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Prototype stunner tested on rainbow trout

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Stun rates range between 90.7 and 96.3 percent

The air-lift fish pump at the left delivers rainbow trout from the culture tank in the rear to the water-filled orientation chamber at front. Fish swim automatically or are slid into the channels that feed into the blue stunning chamber and collection basin at right.

During the 2004-2005 period of production system research at the Conservation Fund's Freshwater Institute in West Virginia, USA, almost 50 metric tons (MT) of rainbow trout were produced, harvested, and donated to the Virginia Food Banks Consortium. Initially, the 0.9-kg fish were killed by submergence for 10-15 minutes in an ice slurry containing a high level of dissolved carbon dioxide, followed by a manual blow to the skull.

The institute staff considered the ice slurry an acceptable method to euthanize fish quickly with minimal loss of end-product quality, as evidenced by a delayed onset of rigor and pH decline. However, observations of rainbow trout trying to flee the ice slurry tank indicated the technique was stressful to the fish and not as humane as desired. The technique was also labor-intensive, requiring the manual handling of fish into and out of the ice slurry.

For these reasons, researchers at the Freshwater Institute evaluated the performance of a prototype percussive stunning system for the slaughter of food-size rainbow trout with support from a U.S. Department of Agriculture, Agriculture Research Service grant.

Prototype stunner

The stunner was recently developed by Seafood Innovations of Brisbane, Australia, based on work with another unit designed to stun salmon of 1.5- to 15-kg size. This automated system has been successfully used in Canada, Australia and the United Kingdom.

The tested stunner was scaled to suit the trout, with the added efficiency of dual channels that allowed the enhanced throughput necessary to achieve suitable harvest efficiency with the smaller fish.

Institute staff evaluated the prototype stunner with two size groups of fish. For the smaller size, the vertical guides of the stunner were pulled far forward to better support the narrower fish. A fish orientation chamber induced the rainbow trout to swim head first into the slide channels that fed the stunner unit. Several trials led to an understanding of how to adjust the machine for fish of various sizes.

Results

In four trials of approximately 70 fish each, 426-gram fish were hand netted into the orientation chamber. From there, they swam into the slide channels, providing automatic delivery to the stunning chambers. Fish entering the stunner unit triggered a nearly instantaneous percussive blow from a pneumatically driven striker piston to the tops of their skulls.

The stunner was also tested during four harvests of 2 MT or less of 800- to 900-gram average rainbow trout that ranged in size from 0.4 to 1.4 kg. For these evaluations, clam-shell crowder gates guided the rainbow trout toward an air-lift pump intake in the circular depuration or grow-out tanks. The fish were pumped out of the crowding areas using a 20.3-cm-diameter air lift that incorporated a dewatering box to allow water to return to the fish tanks.

Rainbow trout were previously killed by submergence in ice slurry followed by a manual blow to the skull.

From the lift, the rainbow trout dropped into the fish orientation chamber. Although some of the trout self-oriented and swam head first into the slide channels, most of the larger fish were not able to readily turn within the orientation chamber. Therefore, one person manually pushed fish into the slide channels, achieving a sustainable stun rate of approximately 40 fish per minute.

During these latter trials, the prototype stunner provided stun rates of 90.7 to 96.3 percent (Table 1). It appeared that most of the unstunned fish passed through the unit upside down or tail first, or were the extremes in size. To accommodate their larger size, a wider orientation chamber will be fabricated to enhance automatic delivery of the 800- to 900-gram rainbow trout to the stunner.

Summerfelt, Stun performance of the prototype stunner, Table 1

Harvest Date (2005)	March 21	April 12	April 27	June 8
Total fish weight (kg)	1,830	1,992	663	653

Mean individual fish weight (kg	0.80	0.91	0.82	1.0
Total fish	2,275	2,205	805	653
Stunned fish	2,127	2,045	775	592
Stunned fish (%)	93.5	92.7	96.3	90.7

Table 1. Stun performance of the prototype stunner.

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