the community:

- a) To minimise the level of impact of insect pest control measures upon fisheries resources and to define acceptable levels of impact resulting from either mosquito and biting midge control.
- b) To protect fisheries resources through adoption of appropriate management practices in Fish Habitat Areas, where insect pest control may be taking place or is proposed.
- c) To maintain a standard approach to assessment and permit issue of activities requiring Fisheries approval with regard to mosquito and biting midge control in wetlands, throughout coastal regions of the State.
- d) To keep a register of acceptable control options for use in the marine ecosystem to assist with Regional Fisheries staff advice to clients.
- e) To establish an effective line of communication between Federal/ State/ local authorities and Department of Primary Industries, and, in particular, to provide Fisheries input to registration of products used for chemical and biological control of mosquitoes and biting midge.

- f) To facilitate the formation of regional coordinating committees to ensure certain benefits e.g. cost-effectiveness, application efficacy, management coordination, approval streamlining.
- g) To ensure compatibility with other relevant legislation such as *Local Government (Planning and Environment) Act*, *Marine Parks Act*, *Harbours Act*, *Coastal Protection Act*, *Chemical Usage (Agricultural and Veterinary) Control Act*, *Health Act*, *Nature Conservation Act*, *Lands Act* and procedures (e.g. Environmental Impact Assessment procedures) and present a whole-of-government approach to impacts of mosquito and biting midge control.
- h) To develop monitoring programs to assist with assessment and documentation of the levels of impacts of specific insect pest control measures to fisheries resources to quantify acceptable limits for future Fisheries approvals.
- i) To identify and quantify potential risks and impacts (including 'acceptable' impacts) of proposals for insect pest control in coastal wetlands. Often the potential risks and impacts will be difficult to quantify and there will be a need to proceed with caution.
- j) To increase knowledge of the specific roles of marine plants in the maintenance of fisheries resources and fisheries habitat biodiversity and to develop research priorities with respect to the disturbance of saltmarsh-claypan and mangrove habitats resulting from various control measures.
- k) To consider and quantify the economic, social and other costs to the community resulting from fisheries approvals of decisions relating to authorisation of aspects of mosquito and biting midge programs, where possible. Often costs associated with decisions will be difficult to quantify and there will be a need to proceed with caution.
- l) To develop a program to evaluate the management practices outlined in this policy, including the maintenance of a register of all authorities issued and applications. As the effects of permit issue or refusal may only be apparent in the long term, long term monitoring programs of the resource will be required.

5.0 Policy Principles

5.1 *Ecologically Sustainable Development*

Fisheries Group supports the proper management of Queensland's marine plant resources for the continued use and protection of fisheries resources and fish habitats, the maintenance of gazetted Fish Habitat Areas and the need to require urgent restoration of damaged or destroyed fisheries habitat, in accordance with the principles of Ecologically Sustainable Development (ESD) recognising the following specific ESD principles:

- maintenance of ecological systems and protection of biodiversity;
- dealing cautiously with risks, uncertainty and irreversibility (the 'Precautionary Principle'), especially with the assessment of applications for fisheries approvals for works and the implications for fisheries stocks and habitat;
- intragenerational equity which incorporates the costs and benefits of development for all existing sections (environmental, economic, social, and cultural) of the community; and
- intergenerational equity which provides for the needs of future generations, particularly in terms of protection of biodiversity and the maintenance of ecological systems through proper resource management.

5.2 Documentation and monitoring of marine insect pest control programs

Fisheries Group shall document the types of control measures for mosquitoes and biting midges. In addition, the actual locations of various control programs will be documented.

Increased knowledge of actual control practices undertaken on a regional basis will enable documentation of the extent/ demand for future possible programs. This provides a basis for effective planning with regard to fisheries habitats and resources, ensures all options for control are explored and assists in the decision making process for Fisheries support/ non-support of various control programs.

5.3 Fisheries Group approval system for marine insect pest control programs

Fisheries Group will continue to develop and extend its role in the assessment of marine insect pest control programs in Queensland. Fisheries Group approvals currently granted follow assessment of Permit applications for physical control methods and includes assessment of works within Fish Habitat Areas. Other non-statutory roles extend to Fisheries Group having input to the assessment of chemical and biological agents as co-ordinated by the National Registration Authority (NRA) and fisheries assessment and advice for applications involving 'integrated insect pest control', which combine physical, biological and chemical methods.

Approval of Physical Control Methods

In general, consideration is given to an application for approval under Section 51 of the *Fisheries Act*, to disturb marine plants for operation of marine insect pest control programs, using *physical control methods* (minor landform modification). Approval may be given if an application has satisfied Fisheries Group's guidelines, as outlined in Appendix 4 and following consideration of any other necessary approvals which may be required (e.g. a Marine Park Permit). Approvals may not be granted for the removal of marine vegetation specifically for adult mosquito or biting midge control (e.g. resting or shelter sites in foliage or canopies).

Approval of Chemical and Biological Agents

It is intended that Fisheries approvals be streamlined where possible to accommodate existing legislation or assessment procedures (e.g. NRA and QDPI Animal and Plant Health Service). Application and use of *chemical* or *biological* agents may be authorised, in accordance with Section 81 of the *Fisheries Act* and Section 35(2) of the *Fisheries Regulation*. This would apply to larviciding and adulticiding if agents are considered as ‘noxious substances’ (refer to Section 4 *Fisheries Act*). Further, by definition under the Act, the term ‘take’ includes the meaning ‘kill’. ‘Take’ is also referred to in Section 81 of the Act and includes the use of noxious substances. In keeping with this definition, approval from Queensland Fisheries Management Authority (QFMA) would be required for issue of a *general fisheries permit* (Section 35(2) of the *Fisheries Regulation*) which covers the inadvertent ‘taking’ of fisheries resources, a non-target group subject to impacts of the chemical controls.

During the process of application of chemical or biological agents, fish kills may occur through use of higher dosage rates, pesticide drift or operator error. It is considered that the use of noxious substances should be regulated to emphasise the responsibilities of local authority staff undertaking mosquito and biting midge control programs. However regulation of biological or chemical agents in accordance with the above mentioned fisheries legislation needs to be in conjunction with existing Commonwealth and State legislation and regulatory controls. Additional regulation under the *Fisheries Act* is not considered to be an appropriate option at this time given that on some occasions, approval under Section 81 (*Fisheries Act*) and Section 35(2) (*Fisheries Regulation*) may contravene Commonwealth/State legislation should such approval by the QFMA/QDPI be granted for the use or application of products not registered with the NRA.

It is therefore accepted that control of product supply and application for treatment of mosquitoes or biting midges *in all aquatic situations* should be the primary and sole responsibility of the relevant Commonwealth and State agencies (NRA and QDPI Animal and Plant Health Service, respectively). This removes the need for independent/parallel Fisheries approvals.

Furthermore, the authorisation of product application in Fish Habitat Areas (Section 51, *Fisheries Act*) will be contingent on existing lead agency product registration processes.

Fisheries Group assessments

Two categories are established by this policy for larvicides/ adulticides, specifically for mosquito and biting midge control. This ensures consistency of Fisheries advice to local authority groups and fosters the use of registered products. The categories have been developed with respect to national registration status and include:

Category A

Product is registered for the proposed use by the National Registration Authority (NRA)

or

a compliance Permit has been issued to the product manufacturer, pending registration.

Category B

Product is not registered for the proposed use by the NRA and a compliance permit has not been issued.

Appendix 8 outlines an assessment process to be adopted once categories have been determined for both saltmarsh mosquito and biting midge control and whether or not a product (chemical or biological) may be used fisheries habitats.

Approval of control methods (physical/ biological/chemical) within Fish Habitat Areas

A Permit may be approved by the Chief Executive (Director-General) or a delegate, under Section 51 of the *Fisheries Act*, for works in declared Fish Habitat Areas, using *physical, biological or chemical* control methods. This must be in accordance with Section 38(2)(f) of the *Fisheries Regulation* and may be necessary for public health or safety reasons. This applies specifically to mosquito control, **for the purpose of disease eradication or prevention**, within residential communities. Authorisation of the use of chemical or biological agents as part of a mosquito control program is required from Fisheries Group. In consideration of possible products that may be used, only 'Category A' products would be considered.

⇒ *Note: Proposed measures for the purpose of controlling biting midges in Fish Habitat Areas are not supported from a Fisheries viewpoint, in the absence of an identified need for the maintenance of public health or safety.*

5.4 Fisheries Group authorisation of Strategic Vector Eradication Plans

Fisheries Group may formally authorise control programs by issuing Permits for works integral to strategic or environmental health plans, formulated by individual or contiguous local authorities for marine insect pest control in coastal wetlands. Specifically:

- Fisheries Group advocates the development of management programs for marine insect pest control which adopt a strategic planning approach for the implementation of insect pest control methods. Management programs/strategic plans (e.g. 3-5 year plans) may address the long term management needs of communities or may be specific to proposed residential developments. An agreed-to management plan (between Fisheries staff and individual/contiguous local authorities or regional coordinating committees) would form the basis of consideration for the granting of Permits required under the Fisheries Act. An example of management program/ strategic plan content and uses for Fisheries Group vector control program assessment is provided for consideration (Appendix 5).

- Permits may only be authorised following an assessment of all possible fisheries impacts (on marine plants and animals) and that likely impacts are minimal. Appendix 2 outlines the chief chemical and biological agents and status of habitat modification measures which may have been considered for use by local authorities for mosquito and biting midge control. 'Best management practice' guidelines, specifically for marine insect pest control, may be developed between Fisheries staff and a local authority or regional coordinating committee for adoption by local authorities, where possible.
- An applicant must provide information on community benefits (social, economic and health) which result from insect pest control programs, to assist with Fisheries Group assessment of proposed control measures.
- Documentation of all other options explored and eliminated must be provided by the applicant for consideration by Fisheries Group.

5.5 *Contingency and mitigation measures*

Where appropriate, Fisheries Group may consider authorisation of approvals where assessment of applications for mosquito and biting midge control programs includes an Environmental Management Plan (EMP) which documents works (*physical, chemical and biological* measures) associated with the proposed disturbance. Accepted contingency measures included within the EMP will form part of a Condition of Permit and shall be implemented by the Permittee during the construction phase of the authorised works. Specifically:

Environmental Management Plans are necessary for disturbances of fisheries habitat such as those which have the potential to result in run off of exposed acid sulfate soils/enhancement of the development of acid sulfate soils, increased turbidity, sedimentation and smothering of marine plants adjacent to or within the authorised disturbance site, increased nutrient levels in discharge waters, bank erosion, alteration of surrounding landform profiles and unauthorised loss of fisheries habitat. A contingency plan for all proposed forms of marine insect pest control may be provided by an applicant (e.g. by a local authority) as part of a strategic marine insect pest control program.

