

Policy for the Management of the South Australian Commercial Miscellaneous Dive Fishing Activities

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1 Purpose and scope of this policy

The purpose of this policy is to provide guidance as to how PIRSA will manage fishing activities by diving for a range of species. The activities in this policy are collectively referred to as miscellaneous dive fishing activities.

This policy applies to the commercial harvest of some species of scallops, sea urchins, turbo, native oysters, as well as several families of specimen shells (Appendix A1). Harvesting includes the removal, clearance or disturbance of these resources. In future, this policy may apply to other species if appropriate. This policy does not apply to the commercial harvest of abalone species. The South Australian Abalone Fishery is covered under the *Management Plan for the South Australian Commercial Abalone Fishery* (PIRSA 2012).

The activity to which this policy applies includes the harvest using underwater dive equipment including hookah, SCUBA and/or snorkelling gear. Divers may use hand-held implements to aid collection, remote operated underwater vehicles and shark cages.

The area of the activities covered under this policy includes all marine waters of South Australia except within Aquatic Reserves, Marine Park sanctuary zones or restricted access zones (unless otherwise authorised under the *Marine Parks Act 2007*) and waters seaward of the line of Mean High Water Springs to a depth of 2 m, and if those waters extend past the low water mark, not waters landward beyond the low water mark line.

This policy applies to miscellaneous dive fishing activities currently conducted under specific Miscellaneous Fishery licences that allow for this activity or in the future under Exploratory or Developmental Permits. If the activity described in this policy are conducted under a fishing permit in the future, the policy would only apply to that activity for the period that the permit is in force.

This policy does not apply to broodstock and seedstock collection. Broodstock and seedstock collection is the taking of aquatic resources or part of resources for the purposes of commercial aquaculture. If the species is part of an existing commercial fishery, broodstock and seedstock collection activities will be considered through a permit system under the *Fisheries Management Act 2007*.

Stock enhancement to improve fishery performance is considered under the *Policy for the Release of Aquatic Resources* released by PIRSA in 2015 and is not covered under the miscellaneous dive fishing activities policy.

2 Review

This policy may be reviewed any time if new ideas or initiatives become available.

3 Description of the fishing activities

Miscellaneous dive fishing activities are not formally identified as a discrete fishery under the *Fisheries Management Act 2007*. Rather the activity forms part of the broader Miscellaneous Fishery, noting that some species including, native oysters and scallops, are also included as prescribed species in the Marine Scalefish Fishery. Miscellaneous dive fishing activities are mainly regulated under the:

- *Fisheries Management (Miscellaneous Fishery) Regulations 2015*
- *Fisheries Management (General) Regulations 2017*

Commercial fishers undertaking miscellaneous dive fishing activities may hold a Miscellaneous Fishery licence granted under *Fisheries Management (Miscellaneous Fishery) Regulations 2015*. Historically, some commercial fishing using diving activities has been undertaken under a Ministerial exemption under section 115 of the *Fisheries Management Act 2007*. At the time of developing this policy there were four Miscellaneous Fishery licences and two Ministerial exemptions issued in South Australia for the commercial harvest of species by dive fishing activities. At the time of developing this policy, PIRSA was considering a number of applications for Exploratory and Developmental fishing permits related to miscellaneous dive fishing activities.

Miscellaneous dive fishing activities are currently used to harvest sea urchins, scallops, turbo, specimen shells and native oysters using underwater SCUBA, hookah and/or snorkeling gear. Fishers may be assisted by hand held implements and may use shark cages that provide protection from sharks whilst diving consistent with those used in the Abalone Fishery. Remote operated underwater vehicles may be used in the future to assist with collection.

The area of activity across all species considered in this policy includes marine waters adjacent to the South Australian coast from the Victorian Border to the Western Australian Border except within Aquatic Reserves, Marine Park sanctuary zones or restricted access zones (unless otherwise authorised under the *Marine Parks Act 2007*) and waters seaward of the line of Mean High Water Springs to a depth of 2 m, and if those waters extend past the low water mark, not waters landward beyond the low water mark line.

Due to the diverse nature of the dive fishing activities there are currently a range of management arrangements in place, predominately as licence or exemption conditions. Management arrangements include total allowable catch, spatial restrictions, gear restrictions and a limit on the number of agents allowed to fish at any one time. Reporting of catch and effort is required. More details about the current management arrangements are provided at Section 7.

3.1 Commercial fisheries

PIRSA Fisheries and Aquaculture regularly monitors catch and effort of miscellaneous dive fishing activities through mandatory reporting. However, due to the limited number of commercial fishers harvesting each species or species group, publication of catch and effort information is often not possible due to the confidentiality requirements outlined in section 124 of the *Fisheries Management Act 2007*.

Scallops

Commercial fishing for scallops is at a small-scale with low volumes of harvest of two species, commercial scallop (*Pecten fumatus* also known as king scallop) and queen scallop (*Chlamys bifrons*).

Commercial fishing for scallops has occurred since the 1970s with high variation in total catch and catch rate since commencement. There are currently three Miscellaneous Fishery licence holders that are permitted to hand-collect scallops while diving. Licence holders are permitted to harvest scallops in all waters of South Australia except for Coffin Bay. Marine Scalefish Fishery licence holders are also permitted to harvest scallops but not by diving; hence, they have little capacity to commercially harvest this species. The use of scallop dredges is prohibited in South Australia.

