

INTERIM MANAGEMENT MEASURES FOR THE RED SEA URCHIN
IN SOUTHEAST ALASKA FOR THE 1990 - 1991 SEASON



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FISHERY OUTLOOK

Test Fishery

A pilot test fishery was conducted in the Sitka area from 28 November to 9 December 1990 to evaluate the use of commercial divers to assess red sea urchin stock densities. Results from this pilot study are available from the department as Regional Information Report number 1J91-03 (Woodby 1991). In summary, the pilot study was successful in obtaining reliable population abundance and size frequency data at low cost to the department. These results indicate that a limited fishery is possible at this time.

Commercial Fishery

The commercial fishery will open on January 19, 1991 in the Sitka area and will close no later than April 30, 1991. The quota for the fishery will be 220,000 red sea urchins.

Openings will be from 12:01 a.m. Saturday through 12:00 noon Thursday each week until the quota is taken. The fishery will be opened and closed by emergency order and managed with the miscellaneous shellfish permitting system (5AAC 38.062).

Openings in the Sitka area will include the following subdistricts (Figure 1):

- 113-31 only those waters of the subdistrict north of the latitude of Dorothy Narrows;
- 113-41 only those waters of the subdistrict south of a line from Shoals Pt. on Kruzof Is. to the westernmost tip of Long Is., to the easternmost tip of Long Is., to a point on the northern entrance to Deep Inlet at 56° 59' 37" N latitude 135° 18' 40" W longitude;
- 113-38 all waters in Deep Inlet.

The above areas will open at the same time. However, to avoid local overharvesting, it may be necessary to close portions of rotational areas prior to attainment of the overall quotas if catches in those areas are excessive.

All other areas of Southeast Alaska will remain closed to commercial harvest of sea urchins until stock assessments are conducted.

INTRODUCTION

This document specifies how the Alaska Department of Fish and Game (department) will manage the commercial fishery for red sea urchins (*Strongylocentrotus franciscanus*) in Southeast Alaska under the authority of Alaska Statutes (SEC. 16.05.060) and regulations of the Alaska Board of Fisheries (5AAC 38.062) during the 1990-1991 season.

This document specifies management objectives that will guide department actions, identifies specific management measures that will be used to achieve those objectives, and presents the outlook for harvesting during the 1990-1991 season. These management measures will serve as a basis for subsequent years, but are subject to change as the fishery evolves and as our understanding of the red sea urchin resource improves.

GOAL AND OBJECTIVES

The management goal for the Southeast Alaska commercial red sea urchin fishery is to maximize the overall long-term benefit of the red sea urchin resource to the State of Alaska consistent with responsible stewardship for conservation of red sea urchin populations and their habitats. To attain this goal, four objectives are to be met concerning biological conservation, subsistence, sustainable and orderly fisheries, and adaptive management and research. For the purposes of interim management, the fishery will be limited both in area and allowable harvest levels.

Biological Conservation Objective

The biological conservation objective is to ensure the long-term reproductive viability of red sea urchin populations and the quality and availability of their habitats. This objective takes precedence over other objectives that address social, economic, management, and research considerations.

To ensure the long-term reproductive viability of red sea urchin populations, management must prevent recruitment overfishing, in which spawning stocks are reduced by fishing below a level that ensures adequate production of young red sea urchins to provide future recruits to the fishery. To maintain the quality and availability of red sea urchin habitat, harvesting methods that may destroy or damage habitats required by red sea urchins shall be prohibited. Last, harvesting methods which substantially impact other species shall not be permitted.

Subsistence Objective

The subsistence objective is to ensure that red sea urchin harvest requirements by customary and traditional users in coastal communities are met, as required by law. To meet this objective, management must prevent deleterious effects of commercial fisheries on the availability of red sea urchins to

subsistence users. Area closures, reduced catch quotas, or other restrictions on commercial harvest may be used to ensure that traditional subsistence users are not adversely impacted.