Similarly, implementation of mitigation measures to reduce the level of disturbance from marine insect pest control programs on fisheries habitats will be supported by Fisheries Group wherever possible. Some mitigation measures include:

- a) gradual incorporation of physical modification programs into existing chemical control programs;
- b) comprehensive assessment of drainage conditions in locations proposed for physical modification;
- c) incorporation of options for use of low impact machinery for runnel construction (e.g. Carpenter Parker Runnelling Machine);

- d) conducting preliminary field trials of prototype machinery, where alternatives to hand-digging for construction of runnels are proposed, to allow assessment of impacts prior to Fisheries acceptance and proposed use;
- e) use of registered chemical or biological agents in accordance with labelled directions; or
- f) adoption of monitoring programs where approval has been granted to assess the effectiveness of the selected control method.

5.6 *Optimum use of materials resulting from authorised disturbances.*

Fisheries Group will foster optimum use of materials (marine plants, soils etc.) from authorised disturbances resulting from habitat/landform modification for insect pest control. Specifically:

Where habitat modification is approved for a given site, all material (spoil and marine plants) removed during construction of runnels should be used for works specifically undertaken to further reduce the extent of breeding areas. For example, spoil from the construction of runnels may be broadcast finely using authorised machinery (runnelling machine) or placed in outlying depressions (also acting as mosquito habitat), isolated from a main runnel system.

5.7 *Biological limitations of marine insect pest control programs*

Fisheries Group acknowledges that biological limitations currently exist within ongoing marine insect pest control programs. These include the possibility of deleterious effects on non-target marine fauna as a result of the implementation of such programs. Specifically:

Fisheries Group will not support implementation of programs that do not address the uses of saltmarsh-claypan habitats by non-target fin fish, crustaceans and molluscs. Control programs of a *biological, chemical or physical* nature must not be endorsed without consideration of impacts on fisheries resources. Advice from Fisheries staff during assessment of such proposals shall include information on species composition, seasonality, recruitment or breeding of various marine species using the saltmarsh-claypan area and adjacent tributaries. To fully catalogue this information, extensive Fisheries research needs to be undertaken or where possible, the knowledge of local Fisheries staff and fishing industry knowledge should form part of individual assessments.

5.8 *Rehabilitation and regeneration of fisheries habitat*

Fisheries Group will foster the rehabilitation/regeneration of wetlands. Fisheries supports initiatives by developers, State and Local Authorities and the community to rehabilitate tidal wetlands and undertake restorative measures to regenerate degraded or disturbed fisheries habitat for community benefit, in particular, with respect to insect pest control in coastal wetlands.

Major disturbance to tidal wetlands should be avoided wherever possible. However unavoidable impacts from urban, industrial and port development and provision of public infrastructure may lead to altered geomorphological, hydrological and water quality characteristics of tidal wetlands. This may affect the distribution and abundance of marine plants and associated fauna resulting in the destruction of, or a decline in the quality of habitat capable of supporting important fisheries resources.

High levels of sedimentation of tributaries or erosion of vegetation caused by natural or anthropogenic disturbances may enhance the colonisation of marine insect pest species in saltmarsh-claypan habitats. This results in a requirement for some form of control program, where disturbed areas are proximal to residential areas. Rehabilitation of disturbed sites to restore fisheries values is a high priority for sound environmental management of tidal wetlands, reduces areas available for mosquito breeding and is encouraged where clear benefits to the community can be demonstrated.

Whenever possible, rehabilitation of degraded fisheries habitats should be employed to remove mosquito breeding problems. For example, the reversal of stagnation and ponding of tidal waters may be achieved by restoring tidal influences to marine plant zones that have been disturbed. This may be appropriate in tidal areas isolated by bund walls, cut-off meanders or in areas where there has been vehicular damage (wheel ruts ponding water) to claypan substrates. This is a preferred option to the ongoing use of chemicals for insect pest control within degraded fisheries habitats. Appendix 6 outlines relevant Sections of the *Fisheries Act* which relate to rehabilitation of wetlands.

6.0 Decision Making Process

A critical component of the policy relates to the provision of a consistent and accountable Statewide mechanism for decision making applied during the assessment of applications made under the provisions of the Queensland *Fisheries Act* or its *Regulation*. In order to achieve this mechanism, the following process will be applied:

- a) Each application will be made on the required form and be submitted with the appropriate fees.
- b) Where appropriate, categorisation of impacts will be provided to applicants and assessment staff to facilitate documentation of the relative impacts on fisheries resources.
- c) Each application will be treated separately and on its merits, justification and the information supplied.
- d) Each application will be processed according to departmental administrative standards, statutory requirements under fisheries legislation and the necessary auditing requirements.
- e) Assessment criteria have been developed to allow a standard review process of applications which entail a site inspection and subsequent report preparation which must detail all potential impacts to fisheries resources and likely benefits to the community, as assessed. (Refer Appendices 4 and 8).
- f) On-site inspections will be undertaken with each applicant to ensure that the extent of any proposed works is fully understood by all parties. Where appropriate, other government agencies will be invited to participate in the inspections to ensure a Whole-of-Government approach is considered.

- g) On recognition of the potential impacts of any proposed works, a full and open discussion of the necessary contingency options will be held with the applicant to ensure that impacts are either temporary or minimal.
- h) Each assessment will incorporate application details, an inspection report outlining likely benefits, impacts, losses and any options for contingency plans related to the proposed works. Monitoring and mitigation requirements and recommendations of support or non-support of the proposal should also to be provided with assessments.
- i) No decision will be undertaken until a comprehensive assessment report has been completed. The decision will relate to the granting or refusal of an approval, subject to certain conditions, including an EMP and monitoring to be undertaken.
- j) Following a decision, the applicant will be advised as will be the Queensland Boating and Fisheries Patrol and any other relevant government agency. Applicants will be forwarded decisions in writing, with approvals granted on specific forms.
- k) Each applicant will be advised of the provisions of the Appeals Tribunal in relation to each decision made. This advice will include reference to the relevant Sections of the fisheries legislation and the contact details for the Secretary of the Tribunal.
- l) Any decision can only be made by a departmental officer who carries the necessary delegation from the Chief Executive of the Department.
- m) Monitoring will be undertaken by the appropriate departmental officer and a record of the monitoring inspection will be kept.
- n) Tenure of issued permits is for a period of 12 months for all categories unless there is a demonstrated need for a longer term with a maximum tenure of five (5) years is permitted (e.g., a Permit issued for a Strategic Local Authority Vector Eradication Plan). Maintenance or investigation permits (e.g., removal of seedlings from runnels or lopping of mangrove branches for access to insect breeding sites) may be issued for a period of 6 months. Permits are not renewable. Permit extensions may be considered to allow completion of works covered under an existing authority. The previous authority must be current at the date of the new application.

7.0 Implications of Policy

7.1 *Monitoring effectiveness of policies*

Operational policies developed for habitat protection (marine plants, fish habitat areas and marine insect pest control) are subject to review by Central Office and Regional Management, following initial implementation of policies in the Regions. A review of proposed changes to Operational Policy may be undertaken if consistent with existing Strategic Policies.

Similarly, new policies may be developed in accordance with changes to relevant legislation.

The Policy Review Process is to be coordinated by Central Office and may be undertaken at any time following determination that the policies are:

- inconsistent with other relevant legislation;
- ineffective with respect to policy objectives; or
- can not be implemented in the Regions.

The Policy Review Process shall include documentation of the following for consideration:

- limitations of the policy,
- an assessment of the effectiveness/ineffectiveness for fisheries habitat protection,
- proposed changes to existing policy, and
- new policy proposals.

7.2 Implications for the assessing QDPI officer:

- a) where relevant, staff should ensure an initial advice statement (IAS) accompanies a completed, signed and dated **Application Form for a Permit to Cut etc. Mangrove/Marine plants or undertake works or related activity in a FHA (which includes application of larvicides or adulticides for control marine insect pests)** and full payment of all (Permit, assessment and survey) fees (Appendix 7), prior to any further action being taken by the Department;
- b) should promptly advise the proponent of any application deficiencies;
- c) where development proposals are being assessed, staff should provide clear and concise Terms of Reference from a fisheries viewpoint in regard to marine insect pest control when a request by the Department of Local Government and Planning for preparation of Environmental Impact Statement (EIS) guidelines has been received;
- d) should make a thorough assessment of any EIS report on a development proposal which addresses marine insect pest control issues and potential impacts on Fish Habitat Areas or marine plants and report to the Department of Local Government and Planning;
- e) should undertake a site inspection with the proponent to consider mitigation options for the proposal and make a written report in the standardised format;
- f) should enter all applications in regard to control of marine insect pests in a register and receipt all payments according to the assessment guidelines and administrative standards;
- g) should, where an application is not approved, advise the applicant in writing of their right to appeal under Part Nine of the *Fisheries Act*, within 28 days of the date of the receipt of the decision;

- h) should make a full and reasoned assessment of the proposal in writing observing the objectives of the *Act*, outlining the costs and benefits of the proposal and recommending to the Regional Fisheries delegate that approval be given or refused;
- i) should, if approved, issue or arrange for the issue of a permit using the Fisheries Licensing Database System and accompanying plan showing the location and area of impacts of the proposal in a standardised format with appropriate conditions consistent with the objectives of the *Act* and current environmental management practices;
- j) should make and keep safe a copy of all permits with accompanying plans, fee payment receipts, memo of recommendation to approve or otherwise, covering letter to the proponent, inspection report, IAS/EIS and application documents as a Departmental record. Copies should also be forwarded to the appropriate Queensland Boating and Fisheries Patrol Office;
- k) maintain a database of all permits issued indicating the name, address and contact details of the Permittee, the purpose of the permit, effective location(s) as shown on the permit plan, character and estimated area of disturbance;
- l) notify Fisheries Group, Brisbane, of all regional developments granted a permit under S.51 of the *Act* by forwarding a copy of the application, permit and plan for reference; and
- m) monitor and report to the Regional Fisheries Manager on permit compliance or otherwise regarding the rehabilitation/restoration of the disturbed site at an appropriate time following the permitted works/activities. In addition the level of recovery of the site to its former condition may need to be reported at this stage and acted on as appropriate (e.g., permittee to provide and install physical protection to seedlings where natural re-establishment of marine plants can be enhanced).