Annual commercial catch of scallops in South Australia have fluctuated greatly since the activity began, mainly driven by changes in participation rates of fishers. A minimum legal size of 6.5cm is in place for both the recreational and commercial fishery. There are no output controls for commercial harvest of scallops.

Sea urchins

Sea urchins are harvested for their roe which can constitute up to 10% of their body weight. Roe is considered a delicacy in many countries and can demand high prices.

There are extensive sea urchin stocks found in Australia; however, only three species (*Heliocidaris erythrogramma*, *Centrostephanus rodgersii* and *H. tuberculata*) have been commercially harvested due to variation in roe quality (colour and texture) and recovery rate. In South Australia, the only species currently harvested commercially is the purple sea urchin (*H. erythrogramma*).

Commercial harvest of sea urchins in South Australia developed in the late 1990s. Total catch of sea urchins in South Australia has fluctuated greatly over the period since the activity began (Ivey et al. 2013). Currently there are three Miscellaneous Fishery licences that allow for sea urchin harvest. Licence holders are permitted to harvest sea urchins in all waters of South Australia.

Harvest of sea urchins in South Australia usually operates prior to the spawning season between May and December when the quality of roe is optimal (Ivey et al. 2013). Harvesting of sea urchins is undertaken by hand by divers operating from small vessels in inshore waters. Urchins are transported live to Adelaide where they are processed. Harvesters remove approximately 40% of any sea urchins from an area (Ivey et al. 2013). There are no size limits or output controls for the sea urchins at the time this policy was developed.

Turbo

Commercial harvest of turbo in South Australia targets turbo (*Turbo undulatus*), a gastropod snail. The product is sold domestically as well as some being exported to overseas markets. Harvest of turbo is currently undertaken all year round. The turbo catch from South Australia has grown since inception in 2000 to 2009 as has catch rates (Ivey et al. 2013). Catch, effort and catch rate has remained fairly stable since 2010 (based on SARDI confidential data).

The commercial harvest of turbo is currently permitted through exemptions provided to a limited number of fishers. Conditions on the exemptions limit fishing to hand collection with total allowable catches provided to individual fishers. At the time of developing this policy PIRSA was considering applications for Exploratory or Developmental Permits for the harvest of turbo.

Specimen Shells

Commercial harvest of specimen shells is based on the capture of multiple species from the following families: Cassidae, Olividae, Spondylidae, Cardiidae, Mactridae, Conidae, Solenidae, Clavagellidae, Carditidae, Marginellidae, Cypraeidae, Cymatiidae, Chitonidae, Naticidae, Neritidae, Harpidae, Turridae, Nassaridae, Columbidae, Patellidae, Volutidae, Vasidae, Eulimidae, Muricidae, Scalidae, Fasciolaridae, Phasianellidae, Buccinidae, Acmaeidae, Fissurellidae, Siphonariidae, Mitridae, Cancellariidae, Liotidae, Tellinidae, Thaididae, Triviidae, Trochidae and Veneridae.

Specimen shells are harvested by hand whilst diving to minimise the potential for damage and thereby maintaining the value of the shells, or on beaches as beach-washed shells.

There were no licences that provide for harvest of specimen shells at the time of developing this policy. The harvest of specimen shells was previously permitted for up to four fishers with Miscellaneous Fishery licences prior to 1988, however in the 1990's interest in the fishery diminished and licences were surrendered. In 2004 only one licence remained and this licence was surrendered by the licence holder in 2013. At the time of developing this policy PIRSA was considering an application for Exploratory or

Developmental Permit for the harvest of specimen shells, this application included the use of remote operated underwater vehicles to collect specimen shells.

Native Oyster

The Australian native oyster (*Ostrea angasi*) is closely related to the European edible oyster (*O. edulis*) and is currently being developed as an aquaculture species in Australia. This species was once harvested in large numbers in South Australia (Edgar 2008).

There is one licensed fisher permitted to take native oysters by diving by hand. Management arrangements include setting a total allowable catch for the individual operator. This licence holder is able to operate in all waters of South Australia except for Boston Bay and Proper Bay. At the time of preparing this policy, habitat enhancement involving native oysters on artificial reefs in north-western Gulf St. Vincent was in development. Following construction of the reef, arrangements for commercial fishing of native oysters in that area may change.

3.2 Recreational fishing

Recreational fishing for aquatic resources using underwater SCUBA equipment or snorkeling, except for abalone is relatively limited. In 2013/14 the reported harvest of scallops by recreational fishers was 11.42 tonnes (Giri and Hall 2015) representing a 68% increase from the previous recreational fishing survey in 2007/08 (7.8 tonnes, Jones 2009). No other species relevant to this policy are reported as harvested in 2013/14 by recreational fishers (Giri and Hall 2015).

Diving was reported to be the method of collection on 1.7% of recreational fisher days (Giri and Hall 2015) noting that this effort would include recreational fishing for abalone and is therefore not representative of the proportion of recreational fishing effort relevant to this policy.

3.3 Aboriginal Traditional Fishing

Aboriginal People have fished the coastal waters of South Australia since long before European settlement (Cann et al. 1991). Archaeological evidence and oral history collected from the Yorke Peninsula suggests that a variety of gastropods were collected including turbo, periwinkle and abalone (Egloff et al. 1989, Fowler 2015). Any further information on Aboriginal traditional harvest of any species included in this policy that becomes available in the future will be included in reviews of the policy.

