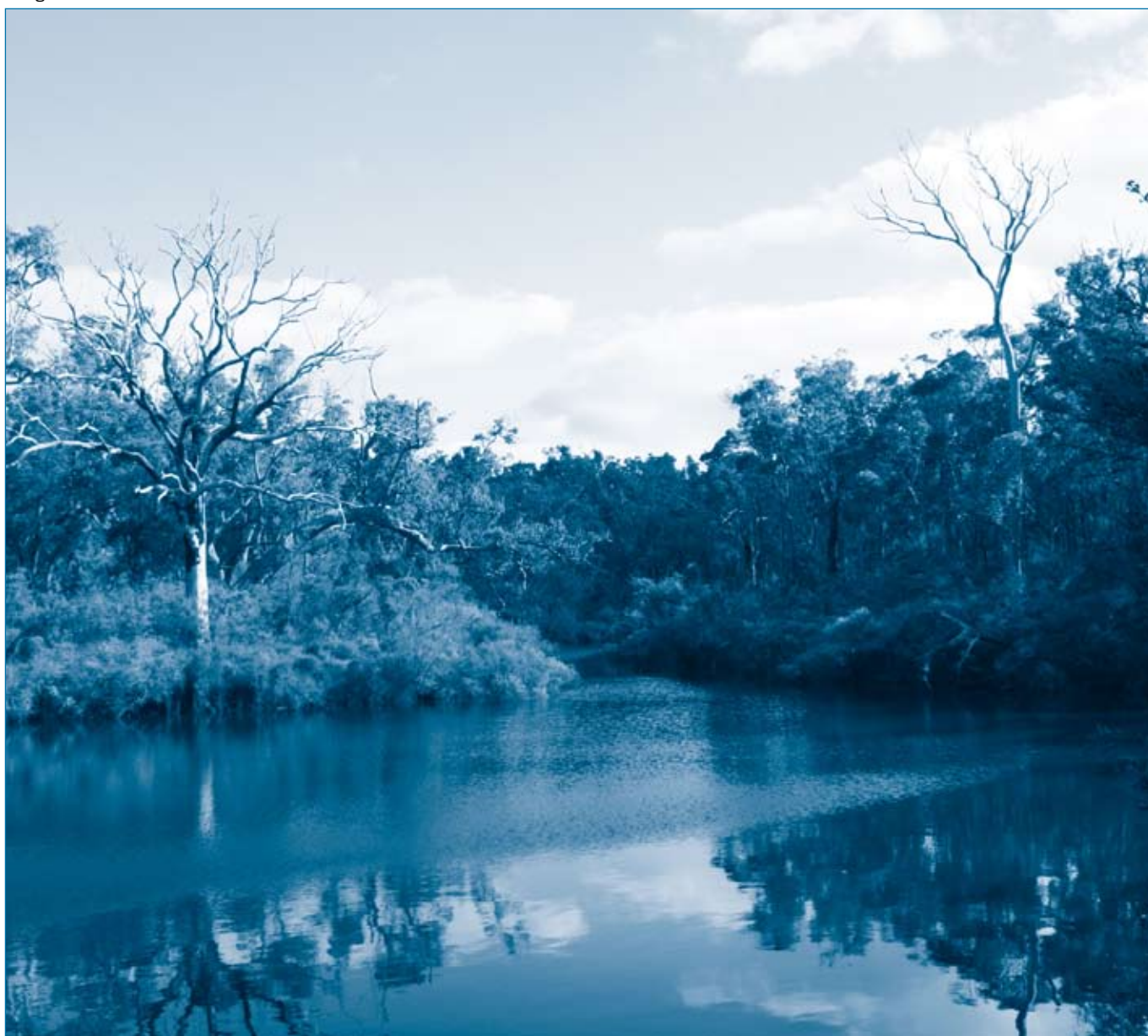


SOUTHERN INLAND BIOREGION

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Margaret River.



SOUTHERN INLAND BIOREGION

ABOUT THE BIOREGION

This region contains WA's only natural permanent freshwater rivers, which are fed by rainfall through winter and spring. These permanent rivers are restricted to the high-rainfall south-west corner of the State and flow through the significant native forest areas. Some of the rivers are more saline in their upper reaches owing to the effects of agricultural clearing of native vegetation in more inland areas.

Across the remainder of the Southern Inland bioregion, rivers flow primarily during the 3 months of winter rainfall, with very occasional summer flows from inland rain-bearing depressions resulting from decaying cyclones. Permanent fresh water bodies are essentially all man-made irrigation, water supply or stock-feeding dams. Some natural salt lakes also occur but generally dry out over summer each year.

The few natural freshwater rivers and man-made lakes support a small native fish fauna and create an environment, particularly in forest areas, which is highly valued by the community for a variety of recreational pursuits.

While there are no commercial fisheries in the Southern Inland bioregion, it provides significant recreational fishing opportunities. The major species fished recreationally are native marron, trout (both rainbow and brown trout) stocked by the Department of Fisheries into public dams and rivers, and feral redfin perch, an introduced, self-perpetuating stock. The native freshwater cobbler is also taken in small numbers, as are black bream artificially stocked into some inland impoundments.

Aquaculture development in the Southern Inland bioregion is dominated by the farm-dam production of yabbies, which can reach about 200 t annually depending on rainfall and market demand. Semi-intensive culture of marron in purpose-built pond systems provides around 50 t per year and has the potential to expand significantly.

Trout have historically been the mainstay of finfish aquaculture production in this region, originating from heat-tolerant stock maintained at the Department's Pemberton Freshwater Research Centre. Recent developments have focused on the short-term winter grow-out of trout in inland saline waters. Silver perch are also grown in purpose-built ponds in the warmer northerly areas to supply local markets, while intensive closed-circuit systems are being used to produce barramundi for the metropolitan restaurant trade.

Researchers from the Biodiversity and Biosecurity Branch are involved in several research projects related to freshwater biodiversity and conservation. One of these projects has been monitoring and assisting the restoration of hairy marron (freshwater crayfish) populations in the Margaret River. The critically endangered hairy marron (freshwater crayfish) is endemic to the Margaret River. However, the common, widespread smooth marron was accidentally introduced to the lower reaches of the river in the early 1980s. Over time, smooth marron have replaced hairy marron, first from the lower reaches (in the 1980s), then the middle reaches (in the 1990s) and at present hairy marron are only found in significant number in the upper reaches, but together with smooth marron.