7.3 Implications for stakeholder groups

The implications of the policy for stakeholder groups are discussed separately below.

QDPI

The policy requires that various roles and functions performed by QDPI officers assessing proposals in the normal course of their duties be clarified and documented to provide mutual understanding of an individual officer's responsibilities in dealing with approvals under the *Fisheries Act 1994* and *Regulation 1995*.

An outline of the process to be adopted for assessment of applications for approvals and for programs for marine insect pest control is summarised in Appendix 8 to enhance the delivery of high quality service to clients and provide consistent advice and an accountable outlook to recommendations and decisions. The background provided will in turn enable QDPI officers to negotiate more successfully with stakeholders to achieve satisfactory outcomes in accordance with the objectives of the *Act* and to provide advice which reflects sound environmental management principles.

National Registration Authority

The policy will assist with Fisheries Group input to the ongoing review of chemical and biological agents for registration by the National Registration Authority (NRA), specifically for mosquito and biting midge control. An approach to the assessment of control agents for use in Fish Habitat Areas is incorporated within the policy. Recognising Fisheries Group's views during the planning and registration process undertaken by NRA, the policy outlines the Group's steps for advice to local government authorities, from an operational perspective.

Community

The proposed policy will facilitate the further documentation of the marine plant resources and marine insect pest control measures within Queensland and will provide an information base for the community to provide comments and suggest action on specific issues affecting fisheries resources.

The implementation of the policy will ensure the proper use and management of marine habitat which is a common use resource and a community asset.

Community use of the resource will not be restricted by the policy except as outlined in the *Fisheries Regulation*.

Landholders

The implementation of this policy will foster recognition of possible flow-on effects from development and management of land adjacent to fisheries habitat. The proper development of adjacent lands, so as not to adversely affect marine habitat resources or create additional breeding habitats for marine insect pests, will be monitored. Landholders must make application for a permit if disturbance of marine plants, for minor land modifications as a component of mosquito or biting midge control measures, is proposed.

Landholder rights are recognised by this policy and include riparian rights. However these rights do not preclude the protected status of fisheries resources under the *Fisheries Act*, irrespective of land tenure.

The policy documents the Fisheries Group's position with respect to the need for preliminary insect pest control management strategies having no or low fisheries impacts and, for which assessment of an application for authorisation may be considered at an early stage of the planning phase of new development proposals.

Further reference to directives for undertaking mosquito control given to landholders by government authorities is provided below (*Health Act*).

Government Agencies

This policy facilitates a Whole-of-Government approach to the management of marine habitat and issues of insect pest control. Recognition of responsibilities by each agency in ensuring ecosensitive development adjacent to marine habitat will be enhanced through active consultation with these agencies and through recognition of the lead agency role of the Department in the area of marine habitat management.

Fisheries policy development in regard to documentation of acceptable control methods and required approvals allows a consistent approach to be adopted by Fisheries staff when dealing with pest control measures that may contravene fisheries legislation. The *Mosquito Prevention and Destruction Regulations 1982* of the *Queensland Health Act* are currently under review by Queensland Health. However, these Regulations currently give authority to government agencies to direct landholders to remove mosquito breeding habitats. The direction must be given with due regard to disturbance of marine plants protected under the *Fisheries Act* (e.g. filling or draining of mosquito breeding areas in the upper tidal zone).

Local Government

This policy emphasises the level and benefits of cooperation and consultation between Fisheries Group and Local Government agencies with regard to insect pest control measures and strategies and to further develop complementary town planning practices which will enhance and protect local and regional fisheries. The preparation of Development Control Plans and planning schemes should recognise the ongoing protection of marine plants and fisheries habitats, whilst providing for a strategic vector control program in proximity to new or existing residential developments.

Fishing industry

The fishing industry will benefit directly from the implementation of this policy. The proper management of fisheries resources and documentation of their uses and status will ensure the health of fisheries stocks and their ecologically sustainable use. The policy will assist with regulation of insect pest control practices in sensitive fish habitats, vital to the maintenance of fisheries resources.

Developers, consultants, River Improvement Trusts

The policy highlights the responsibilities to the resource of potential developers and will encourage ecosensitive development which reduces the need for high impact insect pest control, which in turn may affect the condition of fisheries resources.

Aquaculture

The aquaculture industry will benefit through the further documentation and proper management of marine habitats. The development of a specific policy in relation to authorisation and therefore regulation of the use of noxious substances associated with marine insect pest control, which may be harmful to aquaculture produce (farmed fisheries resources), may benefit the aquaculture industry, where assessments of insect pest control programs incorporating aquaculture needs, carried out on local or regional levels, are undertaken by Fisheries staff.

Research / educators

Further research will need to be undertaken to facilitate the documentation of the impacts of land modification control measures on Queensland's marine plant and other habitat resources and on the potential impacts of the use of noxious substances on marine pest species in fisheries habitats. This policy encourages such research, identifying the need for specific research regarding insect pest control practices which may be harmful to fisheries resources.

Non-Government organisations (NGOs)

Non-Government organisations (e.g. conservation organisations and progress associations) will be better able to make informed decisions and comments on marine habitat issues through a greater recognition of the Department's lead role in the protection of marine fisheries resources and the assessment process for applications and control programs for marine insect pest species. Documentation and proper management of the resource will benefit NGOs and will support their programs in the marine habitat area.

8.0 Policy Definitions/ Glossary

The following definitions apply for interpretation of the document:

| | |
|--|---|
| Area: | Means an area of land, waters or both land and waters, and includes a place (Section 4, <i>Fisheries Act</i>) |
| Biting midges: | Biting insect pests belonging to the Family Ceratopogonidae. Australian sandflies (non-biting) and blackflies (occurring inland after flooding) belong to Psychodidae and Simuliidae, respectively, and are not included in the definition of biting midges. |
| Chemical: | Includes an element (Section 94, <i>Fisheries Act</i>) |
| Declared fish habitat area: | Means an area that is declared under this Act to be a fish habitat area (Section 4, <i>Fisheries Act</i>) |
| Ecologically sustainable development: | Means development - <ol style="list-style-type: none"> a) carried out in a way that maintains biodiversity and the ecological processes on which fisheries resources depend; and b) that maintains and improves the total quality of present and future life. (Section 25, Subsection 4, <i>Fisheries Act</i>) |
| Fish habitat: | Includes land, waters and plants associated with the life cycle of fish, and includes land and waters not presently occupied by fisheries resources (Section 4, <i>Fisheries Act</i>) |
| Fisheries resources: | Includes fish and marine plants (Section 4, <i>Fisheries Act</i>) |
| Habitat modification: | Large or small scale landform modification which involves physical alteration of existing hydrological regimes of saltmarsh-claypan areas or mangrove areas for the control of mosquito or biting midge larvae, respectively; also surface disturbance of intertidal sand bars. |
| Impoundment: | Large scale habitat modification which involves seasonal or permanent impoundment of mosquito breeding areas, followed by stocking with larvivorous fishes. |
| Intertidal zone: | Area of land subject to ebb and flood of tidal waters |
| Land: | Includes foreshores and tidal and non-tidal land (Section 4, <i>Fisheries Act</i>) |
| Marine plant: | Includes the following- <ol style="list-style-type: none"> a) a plant (a tidal plant) that usually grows on, or adjacent to, tidal land, whether it is living, dead, standing or fallen; b) material of a tidal plant or other plant material on tidal land plant; c) a plant, or material of a plant prescribed under a regulation or a management plan to be a marine plant <p><i>does not include</i> - a declared plant under the <i>Rural Lands Protection Act 1985</i> (Section 8, <i>Fisheries Act</i>)</p> |
| Noxious substance: | Means anything that- |

a) is harmful, or produces conditions that are harmful, to fisheries resources or fish habitats; or

b) is prescribed under a regulation or management plan to be a noxious substance; (Section 4, *Fisheries Act*)

Open marsh water management: Creation of ponds, reservoirs, circuit radials, radials, selective ditches or sill ditches (Anon., 1991) which may involve large scale modification of tidal wetlands.

Queensland waters: Means all waters that are-

a) within the limits of the State; or

b) coastal waters of the State (Section 4, *Fisheries Act*)

Runnels: Shallow, spoon shaped drains (width 90cm max., depth 30 cm max linked to follow existing topography and drainage lines, to enhance tidal flushing of mosquito breeding grounds in the upper littoral zone.

Runnelling: Small scale habitat modification

Runnelling machine: An operationally low-impact machine designed to replace hand digging of runnels

Take fisheries resources: Means

a) catch, gather, kill or obtain from water or land; and

b) attempt to catch, gather, kill or obtain from water or land; and

c) land (from a boat or in any other way), bring ashore or tranship; (Section 4, *Fisheries Act*)

Tidal land: Includes reefs, shoals and other land permanently or periodically submerged by waters subject to tidal influence (Section 4, *Fisheries Act*)

Unlawfully: Means without authority under the *Fisheries Act* or other legal authority, justification or excuse under an Act (Section 4, *Fisheries Act*)

Vector: Carrier of disease or infection from one organism to another

9.0 References / Suggested Reading

- Adam, P.** (1990). **Saltmarsh ecology**. Cambridge University Press. 461 pp.
- Anon.,** (1994) **Fact sheet Ross River virus disease**, Queensland Health and Queensland Institute of Medical Research, Brisbane, 2pp.
- Anon.,** (1993) **Native fish as alternatives to the exotic fish, *Gambusia* for mosquito control**. Queensland Department of Primary Industries, Brisbane, QL93001, leaflet, 6 pp.
- Anon.,** (1992) **Mosquito control in coastal wetlands**. Queensland Department of Primary Industries Brisbane, QL92005, leaflet, 3 pp.
- Anon.,** (1991) **Discussion paper - guidelines for habitat management for mosquito control in southeast Queensland**. Griffith University, CLAG and QIMR, 23 pp.
- Beale, J.P.,** (1995) **Report on the environmental impact of biting midge control measures on Illidge's ant-blue butterfly, Part A**, prepared for Hervey Bay City Council, 82 pp.
- Catts, E. P., Jr., Lesser, F.H., Darsie, R. F., Jr., Florschutz, O., and Tindall, E.E.,** (1963) Wildlife usage and mosquito production on impounded tidal marshes in Delaware, 1956-1962, Transactions of the 29th North American Wildlife and Natural Resources Conference., 125.
- CEPA.** (1994) **Environmental assessment report temephos**. Commonwealth Environment Protection Agency, Canberra, 25 pp.
- Couchman, D., Mayer, D. and Beumer, J.,** (1996) **Departmental procedures for permit applications assessment and approvals for marine plants**. Queensland Department of Primary Industries Fish Habitat Management Operational Policy 001, 62 pp.
- Dale, P.E.R.,** (1993) **Australian wetlands and mosquito control - contain the pest and sustain the environment**. *Wetlands*, **12** (2), 1-12.
- Dale, P.E.R. and Hulsman, K.,** (1990). **A critical review of salt marsh management methods for mosquito control**. *Reviews in Aquatic Sciences*, **3** (2,3), 281- 311.
- Dale, P.E.R. and Hulsman, K.,** (1988). **To identify impacts in variable systems using anomalous changes: a salt marsh example**. *Vegetatio*, **75**, 27-35.