The *Native Title Act 1993* (Cth) provides the legislative recognition of native title rights for traditional fishers for hunting, fishing, and gathering for the purpose of satisfying their personal, domestic or non-commercial communal needs.

The South Australian *Fisheries Management Act 2007* recognises Aboriginal traditional fishing as a separate and unique fishing sector alongside commercial and recreational fishing. Under the Act, the Minister and a Native Title Group that is party to an Indigenous Land Use Agreement (ILUA) may make an Aboriginal traditional fishing management plan under the ILUA for the management of specified Aboriginal traditional fishing activities in a specified area of waters.

4 Biology of key species

Scallops

Scallops are filter-feeding bivalves that lie unattached to the seabed. Commercial scallops are distributed from New South Wales across southern waters to the west coast of Western Australia including Tasmania. They are found in discrete beds to depths of at least 120 m over bare, soft sand or mud (Kailola et al. 1993). Although they can swim actively, adults are generally sedentary. Scallops are preyed upon by sea stars, whelk and octopus. In South Australia, predation of scallops is predominately by the many-armed

sea star, tulip and spindle shells, and spider crabs (Mark Johnson pers comm. in Ivey et al. 2013).

The size at maturity for commercial scallops is 12-18 months (Sause et al. 1987), with spawning occurring from late June to September (Shepherd 1988). Spawning for queen scallops was reported to occur between spring and autumn with multiple localised events reported (Styan and Butler 2003).

Commercial scallops are broadcast spawners with external fertilisation in the water column. Larvae are planktonic for 2-4 weeks depending on the species, settling on algae or shell substrate. Due to variation in the intensity of spawning and in oceanographic events the success of settlement is highly variable temporally and spatially. This variation results in large fluctuations in annual abundance and catch (Shepherd 1988).

In Tasmania commercial scallops are estimated to have a life span of up to 16 years with the majority being between 5-12 years (Fairbridge 1953).

Sea urchins

Purple sea urchin are found along the southern Australian coast from Shark Bay in Western Australia to southern Queensland, inhabiting intertidal rocky reefs to depths of 35 m (Edgar 2008). In South Australia they are often found on rocks and crevices on shallow, subtidal reefs (Connolly 1986) and are often found associated with Greenlip Abalone (Keesing 2007), moving at night to favourable feeding sites.

Sea urchins feed by grazing on filamentous and encrusting algae found on substrate or can capture drift algae (Connolly 1986). In southern Australia sea urchins are considered the dominant herbivore (Lawrence 2001). The effects of overgrazing by urchins resulting in the formation of urchin 'barrens' has been well documented (Valentine and Johnson 2005) however are uncommon in South Australia.

Size and age estimates for sea urchins is difficult as the size of urchins may change with food availability (Constable 1989). Size at maturity of purple sea urchin has been reported to differ among locations. Constable (1989) reported a size at maturity of 25-30 mm and age of 2 years while Sanderson et al. (1996) reported the age at maturity at 5-10 years.

Spawning usually occurs in early summer to late autumn with high water temperature. Sea urchins are broadcast spawners with eggs and sperm released into the water column triggered by environmental cues. The fertilised eggs are large and buoyant developing into non-feeding larvae. The success of fertilisation has been shown to be highly correlated to the distance between female and male urchins at the time of spawning (Lawrence 2001); therefore any depletion of urchin abundance may limit reproductive success through reduced fertilisation rates.

Turbo

Turbo are distributed in southern waters from New South Wales to Hopetown in Western Australia including Tasmania. (Kailola et al. 1993). Turbo are associated with algal species including the kelp *Eklonia radiata* (Clarkson and Shepherd 1985) for food and for habitat (in the case of the coralline algae *Corallina officinalis*) (Underwood and Chapman 1995).

There is little available biological information on turbo, although a closely related snail *T. torquatus* spawns twice a year (Ward and Davis 2002). Turbos are broadcast spawners with a likely larval period of around five days, as is the case for other species of this group (S Shepherd pers comm. reported in Ivey et al. 2013).

Specimen Shells

Due to the wide range of species that may be considered to be specimen shells it is difficult to provide information on biology for all of them. Baker (2011) noted that hundreds of species of gastropod snails occur in South Australia found in intertidal, subtidal and upper shelf waters. Biological information about the three key species for the fishery including black cowrie, *Cypraea friendii*, *Voluta undulata*, *Umbilia armeniaca* and *Cypraea marginata*, are provided here.

The black cowrie shell in South Australia is considered to be an isolated sub-species of the *friendii*-complex (Wilson 1993) and is highly sought after. Due to the geographic isolation of this species and population characteristics, the South Australian stock may be considered vulnerable to fishing pressure (Ponder and Grayson 1998). Baker (2011) and Baker et al. (2015) reported this species as being recorded from reefs across South Australia over a broad depth range. Ponder and Grayson (1998) reported widespread distribution throughout the state. Baker (2011) noted that over collection in some easily accessible areas was apparent.

Voluta undulata (amoria) occurs from southern Queensland to Tasmania, including South Australia. It can be found in sublittoral and intertidal waters (Wilson 1993). This species is the most common species targeted by commercial fishers, although of relatively low value.

