

CHANGES TO REGULATIONS AND THE GEAR USED IN THE SOUTH AFRICAN COMMERCIAL FISHERY FOR *JASUS LALANDII*

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Alterations to the operational fishing gear used in the South African west coast rock lobster *Jasus lalandii* fishery and their resultant impacts are investigated. The most important developments have been: (i) a change during the 1960s from hand-hauled hoopnets to winch-hauled traps, with a concomitant modification of vessels; (ii) the introduction of deck-grid sorters in 1975; (iii) an increase during 1984 of minimum mesh aperture from 62 to 100 mm (stretched), with a concomitant decrease in the length of the trap codend; (iv) a decrease in the minimum legal size during the early 1990s; and (v) the introduction of bottom-grid traps in 1994. Most of these alterations have been driven by a tradeoff between the need for greater operational efficiency and concerns surrounding the issue of how best to deal with the problem of catching and releasing specimens smaller than the minimum legal size.

Key words: fishing gear, fishing regulations, *Jasus lalandii*, rock lobster

Following its inception in the late 19th century, the commercial fishery for West Coast rock lobster *Jasus lalandii* expanded rapidly to reach its pinnacle in the 1950s, when almost 11 000 tons were landed annually (Pollock 1986, Fig. 1). Then, large catches were made along the entire South African west coast, from the Orange River in the north to Cape Point in the south (Pollock and Shannon 1987). However, since then, catches have declined markedly, especially on the northern fishing grounds (Pollock *et al.* 2000). This trend has been assumed to reflect decreasing population strength and has been attributed to a combination of fishing pressure and large-scale environmental change (Pollock 1986, 1987, Cockcroft and Goosen 1995, Cockcroft 1997, Pollock *et al.* 1997, 2000). Consequently, annual catch restrictions have reduced the yield from about 11 000 tons in 1959 to about 2 000 tons in 1999 (Fig. 1). Coincident with this decrease in yield were several changes that were made to the fishing gear as a means of increasing operational efficiency. This paper provides a record of these changes and illustrates how they may have impacted the rock lobster fishery.

GEAR TYPE AND PERFORMANCE

Prior to 1960, all commercial West Coast rock lobster catches were made using hoopnets (Newman and

Pollock 1969), consisting of a steel hoop (about 0.75 m in diameter) to which a mesh bag was attached (Fig. 2a). This gear was buoyed by a surface line and deployed and retrieved by hand from rowing dinghies in shallow water. However, by the mid 1960s, the industry found difficulty in landing their Total Allowable Catch (TAC) using traditional infrastructure (Fig. 1). As a result, various trap designs were tested, and by 1970, the use of simple, rectangular traps was common (Pollock 1986). These traps had a fairly uniform construction, measuring about 1.5 m in height and having lateral dimensions of approximately 0.8 × 0.5 m (Fig. 2b). The frame was made of welded mild steel, with two rigid, funnel-shaped entrances, one on either of its narrowest sides. A bait box was located in the centre of the trap, between the two entrances. At one end of the trap, the frame was bent to form a loop, which was used to attach the gear to a buoyed surface line. At the opposite end, a polypropylene mesh bag was attached to the frame and used as a codend. The entire trap was covered with polypropylene 62-mm mesh (stretched). These traps proved to be almost five times more efficient (per crew member) than hoopnets (Newman and Pollock 1969). Consequently, by 1980, traps were used to land most of the catch made by the South African commercial fishing fleet (Pollock 1986).

Because traps were considerably heavier than hoopnets, many fishers abandoned their traditional rowing dinghies (3–6 m long) in favour of larger, motorized