- Easton, C.E., (1994) Mosquito and biting midge control in the Tweed Council area with an emphasis on planning issues and habitat modification.** In: *Supplement to the MCCA Bulletin, Nov 1994. Conference papers and/or abstracts, 1.1.1 - 1.1.6*
- Edwards, P.B., (1989) Seasonal changes in larval populations of *Culicoides subimmaculatus* Lee & Reye (Diptera: Ceratopogonidae) with observations on the influence of tides on larval ecology.** *Australian Journal of Marine and Freshwater Research*, **40**, 69-78.
- Hughes, P.B., (1994) Insect growth regulators: an overview of the different groups and potential for mosquito control in Australia.** In: *Supplement to the MCCA Bulletin, Nov 1994. Conference papers and/or abstracts, 6.1.1.*
- Hulsman, K., Dale, P.E.R., and Kay, B.H., (1989) The runnelling method of habitat modification: an environment-focused tool for salt marsh mosquito management.** *Journal of the American Mosquito Control Association*, **5** (2), 226-34.
- Hyland, S.J. and Butler, C.T., (1988) The distribution and modification of mangroves and saltmarsh-claypans in southern Queensland.** Queensland Department of Primary Industries, Fisheries Research Branch, Information Series QI89004, 74pp.
- Kettle, D.S., Reye, E.J. and Edwards, P.B., (1979) Distribution of *Culicoides molestus* (Skuse) (Diptera: Ceratopogonidae) in man-made canals in south-eastern Queensland.** *Australian Journal of Marine and Freshwater Research*, **30**, 653-60.
- Marks, E.N. and Reye, E.J., (1982) (revised edition) An atlas of common Queensland mosquitoes with a guide to common Queensland biting midges.** Queensland Institute of Medical Research, Herston, 76 pp.
- Morton, R.M., Beumer, J.P. and Pollock B.R., (1988) Fishes of a subtropical Australian saltmarsh and their predation upon mosquitoes.** *Environmental Biology of Fishes*, **21** (3) 185-194.
- Morton, R.M., Pollock, B.R. and Beumer, J.P., (1987) The occurrence and diet of fishes in a tidal inlet in a saltmarsh in southern Moreton Bay, Queensland.** *Australian Journal of Ecology*, **12**, 217-237.
- Mosquito Control Association of Australia, (1994) Supplement to the MCAA Bulletin, issued November 1994 and March 1995.** Conference Papers and/or abstracts, Brisbane.

- Mottram, P., (1995) Draft guidelines to prevent mosquito and biting midge problems in new development areas.** Queensland Health, Brisbane, 34 pp.
- National Registration Authority, (1996) Interim requirements for the registration of agricultural and veterinary chemical products.** National Registration Authority for agricultural and veterinary chemical products, Parkes, ACT, 257 pp.
- Pierce, R.H., Brown, R.C., Hardman, K.R., Henry, M.S., Palmer, C.L.P., Miller, T.W. and Wichterman, G., (1989) Fate and toxicity of temephos applied to an intertidal mangrove community.** *Journal of the American Mosquito Control Association*, **5** (4), 569-78.
- Queensland Health Department, (1993) Report of the Arbovirus Taskforce, prepared for the Minister for Health.** Queensland Health Department, Brisbane, 26 pp.
- Quinn, R.H., (1992) Fisheries Resources of the Moreton Bay Region.** Queensland Fish Management Authority, Brisbane, 53 pp.
- Reye, E.J., (1982) Midges, man and the environment.** *Operculum*, **5** (4), 153-57.
- Williams, R., (1994) Administrative arrangements to facilitate efficient and effective mosquito control - the CLAG story.** In: *Supplement to the MCCA Bulletin, Nov 1994. Conference papers and/or abstracts*, 1.2.1-2.6.
- WHO, (1982) Data sheet on the biological control agent *Bacillus thuringiensis* serotype H-14, World Health Organisation.** Unpublished communication.
- Zeller, B. and Beumer, J., (1996) Departmental Procedures for Permit Applications Assessment and Approvals to Perform Works or Related Activity in a declared Fish Habitat Area.** Queensland Department of Primary Industries Fish Habitat Management Operational Policy 002, 88 pp.

Acknowledgements

This document has been prepared with the knowledge and experience of many Fisheries Group staff, acquired in dealing with day to day issues of mosquito control in coastal wetlands. Thanks to all involved. Your contributions and feedback greatly assisted the compilation of this document. Special thanks to Ross Quinn and staff, Rick Exten, Ross Lloyd, Stuart Hyland, Kurt Derbyshire, Zoe Draheim and Anne Clarke. Assistance from QDPI Animal and Plant Health Service is also gratefully acknowledged.

APPENDIX 1 Coastal biting insect pest reference tables (mosquitoes and biting midges).

Table 1 Known and potential mosquito vectors and their larval and adult habitats. Note: reference has been made to arboviruses transmitted by marine, brackish and freshwater species.

| SPECIES | LARVAL HABITAT | ADULT HABITAT | QUEENSLAND/AUSTRALIAN DISTRIBUTION | POTENTIAL VECTOR | ARBOVIRUS CARRIED |
|----------------------------------|---|--|---|------------------------------------|--|
| <i>Aedes vigilax</i> * | saltmarsh <i>Sporobolus</i> sp, <i>Suaeda</i> sp, <i>Sarcocornia</i> sp. | includes mangroves, pneumatophores or other trees with dense foliage, pest range 50 km, some inland localities | Australian coasts, NSW and northwards around to Perth | MVE | <i>RRV, Barmah Forest, heart worm in dogs, periodic filariasis (New Caledonia)</i> |
| <i>Culex sitiens</i> * | brackish pools left by high tides, salting irrigation channels | pest range 35 km | Queensland coast, NSW, NT and WA | competent laboratory vector of RRV | |
| <i>Aedes funereus</i> | brackish pools | mangroves, tea trees, paper barks | Queensland coast, NT | | |
| <i>Anopheles farauti</i> | uncommon in deep shade, found in brackish pools | | Queensland - from Ingham north, west coast of peninsula, north of Straaten River, NT and WA | | <i>malaria and filariasis</i> |
| <i>Aedes aegypti</i> | freshwater in artificial containers, tree holes, discarded tyres | indoors, caravan parks | Queensland, previously in NSW, NT and WA | RRV and MVE | <i>dengue viruses (world wide), yellow fever (Africa and New World tropics), heart worm in canines</i> |
| <i>Aedes notoscriptus</i> * | containers | | Australia wide | suspected RRV carrier | <i>RRV (NZ) heart worm in dogs</i> |
| <i>Anopheles annulipes</i> | temporary/ permanent ground pools, artificial containers | pest range 3 km | Australia wide | | <i>malaria and filariasis</i> |
| <i>Culex annulirostris</i> * | vegetated fresh water pools, swamps | pest range 5 km | Australia wide | | <i>RRV, periodic filariasis, MVE, heart worm in dogs</i> |
| <i>Coquilletidia xanthgaster</i> | vegetated swamps, water holes | swamps and lagoons, pest range 1.5 km | NT, Q, NSW and WA | none known | none known |
| <i>Mansonia uniformis</i> * | vegetated swamps, water holes | swamps and lagoons, pest range 1.5 km | NT, Q, NSW, Vic and WA | RRV and MVE | <i>periodic and non-periodic filariasis (New Guinea)</i> |

| | | | | | |
|-------------------------------|---|-------------------------------|----------------|--|---|
| <i>Culex quinquefasciatus</i> | polluted water close to human habitation, sewage effluent treatment plants, polluted creeks or dams | remain close to breeding site | Australia wide | | <i>periodic filariasis, bird malaria and heart worm in dogs</i> |
|-------------------------------|---|-------------------------------|----------------|--|---|

RRV = Ross River virus, MVE = Murray Valley encephalitis,* = known or potential vector of RRV, [Source: Mottram (1995); Dale (1993); Queensland Health (1993); Marks and Reye (1982)]

Table 2 Main species of Ceratopogonidae (biting midges) affecting Queensland residents in coastal areas.

| SPECIES | LARVAL HABITAT | VEGETATION | QUEENSLAND/ AUSTRALIAN DISTRIBUTION AND ADULT PEST RANGE |
|--|--|-----------------------------------|---|
| <i>Culicoides subimmaculatus</i> | estuarine sand to sandy mud or clay, in association with burrows of surface tunnelling crabs, MHWS or above | sparse | Port Douglas and southwards |
| <i>Styloconops australiensis</i> | sandy substrates, suspected at the level of highest spring tides on stable or building sandy beaches, waves moderate, bays and estuaries | none | along the coast of mainland Australia, activity confined to shore but may extend some 50 m from breeding site, shelter of the Great Barrier Reef |
| <i>Culicoides molestus</i> | natural - clean estuarine sand, open beaches artificial - canal estate developments from MHWS to mean tide level | none | Cairns to southern NSW, 0.4 -1.5 km from breeding site |
| <i>Culicoides</i> sp. near <i>subimmaculatus</i> (undescribed) | surface feeding tunnels of the crab <i>Mictyris livingstonei</i> in open sandy estuarine flats and under mangrove canopies above MHWN, artificial habitats created by sand pumping fill, ditching in soils with a sand underlay and by clearing mangroves so that the silt layer is eroded off | variable | Port Douglas is the southern limit, northern limit unknown, 400m from breeding site, houses |
| <i>Culicoides ornatus</i> | estuarine mud, around MHWN, surface tunnelling crab burrows in creeklets and cut off meanders | <i>Aegiceras corniculatum</i> | Tin Can Bay and northwards to at least Port Hedland in WA, 1.6 km from breeding site in drier parts of the Queensland coast and up to 3.2km in wetter coastal areas |
| <i>Culicoides marmoratus</i> | estuarine mud and/or sand, from MHWS to MHWN or just below | sometimes in mud with algal cover | Queensland, up to 16 km from breeding site |