Cypraea marginata is a white, brown spotted ovate cowrie distributed from central South Australia to Monte Bello Island in Western Australia. This species grows to approximately 70 mm and inhabits recesses of underwater caves from 5-200 m (Wilson 1993). The shell is common in South Australian waters and has a relatively high market value.

Umbilia armeniaca ranges from the Kangaroo Is to Rottnest Is in Western Australia over a broad depth range. It is highly valued in the shell trade and considered potentially vulnerable by Baker (2011) due to biological traits and commercial value.

Several other species of specimen shells have been identified as occurring in South Australian waters and having a medium risk from the fishery related to their biology and market value based on risk rating criteria described in Ponder and Grayson (1998) (Baker 2011). These include *Cypraea (Austrocypraea) reevei*, *Melo (Melcorona) miltonis*, *Nannamoria guntheri*, *Paramoria johnclarki*, *Austroharpa (Palamharpa) punctate*.

Native Oyster

Native oysters are distributed between New South Wales through to Fremantle in Western Australian including Tasmania, attached to hard substrate or free living in silt and mud from 1-30 m (Edgar 2008). Native oysters brood eggs in the body releasing eggs after they have developed to the first stage. This species grows to around 100-180 mm.

4.1 Economic characteristics

Due to the limited size and diverse nature of miscellaneous commercial dive fishing activities, details about the economic characteristics of these activities are limited, and are not able to be published consistent with confidentiality requirements set out in section 124 of the *Fisheries Management Act 2007*.

5 Environment

The species included in this policy are found in waters throughout South Australia from intertidal, subtidal and shelf waters. They inhabit rocky reefs, seagrass beds, soft sand and mud. They may be dominant herbivores (e.g. sea urchins) or primary prey species for high order predators (e.g. scallops and turbo). Other species are filter feeders that are important for water quality (e.g. native oysters).

The southern Australian continental shelf is storm-dominated with high (>2.5 m) modal deep-water wave heights. Winds are predominantly south-easterly during summer and north-westerly during winter (Middleton and Platov 2003). During summer, currents flow westward along the coast of the eastern Great Australian Bight and eastward over the shelf break (Herzfield and Tomczak 1997; Evans and Middleton 1998; Herzfield and Tomczak 1999). The Flinders Current (Bye 1972) flows from east to west along the continental slope, and is the source of cold, nutrient rich water that upwells onto the continental shelf from depths of around 600 m. In summer, south-easterly winds transport warm surface water offshore and cold, nutrient rich water is upwelled from below (Middleton and Platov 2003). During winter, the atmospheric

cooling and predominantly westerly winds lead to the formation of cold, salty dense water within the Gulfs and along the coast that is downwelled to depths of approximately 250 m (Middleton and Bye 2007). This downwelling and wind-mixing leads to water over the continental shelf that is vertically homogeneous, well mixed and characterised by low nutrient levels, high salinities and medium temperatures of ~17°C. The westerly winds also lead to the formation of an eastward coastal current along the shelf break from Cape Leeuwin to the east coast of Tasmania (Cirano and Middleton 2004).

5.1 Ecologically sustainable development risk assessment

The ecological impacts associated with miscellaneous commercial dive fishing activities were identified in consultation with key stakeholders and assessed through the process of conducting an ecologically sustainable development (ESD) risk assessment using the method described by Fletcher et al. (2002).

All the ecological, economic and social factors that affect the management of the activity were prioritised by stakeholders at a workshop on 30 July 2014 from Negligible to High risk. The outcomes of the ESD risk assessment has informed development of strategies for achieving the objectives described in Table 1. Full details about the risks identified for miscellaneous commercial dive fishing activities are provided in the report from the risk assessment *Ecologically Sustainable Development Risk Assessment of Miscellaneous Dive Fishing Activities* (PIRSA 2017).

The general outcomes of the risk assessment noted that hand collection of aquatic resources is a benign harvest technique that is highly selective for the target species with low levels of impacts on the habitat or by-catch. It is also generally considered that the levels of catch and effort utilising miscellaneous commercial dive fishing activities are low relative to the total populations of the target species.

A total of 19 risks with a rating of medium or higher were identified for miscellaneous commercial dive fishing activities (Table 3). One high risk was identified related to harvest of scallops. Medium risk was identified related to the harvest of turbo and specimen shells, with the majority of medium risks being related to general community issues and future changes in the biophysical environment and its impact.

Where medium or high risks were identified management responses have been implemented to mitigate the risk and manage it within acceptable levels of risk. The management strategies implemented for the activities that address these risks are described Table 1.

6 Objectives, goals and strategies

This policy set out management goals and objectives for miscellaneous commercial dive fishing activities that are complementary to the objects outlined in the *Fisheries Management Act 2007*.

The goals and objectives seek to ensure that there is an appropriate balance between the need for long term sustainability of the aquatic resource harvested and both economic and social factors such as the optimum utilisation and equitable distribution of the resource between stakeholder groups and future generations.

The following broad goals are identified for the South Australian miscellaneous commercial dive fishing activities.

Goal 1 – Aquatic resources harvested by commercial dive fishing activities are at ecologically sustainable levels

Goal 2 – Optimum utilisation and equitable distribution between stakeholders of the aquatic resources harvested by commercial dive fishing activities

Goal 3 – Fishery impacts on aquatic habitats and ecosystems are at sustainable levels.