Sustainable and Orderly Fishery Objective

The sustainable and orderly fishery objective is to ensure the conduct of manageable, steady-paced red sea urchin fisheries that provide stable employment opportunities and sustained supplies of a high quality product to seafood markets. To meet this objective, management measures will be established to maintain sustainable fisheries over the long-term and prevent "boom-and-bust" or "derby-type" fisheries. Reporting systems are specified to provide accurate and timely data on catch for each area. As the need arises, other regulations to promote orderly fisheries may be adopted.

Present funding levels do not allow the commitment of staff and other resources of the department to manage region-wide fisheries. For this reason, interim management will provide for exploratory fisheries only on a limited basis.

Research Objective

The research objective is to conduct a fishery research program that contributes information on red sea urchin biology and population dynamics pertinent to management. This growing information base should include better data on stock abundance and distribution, including distribution with depth, so as to determine the population available for harvest.

It is also important to develop an understanding of population growth as a function of stock size so as to promote long-term sustained yield and to determine threshold population levels below which stock recovery is uncertain and no harvest should occur.

Research is also needed to determine if reliable relationships exist between catch-per-unit-of-effort and stock size so as to provide an additional measure of stock abundance independent of direct surveys.

DEFINITION OF FISHERY MANAGEMENT UNITS

Available information indicates that red sea urchins are not uniformly distributed throughout Southeast Alaska. Even in areas where they are relatively abundant, they tend to be concentrated in some areas and depths and sparsely distributed elsewhere. Responsible management strategies will have to account for local differences in stock abundance, productivity, growth rate, and response to harvest.

Stocks of red sea urchins are defined as biologically self-sustaining populations. At this preliminary stage in red sea urchin research and management, biological definitions of stocks are unavailable. Therefore, stock boundaries are defined on the basis of environmental constraints to significant intermixing of populations. To the extent possible, stock boundaries are set to coincide with previously established management districts or area boundaries.

The area enclosed within a stock boundary is considered a Fishery Management Unit (FMU), defined as a restricted area in which red sea urchins are likely to be subject to the same local conditions affecting their seasonal cycles and to exhibit a discrete population structure. A total of 13 FMUs have been identified in Southeast Alaska for red sea cucumbers (*Parastichopus californicus*), and these same areas will be used for management of red sea urchins (Figure 2). Until better stock definition information becomes available, red sea urchins within FMUs will be assumed to belong to the same stock.

MANAGEMENT MEASURES

Permit/Reporting Requirements

Individuals wishing to commercially harvest red sea urchins must first register their vessels and obtain harvest permits from an office of the department. Registrations will be valid for each fishing season. These requirements are in addition to the vessel license and interim-use permit which must be obtained from the Commercial Fisheries Entry Commission. These are current requirements for all miscellaneous shellfish fisheries conducted in state waters.

All commercial red sea urchin fishery participants must also maintain logbooks. As with registrations and permits, logbooks may be obtained from department offices in Southeast Alaska. Logbooks will permit the department to collect data on population sizes and to monitor stock responses to commercial harvest. Logbooks will require catch statistics to be recorded on a daily basis for each location fished. Other information required includes weight of catch, depth, and time fished.

Completed logbooks must be returned to the department along with the department's copy of a fish ticket. This means that each time a diver delivers his or her catch to a processor, he or she must be sure that the log is attached to the department's copy of the sales slip. To assure confidentiality of these records, processors will be required to seal the log books and sales slips obtained from individual divers in separate envelopes which are signed by the diver. It is the diver's responsibility to assure that this process is followed. Divers should retain a copy of their logbooks as proof of compliance with this requirement. Failure to complete and surrender logbooks is sufficient cause to revoke a diver's harvest permit.

The harvesting of red sea urchins shall be confined to the following gear types:

1. SCUBA;
2. Tethered, umbilical, surface-supplied systems;
3. Skin/Free Diving without the aid of a breathing apparatus or diving with a snorkel only.

In order to provide a sea urchin refuge in deep waters, the use of mixed gases or saturation diving will be prohibited. Red sea urchins must be harvested by hand and transported to the surface in bags. A diver may use a rake no longer than 16 inches, possessing no more than six tines, each tine being no more than 5 inches long. Calipers designed to determine if urchins fall within the legal size class, if there is one established in the future, may be attached to the rake. Any means other than individually collecting red sea urchins by hand, placing them in bags, and air-lifting or buoying filled bags for surface collection is

prohibited. Such lifting devices shall be used in such a manner that no rocks, mineral matter, aquatic plants, fish or other aquatic life except red sea urchins shall be disturbed or removed from the bottom.