Source: Marks and Reye (1982), Mottram (1995)

APPENDIX 2

a) Chief chemical and biological control agents (registered and non-registered) which have been used or may have been considered for use by local authorities for mosquito and biting midge control.

| Chemical Control Agents (active ingredients) | Registered /Approved Products Formulation | pest which may be targeted | Situation for use |
|--|---|--|---|
| temephos - registered under the trade name ABATE [organophosphorus compound] | Abate 100 E Insecticide (liquid) Abate 10 and 50 SG Mosquito Larvicide Granules | mosquitoes (larvae and adults), nuisance midges (Chironomid larvae) | aerial application to open water, swamps, marshes, dams and breeding waters |
| pirimiphos-methyl * [organophosphorus compound] | | mosquitoes | registered for control of mosquitoes in domestic/commercial/industrial buildings etc; not registered for use in water situations |
| s-methoprene trade names include Altosid XR, Altosid and Altosand [insect growth regulator] | Altosid XR Extended Residual Briquets, Altosid Pellets Mosquito Growth Regulator, Altosid Mosquito Growth Regulator | mosquitoes | permits issued for control of mosquitoes in various water situations (expire on 28 February 1997) <i>Queensland Only</i> |
| bioresmethrin * [synthetic pyrethroid] | | mosquitoes | registered for control of mosquitoes in domestic buildings etc; not registered for use in water situations |

* use of the product for mosquito or biting midge control contravenes the Chemical Usage legislation

| Biological Control Agents | Registered /Approved Products Formulation | Pest which may be targeted | Situation for use |
|--|---|---|--|
| <i>Bacillus thuringiensis</i> var. <i>israelensis</i> (<i>Bti</i>) [bacterium] Registered under the trade names Cybate, Vectobac G and Vectobac 6AS | Cybate Biological Mosquito Larvicide Abbott Vectobac G Biological Larvicide Vectobac 6AS Biological Larvicide | mosquito larvae <i>Aedes vigilax</i> | control in salt marshes and tidal waters |

b) Status of habitat modification measures which may have been considered for use by local authorities for mosquito and biting midge control.

| Physical Control Measures | Target insect and stage | Impacts on Non-target Species |
|---|---|--|
| runnelling | mosquito larvae | Ongoing monitoring of a runnelled site at Coomera in SEQ by staff of Griffith University over approximately the last 10 years. Stabilisation of the area with respect to water table, becoming wetter and less saline; no change in species composition but a decrease in the density of saltwater couch in the vicinity of works; enhanced fish access (temporary). |
| open marsh water management | mosquito larvae | Exposure of marine sediments and potential acid sulfate soil problems, erosion, major drainage modification, change in vegetation composition, enhanced fish access (permanent). |
| impoundment | mosquito larvae | Exposure of marine sediments and potential acid sulfate soil problems, erosion, major drainage modification, change in vegetation composition, enhanced fish access (permanent). |
| a) strategic and periodic flooding of mangrove areas or b) changing substrates to prevent colonisation of sediments by burrowing crabs (experimental) | biting midge larvae <i>Culicoides ornatus</i> | Preliminary discussions with regard to prevention of biting midge colonisation in intertidal habitats by altering periods of tidal inundation (placement of tidal valves) and changing sediment type (gravel/concrete) in mangrove areas have been undertaken in preparation for an environmental management plan for control of biting midges at Eli Creek, Hervey Bay. Impacts on limited tidal exchange and on littoral vegetation and crab colonisation identified. |
| beach-raking (experimental) | biting midge larvae <i>Culicoides molestus</i> | Trials in canal beaches by Tweed Shire Council showed raking reduced the number of <i>C. molestus</i> when undertaken on a weekly basis, further research is proposed to assess different seasonal conditions (e.g. rainfall at the time of raking may limit the success of the control method by enhancing the survival of biting midge larvae). |
| sandbar excavation (experimental) | biting midge larvae <i>Culicoides molestus</i> | Proposed lowering of the preferred breeding zone of <i>C. molestus</i> in a sandbar, provision of new habitat for seagrass colonisation (Tweed River). |

Sources : Easton (1994); Dale (1993)

APPENDIX 3

Information regarding stocking of native fish for mosquito control.

Table 1 Drainage basins of Queensland as defined by Department of Natural Resources

| Division | | Division/ Basin | | Division | | Division/ Basin | |
|----------|------------------------|-----------------|---------------------|----------|-------------------|-----------------|-----------------------|
| No. | Name | No. | Name | No. | Name | No. | Name |
| I | North East Coast | 101 | Jacky Jacky | IV | Murray Darling | 416 | Border Rivers (a) |
| | | 102 | Olive - Pascoe | | | 417 | Moonie |
| | | 103 | Lockhart | | | 422 | Balonne - Condamine |
| | | 104 | Stewart | | | 423 | Warrego |
| | | 105 | Normanby | | | 424 | Paroo |
| | | 106 | Jeannie | IX | Gulf | 910 | Settlement (b) |
| | | 107 | Endeavour | | | 911 | Mornington Island |
| | | 108 | Daintree | | | 912 | Nicholson (c) |
| | | 109 | Mossman | | | 913 | Leichhardt |
| | | 110 | Barron | | | 914 | Morning |
| | | 111 | Mulgrave - Russell | | | 915 | Flinders |
| | | 112 | Johnstone | | | 916 | Norman |
| | | 113 | Tully | | | 917 | Gilbert |
| | | 114 | Murray | | | 918 | Staaten |
| | | 115 | Hinchinbrook Island | | | 919 | Mitchell |
| | | 116 | Herbert | | | 920 | Coleman |
| | | 117 | Black | | | 921 | Holroyd |
| | | 118 | Ross | | | 922 | Archer |
| | | 119 | Haughton | | | 923 | Watson |
| | | 120 | Burdekin | | | 924 | Embley |
| | | 121 | Don | | | 925 | Wenlock |
| | | 122 | Proserpine | | | 926 | Ducie |
| | | 123 | Whitsunday Island | | | 927 | Jardine |
| | | 124 | O'Connell | | | 928 | Torres Strait Islands |
| | | 125 | Pioneer | | | X | Lake Eyre |
| | | 126 | Plane | 002 | Diamantina | | |
| | | 127 | Styx | 003 | Coopers Creek | | |
| | | 128 | Shoalwater | 004 | Lake Frome | | |
| | | 129 | Waterpark | 007 | Hay | | |
| | | 130 | Fitzroy | XI | Bulloo | 011 | Bulloo |
| | | 131 | Curtis Island | | | | |
| | | 132 | Calliope | | | | |
| | | 133 | Boyne | | | | |
| | | 134 | Baffle | | | | |
| | | 135 | Kolan | | | | |
| | | 136 | Burnett | | | | |
| | | 137 | Burrum | | | | |
| | | 138 | Mary | | | | |
| | | 139 | Fraser Island | | | | |
| | | 140 | Noosa | | | | |
| | | 141 | Maroochy | | | | |
| | | 142 | Pine | | | | |
| | | 143 | Brisbane | | | | |
| | | 144 | Stradbroke Islands | | | | |
| | | 145 | Logan - Albert | | | | |
| | | 146 | South Coast | | | | |

Table 2 Native fish species suitable for mosquito control in drainage basins of Queensland.

| | | |
|---------------------------------|---|-----------------------------|
| Eastern rainbow fish | <i>(Melanotaenia splendida splendida)</i> | Basins 101 - 133 |
| Duboulay's rainbow fish | <i>(Melanotaenia duboulayi)</i> | Basins 128 - 146 |
| Murray rainbow fish | <i>(Melanotaenia fluviatilis)</i> | Basins 416 - 424 |
| Chequered rainbow fish | <i>(Melanotaenia splendida inerrant)</i> | Basins 910 - 928 |
| Desert rainbow fish | <i>(Melanotaenia splendida tatei)</i> | Basins 001 - 007; 011 |
| Fly - specked hardyhead | <i>(Craterocephalus stercusmuscarum)</i> | Basins 101 - 146 |
| Empire gudgeon | <i>(Hypseleotris compressa)</i> | Basins 101 - 146; 910 - 928 |
| Firetail gudgeon | <i>(Hypseleotris galii)</i> | Basins 128 - 146 |
| Purple spotted gudgeon | <i>(Mogurnda adspersa)</i> | Basins 107 - 146 |
| Northern purple spotted gudgeon | <i>(Mogurnda mogurnda)</i> | Basins 910 - 928 |
| Pacific blue - eye | <i>(Pseudomugil signifer)</i> | Basins 107 - 146 |
| Olive perchlet | <i>(Ambassis agassizi)</i> | Basins 114 - 146; 416 - 424 |
| Muller's perchlet | <i>(Ambassis mulleri)</i> | Basins 001 - 007 |
| Australian smelt | <i>(Retropinna semoni)</i> | Basins 002 - 003 |

Source: Anon. (1992)

APPENDIX 4 Habitat Modification and Saltmarsh Mosquito Control

(i) *Habitat modification options for saltmarsh mosquito control*

An outline of methods which may be included in habitat modification program proposals submitted to Fisheries for assessment and authorisation. This summary is adopted from Hulsman, Dale and Kay (1989) and includes information documented by chief investigators in southeast Queensland (refer to Anon., 1991). Additional information regarding impoundment (Catts et al, 1963) has been sourced from Dale and Hulsman (1990).

| Features | Methods | | | |
|--------------------------------------|--|--|-------------------------------|---|
| | Runnelling* | Open Marsh Water Management (OMWM) | Ditching | Impoundment |
| Hydrology | increases tidal flushing | increases tidal circulation and retains fish reservoirs | drains | prevents saltwater entering or regulates its flow, stores water |
| Pattern of Structure | follows lines of natural flow of water | 'natural looking' | regular (often parallel grid) | closed system (freshwater) or open (linked to estuaries via culverts) |
| Depth of Structure | <30cm | a) selective ditch 75 cm b) sill ditch 10-20 cm c) circuit radial/radial 45cm d) pond/reservoir (sides) 0.3 - 1.0 m | 60-90 cm | pond depth variable but 25 - 30 cm may be sufficient (Catts <i>et al</i> , 1963) use of culverts, floodgates, barrages |
| Structure width : depth ratio | 3:1 | a) selective ditch - variable/narrow - min depth 0.15m and max 0.3m b) sill ditch - variable/narrow c) circuit radial/radial variable/narrow | narrow | |
| Shape of Structure | spoon shaped with gently sloping concave sides | steep sided | steep sided | |

**Note:* With the exception of runnelling, Fisheries Group can not provide approval in principal to habitat modification methods outlined in the above table. Additional assessment of impacts and construction methods associated with habitat modification needs to be undertaken. In this regard, Permit issue may only be considered for trial modifications and is to be restricted to one site per Permit.