Goal 4 – Enable effective and participative management of the activity

Table 1: Goals, Objectives and strategies for miscellaneous commercial dive fishing activities

Objective	Strategies	ESD risk addressed	Performance indicator	Description	Trigger point
Goal 1: Aquatic resources harvested by commercial dive fishing activities are at ecologically sustainable levels					
1a Aquatic resources harvested by commercial dive fishing activities are at ecologically sustainable levels	1ai. Harvest strategies for species and/or species groups adhered to 1aii. Defined harvest area, e.g. zoning 1aiii. Defined harvest levels for species groups or individual species, e.g. individual catch limit, total allowable commercial catch, daily catch limit 1aiv. Harvest restricted to hand collection assisted by hand held implements or with a remote operated underwater vehicles 1av. Controls on number of licences/permits 1avi. Size limits where appropriate 1avii. Restriction on collection of specimen shells with egg masses or depositing eggs	Impacts on target species including scallops, turbo, specimen shells, sea urchins and native oysters	Total catch of species groups and/or individual species	Total catch of species groups and/or individual species reported in periodic returns reviewed annually	Performance indicators described in Table 2 for each species or species group collected by miscellaneous commercial dive fishing activities are above trigger reference points in each season.
1b: Sufficient information is collected to manage the commercial harvest to sustainable levels.	1. Fishery-dependent information is collected through commercial harvest and effort logbooks (periodic returns).	Governance Community Stewards	Provision of periodic returns	Spatial and temporal catch and effort (diver days) data provided by all commercial operators for each day fished in periodic returns.	Total catch and effort (diver days) by miscellaneous commercial dive fishing activities are reported and monitored.
Goal 2: Optimum utilisation and equitable distribution between stakeholders of the aquatic resources harvested by commercial dive fishing activities					
2a Miscellaneous commercial dive fishing activities can operate efficiently without compromising sustainability objectives	2ai. Management arrangements allows for commercial activities that take into account sustainability objectives and operational efficiency	Economics	Number of diver days annually conducting miscellaneous dive fishing activities Number of diver days for individual species or species groups	Diver days as recorded in periodic returns.	Some level of commercial effort in miscellaneous commercial dive fishing activities is conducted each year.
2b Miscellaneous commercial	2aii. Management arrangements allows for	Community	Access to all extractive users for		Access to extractive users

Objective	Strategies	ESD risk addressed	Performance indicator	Description	Trigger point
dive fishing activities can be equitably accessed by stakeholder groups.	sustainable access to all extractive users for species by dive fishing activities.	Access security	species by dive fishing activities		to species by miscellaneous commercial dive fishing activities is maintained.
Objective	Strategies	ESD risk addressed	Performance indicator	Description	Reference point
Goal 3: Fishery impacts on aquatic habitats and ecosystems are at sustainable levels.					
3a The impacts of miscellaneous commercial dive fishing activities on the environment are sustainable	3bi. Defined harvest limits for species groups or individual species, eg individual catch limits, total allowable commercial catch, daily catch limits 3bii. Harvest restricted to hand collection assisted by hand held implements or with a remotely operated underwater vehicles 3biii. Prohibition of harvest on intertidal rocky reefs	General Environment	Total catch of species groups and/or individual species Number of diver days for individual species or species groups	Total catch and effort (diver days) of species groups and/or individual species reported in periodic returns	Total catch of species or species groups is within harvest levels if set. Number of diver days of miscellaneous commercial dive fishing activities is not more than 150% that of the previous year for two consecutive years.

Goal 4: Enable effective and participative management of the activity.					
Objective	Strategies	ESD risk addressed	Performance indicator	Description	Reference point
4a Management arrangements for miscellaneous commercial dive fishing activities support cohesion and connectedness between commercial operators and wider community.	<p>4ai. Stakeholder input to the management of miscellaneous commercial dive fishing activities, through consultative processes</p> <p>4aii. Arrangements are communicated to the wider community</p>	<p>Governance – Government</p> <p>External factors affecting fishery - Access</p>	<p>Management information is available on PIRSA website.</p>	<p>Information related to management of the activity is correct and relevant on PIRSA website.</p>	<p>PIRSA website information is updated as required.</p>
4b Stewardship of miscellaneous commercial dive fishing activities is maximised.	<p>4bi. Cost-effective compliance and monitoring program implemented to address identified risks</p> <p>4bii. Management arrangements are communicated to the wider community</p>	<p>Governance</p>	<p>Number of prosecutions.</p> <p>Management information is available on PIRSA website.</p>	<p>Number of prosecutions related to miscellaneous commercial dive fishing activities</p> <p>Information related to management of the activity is correct and relevant on PIRSA website.</p>	<p>Number of prosecutions over three years does not increase significantly.</p> <p>PIRSA website information is updated as required.</p>

7 Management arrangements

Currently regulations that govern the management of miscellaneous commercial dive fishing activities are established in the *Fisheries Management (Miscellaneous Fishery) Regulations 2015*, the *Fisheries Management Act 2007* and the *Fisheries Management (General) Regulations 2017*. In the future, exploratory and developmental fishery permits related to miscellaneous dive fishing activities may be granted. These fishing permits will be governed through the *Fisheries Management (Miscellaneous Developmental Fishery) Regulations 2013*.