Harvest of urchins above mean lower low water (MLLW) shall be prohibited to protect the intertidal habitat zone.

Size Limits

No size limits will be imposed for urchins at this time because the conservative catch quotas (below) are considered sufficient to protect the stocks. Also, the current market for urchin roe targets a narrow size range of approximately 76 to 127 mm (3 to 5 inches), so that urchins outside this range are likely to receive minimal harvest pressure. However, size limits may be instituted in the future if the need arises. The biological basis for size limits is that large red sea urchins often provide a protective spine canopy for small juveniles (Tegner and Dayton 1977), so that it may be important to protect large red urchins by imposing a maximum size limit. Small urchins are needed for subsequent recruitment and may also need to be protected.

Fishing Seasons

The general fishing season for red sea urchins will open no sooner than Saturday, January 19, following review of this management plan. The fishery will continue until April 30 unless closed by Emergency Order.

Weekly Openings

Pending review of this management plan, the red sea urchin fishery will be open initially for 132 hours each week beginning at 12:01 a.m. on Saturday and ending at 12:00 noon on Thursday. The weekly closure is important for orderly fishery management.

Subsistence Priority

Under this plan, a commercial fishery is expected to harvest no more than 6% of the red sea urchins in an area every three years (see Catch Quotas, below). In practice, this harvest may not be spread out evenly within a subdistrict; rather, one can expect commercial divers to seek out concentrations of urchins nearest to local communities. This fishing practice can be expected to reduce the abundance of red sea urchins in some areas by more than 6%. Such reductions may impact the opportunity for subsistence fishing. Therefore, this interim fishery is confined to one area south of Sitka where no conflict with the subsistence harvest of urchins is expected. Expansion of the geographic scope of the fishery may require a decision by the Board of Fisheries to determine if regulations are required to protect the subsistence priority. At that time, the department believes that two options will exist. The first option would be closure of areas, and the second, reduced quotas.

Catch Quotas

Annual catch quotas for red sea urchins will be set to achieve the biological conservation objective by preventing overfishing. Due to limitations in our understanding of sea urchin population dynamics in Southeast Alaska, yield assessments are based on a conservative application of surplus production models (Garcia et al. 1989). Application of surplus production models over several years or rotation cycles carries the risk of fishery collapse if the assumptions upon which the model are based are grossly inaccurate (Koonce and Shuter 1987). For example, these models assume that recruitment will increase as virgin stocks are reduced to levels which are approximately one-half of the original biomass. This assumption is potentially overly simplistic. Evidence from southern California suggests that small urchins are more likely to survive if there are large numbers of adult urchins present to provide a protective spine canopy from predators (Tegner and Dayton 1977). There is also evidence that young of the year occur mostly under the spine canopy of adults in the test fishery area near Sitka (Woodby 1991). Due to this concern and additional uncertainties, the status of urchin stocks will be monitored on a regular basis, preferably prior to each scheduled opening.

A detailed description of the method used to apply surplus production models to estimate quotas for mostly unexploited populations is available in Regional Information Report 1J90-31 (Imamura and Kruse 1990) from the department in Juneau. In summary, the allowable harvest, or quota, is measured in numbers of urchins, and is calculated as a product:

$$\text{Quota} = 3 \times \text{CF} \times \text{GF} \times \text{M} \times \text{P}_0$$

where

CF = 0.4	scaling factor relating maximum sustainable fishing mortality to unexploited population size (e.g. Caddy 1986);
GF = 0.5	correction factor due to Garcia et. al (1989) to allow for errors in assumptions upon which the surplus production model is based;
M = 0.16	estimated instantaneous mortality rate for red sea urchins using method of Van Sickle (1977) as described by Woodby (1991) for the Sitka area; and
P ₀ = 2.3 million	virgin population size, taken as the lower bound of the one-sided 90% confidence interval.