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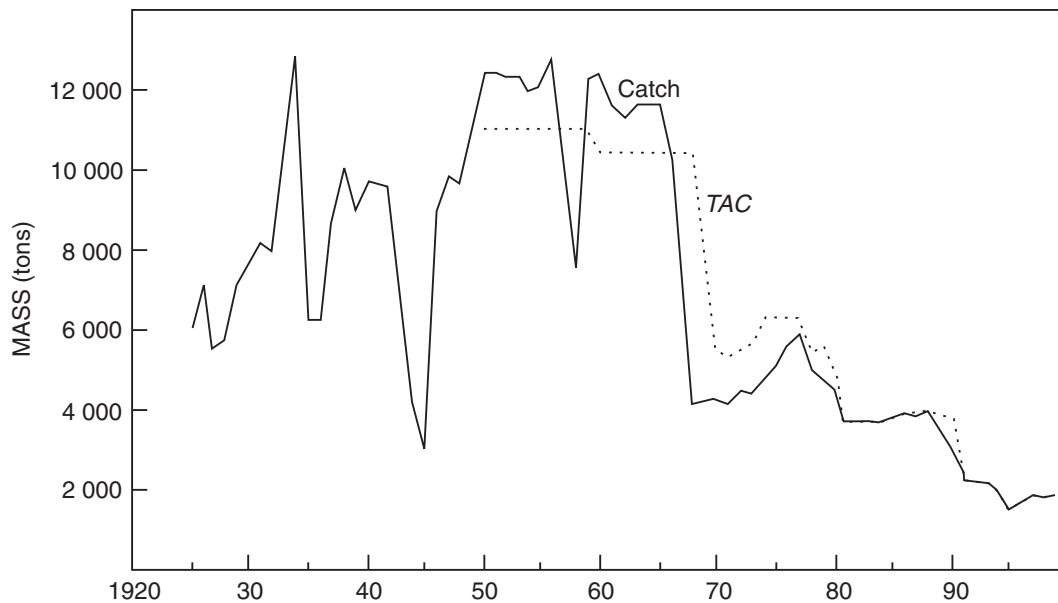


Fig. 1: Historic catch and TAC in South Africa's commercial fishery for *J. lalandii*

vessels (8–14 m long) fitted with power winches capable of lifting the traps. Not only were these larger vessels capable of carrying and servicing more gear, but they could also travel further, to areas previously inaccessible. However, these vessels were generally unable to safely navigate turbulent waters shallower than 10 m. This restricted their utility, especially on the northern fishing grounds where seasonal incursions of oxygen-depleted bottom water force the majority of the resident rock lobsters to move into the surf zone (Pollock and Beyers 1981, Pollock 1986). Therefore, hoopnets are still employed in shallow waters that are inaccessible to the larger craft; during the latter half of the 1990s, 82% of the commercial catch was taken by traps and the rest by hoopnets.

Because most of the catches taken during the 1970s were tailed and sold either canned or frozen, there was little incentive for fishers to keep the catch alive prior to landing. Therefore, in order to maximize efficiency of operations, fishers sorted their catch (i.e. returning undersized rock lobsters to the sea) only after rebaiting and resetting the traps. Apart from the damage to rock lobster population productivity as a result of delayed sorting and handling-related mortalities, injury to released individuals could have also reduced their productivity (Davis 1981, Brown and Caputi 1985, Lyons 1986, Cockcroft and Goosen 1995).

Of concern to the local fishery was the loss of limbs of released rock lobster as well as their possible displacement from suitable habitat, both of which could reduce the amount of energy available for somatic growth. In addition, exposure of ovigerous females to sunlight and air could negatively impact on reproductive capacity. Because the traps retained rock lobsters as small as 50-mm carapace length (*CL*), delayed sorting was believed to have caused considerable damage to individuals between 50 mm and the then minimum legal size of 89 mm *CL*.

In order to alleviate the problems associated with delayed sorting, legislation was introduced in 1975 that forced fishers to sort each trap as it came aboard. This was achieved by means of a mechanical sorting device consisting of a box (minimum width 0.75 m; minimum base area 1.1 m²) attached to the gunwale of the vessel. The base of the box, or "deck grid sorter", consisted of a steel grid, with bars spaced 51 mm apart to allow undersized rock lobsters to pass through them and be discharged (via a chute) at the sea surface (Crous 1976). The use of deck grid sorters both minimized sorting time of undersized rock lobsters and all but eliminated the need to manhandle them.