Hairy crossed with smooth marron hybrids are common in the upper reaches of the Margaret River and the hybrids are fertile and appear to have similar ecological fitness. The displacement of hairy marron by smooth marron is most likely driven by hybridization of what appear to have been two geographically distinct sub-species. Maintaining populations of hairy marron in the upper reaches of the Margaret River is vital for the conservation of the sub-species and will require ongoing removal of smooth marron in combination with re-stocking pure hairy marron from the captive breeding program.

A different project funded by the Swan-Canning Research and Innovation Program (SCRIP) is aimed at determining the invasive potential of the feral cichlid (*Geophagus brasiliensis*) in Bennet Brook, a tributary of the Swan River. Recent salinity tolerance trials showed that this feral cichlid can easily cope with high salinities (>20 PPT). These results suggest that this feral cichlid could spread more widely throughout the Swan catchment in the future, posing a serious threat to native fish.



ENVIRONMENTAL MANAGEMENT

Regional Overview (Southern Inland)

The conservation of the 13 species of native fish in freshwater ecosystems in the south-west of WA is a growing issue for the Department of Fisheries. Many of these freshwater species are endemic to WA, and under pressure through increasing salinity, feral fish populations, infrastructure (bridges and dams) and adjacent land-use development.

The Department has initiated a freshwater fish-working group with representatives from the Department of Water and the Department of Environment and Conservation to facilitate information exchange and identify research projects and associated funding sources to mitigate environmental impacts and so better protect native fish species.

The Department also has an approval process in place for assessing proposals to translocate live non-endemic fish species into and within Western Australia, so as to minimise the environmental risks to freshwater ecosystems associated with this activity.

The Department also has 'introduced aquatic organism incursion' and 'fish kill incident response' programs in place.

FISHERIES

Marron Fishery Status Report

Prepared by *M. de Graaf and T. Baharthah*

Management input by *Nathan Harrison*

Fishery Description

Marron are endemic to Western Australia and are the third largest crayfish in the world. Recreational fishing occurs in freshwater dams and rivers throughout the southern part of the State, extending from as far north as Geraldton, to Esperance in the east. Fishers may only use legal scoop nets, drop nets or snares to take marron.

Governing legislation/fishing authority

Fish Resources Management Act 1994 and subsidiary legislation
Recreational Fishing Licence

Consultation process

Recreational Freshwater Fisheries Stakeholder Sub-Committee (RFFSS) of the Recreational Fishing Advisory Committee (RFAC).

Boundaries

The recreational marron fishery extends from the Hutt River north of Geraldton to waters near Esperance. The fishery operates in both freshwater dams and rivers, although access to drinking water supply dams servicing the Perth metropolitan area and south-west regional centres are closed to the public by the Water Corporation.

Management arrangements

This fishery is managed through input controls of licences, closed seasons and gear restrictions, and the output controls of size and bag limits. The RFFSS was established in 2004 to develop a 5-year strategy for the management of the State's south-west recreational freshwater fisheries and provide advice on ongoing monitoring and adaptive management of the marron and trout fisheries.

The RFFSS reviewed the current management arrangements for the recreational marron fishery during 2005/06. In 2006, a discussion paper was released containing future management options for the fishery. The following adjustments to the existing management options of the recreational marron fishery were implemented from the 2007 season.

- 1) Minimum legal size increased from 76 mm to 80 mm rostrum carapace length.
- 2) Retention of the 10 (or 5 marron in 'trophy waters') marron per day bag limit, but the introduction of possession limit of 20 legal-size marron per licensed fisher.
- 3) Increased season from 16 to 23 days.
- 4) Hutt River managed as a 'trophy water', with a minimum size limit of 90 mm rostrum carapace length and a bag and possession limit of 5 marron per licensed fisher.

- 5) Removal of the 'snare-only' requirement within the Warren National Park.
- 6) Fishers will be permitted to carry marron drop nets and scoop nets by boat to the area that they intend to fish so as to access the relatively inaccessible sections of the Donnelly River (down stream of 'Boat Landing' only).
- 7) Shannon River to be closed to all fishing.

All marron fishers require a recreational fishing licence (either a specific marron licence or an 'umbrella' licence covering all licensed recreational fisheries). Licensed fishers were permitted to fish for marron from 12 January to 4 February 2007. Three types of legal gear exist – scoop nets, drop nets and snares. Only a single scoop net or snare, or six drop nets, may be used at any one time, and some waters, including all major public dams, have been declared 'snare-only'.

In most waters, there is a minimum size of 80 mm carapace length and a bag limit of 10 marron per day. However, Harvey Dam, Waroona Dam and Hutt River are managed as 'trophy waters', with a minimum legal size 90 mm carapace length and a daily bag limit and possession limit of 5 marron.

Research summary

Detailed research on the marron stocks in south-west rivers has been undertaken since the 1970s. Current research involves the annual scientific monitoring of stock levels before the summer fishing season, surveys of catches taken by recreational licence holders and volunteer logbook holders, biological characteristics (growth, size-at-maturity, fecundity, etc) of key marron populations in different catchments, and joint sampling with individual catchment groups and universities. These data enable trends in stock levels to be monitored and recommendations to be made for adjustments to fishery management when necessary. The following status report is based on these research findings.

A major Fisheries Research and Development Corporation (FRDC) research project commenced in July 2003 which aims to quantify the various factors that are influencing the marron fishery, and re-design long-term monitoring so as to provide better management advice to sustain this important fishery for the future.

Current research is mainly focussed on:

- determining the reproductive characteristics (size-at-maturity and fecundity) of marron throughout their range;
- development of a fisheries-independent abundance index in key river and dam populations; and
- development of a tagging program to provide information on long-term growth and mortality throughout the marron range.

Retained Species

Commercial component:

Nil

Recreational catch estimate
(season 2007):

69,800 marron

The total catch for the 2007 season was estimated at approximately 69,800 ± 6,900 standard error (SE) marron or

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20.8 ± 2.1 t of marron (average weight marron 297 g, based on logbook data). This is an increase compared to the previous season (2006: 47,200 ± 7,780 marron or 10.8 ± 1.2 t). The increase in catch in numbers is due to an increase in effort.

Note that the change in minimum legal size from 76 to 80 mm rostrum carapace length during the 2007 season significantly increased the long-term, stable average weight of retained marron from 230g (1971 – 2006) to 300g in 2007.

Fishing effort/access level

Total effort for the 2007 season was estimated from phone surveys at around 20,300 days. Fishing effort significantly increased compared to the previous season (e.g. 2006: 10,700 days). This was due to a large increase in the number of participating licensed fishers (from 3,300 in 2006 to 7,400 in 2007) as the number of fishing days per fisher decreased from 3.2 in 2006 to 2.7 in the 2007 season. The season length increased in 2007 to 24 days from 16 days in 2006.