The quota includes a factor of three to account for the three year rotational schedule (see below). The allowable quota will be three times the annual yield, once every three years, to account for the two years of closure.

Population size was estimated as:

$$\text{P}_0 = \text{Density} \times \text{Shoreline length (in meters)},$$

where density is the lower bound of the 90% confidence interval for the average number of sea cucumbers per linear meter of shoreline of available urchin habitat. Population density was estimated by divers censusing urchin populations on strip transects extending perpendicularly from the shore to the 12 meter depth contour (Woodby 1991). Transect width was 1 to 20 meters. These surveys were systematically distributed along shorelines in the proposed harvest areas. No allowance is made in the quota for

populations below 12 meters depth because scientifically valid assessments of deep populations are not available.

The mean density was 33.6 urchins per meter, and the lower confidence bound on this estimate is 20.9 urchins per meter, which is 62% of the mean. The shoreline length is estimated as 110 km. The product of these terms (20.9 urchins per meter x 110,000 meters), P_0 , is 2,299,000 urchins in the sample area.

The product of the first four terms in the quota equation is 9.6%. This percentage harvest multiplied by the lower bound of the population size estimate results in a quota of about 220,000 urchins over a three year period. This quota is 6% of the mean value of the population size estimate.

Due to weather and sea conditions, not all areas may be accessible to commercial divers; therefore, judgements were made regarding the area which is actually fishable when shoreline length was estimated. Also, protected bays and inlets are likely to have low densities of red urchins, and these areas were not included in estimates of available habitat. This approach leads to a conservative estimate of total population, and therefore a conservative harvest which will help to guard against local depletions in those areas where diving is feasible and where urchins are abundant.

Rotational Areas

All subdistricts in Southeast Alaska open to commercial harvest of red sea urchins are assigned to one of three rotation groups. Each group will be scheduled to open once every three years. Therefore, the areas open for fishing in the 1990-1991 season will not open again until 1993-1994.

In-season Adjustments

Most management measures are established prior to the start of the fishing season, including reporting requirements, gear limitations, closed waters, experimental fishing areas, annual catch quotas, and annual allocations. However, once FMUs are opened, events may occur or new data may be collected that warrant in-season action by fisheries managers. The department may make in-season adjustments to annual catch quotas, fishery opening dates, fishery closing dates, and closed areas. In making such in-season adjustments, the department may consider appropriate factors to the extent in-season data are available on: (1) status of urchin stocks; (2) adequacy of subsistence harvests; (3) overall fishing effort; (4) catch-per-unit-of-effort and rate of harvest; (5) achievement of catch quotas; (6) spawning activity; (7) timeliness and accuracy of catch reporting; and (8) other factors that affect ability to meet the goal and objectives of this interim fishery management plan. In all instances, in-season adjustments will be justified and reported by emergency orders available to the public.

LITERATURE CITED

- Caddy, J.F. 1986. Stock assessment in data-limited situations the experience in tropical fisheries and its possible relevance to evaluation of invertebrate resources. Pages 379 to 392 in G.J. Jamieson and N. Bourne, editors. North Pacific Workshop on Stock Assessment and Management of Invertebrates. Canadian Special Publication of Fisheries and Aquatic Sciences 92.
- Garcia, S., P. Sparre, and J. Csirke. 1989. Estimating surplus production and maximum sustainable yield from biomass data when catch and effort time series are not available. *Fisheries Research* 8:13-23.
- Imamura, K., and G. Kruse. 1990. Management of the red sea cucumber in Southeast Alaska: Biology, Historical Significance in Pacific coast fisheries, and regional harvest rate determinations. Regional Information Rep. 1J90-31, available from the Alaska Dept. of Fish and Game, Juneau.
- Koonce, J.F., and B.J. Shuter. 1987. Influence of various sources of error and community interactions on quota management of fish stocks. *Canadian Journal of Fisheries and Aquatic Sciences* 44(Supplement 2):61-67.
- Tegner, M.J. and Dayton, P.A. 1977. Sea urchin recruitment patterns and implications of commercial fishing. *Science* 196:324-326.
- Van Sickle, J. 1977. Mortality rates from size distributions: the application of a conservation law. *Oecologia* 27:311-318.
- Woodby, D. 1991. The red sea urchin test fishery of south Sitka Sound, 1990. Regional Information Rep. 1J91-03, available from the Alaska Dept. of Fish and Game, Juneau.

