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THE TRANSPORT OF EGGS AND LARVAE OF SKIPJACK TUNA FROM HAWAII TO JAPAN

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OBJECTIVES

Since the chances of obtaining ripe eggs or the larvae of skipjack tuna, Katsuwonus pelamis, in Japanese coastal waters are extremely slim, we examined the possibility of collecting ripe eggs from skipjack tuna, taken in Hawaiian waters, artificially fertilizing the eggs, and transporting them, as well as the newly hatched larvae, from Hawaii to Japan.

METHOD

At its shoreside research facility located at the mouth of Kewalo Basin on Oahu, the Southwest Fisheries Center Honolulu Laboratory of the National Marine Fisheries Service has a number of fish tanks in which live tunas are being kept. In June and July 1982, skipjack tuna taken by pole and line were transported to the Kewalo facility in the live-bait tanks of Hawaiian skipjack tuna pole-and-line fishing vessels and transferred to the shoreside tanks. These fish were kept in the Kewalo tanks until they became sexually mature at which time the eggs were squeezed out of the females and artificially fertilized by the dry fertilization method.

About 4 or 5 h following artificial fertilization, a portion of the buoyant (viable) fertilized eggs was placed in polyethylene bag containing 8 liters of seawater, and to prevent any sudden changes in water temperature, the plastic bag was enclosed in a styrofoam box for transport to Japan.

The styrofoam box containing the skipjack tuna eggs was taken by car to the Honolulu International Airport and sent by air to the Osaka International Airport. In Osaka, Kinki University Fishery Laboratory personnel met the flight and took delivery of the box. The box was then transported by car to the Kinki University Fishery Laboratory in Shirahama, Wakayama Prefecture, where the skipjack tuna eggs were transferred into a seawater tank.

In the meanwhile, back in Honolulu, a second batch from the same group of artificially fertilized eggs was hatched. One day after hatching, the newly hatched larvae were placed in a polyethylene bag in 8 liters of seawater, and transported to Japan in a styrofoam box in exactly the same manner as the eggs. Upon arrival at the fishery laboratory in Shirahama, the larvae were transferred into a seawater tank.

RESULTS

The adult female skipjack tuna from which the eggs were collected measured around 50 cm in fork length and weighed approximately 2,500 g. The fertilized eggs measured 0.92–0.98 mm in diameter. At the time of egg collection, the water temperature in the tank was 23.6°–23.8°C. During the egg transport, the water temperature ranged from 21.8° to 26.8°C; during the transport of the larvae, the temperature ranged from 22.3° to 22.6°C.

The total transport time from Honolulu to the Kinki University Fishery Laboratory in Shirahama ranged from 15 h 30 min to 18 h 20 min.

Upon arrival in Shirahama, 66.9% of the eggs (5,686 eggs) remained buoyant (viable). In most of the tanks, the hatching rate of these eggs was around 70-80%, and in the best case, about 90% of the hatched larvae were "normal and healthy."

The transport of larvae from Honolulu to Japan was attempted four times. At arrival in Shirahama, the survival rate ranged from 43.0 to 90.0%; the maximum density of larvae was 505 larvae per liter of seawater.

One batch of the transported larvae began feeding on seawater rotifers 3 days following arrival at Shirahama.

EXPERIMENTS IN TRANSPORTING SKIPJACK TUNA EGGS

1. Artificial fertilization: June 20, 0155-0230.
2. Depart Honolulu: June 20, 0830. (Japan time, June 21, 0330).
3. Arrive Shirahama: June 21, 1900.
4. Total elapsed time: 15 h 30 min.
5. Results on arrival at Shirahama: Buoyant (viable) eggs, 5,805; non-viable eggs, 2,819.
6. Hatching: June 22, 0100-0500.
7. Feeding: Larvae were fed saltwater rotifers beginning the third day following hatching, and marine copepods were also given after the seventh day.
8. Survival condition: 9 days following hatching, 1 larva left.

EXPERIMENTS IN LARVAL TRANSPORT

Experiment 1:

1. Artificial fertilization: June 13, 0300.
2. Hatching: June 14, 0900-1000.
3. Depart Honolulu: June 15, 0745 (Japan time: June 16, 0245).
4. Arrive Shirahama: June 16, 2015.
5. Total elapsed time: 17 h 30 min.
6. Feeding: Larvae fed saltwater rotifiers 2 days after hatching.
7. Survival condition: 9 days after hatching, 4 larvae remained; 10 days after hatching, 1 larva remained.

Experiment 2:

1. Artificial fertilization: June 16, 0400.
2. Hatching: June 17, 0930-1400.
3. Depart Honolulu: June 18, 0800 (Japan time: June 19, 0300).
4. Arrive Shirahama: June 19, 2000.
5. Total elapsed time: 17 h.
6. Feeding: Fed saltwater rotifiers beginning 2 days following hatching; also given marine copepods 7 days after hatching.
7. Survival condition: 11 days after hatching, 3 larvae remained; 15 days after hatching, 1 larva remained.

Experiment 3:

1. Artificial fertilization: June 20, 0155-0230.
2. Hatching: June 21, 0800-1400.
3. Depart Honolulu: June 22, 2200 (Japan time: June 23, 0300).
4. Arrive Shirahama: June 23, 2010.
5. Total elapsed time: 17 h 10 min.
6. Feeding: Given saltwater rotifers beginning 2 days after hatching; marine copepods also given starting 7 days following hatching.
7. Survival condition: 8 days after hatching, 16 larvae remained; 11 days after hatching, 1 larva remained.

Experiment 4:

1. Artificial fertilization: June 28, 0005-0028.
2. Hatching: June 29, 0600-0900.
3. Depart Honolulu: June 30, 0730 (Japan time: July 1, 0230).
4. Arrive Shirahama: July 1, 2050.
5. Total elapsed time: 18 h 20 min.
6. No additional data reported. These larvae were used in experiments to study larval resistance.