

NORTHERN INLAND BIOREGION

ABOUT THE BIOREGION

The Northern Inland Bioregion, which encompasses the northern half of Western Australia, is predominantly a desert area, with few permanent water bodies. As a result of occasional summer cyclones, the various river systems flow at flood levels for short periods before drying-out to residual waterholes. The only exceptions to this are man-made dams, which trap rainfall for water supply purposes and irrigation.

The only significant fishable water body in the region is Lake Argyle, created by the damming of the Ord River. The continuous release of water from the dam has resulted in the Ord River maintaining its freshwater fish populations year-round, as does the lake, where some freshwater native fish populations have expanded.

Populations of reptiles, such as the protected freshwater crocodile, are also supported by the expanded food chain of native fish, and are thought to have increased significantly from their original billabong-based populations.

SUMMARY OF ACTIVITIES POTENTIALLY IMPACTING THE BIOREGION

Climate Change

The Northern Inland Bioregion is expected to be affected similarly to the North and Gascoyne Coast Bioregions.

Commercial Fishing

The main water body in the Northern Inland Bioregion, Lake Argyle, is a man-made lake in the East Kimberley that was formed in 1973 following the completion of the Ord River Dam. The lake supports the State's only commercial freshwater fishery, the Lake Argyle Silver Cobbler Fishery (LASCF). In Lake Argyle, silver cobbler (*Neoarius midgleyi*) increased after the Ord River Dam was first filled to capacity in the 1974 wet season. The LASCF uses gillnets to specifically target this species.

Recreational Fishing

Relative to the commercial catch, the total recreational catch of silver cobbler is small. A small recreational and charter boat fishery for this species exists in Lake Argyle with fishing activities peaking during the dry season (winter months). The 2015/16 iSurvey of boat-based recreational fishing in WA indicated that silver cobbler are targeted mainly by hook and line fishing, with the majority of fish being released after capture. A

single charter vessel has been operating in Lake Argyle since 2001, with very few silver cobbler being retained in recent years (only 10 fish in 2015)

Lake Argyle and its associated river system also support recreational fishing for the freshwater component of the barramundi stock and cherabin (freshwater prawns). Limited surveys of recreational fishing in this region have been completed. Biennial integrated recreational surveys of boat-based fishers (iSurvey) provide regular bioregional-wide estimates of boat-based catches of all species.

Aquaculture

Aquaculture development operations in the region have previously included the production of barramundi from cage operations in Lake Argyle, and a small but growing pond production of redclaw crayfish in the Ord River irrigation system around Kununurra.

The State Government recently funded a stock enhancement project at Lake Kununurra to create a recreational barramundi fishery in the region.

Tourism

A viable tourism industry operates on Lake Argyle, with boat operators, helicopter and plane flights, fishing, canoeing and bird watching. There is recreational boating usage on the Lake including skiing and swimming.

Other Factors

While the Lake was created to supply water for irrigation and hydroelectric power generation in the Ord River Irrigation Area, it is also a source of water for supplying mining operations, town water supplies and a large number of industrial operations.

BIOREGIONAL SPECIFIC ECOSYSTEM MANAGEMENT

Within each Bioregion there are a range of management measures that have been implemented to manage the potential impact of activities (See the Ecosystem Management Section for an overview).

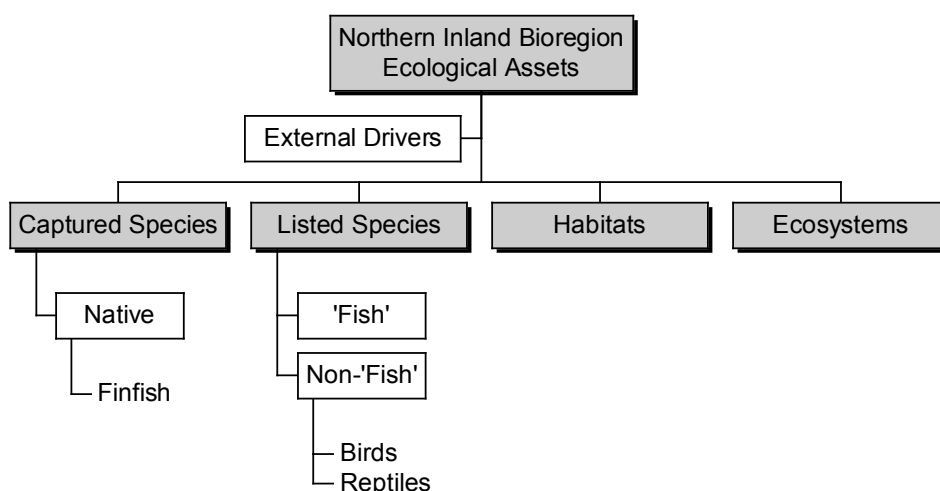
As one of the key ecosystem risks is the introduction of non-endemic species, the Department has an approval process in place for assessing proposals to translocate live non-endemic fish species into and within Western

Australia, so as to minimise the environmental risks to freshwater ecosystems in the Northern Inland Bioregion associated with this activity.

