(Teck et al., 2018)

* When a fishery is roe-based and the product is served raw, such as sea urchins, there can be a high variability in quality due to the reproductive state of the organism and thus a high variability in product price [22,23]
* In the ecological literature, reproductive condition (i.e., a proxy of potential reproductive output) is often measured as gonadosomatic index (GSI) [29]. This metric is simple and objective; it can be easily measured in a laboratory, boat, or dock. Furthermore, it is quantitative, as opposed to the qualitative processor grading scale that is typically employed by buyers in the industry. Gonadosomatic index is predictable across the various stages in the reproductive cycle [21,29], so it is a simple way to compare demographics among seasons and locations.
* Although California sea urchin are fished year round, the price differential paid for sea urchin roe across varying reproductive stages can be substantial [22,27], which creates a strong incentive for selectively harvesting in the best locations and at the best times during the year.
* Urchins increase in gonad size due to the growth of nutritive phagocytes (NPs) [22,30], for red sea urchins this occurs during the summer as they consume abundant drift kelp. Then these NPs support the growth and development of the germ cells (GCs) just before and during the spawning season [22,30,31]. Typically, urchins spawn just after they reach their peak in gonad size.
* The reproductive “ripeness,” or fully mature gonads at the end of gametogenesis, occurs during the spawning season when most of the nutritive phagocytes have shrunken [22]. This is the season when sushi quality declines as GSI declines. Spawning generally indicates lower quality to processors, since most consumers do not like the grainy, watery texture of spawning gonads [22,32]. The gonad reaches its maximum size (highest GSI) just before spawning begins and subsequently shrinks as more gametes are released [17,22,33,34]. Once a sea urchin has fully spawned, the gonad is not as sweet and is smaller (with the lowest GSI) but has a firmer texture, which is preferred by the industry due to the more lasting quality of the product, or “shelf life” (D. Rudie, pers. obs.).

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(Grisolía et al., 2012)

About assessing viability of a new urchin species for local markets. Identifies that a niche market is possible at selected high end restaurants.

Could be interesting to discuss how research on SA markets can be done when introducing parechinus?

(M Lawrence, 2007)

This chapter discusses the biology and ecology of the sea urchins by focusing on their life-history strategies. It is impossible to adequately manage fisheries without understanding the biology and ecology of the species involved because they indicate the potential requirements of a species for aquaculture. Sea urchins are found in middens on the Channel Islands off southern California. Edible sea urchins are distributed among a number of orders of regular echinoids. All sea-urchin species may be edible; they differ greatly in their biology and ecology. The biological differences include growth, survival, and reproduction. These basic components of fitness differ according to the species' life-history strategy and according to how it functions in its particular environment. The models for r- and K-strategies and for bet-hedging are based on bioenergetics. In sea urchins, disturbance is usually lethal and results from either predation or abiotic factors. High growth rate, short time to maturity, and high reproductive effort and output are desirable traits for fisheries and aquaculture. The chapter discusses the characteristics predicted for the extreme life-history strategies of sea urchins.

(Agatsuma, 2020)

World production from fishing of regular sea urchins steadily increased through the latter half of the last century, to a peak of 120,306 ton in 1995. Since 1995, total production has declined quickly, and in 1998 was only 75% of its peak 3 years earlier (Andrew et al., 2002).

It declined further to 69,314 ton in 2016 (FAO, 2019). Over fishing of several important fisheries, and an overall decline in world production (Andrew et al., 2002), has prompted increasing interest in stock enhancement.

The body weight of sea urchins fished is only one determinant of the value of the harvest. Although body weight and roe size are correlated, the time of year and food quantity and quality also interact to determine the size and quality of roe. Nutrients are stored in somatic cells (nutritive phagocytes) within the gonad of sea urchins before being utilized in body growth or reproduction (Giese, 1966; Holland et al., 1967; see Walker et al., [Chapter 3](https://www.sciencedirect.com/science/article/pii/B9780128195703000032)).

(Andrew et al., 2021)

World production of sea urchins peaked in 1995, when 120 306 t were landed. Chile dominates world production, producing more than half the world's total landings of 90 257 t in 1998. Other important fisheries are found in Japan, Maine, British Columbia, California, South Korea, New Brunswick, Russia, Mexico, Alaska, Nova Scotia, and in a number of countries that produced less than 1000 t in 1998. Aside from the Chilean fishery for Loxechinus albus, most harvest is of Strongylocentrouts spp., particularly S. intermedius, S. firanciscanus, and S. droebachiensis. Only a small minority of fisheries have been formally assessed and in the absence of such assessments it is difficult to determine whether fisheries are over-fished or whether the large declines observed in many represent the "fish down" of accumulated biomass. Nevertheless, those in Chile, Japan, Maine, California and Washington and a number of smaller fisheries, have declined considerably since their peaks and are likely to be over-fished. Fisheries in Japan, South Korea and the Philippines have been enhanced by reseeding hatchery-reared juveniles and by modifying reefs to increase their structural complexity and to promote the growth of algae. Sea urchin fisheries have potentially large ecological effects, usually mediated through increases in the abundance and biomass of large brown algae. Although such effects may have important consequences for management of these and related fisheries, only in Nova Scotia, South Korea and Japan is ecological knowledge incorporated into management.