

HYBRID STRIPED BASS^[6]

Project Component Termination Report for the Period
May 1, 1989 to August 31, 1993

NCRAC FUNDING LEVEL: \$232,960 (May 1, 1989 to August 31, 1993)

PARTICIPANTS:

Terrence B. Kayes	University of Nebraska-Lincoln	Nebraska
Christopher C. Kohler	Southern Illinois University-Carbondale	Illinois
Jeffrey A. Malison	University of Wisconsin	Wisconsin
Robert J. Sheehan	Southern Illinois University-Carbondale	Illinois
<i>Extension Liaison:</i>		
Joseph E. Morris	Iowa State University	Iowa

REASON FOR TERMINATION

The objectives for this work on Hybrid Striped Bass were completed.

PROJECT OBJECTIVES

- (1) Obtain and maintain (in captivity) populations of spawning size white bass.
- (2) Define reproductive development in wild and captive white bass by characterizing seasonal changes in hormone titers and gonadal histology.
- (3) Evaluate the effects of selected photoperiod/temperature and hormonal manipulations on gonadal development and spawning in white bass brood stock.

PRINCIPAL ACCOMPLISHMENTS

Southern Illinois University-Carbondale (SIUC) researchers have successfully captured adult white bass, acclimated them to tank culture conditions, and trained them to accept formulated feed. Some fish have been held in captivity for over three years. This level of domestication is not known to have been achieved with white bass in any other laboratory or commercial enterprise.

Considerable numbers of white bass spawns have been accomplished using various hormonal/temperature/photoperiod manipulations over the course of this project. Fish have been accelerated to spawn as early as January, and have had their spawning delayed to as late as October. Accordingly, techniques have been developed that allow successful spawning of white bass any season of the year. Moreover, female white bass that successfully spawned in October 1992 were successfully induced to spawn again in April 1993. Thus, it was demonstrated that white bass can be successfully spawned twice in a 7-month period. It was also shown that male white bass held at or above spawning temperatures (15°C; 59°F) produced viable sperm for at least two months. Average hatching rates have also been improved from 25% to 50%. These findings represent major steps toward the development of domesticated white bass brood stocks to be used for hatchery production of hybrid striped bass.

Injection levels of a synthetic luteinizing hormone-releasing hormone analogue (LhRha) and human chorionic gonadotropin (hCG) have been identified that greatly improve upon previous results at SIUC, and elsewhere, with respect to controlled spawning of white bass. Data indicate that hCG dosages considerably less than that traditionally used to induce final egg maturation are more useful in white bass. In addition to providing guidance for improved spawning performance, these data have positive implications toward eventual regulatory approval of hCG by FDA for spawning *Morone* species.

Annual rhythms of serum levels of estradiol-17 β and testosterone, as well as gonadal growth and histology of the wild and the three captive populations of white bass were documented and correlated with actual spawning events.

IMPACTS

DOMESTICATION

The development of a protocol to habituate adult white bass to captivity, including training to dry formulated feeds, allows for developing domesticated brood stock. Domesticated brood stock is clearly advantageous by:

- obviating need to collect brood stock from wild,
- resolving numerous regulatory issues regarding collection and hauling of wild brood stock,
- allowing for brood stock selection programs, and
- ensuring availability of brood stock when needed.

OUT-OF-SEASON SPAWNING

The development of efficacious procedures to manipulate sexual maturation and induce out-of-season spawning is important for optimal management of brood stock. It leads to:

- greater predictability of gamete production,
- reduced incidence of failed spawnings,
- reduced incidences of brood stock losses due to toxemia, and
- production of fertilized eggs and fry at predetermined times throughout the year.

HATCHING RATES

Improvements in hatching rates allows for increased hatchery production or reduction in brood stock needs.

hCG DOSAGES

Determination of the most efficacious hCG dosages not only improves spawning performance, but these data have positive implications toward eventual regulatory approval of hCG by the FDA for spawning *Morone* species. As a direct consequence of this work:

- standard dosages of hCG are being tested for efficacy in a multi-state Investigational New Animal Drug (INAD) application being administered by Auburn University through sponsorship of Intervet Inc.,
- hCG will be tested for animal safety by SIUC under sponsorship of Intervet Inc., and
- these projects will collectively provide FDA with necessary information to make a determination for approval of hCG for brood fish.

RECOMMENDED FOLLOW-UP ACTIVITIES

NCRAC funded a follow-up study that is focused on developing procedures to intensively rear white bass larvae to a stage when they will consume formulated feed (see next Project Component Termination Report). A proposed study for the next NCRAC funding cycle will, among other topics, compare three strains of white bass in yield trials. Collectively, the results from these studies should pave the way to undertake a white bass brood stock selection program.

