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ABSTRACT: Ten pinto abalones *Haliotis kamtschatkana* were captured in Sitka Sound in 1979 and held in captivity at the Seward Marine Center Laboratory. The first of them died in 1985, and 3 were still alive in 2000 when this note was written. Their shell lengths at capture ranged from 48 to 53 mm. At death 7 individuals had shell lengths ranging from 91 to 102 mm. The 3 live individuals had shell lengths of 81, 96, and 98 mm. These observations indicate pinto abalones have the capacity to live for periods exceeding 20 years in captivity.

INTRODUCTION

A single species of abalone *Haliotis kamtschatkana* Jonas, 1845 occurs in Alaska where it was harvested commercially on a small scale in the southeastern portion of the state until 1996. This species occurs from southeastern Alaska to northern California (Shepherd et al. 2000). In Alaska pinto abalones reach their maximum size at about 100–130-mm shell length (Shepherd et al. 2000). Some information exists on growth and respiration rates as a function of temperature (Paul and Paul 1981, 1998), and Shepherd et al. (2000) provides a recent review on the growth rates of pinto abalones from different regions. The lifespan of this species is not described, and this laboratory observation provides the first data on the potential longevity of pinto abalones.

METHODS

Specimens of *Haliotis kamtschatkana* were captured by divers near Sitka, Alaska on 26 July 1979. The capture site is near the northern limit of their range. The 10 specimens included in this longevity observation had shell lengths of 48 to 53 mm at the time of capture. Their age at capture was unknown. They were held communally in a 100-L tank with flowing seawater at the University of Alaska Fairbanks Institute of Marne Science laboratory in Seward. The flow rate was ≥100% exchange of water every hour. In the laboratory the mean monthly seawater temperature ranged from 3.3° to 10.7°C following the natural seasonal changes that occurred at the 75-m deep seawater intake (Figure 1). The data on rearing temperature are provided so comparisons to natural conditions could be made. During captivity the abalones were continuously fed a variety of intertidal macroalgae with *Laminaria, Alaria, Ulva,* and *Rhodymenia* being the most common genera (Paul et al. 1977). They also grazed on attached diatoms that grew on the sides of the tank. No attempt was made to track growth; during the study, the abalones were left undisturbed to minimize stress.

RESULTS AND DISCUSSION

The first captive abalone died in 1985, 6 years after capture. Its shell length was 101 mm. Others died in 1987 (99 mm), 1990 (102 mm), 1992 (97 mm), 1993 (91 mm), and 1994 (95 and 99 mm). The 3 individuals still alive in 2000 had shell lengths of 81, 96, and 98 mm. These observations indicate that, at least in captivity, a pinto abalone can live for 20 years or more.

The thermal range occurring in surface waters off Sitka, Alaska, where these animals were captured, is about 3° to 18°C (U.S. Department of Commerce 1970). Because our laboratory is north of Sitka, our maximum seawater temperatures tend to be lower. In nature pinto abalones live intertidally and subtidally, in the algal zone, around 3–5-m depth (Stekoll and Shirley 1993). Our laboratory seawater from 75-m

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depth was cooler than a shallow subtidal pinto abalone would normally encounter, especially during the summer near Sitka. The water temperature in our laboratory did not simulate a southeastern Alaskan environment, so we cannot be sure the longevity we observed occurs in nature. Metabolic rates are regulated by temperature (Paul and Paul 1998), so the lifespan might also be related to thermal conditions. However, the growth rates of the captives were comparable to abalones from southeastern Alaska. Our first mortality was about 50 mm at capture, and 6 years later it had reached 101-mm shell length. According to Shepherd et al. (2000) a 50-mm pinto abalone grows to about 100 mm in 6 years (their Figure 9). Regardless of these apparent similarities in growth rates our observations should not be considered representative of longevities in southeastern Alaska until lifespan observations are completed.

There is very little information on the longevity of other species of abalone, especially those in cold-water habitats. *Haliotis corrugata* has been reported to live for up to 21 years in Baja, Mexico (Muñoz 1976 cited in Guzman del Proo 1992). Shepherd et al. (2000) indicated Alaskan abalones live at least 13 years based on shell rings but did not report any information on the lifespan of *H. kamtschatkana* in their review of other growth studies. Our observations suggest that once they reach maximum size captive pinto abalones