A set of conditions are listed on each fishing licence or permit that describe the management arrangements specific to that licence or permit.

The following management arrangements for the harvest of aquatic resources (other than abalone) that include commercial dive fishing activities may include, but are not limited to the following:

Harvest Strategies

- Harvest strategies developed for each species/species group have been developed to ensure the objectives, including sustainable harvest of aquatic resources are met.
- Trigger reference levels identified in harvest strategies for scallops, turbo and specimen shells to addresses risks identified in the ESD risk assessment.

Area of Harvest

- Licence/permit holders will have a set of defined areas from which they may operate.
- The area of operation will exclude Aquatic Reserves, Marine Park sanctuary zones or restricted access zones (unless otherwise authorised under the *Marine Parks Act 2007*) and waters seaward of the line of Mean High Water Springs to a depth of 2 m, and if those waters extend past the low water mark, not waters landward beyond the low water mark line.
- Closed areas may be identified for a part of the activity or for all miscellaneous commercial dive fishing activities as a whole, or for individual species/species groups. A restriction on commercial harvest of scallops in Coffin Bay is in place to address the high risk identified for this species in the ESD risk assessment.

Harvesting activities

- The licence/permit holder may only harvest defined species pursuant to their licence/permit. The defined species that may be harvested will be listed on the licence/permit.
- The harvest of specimen shells from egg masses and of those depositing eggs will be prohibited to address medium risks identified in the ESD risk assessment.
- Total allowable commercial catch, catch limits or daily catch limits may be applied over one or more licences/permits for a species group or individual species. The time period that applies to the catch limits will be defined on the licence/permit. Commercial catch levels for individual fishers set for the turbo and specimen shell address medium risks identified in the ESD risk assessment.
- Minimum or maximum legal size limits may be applied to individual species or species groups.

Gear

- Harvest will be restricted to collection by hand, assisted by hand held implements or by remote operated underwater vehicles (ROVs). ROVs are unmanned, underwater mobile device that are controlled by an operator remotely and may be fitted with manipulator arms for collection of samples.

Closures

- Seasonal closures over the whole area of the activity, or part of the activity may be implemented.

Fishing Season

- The fishing season will generally be for twelve months from 1 July unless otherwise described in licence/permit conditions.

Reporting

- Licence/permit holders may be required to submit catch disposal records on landing of catch at the end of a fishing trip.
- All licence/permit holders will be required to submit a periodic return recording the daily catch and harvest activities in respect of each calendar month within 15 days of the end of the month to which it relates.
- All licence/permit holders are required to complete records of any interactions with threatened, endangered or protected species in the Wildlife Interaction Logbook.
- Or as directed by the Minister.

8 Research and monitoring

Research and monitoring activities related to miscellaneous commercial dive fishing activities will be appropriate to the level of harvest and/or effort for individual species/species groups. The following research priorities have been identified for miscellaneous commercial dive fishing activities:

- Growth, ageing, settlement, recruitment and reproductive periodicity for sea urchins.
- Inter-annual variability of spatial distribution and biomass of scallops.
- Age and size-at-first-maturity of turbo to determine biologically appropriate size limits.
- Distribution, growth and biomass of turbo in South Australia to refine setting of catch limits.
- Distribution, abundance, growth and reproduction data for most species of specimen shells.

9 Harvest strategy

A harvest strategy is a framework that specifies pre-determined actions in a fishery for defined species (at the stock or management unit level) necessary to achieve the agreed ecological, economic and social management objectives (PIRSA 2015).

The harvest strategy for miscellaneous commercial dive fishing activities broadly outlines the objectives, performance indicators and decision rules for the activity encompassing all species harvested within it. It is acknowledged that the elements of this harvest strategy are broad to ensure that the decision rule outcomes are adequate over the range of species characteristics without unnecessarily constraining the activity. It is also acknowledged that there is a level of uncertainty around the risk profile of the performance indicators. In the case of this activity with low numbers of fishers, low levels of catch and effort and the benign method of harvest, it is considered that in the current conditions, the risk of overfishing of any species is considered to be low.

9.1 Objectives

The broad biological objectives described in section 6 are to:

1. Aquatic resources harvested by commercial dive fishing activities are at ecologically sustainable levels
2. Fishery impacts on aquatic habitats and ecosystems are at sustainable levels.

The operational objective for miscellaneous commercial dive fishing activities is:

Performance indicators for individual species or species groups are above their relevant trigger reference points in each season.

9.2 Performance indicators

Performance indicators are measurable information that can be used to track changes in the fish stocks harvested by miscellaneous commercial dive fishing activities with respect to the objectives identified.

Performance indicators identified for the activity have been derived from considering historical fishery-dependent statistics for individual species/species groups as the only information available. These data are highly variable over all aspects considered. This variability is likely due to recruitment levels, environmental impacts, markets and levels of effort in miscellaneous commercial dive fishing activities. This variability makes it difficult to appropriately identify performance indicators, and appropriate reference levels for individual species.

The performance indicators and their reference levels have been identified in consideration of the size of the activity, level of risk of overfishing at the current level of fishing pressure, potential risks to individual species, as well as the amount of information available.

Sea Urchin: Annual average CPUE (kg/diver day) and total catch from periodic returns provided by fishers.