In support of the internationally accepted opinion that it is more preferable to reduce the probability of catching undersized fish than releasing them after

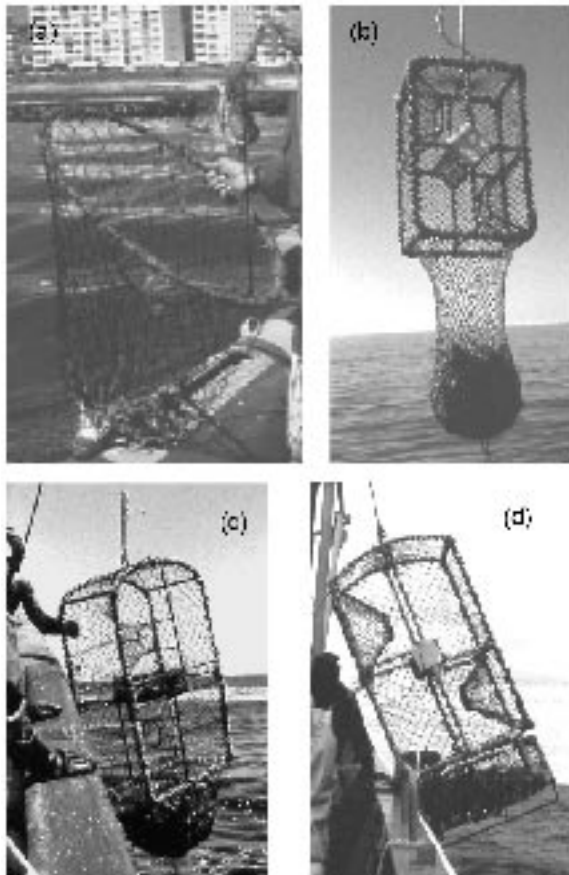


Fig. 2: Fishing gear used in the *J. lalandii* fishery: (a) hoopnet; (b) trap c. 1970; (c) trap c.1990 (note increased mesh size and decreased length of codend); (d) bottom-grid trap

capture (Krouse 1978, Nulk 1978, Fogarty and Borden 1980, Brown 1982), it was demonstrated that the selectivity properties of the mesh used in the South African trap fishery were particularly problematic; more than eight undersized rock lobsters were retained for every legal-sized specimen caught (Marine & Coastal Management [MCM], unpublished data – Fig. 3). It was found that, by increasing the minimum mesh aperture to 100 mm (stretched), the number of undersized animals caught decreased by 30%, whereas only 10% fewer rock lobsters larger than the minimum legal size were caught. As a result, legislation was introduced that required all rock lobster traps used after November 1984 to be fitted with the larger

mesh. Furthermore, the maximum length of the codend was fixed at 400 mm, in an attempt to limit the amount of damage done to captive rock lobsters during hauling over the gunwale of the vessel (Figs 2b, c). Thereafter, only the codend and the entrance funnels were allowed to be covered with the 62-mm mesh.

Although these modified traps initially maintained reasonable catch rates, the fishery again experienced problems at the beginning of the 1990s: the TAC could not be landed in full for three consecutive seasons (Fig. 1). It was therefore recommended that the minimum legal size be reduced temporarily from 89 to 75 mm CL for part of the 1991/1992 season. This was readjusted to 80 mm CL for the 1992/1993 season and back to 75 mm CL for the 1993/1994 season onwards (Cockcroft and Payne 1999, Pollock *et al.* 2000). These changes to the minimum legal size were not accompanied by further alterations to the trap mesh size, with the result that even the smaller categories of legal-sized rock lobster could escape the traps (Fig. 3). However, to prevent excessive losses of these lobsters through the deck grid sorter, the gaps in the grid were reduced to 42 mm.

Because of the declining catch rates in the early 1990s, believed to be a result of depressed somatic growth (Cockcroft 1997, Cockcroft and Payne 1999), there were concerns that handling-related damage was still contributing to reduced population productivity, especially through physical damage to undersized rock lobsters. In view of the apparent effectiveness of escape gaps in other crustacean trap fisheries elsewhere (see reviews by Krouse 1989; Miller 1990), the design of the local standard commercial trap was modified by replacing the polyethylene mesh at the codend with a steel grid (similar to a miniature version of that used in deck grid sorters, but with 44-mm grid spacing). These bottom-grid traps (Fig. 2d) were phased in during 1994, and by 1998 they constituted 20% of the traps in use by the industry. However, despite the intended advantages of these experimental traps, fishers have increasingly resisted their use because they are heavier and more difficult to empty than conventional traps, so making them particularly dangerous to operate in rough weather.

