

Institutional Analysis of Victorian Scallop Fisheries: Lakes Entrance, Australia

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1.0 Part I: System Structure - Collective Action

The Lakes Entrance scallop fishery is located in Bass Strait outside the city of Lakes Entrance in eastern Victoria, Australia and as far south as Tasmania in depths of 10-30 fathoms. The original case, which was published in 1982, catalogues the management of both Lakes Entrance and nearby Port Phillip Bay fisheries following a decline in scallop stocks in the early 1970s. The shared resources relevant to the commons dilemma faced by the community include scallop stocks and their productivity (common-pool). The action situation involved 90 fishermen. The natural infrastructure includes the ocean water, seabeds (fine silts to coarse grain sands), plankton, and other components of the marine food web.

This case study is part of the original Common-Pool Resource (CPR) database. A summary of the original CPR coding conducted in the 1980s by Edella Schlager and Shui Yan Tang at Indiana University. The original CPR report can be found [here](#).

1.1 The Commons Dilemma

- The Lakes Entrance scallop fishery was discovered after nearby Port Phillip Bay scallop fishery was overfished less than a decade after resource extraction began. The depletion of the D'Entrecasteaux Channel fishery in Tasmania caused a scarcity of scallops and drove fishermen to Port Phillip Bay in 1963, where catch rates and incomes were both high. The Port Phillip Bay fishery peaked in 1967, when 170 fishermen took 2,000,000 kg of edible flesh. In June 1970 a fisherman discovered that a commercial scallop fishery existed in Bass Strait just offshore from Lakes Entrance. Within five months 68 boats were involved in this new fishery, most of them coming from the nearby Port Phillip Bay fleet.
- Overfishing is a result of the commons dilemma. Due to the increased potential for overfishing and a potential for free riding, the Fisheries and Wildlife Division initiated a licensing scheme for scallop fisheries in Victorian waters. There are three types of licenses: 1) Port Phillip Bay only; 2) Lakes Entrance only; and 3) all Victorian waters. Fishermen must possess the appropriate license to extract scallops from the fishery. By 1979, there were 90 boat licenses issued for the Lakes Entrance scallop fishery.
- During the dredging process, crowding problems manifest themselves in the form of snagged dredges, collisions, abusive language, and the occasional fight. State government introduced a set of regulations to overcome these problems by reducing the fishing effort.

1.2 Biophysical Context (IAD)

- The **natural infrastructure** for the Lakes Entrance scallop fishery is in the open ocean and covers a large area of Bass strait east of Wilson's promontory, offshore from the town of Lakes Entrance, and as far south as Tasmania at depths between ten and thirty fathoms. The fishery is bounded by the ocean shelf and coastline, but otherwise is open ocean (waters within set international boundaries). The case study does not mention the size of the Lakes Entrance scallop fishery. The resource unit the commercial scallop, *Pecten alba*, which can be found below at depths between 10-30 fathoms. The scallops live on seabeds ranging from fine silt to coarse grain sand, but are not found on reefs or weed

beds. Their life span is about 12 years, and spawning occurs in the second year of life between August and November, induced by rising sea temperatures. Their only known predators are the spiny starfish (*Conscirasteria calameraia*) and humans.

- The **hard human-made infrastructure** includes equipment used for fishing, including boats, dredging equipment, and wire. A dredge is a chain mesh net that is dragged along the seafloor to collect scallops. There is no mention of public hard human-made infrastructure in the text.