Scallops: Annual average CPUE (kg/diver day) and total catch from periodic returns provided by fishers

Turbo: Annual average CPUE (kg/diver day) and total annual catch from periodic returns provided by fishers

Other Species: Total catch and effort reported in periodic returns provided by fishers

9.3 Reference levels

Reference levels are benchmark levels of the performance indicators. In this policy only trigger points are identified.

A trigger reference point is set at a level of the performance indicator where a change in management arrangements will be considered or adopted to avoid an aquatic resource becoming overfished.

Scallops

Reference levels for scallops are complex as recruitment of this species is highly influenced by environmental conditions and is episodic. Historical records include years of very low (or no) catch possibly due to recruitment levels. In these years low CPUE may not be due to the effects of fishing pressure.

It is considered appropriate that a conservative level of CPUE in years where catch is reasonable (>10 tonnes) is an appropriate trigger reference point. A conservative trigger limit is considered to be appropriate to adequately account for high risk identified for this species in the ESD risk assessment (Table 4). The trigger reference level reflects a lower level of CPUE at a stable total catch level recorded for harvest of this species from 2009 to 2012. A CPUE level of 125 kg/day in years when total catch was >10 tonnes is proposed as a trigger reference point.

To monitor risk of localized depletion at a finer scale, a reference level of total catch in an individual MFA increases by >150% from one year to the next in two consecutive years.

Sea Urchin

There is no catch limit implemented for sea urchin. Trends in historic catch, effort and CPUE have been consistent. It is considered appropriate that a conservative upper level of CPUE in years where catch is reasonable is an appropriate trigger reference point to monitor performance of the activity. A conservative trigger limit is considered to be appropriate to adequately account for potential risk of localised depletion for this species due to their density dependent reproductive strategy. A CPUE level of 125 kg/day in years when total catch was >5 tonnes is proposed as a trigger reference point.

To monitor risk of localized depletion at a finer scale, a reference level of total catch in an individual MFA increases by >150% from one year to the next in two consecutive years.

Turbo

There is catch limit in place for individual fishers fishing for turbo (currently through conditions on Ministerial exemptions). A reference level of 50 kg/day is indicative of the CPUE over the period 2001 – 2009 being a period of low catch prior to an extended period of increasing catch rate and harvest.

To monitor risk of localized depletion at a finer scale, a reference level of total catch in an individual MFA increases by >150% from one year to the next in two consecutive years where fishing has occurred in that MFA for at least the previous four years.

Other species

For other species harvested by miscellaneous commercial dive fishing activities (other than abalone) where there is a paucity of data over moderate timeframes, it is difficult to appropriately set reference levels. The performance indicators and reference levels are therefore set to ensure that individual species are monitored appropriately and a management response by way of a review of the activity will be implemented if required.

Table 2: Trigger reference points for individual species in miscellaneous commercial dive fishing activities

Performance Indicator	Trigger Reference Point
Scallops	CPUE (kg/day) <125kg/diver day AND catch >10 tonnes in any season OR Total catch (kg) in an individual MFA increases >150% from one year to the next in two consecutive years.
Sea Urchin	CPUE (kg/day) <125kg/diver day AND catch >5 tonnes in any season OR Total catch (kg) in an individual MFA increases >150% from one year to the next in two consecutive years.
Turbo	CPUE (kg/day) <50kg/diver day in any season OR Total catch (kg) in an individual MFA increases >150% from one year to the next in two consecutive years where fishing has occurred in that MFA for at least the previous four years.
Other Species	Total catch increases significantly Total effort decreases significantly

9.4 Decision rules

If the trigger reference level is reached, PIRSA will review any information available for the relevant species/species groups. The review will be conducted within 12 months in consultation with relevant key stakeholders, such as (but not limited to) licence holders, Conservation Council SA and other government departments where appropriate and necessary. The review should consider (but not be limited to) any external factors such as market fluctuations, environmental conditions that may have impacted on the activity that is not related to stock abundance, fishery-dependent data, and any other relevant factual information. Following the outcomes of this review, additional management arrangements may be considered for implementation within 18 months of the review being initiated. The arrangements may include (but not limited to):

- Changes to total allowable commercial catch or individual catch limits
- Effort controls
- Gear controls (the use of hand held implements or remotely operated underwater vehicles)
- Temporal or spatial closures
- Moratoria on the take of individual species/species groups
- Introduction or amendments to minimum legal size limits
- Refusal to grant of fishing permits

10 Compliance and monitoring

Compliance with the management arrangements relevant to miscellaneous commercial dive fishing activities are undertaken by PIRSA Fisheries and Aquaculture Operations Branch. The compliance program has dual objectives:

- To maximise voluntary compliance with the fisheries rules including licence/permit conditions, regulations and any other enforceable instrument. Voluntary compliance will be encouraged through ensuring licence/permit holders are aware of and understand the rules that apply to their harvest activities, and the purpose of the rules.
- To create effective deterrence to breaches of fisheries rules through the presence of fisheries officers and compliance operations as well as through the detection and prosecution of illegal activity¹.

¹ Prosecution may include the issuing of a formal caution or an expiation notice, in addition to prosecution through the courts.