PUBLICATIONS, MANUSCRIPTS, OR PAPERS PRESENTED

See the [Appendix](#) for a cumulative output for all NCRAC-funded Hybrid Striped Bass activities.

SUPPORT

YEARS	NCRAC- USDA FUNDING	OTHER SUPPORT					TOTAL SUPPORT
		UNIVERSITY	INDUSTRY	OTHER FEDERAL	OTHER	TOTAL	
1989-91	\$136,410	\$93,436				\$93,436	\$229,846
1991-93	\$96,550	\$54,317				\$54,317	\$150,867
TOTAL	\$232,960	\$147,753				\$147,753	\$380,713

APPENDIX**HYBRID STRIPED BASS*****Publications in Print***

Kelly, A.M., and C.C. Kohler. 1996. Sunshine bass performance in ponds, cages, and indoor tanks. *Progressive Fish-Culturist* 58:55-58.

Kohler, C.C., and R.J. Sheehan. 1991. Hybrid striped bass culture in the North Central Region. Pages 207-209 *in* Proceedings of North Central Aquaculture Conference, Kalamazoo, Michigan, March 18-21, 1991.

Kohler, C.C., R.J. Sheehan, C. Habicht, J.A. Malison, and T.B. Kayes. 1994. Habituation to captivity and controlled spawning of white bass. *Transactions of the American Fisheries Society* 123:964-974.

Woods, L.C., C.C. Kohler, R.J. Sheehan, and C.V. Sullivan. 1995. Volitional tank spawning of female striped bass with male white bass produces hybrid offspring. *Transactions of the American Fisheries Society* 124:628-632.

Manuscripts

Brown, G.G., R.J. Sheehan, C.C. Kohler, C. Habicht, L. Koutnik, L. Ellis, and L.D. Brown. In preparation. Short-term and long-term storage of striped bass *Morone saxatilis* semen. *Journal of the World Aquaculture Society*.

Brown, P.B., R. Twibell, Y. Hodgin, and K.A. Wilson. In review. Use of soybean products in diets fed to juvenile hybrid striped bass. *Journal of the World Aquaculture Society*.

Kohler, C.C. In press. Chapter 6 *in* Harrell, R.M., editor. White bass production and brookstock development. Elsevier Press, Amsterdam.

Morris, J.E., and C.C. Kohler. In press. Pond culture of hybrid striped bass fingerlings in the North Central Region. NCRAC Fact Sheet Series, NCRAC Publications Office, Iowa State University, Ames.

Suresh, A.V., J.B. Rudacille, M.L. Allyn, V. Sheehan, R.J. Sheehan, and C.C. Kohler. In review. Induction of ovulation in white bass (*Morone chrysops*) using hCG and LHRHa. *Aquaculture*.