Other modifications to fishing gear and practices have been introduced, but with little impact to the efficiency of the fishery. For example, the introduction of electronic aids such as echo-sounders and Global Positioning Systems have not markedly increased overall fishing efficiency. Instead, the knowledge and experience of skippers appears to be more important, with traditional fishing grounds readily identifiable from land markers. Also, the number of traps allowed per fishing vessel has been reviewed at various times,

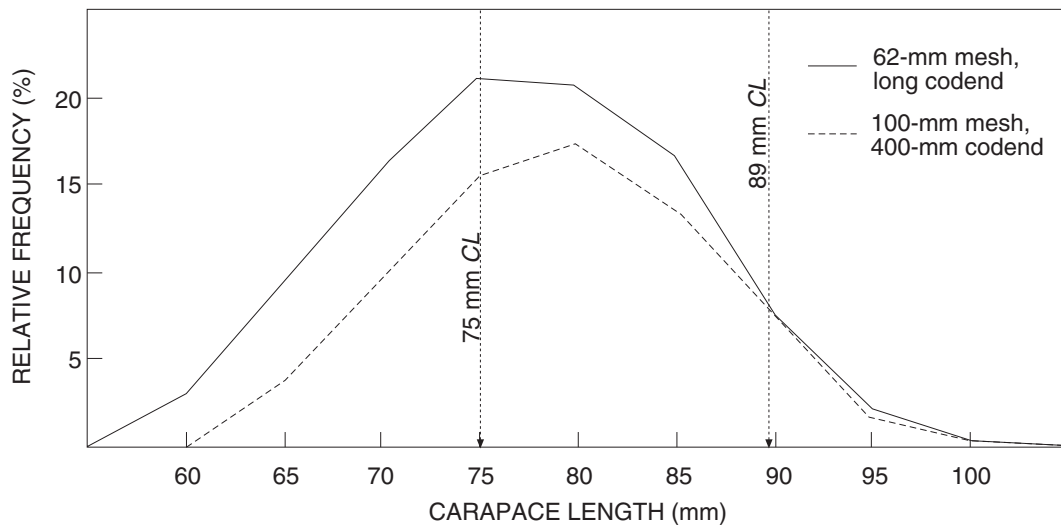


Fig. 3: Catch composition from test fishing during 1984 using two trap designs

but all limitations in this respect have been on an unofficial voluntary basis. Furthermore, the size of vessels most commonly used in the fishery has ensured that agreed trap quotas have not regularly been exceeded.

The decline of the *J. lalandii* resource has been described largely in terms of hypothetical environmental change (Pollock 1987, 1994, Melville-Smith *et al.* 1995, Pollock *et al.* 1997, 2000). However, to date, little consideration has been given to the possible

damaging aspects of the fishing operations, which have undergone large-scale changes over fairly short timeframes (Table I). Historical fishing practices may have had more severe consequences for the sustainability of the resource than is widely accepted. Unfortunately, because most of this damage was done to rock lobster smaller than the minimum legal size, the effects were not immediately evident. Furthermore, the composition of future commercial gear is uncer-

Table I: Summary of major changes to fishing gear and regulations and their effects on the South African commercial fishery for *J. lalandii* over the past 50 years

Date	Gear	Effect
Pre-1960 1960-1970	Almost exclusively hoopnets Experimentation with traps	Fishing restricted to fairly shallow water (<30 m) Improved catching efficiency Increased use of larger, motorized vessels Increased geographic range (new grounds, deeper water) Increased overall fishing capacity
1975	Deck grid sorters introduced	Increased catches of undersized specimens Decreased handling times for undersized specimens Decreased incidental mortality
1984	Increase in trap mesh size from 62 to 100 mm (stretched) Limit codend length to 400 mm	Reduced relative catch of undersized specimens Reduced damage to captive animals as traps hauled over gunwale
1992-1993	Reduction in minimum legal size from 89 to 75 mm CL	Reduced discarding through retention of greater proportion of catch Increased opportunity for undersized specimens to escape traps before hauling
1994-1999	Bottom-grid traps phased in	Greater escapement of undersized specimens Resistance by fishers

tain in the face of changing political and management pressures. It is therefore essential that the management plan for this resource considers the size-selectivity characteristics of gear types currently in use by the commercial fishery.

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