1.3 Attributes of the Community (IAD)

- The **social infrastructure** includes Bass Strait and the surrounding waterways that make up the Lakes Entrance Scallop Fishers, all of which are owned by the Australian state. There are 90 fishermen licensed to fish in Lakes Entrance: 34 with licenses exclusively for Lakes Entrance and 56 with licenses for all Victorian waters. The Lakes Entrance scallop fishery is closely tied to the Port Phillip Bay scallop fishery, because those 56 fishermen with licenses for all Victorian waters may use either fishery. This means that conditions in one fishing area will affect the other fishing area, with the 56 fully licensed fishermen seeking the best spots and moving between these fisheries.
- The Ministry of Conservation's *Fisheries and Wildlife Division* provides **soft human-made infrastructure** in the form of regulations, including boat licenses, dredge license fees, catch limits, and dredge width limits. Even with these restrictions, the original authors hypothesized that the amount of fishing effort used in the fisheries remains excessive. The government also has no direct rules in place to buy licenses back once they have been established.
- Restrictions on licenses have led to a number of social developments within the fishing community. Fishermen may not sell their licenses, although they often transfer licenses when selling their boats, which has created an informal de facto market for fishing licenses. The government has argued against saleable licenses due to perceived negative impacts from: a) windfall gains to the first generation of fishermen, b) potential discrimination in who licenses are sold to, and c) the difficulty of revoking such a system in the future. The government also maintains control over fishing licenses by preventing formal license markets.
- **Human Infrastructure:** Human infrastructure in the Lakes Entrance scallop fishery is generally assumed to be adequate among the fishermen but the governance structures and rules regarding resource extraction may facilitate overexploitation.

1.4 Rules in Use (IAD)

1. Position Rules:

- The Ministry of Conservation's *Fisheries and Wildlife Division* has supervisory authority over marine fisheries in Victoria, including the Lakes Entrance scallop fishery.
- *Licensed fishers* are permitted entry to the Lakes Entrance scallop fishery.
- Fishermen from the various fisheries provide governance advice to the *Fisheries and Wildlife Committee*.

2. Boundary Rules:

- There are 3 types of scallop fishing licenses in Victorian waters: Port Phillip Bay only, Lakes Entrance only, and all Victorian waters. Fishermen must possess the appropriate license to extract scallops from the Lakes Entrance Scallop Fishery.
- Fishermen must pay a license fee of \$8.00 per every 10 centimeters of dredge width.

- The right to fish for scallops is licensed to specific boats. Those individuals who can afford to pay for a boat license are permitted entry to the Lakes Entrance scallop fishery. These licenses transfer with the sale of the boat.

3. **Choice Rules:**

- Fishermen with licenses may choose to:
 - Actively use their right to fish (subject to Scope Rules—see below);
 - Defend their right to fish if challenged by the government for being inactive;
 - Voluntarily withdraw their licenses; or
 - Transfer their licenses with sale of their boats.

4. **Aggregation Rules:**

- There is no mention of aggregation rules in the original case study.

5. **Payoff Rules:**

- The *Fisheries and Wildlife Division* may take away licenses if fishermen cannot prove that they are actively involved in the fishery.

6. **Scope Rules:**

- The fishermen are limited to a catch limit of 50 bags per day in the Lakes Entrance Scallop Fishery.
- The fishermen must comply with the permissible gear requirements stipulated in the regulation (maximum of 3.36 meters).
- There is no limit on the size of scallop that can be caught.
- The Lakes Entrance scallop fishery is open all year, with no restrictions on times of fishing.

7. **Information Rules:**

- There is no mention of information rules in the original case study.

1.5 **Summary**

The Australian government implemented a number of management strategies to address the overexploitation of scallops in Port Phillip Bay and Lakes Entrance in the early 1970s. These strategies include license allocations, limits on seasons and times that fishermen can harvest scallops, limits on the size of dredges used in the bay, and limits on the number of bags a fisherman can harvest daily. This set of arrangements by which Lakes Entrance scallop fishery is managed has evolved in a trial and error fashion to meet a complicated and imperfectly specified set of economic, social, and political objectives. Given the slow accumulation of knowledge about scallop populations and their interaction with the environment, including fishing, it is not surprising that there have been trials and changes. Regardless, the total number of licenses still potentially allows too many fishermen to extract scallops from the bay, which would make all of the additional management strategies less effective as well. The study suggests a need for more direct limits on licenses.

2.0 Part II. Dynamic Analysis - Robustness

This update to the Lakes Entrance scallop fishery case was made in 2015 by David Gillum at Arizona State University. In-text parentheses indicate corresponding links in the system representation on the SES library.