Stock Assessment

Assessment complete: Yes
Breeding stock levels: Adequate

Current assessment involves the research surveys of stock levels at several indicator sites before the summer fishing season, phone surveys of recreational licence holders and volunteer logbook holders, and joint sampling with catchment groups and universities. These data enable trends in stock levels to be monitored and recommendations to be made for adjustments to fishery management when necessary.

The catch per unit effort (CPUE) recorded by fishers, based on phone surveys, was lower (~20%) in 2007 at approximately 3.4 marron per fisher per day compared to the previous season (2006: 4.4 marron per fisher per day). A decline in CPUE (in number) was to be expected after increasing the minimum legal size from 76 to 80 mm rostrum carapace length. Therefore the average weight of a retained marron increased significantly from 230 g (1971-2006) to 300 g in 2007 resulting in the catch rates, measured as g/day, being reasonably similar.

Fishery-dependent catch and effort data (e.g. CPUE as determined by logbook or phone survey) can often be a poor indicator of true stock abundance. Therefore, in 2006 a new fishery-independent, stock assessment program was conducted to generate data on the relative abundance of marron in 3 dams (Waroona Dam, Wellington Dam, Harvey Dam) and 6 rivers (Shannon, Warren, Blackwood, Preston, Murray and Moore River).

The fishery operates over a number of river and dams, which contain essentially separate stocks. From the small number of stocks surveyed, the current breeding stock levels appear adequate (based on typical size-at-maturity). Size-at-maturity (i.e. size at which 50% of the females are mature) seems to be below the minimum legal size of 76 mm rostrum carapace length for the majority of marron stocks in the south-west (e.g. Warren River ±56 mm rostrum carapace length, Murray River ±54 mm rostrum carapace length, Collie River ±42 mm rostrum carapace length, Preston River ±60 mm rostrum carapace length, Waroona Dam ±63 mm rostrum carapace length, Drakesbrook Dam ±31mm

rostrum carapace length, Wellington Dam ±54 mm rostrum carapace length). Present size restrictions seem to adequately protect the majority of the female breeding stocks. Further information on size-at-maturity from other catchments throughout the marron range needs to be obtained in the near future.

In the Harvey Dam, female size-at-maturity is about 85 mm, and a larger minimum legal size of 90 mm rostrum carapace length has been introduced to protect this breeding stock. Recent studies revealed that female size-at-maturity in the Hutt River, 600 km north of Perth, is also significantly larger (about 95 mm rostrum carapace length) than the minimum legal size of 76 mm rostrum carapace length. From 2007, the Hutt River has been managed as a ‘trophy water’ with an increased minimum legal size of 90 mm rostrum carapace length and a reduced bag limit of 5. An increase in the minimum legal size might also be required in the near future for the marron in the Moore River, where preliminary data show that size-at-maturity is large (± 79 mm rostrum carapace length).

Non-Retained Species

Bycatch species impact: Negligible

The marron fishery does capture small quantities of non-target species, principally gilgies (*Cherax quinquecarinatus*, *C. crassimanus*) and koonacs (*C. plejebus*, *C. glaber*). Although little is known about their biology, the impact of the marron fishery on these species is thought to be low, as gilgies and koonacs are smaller than marron and are not targeted by marroners.

Protected species interaction: Negligible

This fishery does not interact with protected species. However, a second type of marron has been identified (‘hairy’ marron) which is threatened mainly by the extension in range of the more common ‘smooth’ marron, which is the basis of the recreational marron fishery. In late 2002, recreational marron fishing upstream of Ten Mile Brook Junction (including all its tributaries) on the Margaret River was prohibited to remove the impacts of fishing on the remaining ‘hairy’ marron stocks. However, illegal fishing is still reported in this reach of the Margaret River. A recovery plan, developed jointly between the Department of Fisheries, the Department of Environment and Conservation, and other stakeholders on the recovery team is underway for the ‘hairy’ marron.

Ecosystem Effects

Food chain effects: Low

The removal of legal-sized marron from freshwater rivers is unlikely to have a significant effect, noting that the bulk of the marron biomass is below legal size and that marron of all sizes have similar food and habitat requirements. Marron taken from man-made dams do not significantly impact natural freshwater ecosystems.

Habitat effects: Negligible

The impact of this fishery on the aquatic habitat is negligible. The major effects are litter in surrounding areas and the trampling of areas of riparian vegetation by marroners and subsequent bank erosion.

Social Effects

A large number of recreational marron licences are sold annually. For the 2007 season, a total of 21,452 licences were sold, including umbrella licences (14,342). This represents a considerable (35%) increase from the 15,918 licences in 2006. The marron fishery in the 2007 season involved approximately 7,400 licence holders undertaking about 20,300 fishing days, and provided a major recreational activity in regional areas of the south-west of the State.

Economic Effects

The value of the 2007 season recreational marron catch was in the approximate range of \$499,000 (based on an average sale price of marron from aquaculture farms of approximately \$24/kg, and a range of tonnage based on estimated total catch in numbers as calculated from the phone survey and estimated average size of marron captured as calculated from logbook returns). Revenue from licence sales was estimated at approximately \$353,000, which is used to support recreational fishery management, research and compliance. In addition, the estimated 20,300 days of marroning in regional locations provided a significant economical boost to regional towns in the south-west.

Fishery Governance

Target catch (or effort) range:
maximum < 96,000 – 136,000 marron

In 2006, the Recreational Freshwater Fisheries Stakeholder Subcommittee (RFFSS) proposed that, based on the available research data and the knowledge of the marron fishery, the fishery be managed to a maximum target catch of between 96,000 – 136,000 marron.

Current fishing (or effort) level: Acceptable

Under recent management arrangements (short 16-day season since 2003) the average estimated recreational catch has been around 55,000 marron, with the current low annual catch not due to limited marron stocks but to this sharp reduction in effort (Recreational Marron Figure 1). In 2007 the marron season increased from 16 to 23 days – this should see a limited growth in the fishery while maintaining catches at a sustainable level.

New management initiatives (2007/08)

The marron season for 2008 is again scheduled to last for 23 days, from 12 noon, Friday 25 January 2008 to 12 noon, Sunday 17 February 2008.

Marron abundance (fishery-independent surveys) and catches (phone survey and logbook) will be examined following the 2007 season to determine the impact of the changes in season length and increase in legal minimum size. The management arrangements will, if necessary, be reviewed prior to the beginning of the 2008 season.

External Factors

The three main external factors that affect the marron fishery are winter rainfall, access to dams, and introduced species.