ECOSYSTEM MONITORING AND STATUS

In order to assess the adequacy of management arrangements aimed at ensuring sustainability of the ecological assets within the Northern Inland Bioregion, the Department must identify and monitor trends in the

condition of these resources. This is achieved through application of an Ecosystem Based Fisheries Management (EBFM) framework (Fletcher, *et al.*, 2010) to identify, in a hierarchical manner, the key ecological resources that require ongoing monitoring and assessment. (See *How to Use* section for more details). The key ecological assets identified for the Northern Inland Bioregion are identified in Northern Inland Overview Figure 1 and their current risk status reported on in the following sections.



NORTHERN INLAND ECOSYSTEM MANAGEMENT FIGURE 1

Component tree showing the ecological assets identified and separately assessed for the Northern Inland Bioregion.

External Drivers

External factors include factors impacting at the bioregional-level that are likely to affect the ecosystem as whole and may not fall within the direct control of Fishery legislation (e.g. climate change). An understanding of these factors, which are typically environmental (e.g. floods and droughts) is necessary to fully assess the performance of the ecological resource. The main external drivers identified with potential to affect the Northern Inland Bioregion include climate and introduced pests and diseases.

Climate

External Drivers	Current Risk Status
Climate	MODERATE

The Northern Inland Bioregion is predicted to have moderate impacts from climate change, especially in the coming decade, compared to more southerly locations.

Introduced Pests and Diseases

External Drivers	Current Risk Status
Introduced Pests	NEGLIGIBLE
Introduced diseases	NEGLIGIBLE

There is currently minimal activity in this region that will generate risks from pests or diseases.

Captured Species

FINFISH

Captured Species	Aquatic zone	Ecological Risk
Native Finfish	Freshwater	LOW

The LASCFC operates throughout Lake Argyle using gillnets to target silver cobbler (*N. midgleyi*). Gillnets have relatively low habitat impacts and fishers actively avoid fishing in areas where the nets may become entangled on submerged vegetation. Therefore, the

Fishery is considered to be a negligible risk to the habitats of Lake Argyle. As silver cobbler is essentially the only retained species, the main impacts of the fishery on the ecosystem are likely to be due to the removal of individuals of this species. The Fishery removes only a small portion of the overall biomass of this species within the lake.

Listed Species

Fish

Listed Species	Aquatic zone	Ecological Risk
Fish	Freshwater	NEGLIGIBLE

The stocks of freshwater fishes are not under threat.

Non-Fish

Listed Species	Aquatic zone	Ecological Risk
Birds and Reptiles	Freshwater	LOW

There is an incidental capture of freshwater or Johnston's crocodiles (*Crocodylus johnstoni*) and some tortoises by the LASCF. Where practicable freshwater crocodiles are released alive, however, there is an incidental mortality of some individuals that do not impact the ongoing sustainability of the species.

Habitats and Ecosystems

Category	Aquatic zone	Current Risk Status
Habitats	Freshwater	NEGLIGIBLE
Ecosystems	Freshwater	NEGLIGIBLE

The Northern Inland Bioregion occurs north of Shark Bay (27° S), from the coast to the Northern Territory borders. Within the Bioregion are a series of freshwater rivers and wetlands. Healthy wetlands and rivers have native fringing vegetation and aquatic plants and provide habitat for birds, frogs, reptiles, native fish and macroinvertebrates.

Lake Argyle, with its large capacity, deep water and rapidly fluctuating water levels, provides a range of habitats not available at the adjacent Lake Kununurra or downstream Ord River. Most of the eastern and southern shoreline of Lake Argyle is bare sediment, with highly variable water levels preventing the establishment of plants. There are areas of emergent sedges (*Eleocharis brassii*), as well as submerged aquatic plants such as *Myriophyllum spp.*, *Najas tenuifolia* and *Potamogeton sp.* However, distribution is limited to localised patches where large weed mats can form. The western and northern shorelines are generally steeper and consist of rock exposed by wave action.

NORTHERN INLAND LAKE ARGYLE FINFISH RESOURCE STATUS REPORT 2017

S. Newman, G. Mitsopoulos and E. Smith

OVERVIEW

The Lake Argyle Silver Cobbler Fishery (LASCF) is the only commercial freshwater fishery in Western Australia. This gillnet fishery is located in the artificially created Lake Argyle in the north-eastern Kimberley and specifically targets silver cobbler (*Neoarius midgleyi*), with catches of barramundi (*Lates calcarifer*) not permitted. A small recreational and

charter boat fishery also operates in Lake Argyle and surrounding waters for silver cobbler and barramundi, with fishing activities peaking during the dry season (winter months).

