Annual Report 2003
Texas Cooperative Fish and Wildlife Research Unit

In cooperation with
Texas Tech University
U.S. Fish and Wildlife Service
The Wildlife Management Institute
Texas Parks and Wildlife
U.S.G.S. Biological Resources Discipline
Fiscal Year 2003 Annual Report

Texas Cooperative Fish and Wildlife Research Unit

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Unit Cooperators
Texas Parks and Wildlife
Texas Tech University
U.S. Geological Survey
U.S. Fish and Wildlife Service
The Wildlife Management Institute
Introduction

The Cooperative Fish and Wildlife Research Units Program was established to facilitate cooperation among the U.S. Department of the Interior (currently through the U.S. Geological Survey), universities, state and federal natural resource agencies, and private organizations in the areas of research and education related to natural resource management and conservation. The Texas Cooperative Fish and Wildlife Research Unit emphasizes aquatic and terrestrial ecosystems, and the specific fields of interest include fish and wildlife management, aquatic and wildlife ecology, ecotoxicology, reproductive biology, and integrated aquaculture. These research and educational efforts are based on the technical expertise of unit staff and collaborators.

The Texas Unit was formally established by the U.S. Congress in 1988 and staffed in 1989. The present annual report details the activities and accomplishments for fiscal year 2003. This year has been one of opportunity and change for the Texas Unit. Dr. Reynaldo Patiño was on assignment to the National Science Foundation as a program director during this period. Also, March 2003 brought the retirement of Dr. Nick Parker, Leader of the Texas Unit since 1989. Due to federal budget constraints, the Unit Leader position remains vacant at this time. Until the vacancy is filled, Dr. Clint Boal and Dr. Reynaldo Patiño will share administrative responsibilities.

The unit has continued to work with a wide array of cooperators including university, federal, state, and international scientists and resource managers to further advance its mission of conducting research, educating graduate students, and providing technical assistance in the various areas of interest. Funding to support unit research and graduate student participation during the current fiscal year has come from the U.S. Geological Survey, Texas Parks and Wildlife Department, U.S. Department of Agriculture, U.S. Fish and Wildlife Service, U.S. Department of Defense, and U.S. Agency for International Development. Some of these same agencies as well as the National Park Service and Bureau of Land Management have supported unit affiliated Texas Tech University faculty and students.

Please feel free to contact us with comments or requests for additional information.

Thank you to our many partners and collaborators.

Dr. Clint W. Boal
Assistant Unit Leader – Wildlife
TX CFWRU

Dr. Reynaldo Patiño
Assistant Unit Leader – Fisheries
TX CFWRU
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Personnel and Cooperators

Unit Personnel

Unit Staff – U.S. Geological Survey – Biological Resources Discipline
Cooperative Research Units

Vacant, Unit Leader
Dr. Reynaldo Patiño, Assistant Unit Leader-Fisheries
Dr. Clint Boal, Assistant Unit Leader-Wildlife

Unit Staff – Texas Tech University

Digbo Bolamba, Senior Research Associate
Sheri Haskell, Research Associate
Nancy Hubbard, Senior Business Assistant
Naoki Kumakura, Postdoctoral Research Associate
Jodi Martin, Administrative Business Assistant

Cooperator Representatives

Mr. Ron George
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4015 Cheney Dr.
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970-223-1099
lenc@verinet.com
Cooperators

Cooperating Scientists

David Andersen, Minnesota Fish and Wildlife Research Unit
Warren Ballard, Range Wildlife and Fisheries Management
Robert Betsill, Texas Parks and Wildlife
Carlton Britton, Range Wildlife and Fisheries Management
Wilfrido Contreras, Universidad Juarez Autonoma de Tabasco, Mexico
Brad Dabbert, Range Wildlife and Fisheries Management
Ernest Fish, Range Wildlife and Fisheries Management
David Haukos, U.S. Fish and Wildlife Service
David Holderman, Texas Parks and Wildlife
Loren Smith, Range Wildlife and Fisheries Management
Kevin Pope, Range Wildlife and Fisheries Management
Peter Thomas, University of Texas-Austin Marine Science Institute
Mark Wallace, Range Wildlife and Fisheries Management
Goro Yoshizaki, Tokyo University of Fisheries
John Zak, Biological Sciences