Winter rainfall plays a major role in marron reproduction, growth and survival. Rainfall increases the quality of areas for marron by transporting leaf-litter into streams (providing food sources for marron growth and reproduction) and by maintaining water volume and quality. It may also affect the ease with which fishers can access the water bodies, reducing pre-season illegal fishing.

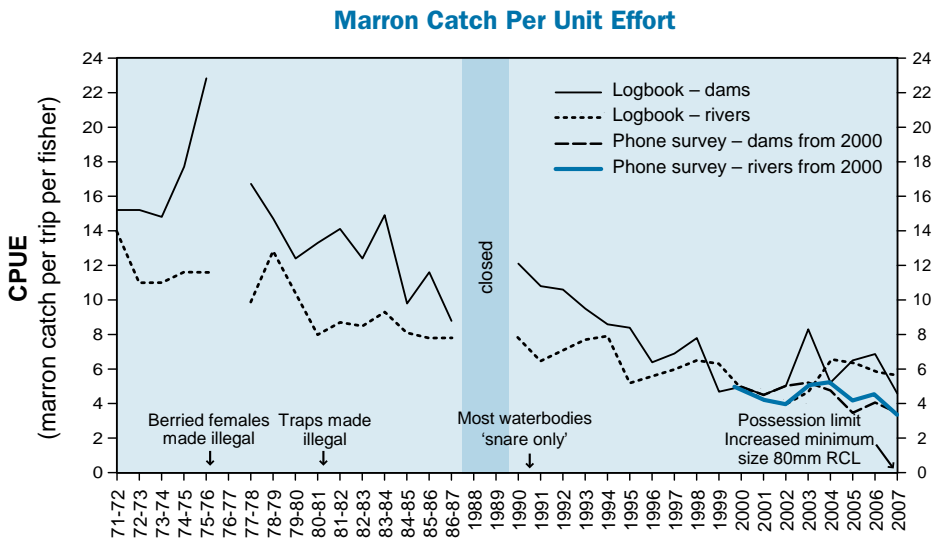
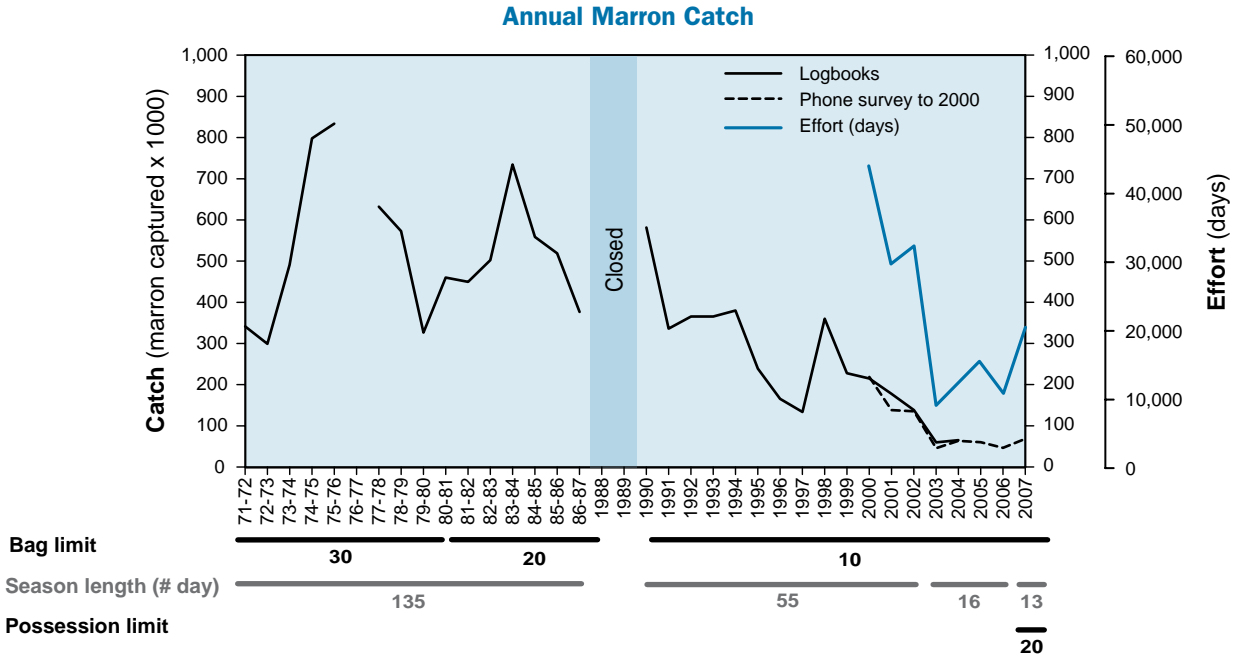
A second major issue in this fishery is access to irrigation dams. The Water Corporation closed access to Stirling Dam in 2001 and Logue Brook Dam in 2008 to divert the water to the Perth metropolitan water supply, and there is a strong possibility of limitations to fishing in Wellington Dam in the near future. Waroona Dam was closed for several seasons (2002 – 2005) for refurbishment, re-opening to marron fishing in 2006. Drakesbrook Dam, the next in line for maintenance work, is expected to be unavailable for recreational marron fishing in 2009 to possibly 2012.

The Department of Fisheries is working closely with the Water Corporation to ensure the refurbished and refilled dams will provide a high-quality marron fishery by installing refuges, adding marron and controlling introduced species. Trials in Waroona Dam and Drakesbrook Dam showed that the artificial habitat (rock wall) provides an important refuge for juvenile marron and berried females. The Department of Fisheries secured funding from the Water Corporation to de-stock stock marron from Drakesbrook Dam before the complete drainage. The marron will be kept at the Department's hatchery facilities in Pemberton and will be re-stocked during the winter of 2009. Furthermore, in co-operation with RecFishwest and the Water Corporation, funding was secured from the Recreational Fishing Community Grants Program to create large-scale artificial habitats in Drakesbrook Dam to enhance the recreational marron fishery.

The major introduced species that impact on the marron fishery are redfin perch (*Perca fluviatilis*), trout (*Oncorhynchus mykiss* and *Salmo trutta*) and yabbies (*Cherax albidus*). Redfin perch, which predate heavily on small marron, have been illegally stocked into most rivers and irrigation dams in the south-west. Redfin perch may be of greatest concern in irrigation dams, which generally have all structure (e.g. tree stumps) removed prior to filling and provide little shelter or protection for marron. Redfin perch control has been attempted at Waroona Dam as part of the refurbishment process.

Trout also predate on marron but to a much lesser extent than redfin perch due to the wider diet of trout, particularly rainbow trout, which prey predominantly on freshwater insects.

Yabbies, a direct competitor and a potential threat to marron, have been recorded from a number of areas within the marron recreational fishery, but at low abundances.