In addition to the waters of Lake Argyle, recreational anglers can fish in all creeks and tributaries that feed into the Ord River and Lake Argyle.

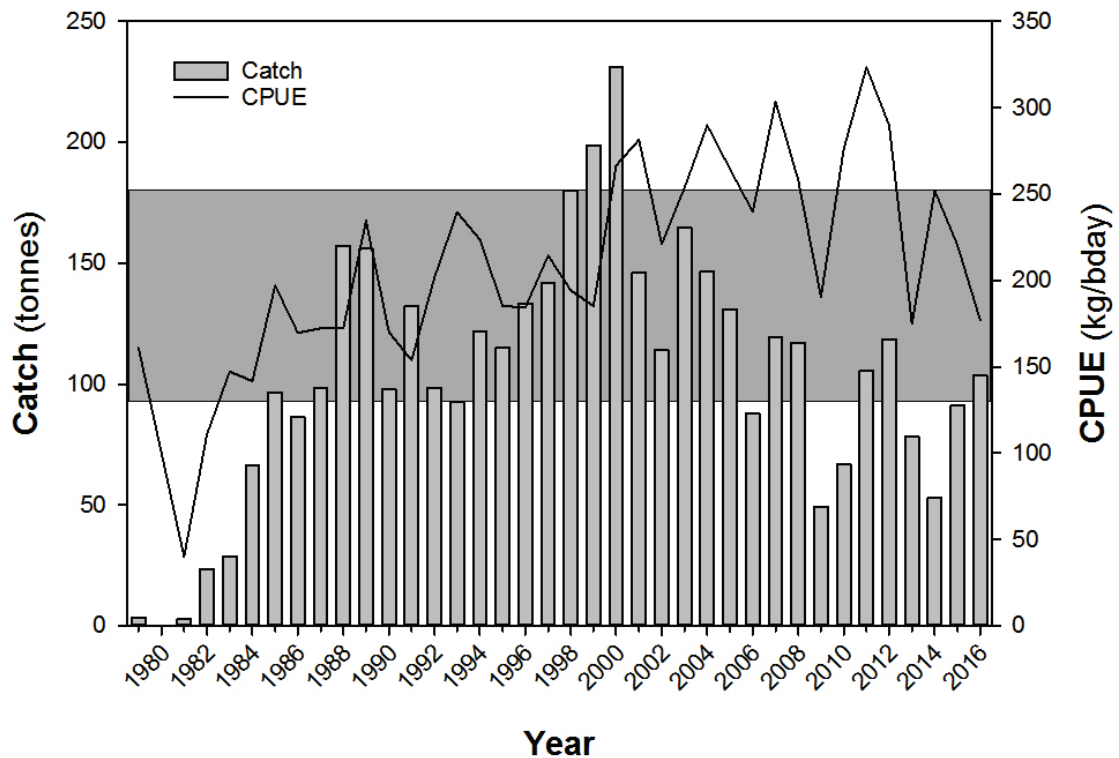
SUMMARY FEATURES 2017

Fishery Performance		Commercial	Recreational
Total Catch 2016		103 t	NA
Fishing Level		Acceptable	Acceptable
Stock/Resource Performance		Stock Status	Assessment Indicators
Northern Inland		Sustainable - Adequate	Annual: Catch, Catch Rate
EBFM Performance			
Asset	Level	Asset	Level
Bycatch	Negligible Risk	Listed Species	Low Risk
Habitat	Negligible Risk	Ecosystem	Negligible Risk
Social	Low Risk	Economic	Level 1 (<\$1 mill)
Governance	Stable	External Drivers	Low Risk

CATCH AND LANDINGS

Following the damming of the Ord River in 1971 and the creation of Lake Argyle, the commercial fishery first developed in 1979 with annual catches of silver cobbler landed up to 1984 being less than 41 t (Lake Argyle Silver Cobbler Figure 1). From 1984 catches increased to reach an historical peak of 231 t in 2000

and then, following reductions in effort, catches steadily declined to a low of <50 t in 2009 (Lake Argyle Silver Cobbler Figure 1). Catches from 2008 to 2016 have fluctuated between 49 t and 119 t. In 2016, the catch of silver cobbler was 103 t.



LAKE ARGYLE SILVER COBBLER FIGURE 1.

The annual catch and catch per unit effort (CPUE, kg/block day) for silver cobbler in the Lake Argyle Silver Cobbler Fishery over the period from 1979 to 2016. The upper and lower bounds of the target commercial catch range are shown by the shaded catch area between 93 and 180 tonnes.