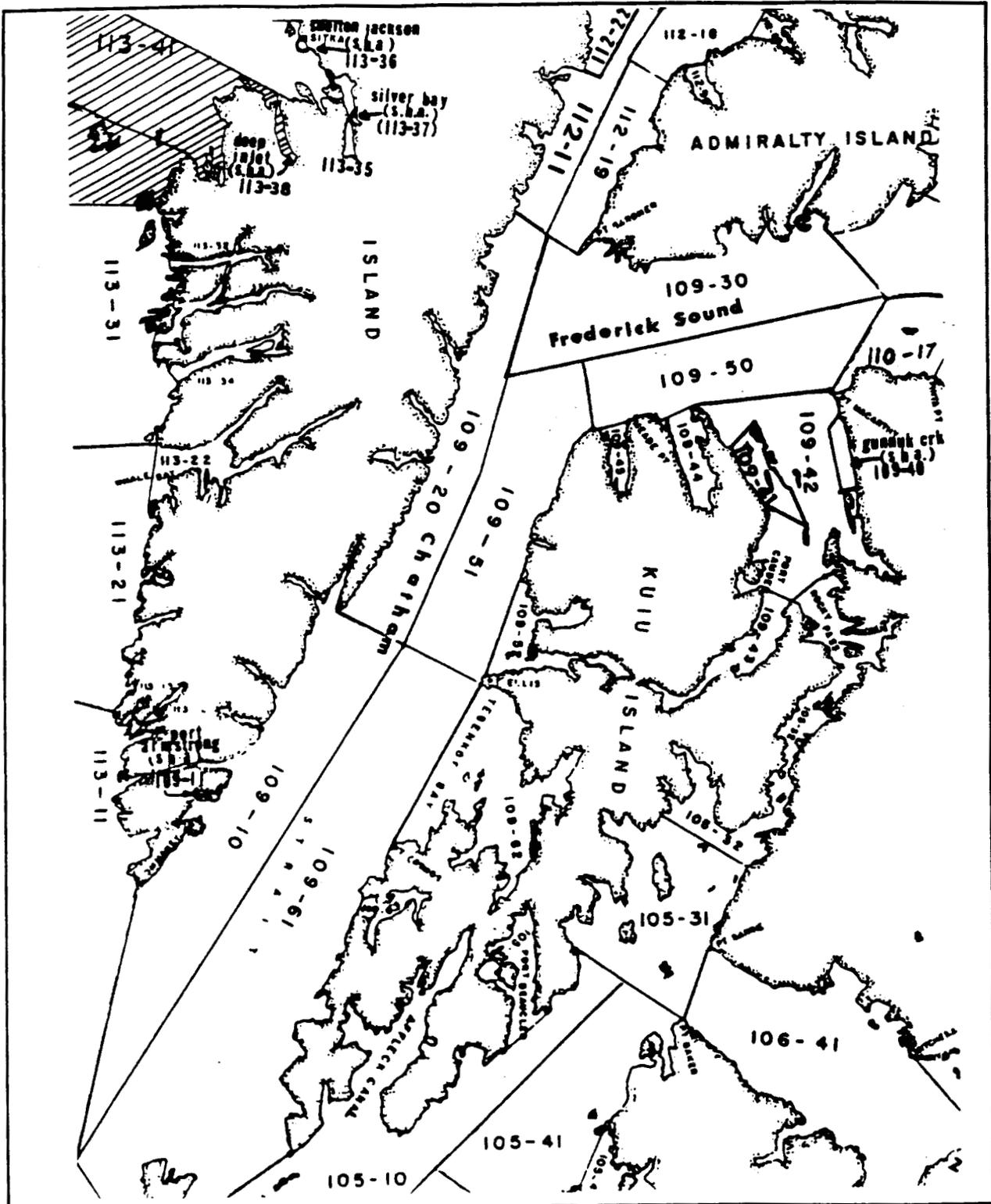


Figure 1. Areas open to commercial harvest of red sea urchins near Sitka for the 1990-1991 season. Open areas are indicated by diagonal hatching.