RECREATIONAL MARRON FIGURE 1

The estimated total catch (a) and catch per unit effort (b) of the recreational marron fishery between 1971 and 2007.

South-West Freshwater Angling Fishery Status Report

Prepared by *M. de Graaf and T. Baharthah*
Management input by *Nathan Harrison*

Fishery Description

The south-west freshwater fishery is a recreational-only fishery that focuses primarily on angling for rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*). These species are both the subject of an annual controlled stocking program undertaken by the Department of Fisheries. In addition, anglers catch the native freshwater cobbler (*Tandanus bostocki*) and an exotic species, redfin perch (*Perca fluviatilis*). Redfin perch was previously released in the south-west but now occurs as self-breeding populations in most water bodies. Licensed anglers may only use a single rod, reel and line or single handline when targeting these species.

Governing legislation/fishing authority

Fish Resources Management Act 1994 and subsidiary legislation
Recreational Fishing Licence

Consultation process

Recreational Freshwater Fisheries Stakeholder Sub-Committee (RFFSS) of the Recreational Fishing Advisory Committee (RFAC)

Boundaries

The south-west freshwater angling license authorizes anglers to fish for freshwater finfish species in all inland waters of Western Australia south of 29° latitude (Greenough) and above the tidal influence including all lakes, dams, rivers and their tributaries.

Management arrangements

Access to this fishery is controlled by licenses, seasonal closures, fish gear restrictions, minimum sizes, and bag limits. People under 16 years of age are not required to hold a license to go freshwater angling.

To protect newly-released trout, a closed season applies from 1 May to 30 August in most rivers and dams in the south-west of the State. During the closed season, fishing is still allowed on the Murray, Blackwood, Donnelly and Warren Rivers and sections of the Serpentine River. However, fishing for trout on the streams, brooks and tributaries flowing into these rivers is prohibited during the closed season. In addition, fishing for all species is totally prohibited in Waroona Dam, Logue Brook Dam and their tributaries during the closed season.

A combined daily bag limit of 4 applies to rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*), together with a minimum legal size limit of 300 mm.

A daily bag limit of 40 applies to freshwater cobbler (*Tandanus bostocki*). No minimum legal size limit applies to this species. No bag limit or size limit applies to redfin perch (*Perca fluviatilis*) and anglers are encouraged not to return any redfin to the water, as this feral species negatively affects the marron fishery and predated actively on trout fry.

To improve the quality of the trout fishery, Waroona Dam is 'artificial lure-only' (no bait areas). A reduced bag limit (2 trout per day) also applies to this water. These measures are designed to improve the quality of the trout fishery over the spring period.

The trout stocking program administered by the Department of Fisheries in consultation with the RFFSS, focuses on public waters where trout have been stocked or been present since the 1930s. All trout stocked into public waters are produced at the Department of Fisheries' Pemberton Freshwater Research Centre (PFRC).

Research summary

The Research Division of the Department of Fisheries produces and distributes trout fry, yearlings and excess broodstock to support the recreational trout fishery. In 2007 approximately 527,000 rainbow and 40,000 brown trout fry, 23,700 rainbow and 220 brown trout yearlings and 2,680 rainbow and 450 brown trout broodstock were stocked in selected public waters.

The annual telephone survey commenced in 2001 and now provides regular information about this important recreational fishery. In cooperation with recreational anglers, redfin perch, freshwater cobbler, rainbow trout and brown trout have been collected for diet analysis.

Research information from these projects, and the annual report from the manager of the PFRC, have been used to compile the following status report.

Retained Species

Commercial catch: Nil

Recreational catch estimate (season 2006/07): 26.8 tonnes

An estimated 26.8 ± 3.2 t of fish were landed in this fishery by recreational anglers in the 2006/07 season, including 18.9 t of retained fish (53,300 fish) and 7.9 t of captured and released fish (45,100 fish). The estimated catch was composed of 15,900 rainbow trout (4.3 t), 2,900 brown trout (0.8 t), 46,300 redfin perch (16.1 t), 600 native freshwater cobbler (0.2 t) and 32,600 black bream (5.4 t) (Freshwater Angling Figure 1).

The overall reported catch is similar to the previous season, which was 23.7 t. Landings of redfin perch (-4%; 1,800 fish) remained similar, while landings of native catfish (-85%; 3,300 fish) and rainbow trout (-15%; 2,700 fish) decreased significantly. Landings of black bream (275%; 24,000 fish) increased substantially and brown trout (120%; 1,500 fish) increased slightly compared to the previous season (Freshwater Angling Figure 1).

Fishing effort/access level

Estimates of fishing effort are based on telephone surveys of license holders. Total effort was estimated to be 23,800 days, similar to the previous season (23,400 days).

Stock Assessment

Assessment complete: Yes

Breeding stock levels: Not applicable

A catch rate of 4.1 fish of all species per day was estimated for the 2006/07 season. This included 2.2 retained fish and 1.9

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released fish per angler per day. This is higher (~17%) than for the 2005/06 season, but well within the range of catch rates reported in the last seven years.

Phone survey data (Freshwater Angling Figure 1) indicate that overall, the stock levels of both rainbow and brown trout, as indicated by catch rates and catches, have remained reasonably stable over the past 7 years.

Both species of trout display little or no breeding in local waters, with the fishery supported through the stocking of fry, yearling and ex-broodstock trout by the Department of Fisheries. Redfin perch breed in, and dominate, the freshwater areas where they are located. The management arrangements (e.g. minimum legal size, bag limit) for native freshwater cobbler are currently under review, based on historical and recent scientific data.

Non-Retained Species

Bycatch species impact: Negligible

Protected species interaction: Moderate

Currently, two species of south-west native fish are protected under the *Environmental Conservation and Biodiversity Protection Act 1999* list of threatened fauna: Western trout minnow (*Galaxias truttaceus hesperius*) listed as critically endangered since 18 August 2006, and Balston's pygmy perch (*Nannatherina balstoni*) listed as vulnerable since 24 November 2006. In areas where the interaction of trout and native fish has been raised, trout stocking has ceased [Margaret River 1998, Bancell Brook (Harvey River) 2004, Blackwood River downstream Jalbarragup crossing 2006]. The likely effects of rainbow trout, brown trout and redfin perch on the endemic fishes of the south-west are discussed under 'Food chain effects' below.

Ecosystem Effects

Food chain effects: Moderate

A major environmental risk in this fishery relates to the spread of the introduced redfin perch. Redfin perch consume (non-) native fishes, aquatic insects and freshwater crayfish species (mainly marron). Further, redfin perch breed throughout the fishery and are the most dominant fish in this region. While the release of captured redfin perch is not illegal, the Department of Fisheries' education program strongly encourages anglers to retain any redfin perch caught, regardless of size.