***(ii) Guidelines for Applications Made Under Section 51 (Fisheries Act, 1994)
(Runnelling)***

Habitat Modification for Mosquito Control in Coastal Wetlands.

In principle, Fisheries Group supports runnelling (where suitable) as an alternative to the use of chemicals for adulticiding or larviciding in known mosquito breeding areas and encourages the gradual phasing out of chemical use in fisheries habitats.

Accepted Design Concept for the Construction of Runnels:

- Runnels must follow naturally occurring drainage lines and should be outlet via existing depressions which may occur along the proposed tidal source embankment.
- Surveying and topographical mapping of the area may be used to determine the direction and placement of runnels which will assist in the overall function of the runnel system, in terms of proposed gradual flushing with receding tides.
- Runnels must be spoon-shaped to reduce the likelihood of erosion and turbid plumes, following flushing.
- The ratio of runnel depth to width is 1:3
- Maximum runnel depth < 0.3 m and width < 0.9 m
- Construction may be undertaken by hand or an accepted method of mechanised runnel construction may be used (e.g. Carpenter Parker Runnelling Machine or CPRM).
- The ground pressure exerted during runnel construction is to be less than 2.5 pounds per square inch to reduce secondary impacts resulting from construction practices
- Spoil is to be removed from the construction site or may be placed in isolated depressions (e.g. in other mosquito habitats) in the upper saltmarsh zone.
- Spoil may be broadcast over the surrounding saltmarsh-claypan vegetation in a fine layer, using an accepted method of broadcasting for which the resultant spoil layer < 0.01m in depth (e.g. using the CPRM).
- runnel construction should be undertaken during dry conditions

Runnelling Proposals (local authorities)

For Fisheries Group authorisation of runnelling or other habitat modification proposals in marine insect pest breeding areas, an application may be made under Section 51, *Fisheries Act*.

Applicants should provide:

1. the exact location of the nominated site (registered title to the lands and property plan)
2. an indication of the site's suitability for runnelling, e.g. existing natural drainage lines, accessibility, the proximity of the breeding site to existing residential areas
3. details about the actual works to be performed such as:
 - the position and direction of runnels throughout the saltmarsh as determined by a survey of the area's topography (this should be indicated in the field by plotting proposed runnel courses and using markers for inspection by Fisheries staff),
 - the source of tidal flushing and the number and location of outlets to the tidal source required,
 - an indication of whether spoil from the construction of the runnels is proposed to be removed or placed in the saltmarsh-claypan zone,
 - the depth of the runnels required with reference to erosion potential and a discussion of techniques to minimise erosion (limiting the gradient of runnels, meandering runnels, sheet dispersal at outlet points), and
 - proposed marine plant disturbance works regarding the removal of saltwater couch and samphires for runnel construction and also additional disturbance such as removal of pneumatophores and/or complete removal of mangrove trees which may be in the runnel path or outlet.
4. the proposed method of runnel construction, using machinery (e.g. Carpenter Parker Runnelling Machine) or by hand *must* be addressed.
5. An indication that the disturbance to fisheries habitat is justified, should be provided:

Including:

- identification of the target mosquito species and confirmation of its vector status in the nominated area (i.e. whether it is a known vector of RRV or some other disease),
- provision of advice in relation to the extent of surveillance work undertaken (e.g. on a weekly or fortnightly basis),

- reference to the number of mosquitoes (provided as dip counts) and the threshold count of larval mosquitoes which determines the need for aerial application of larvicide,
 - a summary of the number of aerial treatments required in the nominated area on an annual basis, and
 - any advice regarding predictive modelling of larval mosquito development in relation to tidal data, e.g. SEQ tides $\geq 2.4\text{m}$ may provide adequate inundation and therefore enhance mosquito breeding at certain times of the year or climate data such as rainfall levels which may be useful in determining peak seasons for the undertaking of marine insect pest control.
5. Details of the applicant's routine field inspections of breeding areas as part of an existing mosquito monitoring program (e.g. fortnightly for chemical control) should be provided and may be used to determine the success rate of mosquito reduction post - modification, if the proposal is approved.
6. Details Other Approvals which may be required such as consent from property owners including Department of Natural Resources where areas may be within Unallocated State Land, or a Marine Park Permit may be required.

Documentation of Management Strategies

In order to minimise the number of Permits for habitat modification which would require individual assessment by Fisheries staff, management strategies that address longer term planning arrangements (e.g., 3 to 5 year plans) for insect pest control may be agreed-to by Fisheries staff and individual local authorities, regional coordinating committees or developers (where programs may be associated with individual development proposals). Local Fisheries staff should be contacted in regard to management strategy development and approvals that may be granted. Permit conditions may reflect the accepted management strategy for example, a three year Permit for habitat modification may refer specifically to the number of proposed locations, the number of runnels at each location and should refer to any maintenance requirements (e.g., hand removal of mangrove seedlings from within constructed runnels). Refer to Appendix 5 for an indication of key elements for Plan submissions.

To phase in habitat modifications, a coordinated approach may need to be adopted to allow integrated pest control management (i.e., a combination of methods physical, chemical and biological). It should be recognised that not all management strategies will rely solely on one form of control, particularly if an applicant seeks to implement new physical control programs as part of the planned approach to an existing control program.

Note:

Design concepts for Open Marsh Water Management methods and physical modification of breeding areas for biting midge species have not been agreed to by Fisheries Group. These will be addressed following application for trial works and included in revision of this policy.

Fisheries Group Contacts:

| Region | Office | Address and Telephone Number |
|-------------------|---------------|---|
| <i>South-east</i> | Deception Bay | Southern Fisheries Centre PO Box 76 DECEPTION BAY Q 4508 (07) 3817 9500 |
| | Burnett Heads | PO Box 1143 BUNDABERG Q 4670 (071) 537 888 |
| | Rockhampton | PO Box 6014 ROCKHAMPTON Q 4702 (079) 360 211 |
| <i>Northern</i> | Mackay | PO Box 668 MACKAY Q 4740 (079) 518 724 |
| | Townsville | PO Box 1085 OONOONBA Q 4811 (077) 222 624 |
| | Cairns | PO Box 5396 CAIRNS Q 4870 (070) 529 888 |

(iii) Criteria for Application Assessment and Approval - Section 51

Runnelling Proposals (local authorities)

- In general, application assessment focuses upon the extent or amount of disturbance to marine plants (within the saltmarsh environment) and other fisheries habitat which may be expected if approval is granted
- Applications include details about the nominated area(s) to be considered by Fisheries staff as part of a Section 51 Permit assessment and an associated Fisheries field inspection of the nominated area and proposed runnelling program

Site Inspections

Departmental site inspections should evaluate and verify that the information provided in the application is correct, to enable a recommendation of support (or refusal) to be made. Inspections also provide an opportunity to discuss possible deficiencies of the application in the context of the nominated site with the applicant and, if necessary, a request for additional information may be made.

Applicants should provide a clear indication of the proposed runnel paths for observation on the inspection day (e.g. using spray paint or markers).

Site inspections should determine:

- a) possible benefits to fisheries habitat from the proposed works, including a reduction in the use of chemicals which may be harmful to non-target marine fauna;
- b) the exact number and location of outlets and runnels;
- c) marine plant species to be disturbed;
- d) the size of the proposed disturbance;
- e) possible alternative disturbance paths;
- f) the removal, placement or broadcasting of any spoil from the works; and
- g) the proximity of works to any Fish Habitat Areas.

Assessment proformas

Assessment should be undertaken on forms as stated in FHMOP 001 Departmental Procedures for Permit Applications Assessment and Approvals for Marine Plants (Couchman *et al*, 1996). A recommendation to issue or refuse a permit should then be made to the delegated fisheries officer.

Permit Conditions

Once an assessment is completed and a recommendation to issue a permit is accepted, a Section 51 Permit may be drafted to include specific conditions as part of the authorisation. Follow-up monitoring of the Permit area, to be undertaken by the Permittee, should be requested as a condition of Permit in order to determine the success of the runnelling works, with regard to the reduction of mosquito breeding habitat and actual numbers.

Specific Permit Conditions will apply to Section 51 Permits issued for insect pest control programs and should not be restricted to the following standard conditions:

- the level of any spoil placed in depressions on tidal lands must not exceed the level of soil in immediately adjacent areas,
- a report providing advice of the completion of works and detailing all activities undertaken and the effectiveness of habitat modifications, including any changes in larval mosquito distribution and abundance, as observed by the applicant's staff, is to be provided within 30 days of completion of works to the District Officer, Queensland Boating and Fisheries Patrol (address) and the Fisheries Manager (Fisheries Group), Department of Primary Industries (address), and
- construction should be undertaken during dry conditions.

Other approvals

Other approvals for the proposed works may be required by the local authority, e.g. Department of Environment (Environmental Park, Marine Park or National Park Permits), in conjunction with a Section 51 Permit.

APPENDIX 5

A draft Strategic Local Authority Vector Eradication Plan (see below) which specifically addresses fisheries issues is currently being negotiated with Local Authorities by Fisheries staff in southeast Queensland.

PROPOSED LAYOUT FOR THE STRATEGIC PLANNING & IMPLEMENTATION OF HABITAT MODIFICATIONS AND CHEMICAL APPLICATIONS FOR MOSQUITO CONTROL IN KNOWN BREEDING AREAS

The Strategic Plan to be adopted by Council should specifically detail the key Fisheries issues outlined during assessment of project impacts and requirements. Subordinate issues should be described at a level appropriate to the extent of environmental impacts.