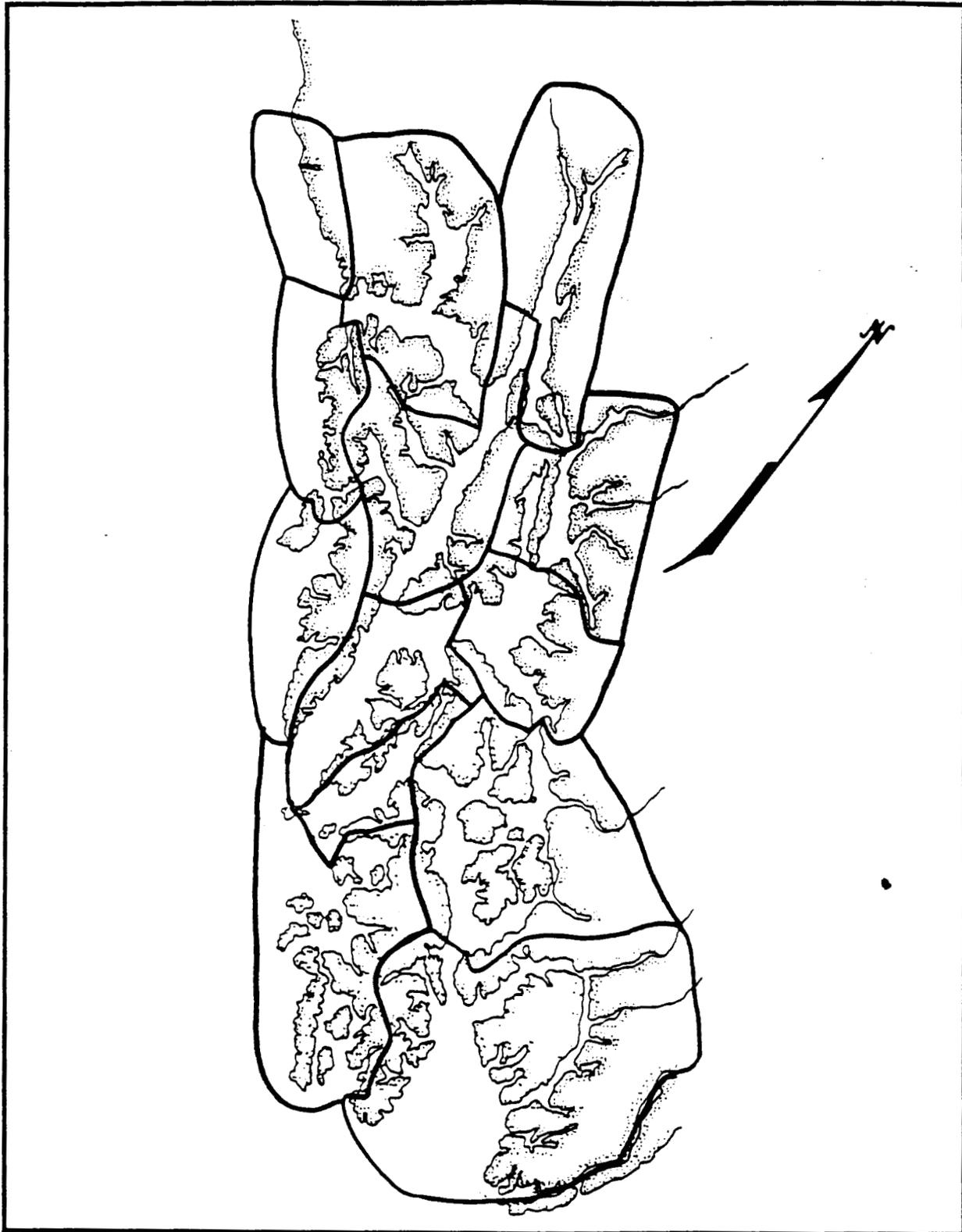


Figure 2. Fishery management unit boundaries for red sea urchins in Southeast Alaska.

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