INDICATOR SPECIES ASSESSMENTS AND STOCK STATUS

Northern Inland (Sustainable-Adequate)

Data for assessing the status of the silver cobbler stock in Lake Argyle are derived from the catch and effort returns provided by industry. These data are compiled annually and used as the basis for this assessment. Biological data on the species' specialised reproductive behaviour and low fecundity are used to interpret these assessments. There remains uncertainty around the biological parameters (e.g. longevity, growth rate) for silver cobbler.

The level of catch in the fishery in 2016 is within the acceptable catch range. This level of catch is considered acceptable as the effort in the fishery is relatively low and catch rate is within the historical range. The lower level of catch in the fishery in recent years is likely to have allowed the stock to increase and it is thus considered **sustainable-adequate**.

BYCATCH AND PROTECTED SPECIES INTERACTIONS

As a result of the large mesh size used relative to the species present in the lake, there is minimal fish by-catch in this fishery. **Negligible** risk.

Although Lake Argyle is an artificially-created aquatic environment it is now designated as a wetland of international importance under the Ramsar Convention. There is an incidental capture of freshwater or Johnston's crocodiles (*Crocodylus johnstoni*) and some tortoises by the silver cobbler fishery in Lake Argyle. Where practicable, freshwater crocodiles are released alive and based on the reports by fishers, only low levels of crocodile capture occur and this is considered to be of **low** risk to the stock.

HABITAT AND ECOSYSTEM INTERACTIONS

The gillnets used in this fishery have minimal impact on the habitat. This results in a **negligible risk** to the overall ecosystem from the fishery.

SOCIAL AND ECONOMIC OUTCOMES

Social

During 2016, five vessels fished in the LASC, with an average crew of 1.8 people per vessel, indicating that nine people were directly employed in the fishery, which operates from 1 January to 31 October each year. Additional employment occurs throughout the fish processing and distribution networks. **Low** risk.

Economic

The fishery's score value in 2016 was estimated to be Level 1 (i.e. Risk level – **Low**; Economic value – < \$1 million). There is limited social amenity value for the silver cobbler fishery. There is currently a **low** level of risk to these values.

GOVERNANCE SYSTEM

Annual Catch Tolerance Levels (Acceptable)

The target commercial catch range is calculated based on catch information from 1990 – 1998, a period during which the fishery was stable and levels of exploitation were considered to have been sustainable. The catch range is specified as the values within the minimum and maximum catches observed during the reference period. The target catch range is 93 – 180 t. The level of catch in the fishery in 2016 is within the target acceptable catch range. The catch rate is within the historical range and the lower level of catch in the fishery in recent years is likely to have allowed the stock to increase and it is thus considered **adequate**.

Harvest Strategy

The harvest strategy for silver cobbler in the Lake Argyle Silver Cobbler Fishery in the Northern Inland Bioregion of Western Australia is based on a constant commercial catch policy where the annual commercial catches of silver cobbler are allowed to vary within the target catch range.

Compliance

A licence condition restricts the net type permitted, with fishers permitted to use no more than 1,500 m of set nets at any one time. These nets must have a minimum mesh size of 159 mm and maximum net drop of 30 meshes.

The management arrangements for the fishery are contained in the *Prohibition on Commercial Fishing (Lake Argyle) Order 2012*. The six Fishing Boat Licences listed are prohibited from taking any fish by means of nets during the period from 1 November to 31 December in any year. This seasonal closure is aimed at protecting silver cobbler during the spawning

season. Additionally, at this time of the year water temperatures in the lake are high and would cause spoilage of fish in the nets. Commercial operators in the LASCFC are not permitted to take barramundi at any time and all nets used by LASCFC fishers must be suitably marked with licence identification.

Consultation

The Fisheries Division of the Department of Primary Industries and Regional Development (Fisheries) undertakes consultation directly with licensees on operational issues. Industry Management Meetings are convened by the West Australian Fishing Industry Council (WAFIC), who are also responsible for statutory management plan consultation under a Service Level Agreement with Fisheries. Consultation processes for the recreational fishing sector are facilitated by Recfishwest under a Service Level Agreement, although Fisheries undertakes direct consultation with the community on specific issues.

Consultation with non-fisher stakeholders is undertaken in accordance with the Department's Stakeholder Engagement Guidelines.

Management Initiatives (Stable)

The next management review for the Fishery is scheduled for 2018/2019.

EXTERNAL DRIVERS

A number of external factors may impact on silver cobbler biomass. These include the introduced cane toad (*Rhinella marina*) which has been observed in Lake Argyle and may affect prey and predators of silver cobbler.

The population of the freshwater crocodile (*Crocodylus johnstoni*) has increased and is likely to impact silver cobbler biomass in the form of predation and competition for food. The external drivers pose a **low** risk to the stock.