Phone survey data indicates that the release rates of redfin by licensed anglers have been low (~10%) and similar over the last 7 years, suggesting angler support for this initiative. However, ongoing educational campaigns are required to increase the awareness among recreational fishers that redfin perch have a negative impact on native fish and crayfish (especially marron) stocks and should not be released in any river or dam.

Rainbow and brown trout are also introduced species but have different diet and habitat requirements than redfin perch. Brown trout feeds on (non-) native fish, freshwater crayfish and, to a lesser extent, terrestrial insects. Rainbow trout on the other hand consume predominantly aquatic and terrestrial insects. Brown trout probably negatively affect native fish and crayfish populations directly through predation, while rainbow trout are

more likely to affect native fish populations indirectly through competition for limited food resources.

Further, the reproduction of trout in the wild in Western Australia is minimal, due to a lack of suitable spawning sites. The stocking locations and the numbers of trout can therefore be controlled by regulating the quantities of hatchery-produced fish stocked. Currently, trout are stocked in only 25 locations and not throughout the entire range of fresh waters in the south-west. Thus, although trout are also predatory fishes, the lack of natural reproduction means they are more controllable than redfin perch and are thus more acceptable as an introduced recreational species.

Habitat effects: Negligible

The impact of this fishery on the aquatic habitat is negligible.

Social Effects

A large number of freshwater angling licenses are sold annually. For the 2006/07 season, a total of 18,200 licences were sold, including umbrella licenses (14,342). This is a modest (10%) increase in comparison to the 16,500 licenses sold in 2005/06.

Economic Effects

The fishery operates in the south-west and is a significant tourist attraction for the region, generating valuable income for regional centres. There are also a number of pay-for-fishing operators who target the tourist market. The license sales contributed approximately \$275,000 of revenue, which is used to support breeding, stocking, research, management and monitoring activities.

Fishery Governance

Target catch (or effort) range: Not applicable

Current fishing (or effort) level: Acceptable

New management initiatives (2007/08)

The Recreational Freshwater Fisheries Stakeholder Sub-committee (RFFSS) of the Recreational Fishing Advisory Committee was established in 2004. The RFFSS assumes the role of the former trout stocking committee in the development of trout stocking strategies for the fishery and provides advice on ongoing monitoring and adaptive management of the trout and marron fisheries.

The RFFSS is currently reviewing the management arrangements for freshwater fisheries in the State's south-west. Part of the review will be the management arrangements (size limits, bag limits etc.) of the native cobbler based on the available historical and recent scientific data.

External Factors

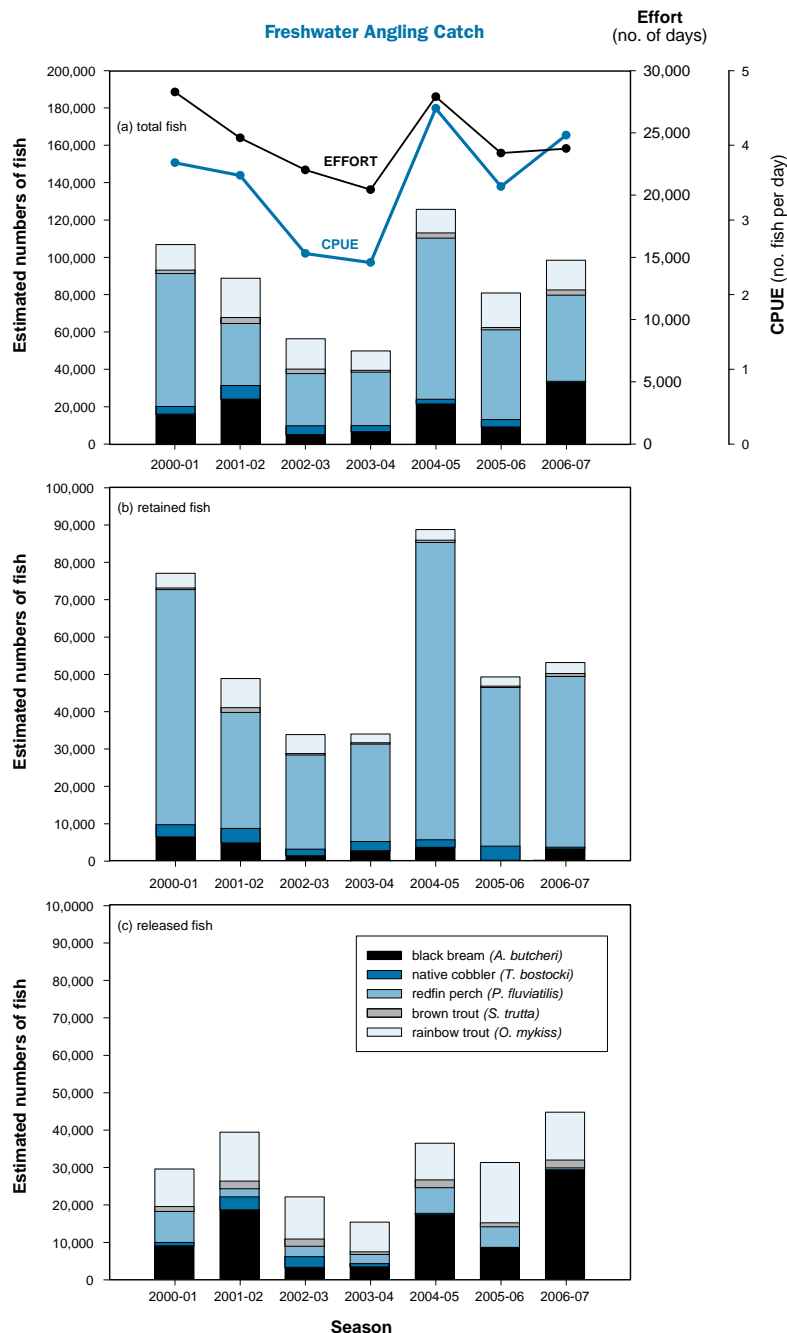
The extent and success of the freshwater angling fishery in the south-west is dependent mainly upon availability of high-quality fresh waters for stocking. The degraded nature (e.g. increased salinity) of many freshwater streams and rivers, coupled with the effect of climate change (e.g. reduced flow and water levels), has a strong negative effect on the future of recreational fishing. The availability of water is dependent on rainfall and access to irrigation dams. Thus, low rainfall and reduced access to

permanent water bodies are having a negative influence on the freshwater angling fishery.