Unit Students

<table>
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<tr>
<th>Student</th>
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<tr>
<td>M. Todd Byerly</td>
<td>MS Fisheries Science</td>
<td>Patiño</td>
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<tr>
<td>Tim Capps</td>
<td>MS Environmental Toxicology</td>
<td>Patiño</td>
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<tr>
<td>Neil Crouch</td>
<td>PhD Biology</td>
<td>Patiño</td>
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<tr>
<td>Emma Dawson</td>
<td>PhD Landuse Planning Mgt and Design</td>
<td>Parker/Baker</td>
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<tr>
<td>Matthew Giovanni</td>
<td>MS Wildlife Science</td>
<td>Boal</td>
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<tr>
<td>Joel Merriman</td>
<td>MS Wildlife Science</td>
<td>Boal</td>
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<tr>
<td>Sandeep Muhki</td>
<td>PhD Environmental Toxicology</td>
<td>Patiño</td>
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<tr>
<td>Alison Pruett</td>
<td>MS Wildlife Science</td>
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<tr>
<td>Brett Smithers</td>
<td>MS Wildlife Science</td>
<td>Boal</td>
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<tr>
<td>Thomas Thompson</td>
<td>MS Wildlife Science</td>
<td>Boal</td>
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<tr>
<td>Dorothy Tinkler</td>
<td>PhD Biology</td>
<td>Parker/McIntyre</td>
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<tr>
<td>Lindi Van Heuklon</td>
<td>MS Public Administration</td>
<td>Parker</td>
</tr>
<tr>
<td>Fajin Wang</td>
<td>PhD Biology</td>
<td>Parker/Chesser</td>
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Unit Affiliated Students

<table>
<thead>
<tr>
<th>Student</th>
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<tbody>
<tr>
<td>David Butler</td>
<td>MS Wildlife Science</td>
<td>Ballard</td>
</tr>
<tr>
<td>Matt Butler</td>
<td>PhD Wildlife Science</td>
<td>Ballard</td>
</tr>
<tr>
<td>James Campbell</td>
<td>MS Biology</td>
<td>Zak</td>
</tr>
<tr>
<td>Bernice Dankwa-Wierdu</td>
<td>PhD Wildlife Science</td>
<td>Dabbert</td>
</tr>
<tr>
<td>Stephanie Dupree</td>
<td>MS Wildlife Science</td>
<td>Dabbert</td>
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Cooperating Texas Tech University Academic Units

- Department of Range, Wildlife and Fisheries Management
- Department of Biological Sciences
- Department of Environmental Toxicology
- The Institute of Environmental and Human Health
- The Biotechnology Institute

Funding Sources

- Ducks Unlimited
- Minnesota Forest Industries
- Oregon State University
- Texas Parks and Wildlife
- U.S. Agency for International Development (USAID)
- U.S. Department of Agriculture – Cooperative State Research, Education and Extension Service
- U.S. Department of Agriculture-Forest Service
- U.S. Department of Defense - U.S. Air Force
- U.S. Department of Interior - Bureau of Land Management
- U.S. Department of Interior - National Park Service
- U.S. Fish and Wildlife Service
- U.S. Geological Survey-Biological Resources Discipline
Project title: Temperature effects on gonadal and somatic growth of channel catfish

Unit project number: RWO 48
Principal investigators: Reynaldo Patiño, Robert Betsill
Students and staff: M. Todd Byerly (MS)
Period of performance: 6/02-8/03
Funding source: USGS/BRD, Texas Parks and Wildlife (in-kind)
Location: Texas Tech University, Texas Parks and Wildlife Heart of the Hills Fisheries Science Center

Summary of activities and findings
Channel catfish are an important commercial and recreational sports fish in the United States. Many community fishing lakes in Texas are managed as “put-and-take” fisheries for channel catfish. For this purpose, catfish are reared in hatcheries until they reach a desired size before stocking into the lakes. Stocking typically occurs in the fall. Due to the large demand of catfish by fishery managers, hatchery conditions are often overcrowded and result in fish that are smaller than the desired size. Hatcheries could increase fish size by decreasing rearing densities, but the decrease in fish production numbers could negatively impact the put-and-take fisheries program.

Current methods of enhancing growth rates in fishes include sterility induction to prevent reproductive activity, or the production of monosex populations of the sex with greater growth rates. However, these methods can be time-consuming and require the costly maintenance of broodstock, or involve the application of chemicals which in many situations may not be well received by the public. Preliminary evidence suggests that exposure of fry to high temperatures prior to the onset of gonadal development may suppress or delay reproductive activity. Such heat-based treatments may provide an alternative technology to enhance growth rates of fishes by inhibiting early reproductive development. The present study aimed to determine if high temperatures at an early age suppress reproductive development in channel catfish, and if this reproductive suppression results in accelerated growth.