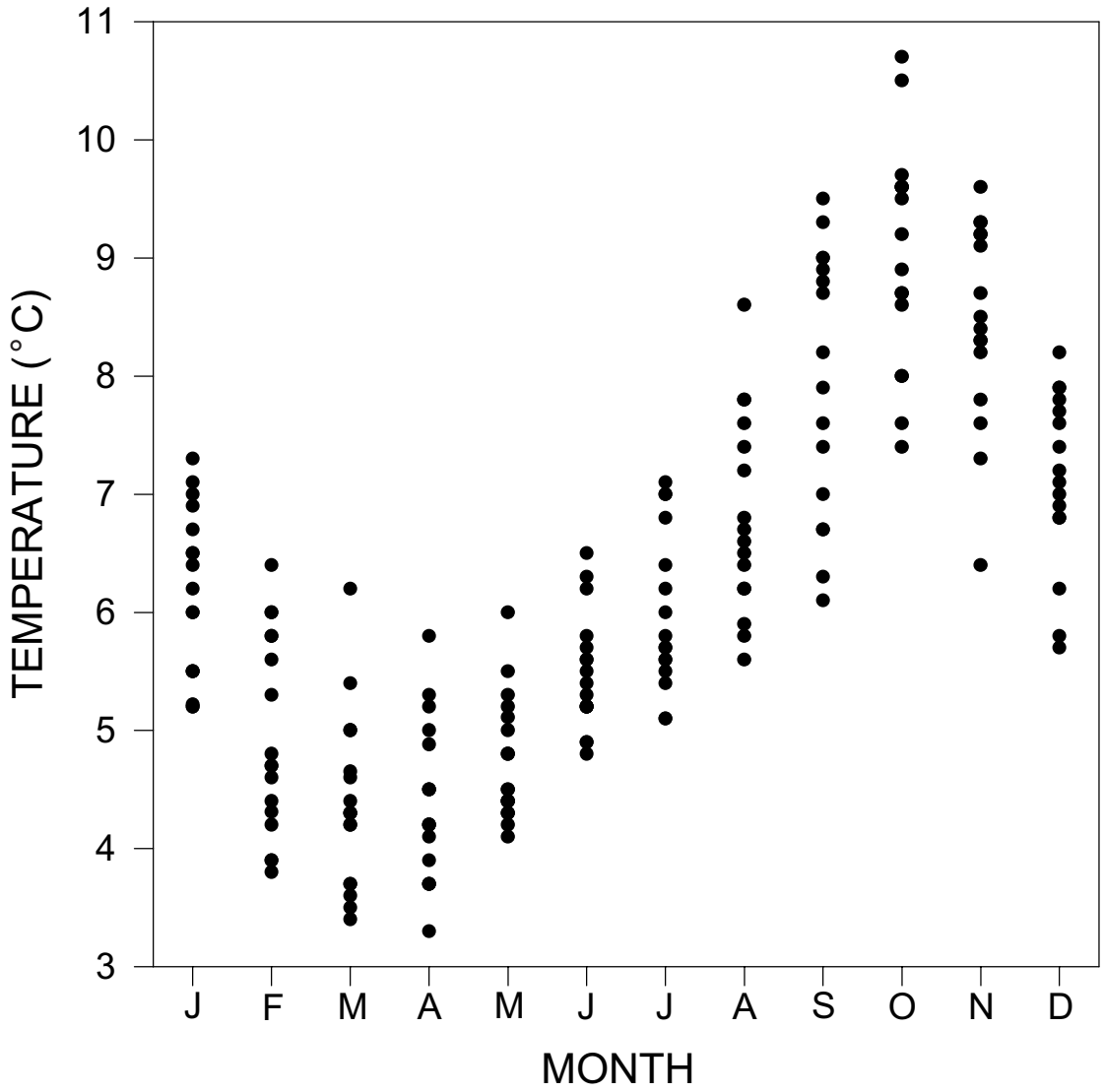

Figure 1. Laboratory seawater temperatures in which *Haliotis kamtschatkana* were held. Data are monthly mean values (●) for 1979–2000.

can live for many more years. Fisheries managers should consider our observations on longevity when determining harvest policy. If pinto abalones on the fishing grounds live as long as our captives, then harvesting them may be more like exploiting a nonrenewable resource rather than a renewable one. It is possible for a fishery to overharvest long-lived species especially if there is underreporting of harvest levels, poor recruitment, and continuous casualties due to methodical predators like sea otters.

LITERATURE CITED

Guzman del Proo, S. A. 1992. A review of the biology of abalone and its fishery in Mexico. Pages 341–360 *in* S. A. Shepard, M. J. Tegner, and S. A. Guzman del Proo, editors. Abalone of the world: biology, fisheries and culture. Fishing News Books, Oxford, England.

Muñoz, L. T. 1976. Resultados preliminares de un metodo par determinar edad en abulones (*Haliotis* spp.) de Baja California. Memorias del primer simposio nacional del recursos pesqueros masivos de Mexico, Vol. Esp. Abulon/Langosta 1:281–301.

Paul, A. J., and J. M. Paul. 1981. Temperature and growth of maturing *Haliotis kamtschatkana* Jonas. The Veliger 23:321–324.

Paul, A. J., and J. M. Paul. 1998. Respiration rate and thermal tolerances of pinto abalone *Haliotis kamtschatkana*. Journal of Shellfish Research 17:743–745.

Paul, A. J., J. M. Paul, D. W. Hood, and R. A. Neve. 1977. Observations on food preferences, daily ration requirements and growth of *Haliotis kamtschatkana* Jonas in captivity. The Veliger 19:303–309.

Shepherd, S. A., D. Woodby, J. M. Rumble, and M. Avalos-Borja. 2000. Microstructure, chronology and growth of the pinto abalone, *Haliotis kamtschatkana*, in Alaska. Journal of Shellfish Research 19:219–228.

Stekoll, M. S., and T. C. Shirley. 1993. *In situ* spawning behavior of an Alaskan population of pinto abalone *Haliotis kamtschatkana* Jonas, 1845. The Veliger 36:95–97.

U.S. Department of Commerce. 1970. Surface water temperature and density, Pacific coast: North and South America & Pacific Ocean islands. National Ocean Survey Publication 31-3, 3rd edition.