A major issue in this fishery is ongoing access to irrigation dams, as the management objectives of these waters change from irrigation and recreation to irrigation and/or public drinking water supply. The Water Corporation closed access to Stirling Dam in 2001 and Logue Brook Dam in 2008, owing to the diversion of this water to the Perth metropolitan water supply. The Department of Fisheries is working closely with the Water

Corporation to reduce the impacts to recreational fishing by enhancing stocks in refurbished dams.

The intermittent flow and general condition of most rivers make many areas in the south-west unsuitable for trout. Livestock access, cleared banks and de-snagging of streams all reduce the quality of the stream for trout and other aquatic species. Rehabilitation projects in the USA have produced better stream quality and better angling, and similar initiatives may be considered in Western Australia, particularly in irrigation dams.



FRESH WATER ANGLING FIGURE 1

Estimates of the development of total catch, effort and Catch Per Unit Effort (CPUE) (a) and total numbers of fishes retained (b) and released (c) by species in the south-west freshwater angling fishery since the 2000 – 01 season.

WEST COAST BIOREGION

GASCOYNE COAST BIOREGION

NORTH COAST BIOREGION

SOUTH COAST BIOREGION

NORTHERN INLAND BIOREGION

SOUTHERN INLAND BIOREGION

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AQUACULTURE

Regional Research and Development Overview

Research undertaken over previous years at the Pemberton Freshwater Research Centre has focused on marron husbandry and selective breeding research; captive breeding programs for conserving endangered native fish and crayfish; and evaluation of the use of grains in aquaculture feeds.

Industry sectors have now adopted and are applying the results of previous years' research to commercial operations.

A major collaborative project was undertaken to assess the quality of local agricultural products, such as lupins and canola, in aquaculture feeds; the influence of feed grains on aquaculture feed manufacturing process; and their milling, storage and transport characteristics.

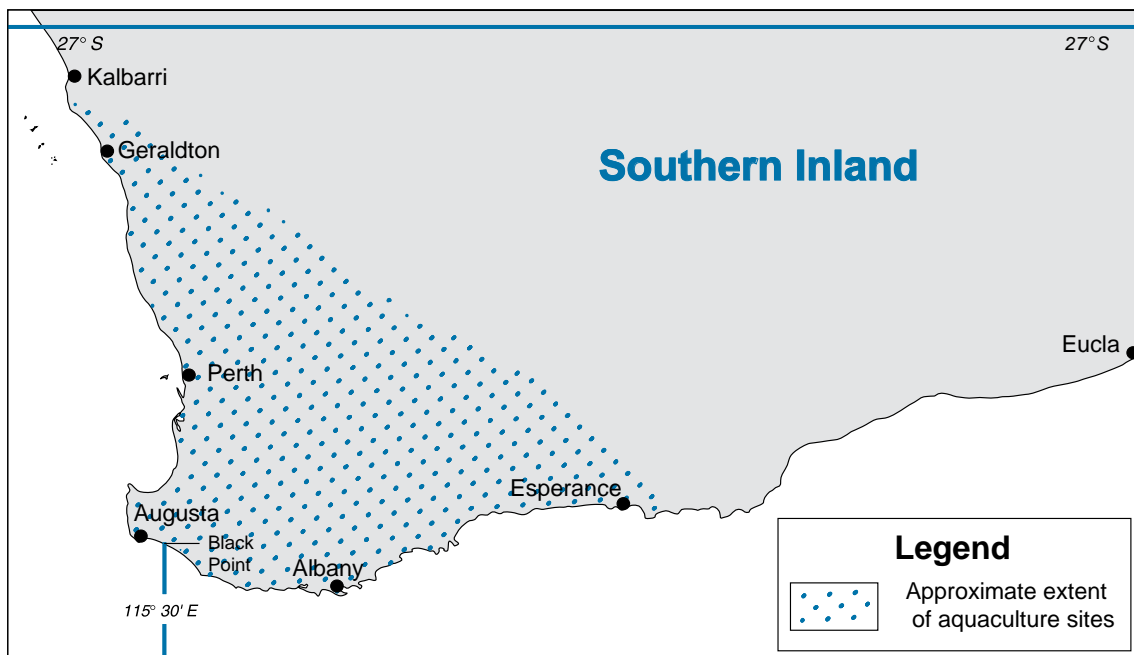
Drawing from this work, a major grain value-adding industry has developed in Western Australia that is already exporting millions

of dollars worth of product inter-state and internationally. Considerable promotional work to the domestic and international markets has also been undertaken to encourage industry adoption of these feed grains.

Industry adoption, both domestically and internationally, has been good, but further export market development has been restricted as a result of the drought.

A Ministerial Exemption has been issued to enable a commercial operator to collect marron from farm dams on a number of private properties. The purpose of the project is to provide information for a review of the current policy, which only allows one property on a licence. The trial project, which will run for three years, is at the end of its first year. It is being undertaken with the co-operation of local compliance officers in the south west.

The Aquaculture Development Council has developed a draft report identifying suitable sites for large-scale, inland aquaculture in Western Australia. The report is being finalized and is expected to become available in late 2008.



SOUTHERN INLAND AQUACULTURE FIGURE 1

Map showing the approximate extent of aquaculture sites in the Southern Inland bioregion.

COMPLIANCE AND COMMUNITY EDUCATION

Fisheries and Marine Officers (FMOs) based in Geraldton, Dongara, Jurien, Lancelin, Hillarys, Fremantle, Rockingham, Mandurah, Bunbury, Busselton, Albany and Esperance conduct recreational fishing compliance and education activities in the Southern Inland bioregion.

The Volunteer Fisheries Liaison Officer (VFLO) program is a vital education mechanism in the Southern Inland bioregion. Although the VFLO program is based in major coastal centres, it is used particularly prior to – and during – the opening of the marron season to conduct peer-to-peer education.

The highest risk of non-compliance in the Southern Inland bioregion is within the recreational marron fishery. As the marron season lasts for just 23 days, the risk of illegal fishing during the closed season (February – December) is extremely high.

Increasingly, dams and catchment areas once open to marroning are being closed by the Water Corporation, which presents further challenges to ensure compliance in these areas. During the open marron season, illegal activities (such as the use of scoop and drop nets in ‘snare-only’ waters, take of undersize marron, and adherence to possession limits in trophy waters such as Harvey Weir) are a focus of compliance activities. FMOs continue to carry out joint initiatives with police to investigate the theft of marron from private properties and licensed aquaculture sites.

The other main fishery in the Southern Inland bioregion is the recreational trout fishery. Compliance and education in this fishery focuses on the illegal use of baits in ‘artificial lure-only’ waters, exceeding bag limits, fishing without a current freshwater or umbrella recreational fishing licence, and the taking of trout during the closed season.