Twenty three-day-old channel catfish fry were exposed to 27 (control), 34, and 36 C for a period of four weeks. Exposure to 34 C reduced oocyte numbers and testicular area, with a slight decrease in overall body weight. Exposure to 36 C resulted in a significant reduction of oocyte number and ovarian and testicular areas. Also, 52% of females in 36 C treatment seemed to lack germ cells in their gonads and may have been sterilized. However, the 36 C treatment impaired fish growth during the treatment period and caused spinal curvatures and enlarged kidneys. The fish were marked by ventral fin ray-clipping at the completion of the temperature exposures and transferred to outdoor ponds for a period of approximately 2 months. The purpose of this second part of the study was to determine the long term effects of heat treatment on reproductive development and growth. Unfortunately, the marking technique failed as the clipped fins in many of the fish re-grew.

The results of this study indicate the potential of heat exposure to reduce or completely eliminate gonadal germ cells in channel catfish. More research is needed to develop a
precise combination of exposure temperature and exposure length so it may be possible to reduce or eliminate gonadal germ cells without adversely affecting the somatic development of the fish. Also, future research should determine if a decrease in energy required for gonadal development would be redirected towards somatic development.

**Presentations**

**Thesis/dissertations**
Byerly, M.T. 2003. Temperature effects on gonadal and somatic growth of channel catfish, MS Thesis, Texas Tech University.

**Honors and Awards**
Todd Byerly – Second Place, Student Presentation Competition, Texas Chapter, American Fisheries Society, January 2003.
<table>
<thead>
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<th>Project title: Endocrine disruption of common carp on National Wildlife Refuges along the Colorado River</th>
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<tr>
<td><strong>Unit project number:</strong> RWO 49</td>
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<tr>
<td><strong>Principal investigators:</strong> Reynaldo Patiño</td>
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<tr>
<td><strong>Students and staff:</strong> Monte Brown (undergraduate student)</td>
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<tr>
<td><strong>Period of performance:</strong> 6/02 - 12/02</td>
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<tr>
<td><strong>Funding source:</strong> US Fish and Wildlife Service - R2</td>
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<tr>
<td><strong>Location:</strong> Texas Tech University</td>
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**Summary of activities and findings**

Several National Wildlife Refuges (NWR) in the Colorado River are located downstream from municipalities with wastewater treatment plants and agricultural return flows. These refuges provide critical refugia to endangered fishes and birds and also provide critical habitat for migrating and wintering waterfowl and shorebirds throughout the arid southwest. Concerns about the status of the biota associated with these refuges arise from the results of a study conducted at Lake Mead, which suggested significant effects of wastewater on feral male carp of Las Vegas Bay (Patiño et al. 2003; Journal of Aquatic Animal Health 15:55-68). The present study is a subproject of a larger effort undertaken by USFWS personnel (Carrie Marr and Anthony L. Velasco) to look at the potential deleterious effects of aquatic contaminants on the biota of the NWR of interest.

A total of 75 common carp (including males and females) were collected from Cibola, Havasu, and Mohave NWR. The objectives of the Texas Cooperative Fish and Wildlife Research Unit were to: (1) estimate fecundity in female carp, and (2) determine stage of gonadal development and incidence of testicular macrophage aggregates (putative markers of contaminant-induced lesions) in male fish.

Cibola females were the most fecund (higher numbers of ovarian follicles per Kg body weight), the Havasu females were intermediate, and the Mohave females were the least fecund (almost one half the value of the Cibola females). Moreover, Cibola and Havasu females had a clutch of ovarian follicles (eggs) that were growing at the same pace with a peak size frequency of 1.4 mm. Ovarian follicles from Mohave females, on the other hand, were smaller with a peak frequency of 1.3 mm. These observations with female carp can be interpreted in one of two ways: (1) the ovarian follicles of Mohave females are less developed but would have caught up with the other sites if sampled later in the breeding cycle, or (2) full-grown ovarian follicles of Mohave females are smaller than fish of the other two sites.