A. PRE-MODIFICATION

1. EXECUTIVE SUMMARY

- **provide for a broad description which forms the basis of the strategic plan to be adopted by Council including the duration for which the Plan shall be in place (e.g. 3-5 years)**

2. BACKGROUND

- **overview of current methods of mosquito control & impacts on fisheries resources**
- **provide justification for proposed works including the identification of “hot spots” e.g.:**
 - * research & monitoring undertaken by Council relevant to mosquito control, outlining the prevalence of each species;
 - * complaint investigations, estimated risk of disease (such as Ross River virus) and an indication of levels of transmission risk associated with both saltmarsh and freshwater vectors, dip counts and thresholds for chemical treatment, nature and extent of current control practices (larviciding versus adulticiding); and,
 - * health benefits to the community with a discussion of how the proposed program relates to other control programs already in place (chemical control programs and/or community education with respect to eradication of freshwater breeding areas in dwellings).
- **statutory planning issues and considerations**
 - * methods of land use planning (e.g. Development Control Plans) which avoid the need for large scale mosquito control programs in the future, particularly in relation to Fish Habitat Areas. Examples could include a review of planning schemes, incorporation of set back distances (buffer zones), urban landscape and drainage (including discharge) layout and design.

3. OBJECTIVES OF HABITAT MODIFICATION

- **broad statement(s) of intent for proposed habitat modification plans & management**
 - * these objectives should embrace minimising impacts to fisheries habitat; and
 - * proposed changes to chemical treatment programs.

4. SCOPE OF HABITAT MODIFICATION

- **provide locality plans of known breeding sites which are addressed in the plan**
- **indicate the tenure arrangements for lands within and immediately adjacent to the investigation area**
 - * include a copy of registered property survey plans, proof of tenure (title, rates notice etc), the name and address of any property holders involved.
- **detail the scope, type and location of proposed habitat modification works**

5. METHODOLOGY

- **outline of project requirements**
- **field survey**

- * describe methods used in an assessment of the existing aquatic environment (biological and physical) for which habitat modification is proposed, substantiating the effectiveness of field methods; and,
- * determine the feasibility of preferred habitat modification plans and outline all modification options which have been investigated.
- **criteria for site selection**
 - * conditions by which proposed habitat modification plans are suited to the selected sites.
- **site survey**
 - * describe methods used in an assessment of the existing aquatic environment (biological and physical) for which habitat modification is proposed, substantiating the effectiveness of field methods involved;
 - * to identify the timing, type and location of proposed works, including any associated access and disturbance paths involved; and,
 - * provide for a cross-section of proposed landforms and habitat modification structures, with site markings and design of proposed modification works
 - * identify the required maintenance of any existing structures (e.g. overgrown drains which may be contributing to the breeding problem).
- **construction methods**
 - * outline method(s), timing and duration of construction with respect to tidal patterns and extent of inundation; and,
 - * indicate volume of earthworks, treatment of excavated areas, and placement/treatment of fill.
- **approvals and schedule for obtaining approvals**
 - * the type and order in which all necessary approvals are to be obtained, indicating expected timing for such; and,
 - * Indicate those elements which are dependent on weather conditions and other contingencies.

6. SITE DESCRIPTIONS (BASELINE)

- **provide study details in relation to the existing aquatic (biological and physical) environment**
 - * describe the distribution and abundance of marine plants, indicating the relative function of marine plant communities, and the area of tidal and non-tidal land involved (include Highest Astronomical Tide (HAT), Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS));
 - * provide details of existing site levels as appropriate (by way of a map(s));
 - * describe the extent of existing and/or potential acid sulfate soils;
 - * briefly outline the extent of ponded waters for which physical modification is proposed; and,
 - * describe the extent of natural structures/disturbances (e.g. berms, cut off meanders or blocked creeks) and indicate the location of artificial structures (bunds, drains, trenches etc).

B. HABITAT MODIFICATION

1. ENVIRONMENTAL ASSESSMENT

- **criteria for impact assessment on fish habitats within areas proposed for physical modification**
 - * immediate and long-term, direct and indirect impacts on fisheries resources according to tidal zonation. Included should be information on the extent and type of marine vegetation to be lost and created with respect to topographic profiles indicating the extent of vegetation stability;
 - * outline the effects on ground/surface hydrology, disturbance of existing and/or potential acid sulfate soils, changes in the distribution of nutrients and sediments (including changes in erosion and deposition), effects on aquatic fauna (including epifauna, infauna) and flora; and,
 - * also include the need for and prioritisation of further research towards refining programs involving physical control.

2. MOSQUITO MANAGEMENT IN MODIFIED AREAS

- **management practices**
 - * outline management and mitigation measures to be implemented which minimise identified impacts during both construction and subsequent operation of proposed physical control structures; and,
 - * identify the allocation of responsibilities for management.
- **measures for impact mitigation and site enhancement**

- * mitigation measures to be undertaken in order to minimise all possible impacts on fish or aquatic life; and,
- * include possible rehabilitation/restoration strategies where appropriate.

3. RECOMMENDED/PROPOSED IMPLEMENTATION STRATEGIES

- **design of structures (e.g. runnels) and flows**
 - * provide recommendations on structural design and location of runnels in light of assessing fisheries impacts and extent of impact management requirements.

C. POST-MODIFICATION

1. MAINTENANCE OF MODIFIED AREAS

- **criteria for instigating future maintenance measures**
 - * identify the environmental parameters and conditions by which maintenance measures would need to be undertaken.
- **maintenance program**
 - * outline any strategies to be used to assist in ecosystem maintenance as well as maintenance of proposed landform modification structures; and,
 - * identify responsibility for maintenance of proposed habitat modifications.

D. CHEMICAL APPLICATION

1. CHEMICAL APPLICATION PROGRAM

- **use of chemicals as a means of controlling pest species**
 - * briefly provide a list of chemicals used to control pest species, the location(s) of use, methods of application and trigger for use.

E. MONITORING

1. MONITORING PROGRAM & REVIEW OF PRACTICES

- **monitoring program**
 - * identify the environmental parameters, chemical application and pest species to be monitored, including the frequency and responsibility for undertaking monitoring strategies.
- **review of implemented habitat management and monitoring practices for future maintenance requirements**
 - * responsibility for program review should be specified; and,
 - * indicate the success of modification works for combating mosquitoes (e.g. percentage reduction of chemical applications) and the surveillance methods adopted.
- **potential problems & solutions**
 - * identify outstanding problems which may influence the success of the project and any impacts which cannot be quantified, outlining proposed management solutions or contingency plans for such.
- **criteria for reviewing report**
 - * indicate the schedule or time frame by which a review of the strategic plan and/or each site plan thereof, should be established.

APPENDIX 6

Rehabilitation

Relevant Sections of Fisheries Act 1994

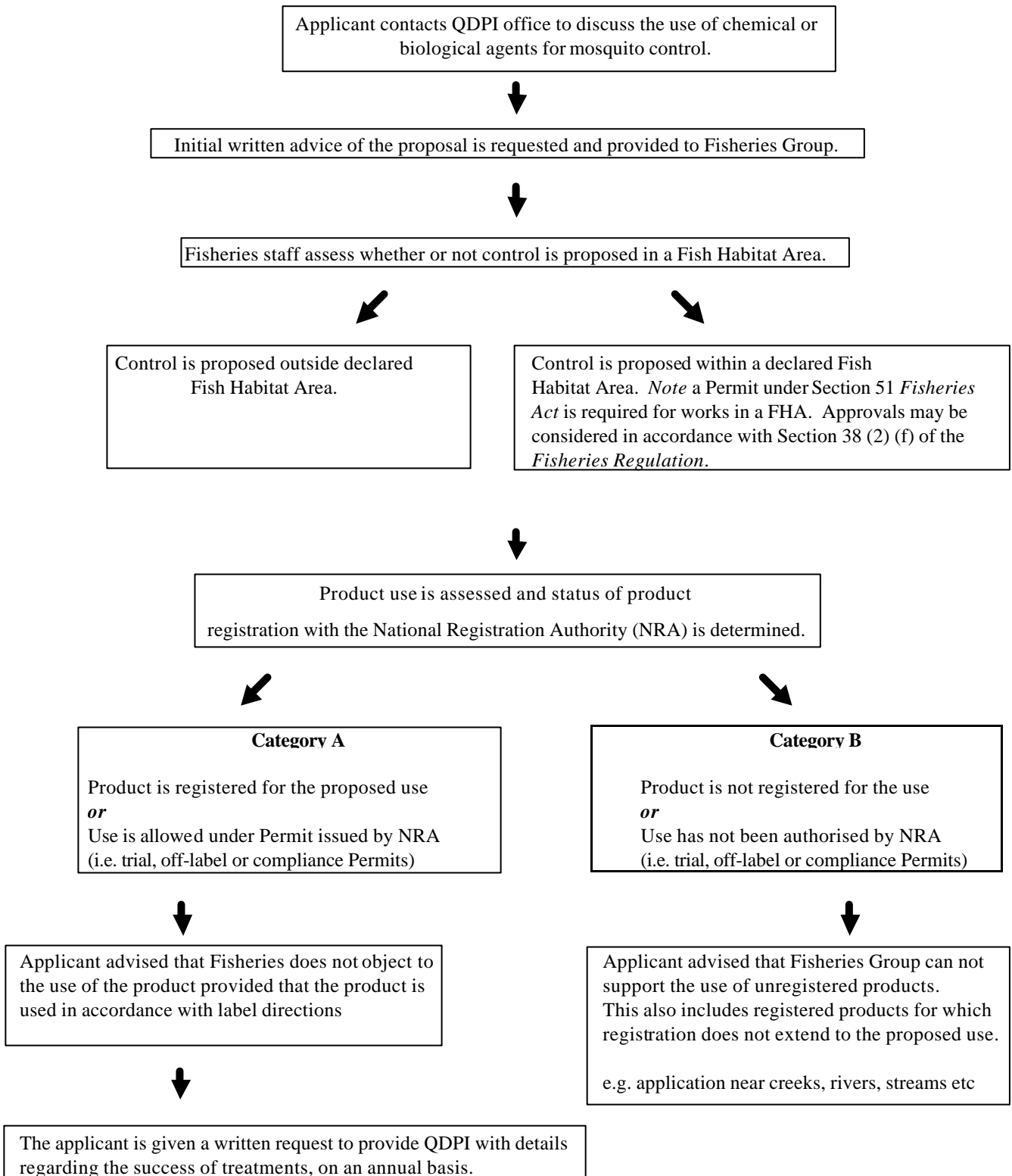
- A person may be required to bear the cost of rehabilitation or restoration of tidal lands under S.124 and S.125 of the *Fisheries Act* where:
- Under S.122 a person unlawfully performs or causes to be performed works or related activity in a declared fish habitat area
- Under S.51(d) a permit within a fish habitat is issued for works having community benefit but where a permit condition to rehabilitate or restore a declared fish habitat area is not met fully to the satisfaction of the chief executive.
- In either case above, the action(s) necessary to rehabilitate or restore a declared fish habitat area may be ordered by the chief executive and failure to comply may result in the costs incurred being by the person responsible and/or prosecution.