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Appendix

A1: Species included in this policy

Species considered as included in miscellaneous commercial dive fishing activities at the time of developing this policy are:

- Scallop (Family Pectinidae)
- Sea urchin (*Heliocidaris erythrogramma*)
- Turbo shell (*Turbo undulatus*)
- Specimen shells from the following families:
 Cassidae, Olividae, Spondylidae, Cardiidae, Mactridae, Conidae, Solenidae, Clavagellidae, Carditidae, Marginellidae, Cypraeidae, Cymatiidae, Chitonidae, Naticidae, Neritidae, Harpidae, Turridae, Nassaridae, Columbellidae, Patellidae, Voluntidae, Vasidae, Eulimidae, Muricidae, Scalidae, Fasciolaridae, Phasianellidae, Buccinidae, Acmaeidae, Fissurellidae, Siphonariidae, Mitridae, Cancellariidae, Liotiidae, Tellinidae, Thaididae, Triviidae, Trochidae and Veneridae.
- Native oyster (*Ostrea angasi*).

New species may be considered for inclusion as a miscellaneous commercial dive fishing activity in the future.

A2: ESD Risk Assessment Summary

Table 3: Summary of ESD risk rating outcomes

Component Trees	High	Medium	Low	Negligible	Total
Retained Species	1	2	1	2	6
Non-retained species	0	0	1	1	2
General Ecosystem	0	0	0	4	4
General Community	0	2	1	6	9
Governance	0	8	3	1	12
External Factors affecting Fishery Performance	0	6	1	1	8
Total	1	18	7	15	41

Table 4: Overview of ESD Risk Assessment for all components H=High, M=Medium, L=Low, N=Negligible, * Review on-going/ annual, ** Review under development of policy, scheduled 2015, *** Review at next ESD assessment, **** Industry deliverable)

Component	Risk	Objective Developed	Performance Indicator Measured	Robustness	Current performance	Actions
Issues related to the retained species						
Primary Species – Scallop	H	Yes	Yes	M	Acceptable	**

Primary Species – Sea Urchin	L	Yes	Yes	M	Acceptable	**
Primary Species – Native Oyster	N	Yes	Yes	M	Acceptable	**
Primary Species – Turbo	M	Yes	Yes	M	Acceptable	**
Primary Species – Specimen Shell	M	Yes	Yes	M	Acceptable	**
By-catch - Epiphytes	N	Yes	No	L	n/a	***
Issues related to the non retained species						
Direct interaction but no capture	N	Yes	Yes	M	Acceptable	***
Captured but not retained	L	No	No	L	n/a	***
Issues related to the general environment impacts of a fishery						
Impact on trophic structure	N	Yes	No	L	n/a	***
Habitat Disturbance	N	Yes	No	L	n/a	***
Broader Environment	N	Yes	No	L	n/a	***
Disease	N	No	No	L	n/a	***
Contribution of the fishery/industry to community wellbeing						
Fishing Industry	N	No	No	n/a	n/a	***
Dependent communities – regional centres – Economic Value	N	No	No	n/a	n/a	***
Dependent communities – regional centres – Social Value	L	No	No	n/a	n/a	***
Dependent communities – regional centres – Infrastructure	N	No	No	n/a	n/a	***
Dependent communities – regional centres –Attitude of recreational fishers	M	No	No	n/a	n/a	***
Non-dependent communities –city centres – Economic value	N	No	No	n/a	n/a	***
Non-dependent communities –city centres –Social value – Health/Food	N	No	No	n/a	n/a	***
Non-dependent communities –city centres – Social value – Research/knowledge	M	No	No	n/a	n/a	***
Non-dependent communities –city centres – Infrastructure	N	No	No	n/a	n/a	***
Issues related to the governance of the fishery/industry						
Government - PIRSA – Policy & Management	M	No	No	n/a	n/a	***
Government - PIRSA – Legal Framework	L	No	No	n/a	n/a	***
Government - PIRSA – Consultation	M	No	No	n/a	n/a	***
Government - PIRSA - Reporting	N	No	No	n/a	n/a	***
Government - PIRSA - Aquaculture	M	No	No	n/a	n/a	***
Government - PIRSA – SASQAP	M	No	No	n/a	n/a	***
Government – Other agencies– SA DEWNR	M	No	No	n/a	n/a	***
Government – Other agencies– Cwth DotE	M	No	No	n/a	n/a	***

Government – Other agencies– AQIS	L	No	No	n/a	n/a	***
Government – Other agencies– ADAS Safework SA	M	No	No	n/a	n/a	***
Industry– Access Security	M	No	No	n/a	n/a	***
Other (NGOs)–	L	No	No	n/a	n/a	***
External Factors Affecting Performance of the Fishery						
Ecological Impacts – Biophysical environment – Physical	M	No	No	n/a	n/a	***
Ecological Impacts – Biophysical environment – Biological - Disease	L	No	No	n/a	n/a	***
Ecological Impacts – Biophysical environment – Biological - Toxins	M	No	No	n/a	n/a	***
Ecological Impacts – Biophysical environment – Biological – Toxic algae	M	No	No	n/a	n/a	***
Ecological Impacts – Biophysical environment – Biological - Exotic species	M	No	No	n/a	n/a	***
Ecological Impacts – Human induced changes –	M	No	No	n/a	n/a	***
Impacts of other drivers	M	No	No	n/a	n/a	***
Access	N	No	No	n/a	n/a	***