Papers Presented

- Brown, G.G., L.D. Brown, K. Dunbar, C. Habicht, R.J. Sheehan, C.C. Kohler, and L. Koutnik. 1991. Evaluation of white bass semen with 31P-NMR for the improvement of transportation, storage, and fertility methods. 53rd Midwest Fish and Wildlife Conference, Des Moines, Iowa, November 30-December 4, 1991.
- Brown, G.G., R.J. Sheehan, C.C. Kohler, C. Habicht, L. Koutnik, L. Ellis, and L.D. Brown. 1995. Use of cryopreservatives. North Central Regional Aquaculture Center Hybrid Striped Bass Workshop, Champaign, Illinois, November 2-4, 1995.
- Brown, P.B., R. Twibell, Y. Hodgins, and K. Wilson. 1995. Soybeans in diets fed to hybrid striped bass. 24th Annual Fish Feed and Nutrition Workshop, October 19-21, 1995, Columbus, Ohio.
- Brown, P.B., Y. Hodgins, R. Twibell, and K.A. Wilson. 1996. Use of three soybean products in diets fed to hybrid striped bass. World Aquaculture '96, January 29-February 2, 1996, Bangkok, Thailand.
- Habicht, C., R.J. Sheehan, C.C. Kohler, G.G. Brown, and L. Koutnik. 1991. Routine collection, storage, and shipping of white bass sperm. 29th Annual Meeting Illinois Chapter of the American Fisheries Society, Champaign, Illinois, March 5-7, 1991.
- Kohler, C.C. 1993. The farm fish of the future: hybrid stripers. AQUA '93: 7th Annual Minnesota Aquaculture Conference, Alexandria, Minnesota, March 5-6, 1993. (Invited paper)
- Kohler, C.C. 1994. Hybrid striped bass aquaculture. Yellow Perch and Hybrid Striped Bass Production: From Fry to Frying Pan, Piketon, Ohio, July 3, 1994. (Invited speaker)
- Kohler, C.C. 1995. Broodstock management of white bass. North Central Regional Aquaculture Center Hybrid Striped Bass Workshop, November 2-4, 1995, Champaign, Illinois.
- Kohler, C.C. 1996. Induced out-of-season spawning of fishes. Missouri Aquaculture Industry Association Annual Meeting, February 3-4, 1996, Jefferson City, Missouri.
- Kohler, C.C. 1996. Advancing hybrid striped bass culture in the North Central Region and elsewhere. Aquaculture America '96, U.S. Chapter of the World Aquaculture Society, February 14-17, 1996, Arlington, Texas.
- Kohler, C.C., R.J. Sheehan, M.L. Allyn, J.B. Rudacille, and A. Suresh. 1996. Controlled spawning of white bass. Aquaculture America '96. U.S. Chapter of the World Aquaculture Society, February 14-17, 1996, Arlington, Texas.
- Kohler, C.C., R.J. Sheehan, C. Habicht, J.A. Malison, and T. B. Kayes. 1992. Acclimation to captivity and out-of-season spawning of white bass. Aquaculture '92, 23rd Annual Meeting of the World Aquaculture Society, Orlando, Florida, May 21-25, 1992.
- Kohler, C.C., R.J. Sheehan, C. Habicht, V. Sanchez, J. Finck, J.A. Malison, and T.B. Kayes. 1991. Domestication and out-of-season spawning of white bass. 53rd Midwest Fish and Wildlife Conference, Des Moines, Iowa, November 30-December 4, 1991.
- Kohler, C.C., R.J. Sheehan, C. Habicht, V. Sanchez, J.A. Malison, and T.B. Kayes. 1993. Development of white bass brood stock and spawning protocol. U.S. Chapter World Aquaculture Society Annual Meeting, Hilton Head Island, South Carolina, January 27-30, 1993. (Invited paper)

- Kohler, C.C., R.J. Sheehan, and T.B. Kayes. 1989. Advancing hybrid striped bass culture in the Midwestern United States. 51st Midwest Fish and Wildlife Conference, Springfield, Illinois, December 5-6, 1989.
- Kohler, C.C., R.J. Sheehan, C. Habicht, V. Sanchez, J.A. Malison, and T.B. Kayes. 1992. Collection, acclimation to captivity, and out-of-season spawning of white bass. American Fisheries Society Annual Meeting, Rapid City, South Dakota, September 14-17, 1992.
- Kohler, C.C., R.J. Sheehan, V. Sanchez, and A. Suresh. 1994. Evaluation of various dosages of hCG to induce final oocyte maturation and ovulation in white bass. 25th Annual Meeting of the World Aquaculture Society, New Orleans, Louisiana, January 12-18, 1994.
- Kohler, C.C., R.J. Sheehan, A. Suresh, L. Allyn, and J. Rudacilffe. 1996. Effect of hCG dosage on hatching success in white bass. International Congress on the Biology of Fishes, July 15-18, 1996, San Francisco, California.
- Kohler, S.T. 1995. Cost of production. North Central Regional Aquaculture Center Hybrid Striped Bass Workshop, November 2-4, 1995, Champaign, Illinois.
- Koutnik, L.A., R.J. Sheehan, C.C. Kohler, C. Habicht, and G.G. Brown. 1992. Motility and fertility of extended and cryopreserved *Morone* sperm: when is cryopreservation the best option? Annual Meeting, Illinois/Wisconsin Chapters of the American Fisheries Society, Waukegan, Illinois, February 10-13, 1992. (Awarded Best Student Paper)
- Morris, J. 1995. Pond preparation for larval fish. North Central Regional Aquaculture Center Hybrid Striped Bass Workshop, November 2-4, 1995, Champaign, Illinois.
- Rudacille, J.B., and C.C. Kohler. 1996. Relative performance of white bass, sunshine bass, and palmetto bass fed a commercial diet. Aquaculture America '96, U.S. Chapter of the World Aquaculture Society, February 14-17, 1996, Arlington, Texas. (Awarded Best Student Presentation)
- Sheehan, R.J. 1995. Use of sperm extenders. North Central Regional Aquaculture Center Hybrid Striped Bass Workshop, November 2-4, 1995, Champaign, Illinois.
- Swann, L. 1995. Cage culture. North Central Regional Aquaculture Center Hybrid Striped Bass Workshop, November 2-4, 1995, Champaign, Illinois.