| <i>Category No.</i> | <i>Method</i> | <i>Location and duration</i> | <i>Assessment Fee</i> | <i>Annual Survey Fee</i> |
|---------------------|--|--|------------------------------|--------------------------|
| 1 | Research specifically relating to habitat/landform modification for mosquito control must be authorised by issue of a Fisheries Resources Permit (\$103.50 permit fee) (e.g. collection/identification of marine plants, undertaken for comparison of modified and unmodified sites and ongoing monitoring by the proponent). Note : Physical modification of a mosquito breeding site must be authorised in accordance with the categories listed below. Note: For research in FHAs refer to FHMOP 002 (Zeller and Beumer, 1996) | Maximum of 3 years | \$51 | nil units (\$0) |
| 2 | Investigation/survey/maintenance ie works undertaken pre- or post- habitat modification. a) pruning for investigation or survey* b) demonstration of runnelling machine (commercial purposes and on tidal land) c) clearing seedlings from runnels for maintenance* | * May be considered in FHA (mosquito control). (6 months) | 1 assessment unit (\$100) | 1 unit (\$100) |
| 3 | Runnelling, up to 10 sites/Council (by hand or by runnelling machine) | May be considered in FHA (mosquito control). (12 months) | 2 assessment units (\$200) | 2 units (\$200) |
| 4 | Use of chemical/biological agents specifically for mosquito control in a Fish Habitat Area (A or B) (one Permit per FHA). Note: a Permit may need to be issued to more than one Local Authority for specific FHAs. | FHA (12 months) | 2 assessment units (\$200) | 2 units (\$200) |
| 5 | Strategic Local Authority Vector Eradication Plan, extending over 3 - 5 years (covers total Shire or City) (Elements of Plan could include habitat/ landform modification of new sites, maintenance of existing sites, use of chemicals etc) Note: A plan may include an area in an adjacent Local Authority (LA) where breeding sites are shared but are separated by LA boundaries. | If in a FHA - runnelling may be considered (3 to 5 year option) | 3 assessment units (\$300) | 3 units (\$300) |
| 6 | Trial for open marsh water management (one site only) Trial impoundment (one site only) Trial biting midge breeding site modification (one site only) | not inside a FHA (12 months) | 5 assessment units (\$500) | 5 units (\$500) |

APPENDIX 8

Decision making process flow chart in relation to the use of biological/ chemical agents used in marine insect pest programs

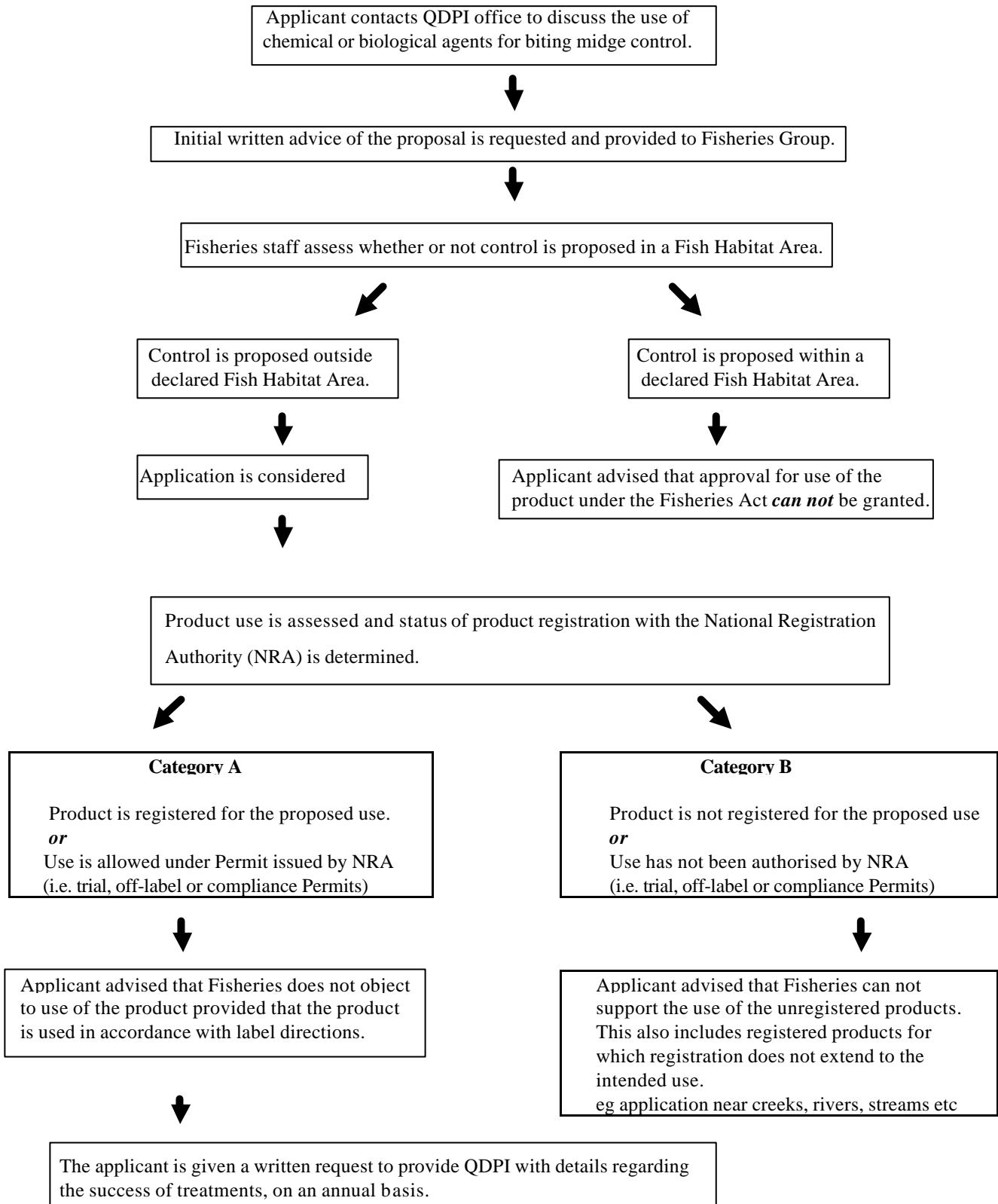
8A. - Mosquito control for public health benefit



APPENDIX 8

Decision making process flow chart in relation to the use of biological/ chemical agents used in marine insect pest programs

8B. - Biting Midge control for relief from nuisance insects



APPENDIX 8

Decision making process flow chart in relation to habitat/ landform modifications used in marine insect pest programs

8C. - Mosquito control for public health benefit

Applicant contacts QDPI office to discuss the implementation of a physical modification program for mosquito control.



Initial written advice of the proposal is requested and provided to Fisheries Group. Applicant advised of applications under Section 51, Fisheries Act required for disturbance of marine plants and that approvals may be considered in accordance with Section 38 (2) (f) *Fisheries Regulation* for approvals in Fish Habitat Areas.

Note: Applicant must be advised that trial habitat modifications may not be considered in Fish Habitat Areas.



Works are assessed in terms of type of modifications

- runnelling
- trial open marsh water management
- trial impoundment

and

Fisheries staff confirm that the proposed form of modification control is outside of any adjacent Fish Habitat Area.



Control is proposed outside declared Fish Habitat Area. Permit under Section 51 *Fisheries Act* is required.



Control is proposed within a declared Fish Habitat Area. The only form of habitat modification which may be considered for Permit is runnelling, either by hand or a recognised runnelling machine. *Note: a Permit under Section 51 Fisheries Act is required for works in a FHA. Approval may be considered in accordance with Section 38 (2) (f) of the Fisheries Regulation.*



Applicant is advised of fees associated with Permit assessment (refer to Appendix 7 Fees for application).

APPENDIX 8

Decision making process flow chart in relation to trial habitat/ landform modifications used in marine insect pest programs

8D. - Trial mosquito and biting midge control modifications

[Where disturbance to marine plants is proposed, Permit assessment procedures should follow those documented in FHMOP 001.]

Applicant contacts QDPI office to discuss the implementation of a trial physical modification program for mosquito *or* biting midge control.



Initial written advice of the proposal is requested and provided to Fisheries Group. Applicant advised of applications under Section 51, Fisheries Act required for disturbance of marine plants and that approvals may be considered in accordance with Section 38 (2) (f) *Fisheries Regulation* for approvals in Fish Habitat Areas.
Note: Applicant must be advised that trial habitat modifications may not be considered in Fish Habitat Areas.



Fisheries staff assess whether or not control is proposed in a Fish Habitat Area.



Control is proposed outside declared Fish Habitat Area. Permit under Section 51 *Fisheries Act* is required.



Applicant is advised of fees associated with Permit assessment (refer to Appendix 7 Fees for application).

APPENDIX 9

Other values of Fisheries Habitats

Marine plants play important non-fisheries oriented roles which may also be affected as a result of operational aspects of marine insect pest programs. For example, the *Nature Conservation Act 1992* provides for the protection of Illidge's ant-blue butterfly (*Acrodipsas illidgei*). The habitat of this species has been recorded as stands of the grey mangrove, *Avicennia marina*. Beale (1995) has reported areas where ant-blue butterfly habitat has been positively identified and these include Mary Riverheads, at Hervey Bay, and Point Halloran and Redland Bay in Moreton Bay. Proposed control programs in these locations have the potential to threaten certain species of ants associated with the larval stages of the butterfly's development. Two ways that current control programs may threaten the lifecycle of the ant-blue butterfly are:

- a) application of noxious chemicals as either larvicides/adulticides to ant colonies and butterflies; and
- b) removal or alteration of hydrological regimes affecting marine plant communities which may result in the long term loss of habitat.

An example of a commercially-oriented use of marine plants where insects are concerned is that of honey production where local bee colonies rely on flowering mangroves and marine plants. Honey production may be threatened as a result of exposure of bees to chemicals during fogging, using adulticides for pest mosquitoes or biting midges.