2.1 Update on the Commons Dilemma

Scallop abundance fluctuates widely from season to season depending on natural conditions and adverse impacts from humans. Since the beginning of the Victorian commercial fishery in the 1960's, catches have varied from tens of tons per year to thousands of tons. Data from the Victoria State Government's Economic Development, Jobs, Transport and Resources shows that scallop catches in 1988/89 through 1990/91 saw a marked drop in catch rates. Rates slightly increased for the next three years and then dropped significantly again in 1996/97. In 1998, the licenses for Bass Strait and Lakes Entrance were combined and became known as the 'Ocean Scallop. Catch rates, and therefore stock abundance, declined again in the mid- to late 2000's, and surveys of scallop grounds conducted in 2009 and 2012 revealed a lack of commercial quantities of scallops. In response, quotas of zero were put in place for the 2010/11, 2011/12 and 2012/13 seasons.

Since the original paper, the number of licenses increased from 90 to 91. The maximum allowed dredge size increased from 3.36 meters to 4.5 meters. Size restrictions were put into place, with scallops smaller than 80mm wide (when measured in a straight line at the widest point across the shell) are prohibited from being taken. To protect juvenile stock, fishing areas can be closed if more than 20% of the scallops in the catch are below the minimum size limit. If the average number of individual scallop meats (adductor muscle) is more than 100 per kilogram, the fishery can be closed until the quality of the scallops improves. The default period for the season is 1 April to 31 December.

The fishery is currently an output-controlled fishery that has been under Individual Transferrable Quota arrangements since 1998. Quota is set annually and each license holder is given an equal share at the beginning of each season. Scallop quota is transferable amongst license holders. In 2015, permit holders in the Bass Strait Central Zone Scallop Fishery were permitted to catch 2001 tonnes, up 500 tonnes from 2014. In 2013, the Bass Strait fishery was valued at \$500,000 (Australian dollars).

2.2 Shocks, Capacities, Vulnerabilities...

... to and of the Resource (link 7 to R)

The target species, commercial scallop, is a highly valued marine species that is subject to overfishing, consistent with the history of the fishery both in this location and elsewhere in the world. Scallop dredging has a high potential to severely impact the flora and fauna found on the bottom, or in the bottom sediments, of the sea and ocean. This high level of disturbance and the destruction of fauna are two dangers to the habitat. The natural infrastructure in the Bass Strait Scallop Fishery is important in maintaining the fishery.

The Australian Fisheries Management Authority regularly monitor the effects fishing activities have on marine species, habitats and communities through ecological risk assessments. The assessment results help to prioritize the management, research, data collection and monitoring needs for the fishery. There are four important habitat factors that help to minimize potential negative impacts to the fishery: (1) the relatively high productivity of the inner shelf (compared to the deeper ecosystems of the regional fishery used by other subfisheries) based on a faster regeneration time of fauna, and adaptation of fauna to a greater degree of natural disturbance, (2) the large areal extent of the habitat types within Bass Strait in combination with the

small areas used for fishing; (3) the preponderance of small encrusting and burrowing faunas associated with sediment habitats, and (4) the inability of scallop dredges/ vessels to negotiate rocky bottom.

... to and of the Public Infrastructure (link 7 to PI)

Insufficient information to determine shocks to public infrastructure.

... to and of the Public Infrastructure Providers (link 8 to PIP)

Insufficient information to determine shocks to public infrastructure.

... to and of the Resource Users (link 8 to RU)

Although current licenses allow fishermen to move between all of the scallop sites in Victorian waters, the closure of nearby Port Phillip Bay would likely have increased competition for resources in other fisheries, which could decrease the catches and income of some of the fishermen. Also, decreases in scallop abundance will decrease catch rates, subsequently decreasing the financial benefits to fishermen.

2.3 Robustness Summary

There is high variability in abundance, growth, mortality, meat yield and condition of commercial scallops in the fishery. This variability means that management of commercial scallops has to be adaptable to sometimes rapidly changing circumstances. The stock recruitment relationship is sporadic and intermittent. Growth rates are variable within the fishery, with scallops growing at different rates in different areas. Changes in the soft public infrastructure governing the extraction of scallops in the Victoria Scallop Fisheries have had a positive effect in ensuring stability of the fishery. The introduction of quotas, legal minimum length of scallops, gear restrictions, and vessel monitoring systems on all boats are being used to manage the scallop fishery.

3.0 Case Contributors

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