Compliance patrols for the other recreational fisheries in these inland areas, as well as inspections of fish wholesale and retail premises, also form part of the compliance activities conducted by FMOs in the Southern Inland bioregion.

Commercial fishing activity in rivers is also included in the Southern Inland bioregion and some compliance patrols target fishing activity in the West Coast and South Coast estuarine fisheries.

Activities during 2006/07

During 2006/07, FMOs delivered 1721 hours of compliance patrol hours to the Southern Inland bioregion (Southern Inland Compliance Table 1) – which is a slight decrease from the compliance hours delivered in the previous year.

Officers conducted patrols throughout the bioregion in vehicles, dinghies and canoes, making 3,595 field contacts with recreational fishers and 89 contacts with commercial fishers. During the year, 36 infringement warnings and 32 infringement notices were issued with 58 prosecutions instigated (49 recreational, 9 commercial).

The marron fishery continues to be the major focus for the compliance and education program in this bioregion. The 2007 marron season was the second year of the five-year marron management strategy, public acceptance of the new rules is good

and catches generally do not seem to have changed greatly in most areas. As was the case in 2006 the compliance activities for the 2007 marron season were developed from a risk assessment process, and targeted areas of high risk identified through that process. The marron season start date may need to be reviewed to permit better long-term planning for recreational fishers.

Aquaculture compliance activities are also a major focus in the Southern Inland bioregion for FMOs. Activities mainly involve inspection of aquaculture facilities, oversight of broodstock collection to ensure compliance with exemption conditions, and joint patrols with police to investigate theft from farm dams.

Initiatives for 2007/08

Joint operations with regional Water Corporation rangers will be increased during the 2008 season. These joint patrols increase the compliance presence in the marron fishery and the expert knowledge that Water Corporation rangers have of the dam areas and activities greatly assist in the compliance operations.

Poaching of wildstock marron during the closed season and theft of marron from dams on private property and aquaculture facilities remains a focus of compliance activities. District FMOs will also continue to work in partnership with local police to develop joint initiatives, facilitate the transfer of intelligence information and respond to compliance situations.

The VFLO program is to be instrumental in delivering information to marron fishers and campers during the opening of the marron season at the Collie River and through the Blackwood River basin.

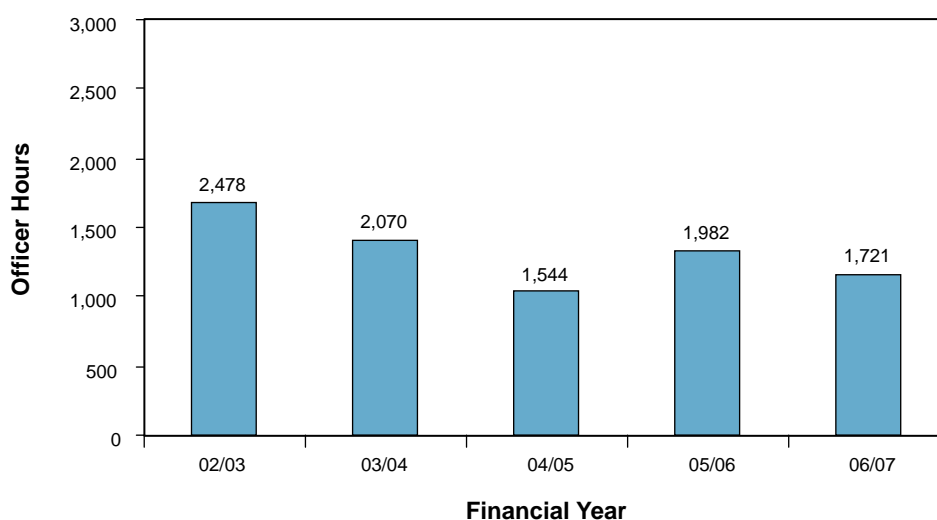
The southern regional Community Education Officer will again be conducting several education activities promoting awareness of endemic freshwater fish and crustaceans of the south-west and highlighting potential threats, including feral fish species. Some of these activities will be carried out in partnership with other agencies and natural resource management groups to enable a holistic approach to catchment management and issues facing the sustainability of freshwater species.

WEST COAST
BIOREGIONGASCOYNE COAST
BIOREGIONNORTH COAST
BIOREGIONSOUTH COAST
BIOREGIONNORTHERN INLAND
BIOREGIONSOUTHERN INLAND
BIOREGION

STATE-WIDE

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Southern Inland Bioregion Compliance Patrol Hours

**SOUTHERN INLAND COMPLIANCE FIGURE 1**

In this figure, 'On Patrol' Officer Hours shows the level of compliance patrol activity delivered to the Southern Inland bioregion over the previous five years. The 2006/07 total gives the patrol hours in the bioregion that resulted in the contacts detailed in Table 1. The totals exclude time spent on other compliance-related tasks, e.g. travel time between patrol areas, preparation and planning time.

SOUTHERN INLAND COMPLIANCE TABLE 1

This table gives a summary of compliance and educative contacts and detected offences within the Southern Inland bioregion during the 2006/07 financial year.

PATROL HOURS DELIVERED TO THE BIOREGION		1,721 Officer Hours
<i>CONTACT WITH THE COMMERCIAL FISHING COMMUNITY</i>		
Field contacts by Fisheries & Marine Officers		89
District Office contacts		0
Infringement warnings		0
Infringement notices		0
Prosecutions		9
<i>CONTACT WITH THE RECREATIONAL FISHING COMMUNITY</i>		
Field contacts by Fisheries & Marine Officers		3,595
District Office contacts		3,100
Infringement warnings		36
Infringement notices		32
Prosecutions		49
<i>OTHER FISHING-RELATED CONTACTS WITH THE COMMUNITY*</i>		
Field contacts by Fisheries & Marine Officers		1185
District Office contacts		0
Fishwatch reports**		Not recorded

* Contacts are classified according to the specific fishery, which is usually clearly delineated as being either commercial or recreational. The "other fishing-related contacts with the community" category is used where multiple fisheries are contacted and it is not possible to accurately classify the contacts into one specific fishery – typically, the majority of contacts are these contacts are recreational in nature (e.g. personal contacts in marine protected areas), but contacts made in relation to fish kills, shark patrols and inspections of commercial fish wholesale and retail premises, etc, are also included in this category.

** Fishwatch calls relating to the Southern Inland bioregion are not recorded, as the service provider reporting mechanism only details calls referred to district offices. Calls relating to the Southern Inland bioregion will be included in both the South Coast and West Coast bioregion totals.