We also determined that macrophage aggregates (MAs) in the testes were more numerous in males from Mohave than the other two sites. MAs are generally considered to be indicative of disease or exposure to environmental contaminants. Further, Mohave males had relatively higher incidences of specific testicular histopathologies such as Sporozoan-like parasites, vacuolization of testicular MAs, and focal granulomas [Dr. Vicki Blazer from the USGS National Fish Disease Laboratory (Leetown, WV) assisted with the identification of these histopathologies.] Finally, the overall stage of development of the testes appeared to be lower for Mohave males.
Overall, our results indicate that the reproductive condition of Mohave carp is impaired relative to fish from the other two sites at the time sampling for this study was conducted. A more detailed analysis of the fish in these NWR is needed before any conclusion about the reproductive health of the fish can be made. Future studies should incorporate a seasonal sampling scheme.
Summary of activities and findings
The major aim of this two-year research grant was to clarify the regulation and requirements of gap junction (GJ) coupling during the period of ovarian follicle maturation and ovulation in fishes. This basic knowledge of fish reproductive physiology is important to understand and manipulate reproductive condition in fishes for the purpose of fish production in management or aquacultural settings. The animal model for this project was the marine fish, Atlantic croaker.

All major research objectives were accomplished. A salient finding was that closure of heterologous GJ in ovarian follicles is not required for the onset of oocyte maturation. This is a simple but important finding since it dismisses for Atlantic croaker the long-held belief that closure of heterologous GJ is necessary for maturation (release from meiotic arrest) in vertebrate animals. We also acquired basic information about the mechanisms of ovulation, an event that precedes spawning. This information was used to formulate a novel model for the regulation of ovulation by reproductive hormones in fishes. This new regulatory model of ovulation is being evaluated under the auspices of a renewal grant award from the USDA.

Publications


Patiño, R., editor (2002). The teleost gonad: Development, function and histopathology. Fish Physiology and Biochemistry (Preface). Fish Physiology and Biochemistry, 26:1.


**Presentations**


Patiño, R. 2002. Recent progress in the physiology of ovarian follicle maturation and ovulation in fishes. New Mexico Biomedical Research Infrastructure Network, Eastern New Mexico University, Portales (Distinguished Speaker Presentation).

Completed Research-Terrestrial
Summary of activities and findings

We used DNA analysis to differentiate free-ranging Mexican gray wolf and coyote scats and compared the results to traditional field methods (i.e., diameter, location, sign, and odor) used for identification for the two species. We then used the scats identified with DNA analysis as deposited by Mexican wolf or coyote to evaluate discriminant analysis for classifying scats using 3 measurements (i.e., diameter, weight, and length). Forty-nine (24%) of the field-collected scats provided amplifiable DNA, which identified 28 scats deposited by a Mexican wolf and 21 deposited by coyote. Scats identified with DNA analysis for the 2 species had a 79% diameter overlap (Mexican wolf 16.3 to 35.8 mm; coyote 17.4 to 27.8 mm) and revealed diameters greater than 28 mm as Mexican wolf scats. There was a significant difference between diameter means for the 2 species (Mexican wolf mean = 26.0 mm; coyote mean = 22.8 mm). Of 45 scats field-identified as deposited by Mexican wolves based on location and odor criteria, 19 (42%) were deposited by coyote; and of 41 scats field-identified as deposited by coyotes based on diameters less than 30 mm criteria, 20 (49%) were deposited by Mexican wolf. We then used Halfpenny's (1986) suggested diameter criterion for field-identification of scats and determined that 3 of the scats would have been identified as fox (0% correct), 24 would have been identified as coyote (62% correct), and 20 would have been identified as Mexican wolf (75% correct). Discriminant analysis indicated the diameter and weight classification offered the best results for accurately classifying coyote scats (86%), but provided relatively low accuracy for classifying Mexican wolf scats (65%).

There were no systematic diet studies of Mexican gray wolves prior to their extirpation from the Southwest. We collected carnivore scats (n=1,682) from the Apache and Gila National Forests of Arizona and New Mexico from April 1998 through October 2001 and identified scats to species using traditional field methods (i.e., diameter, location, sign, and odor; n = 306) and DNA analysis (n = 26) to determine the diets of free-ranging Mexican wolves in Arizona and New Mexico. We analyzed scats (n = 55) greater than 28 mm diameter collected from areas where Mexican wolf packs were supplementally fed (SF) to determine if they consumed non-supplemental fed (NSF) food items. We found a significant difference in diet composition among packs, with the Cienega and Hawks Nest packs consuming more NSF food items than the other 4 packs. We analyzed scats (n = 251) identified with traditional field methods and found that free-ranging, NSF Mexican wolves consumed large-sized food items (92. % frequency of occurrence [PFO], which consisted primarily of elk adults (36.6% PFO) and calves (36.2% PFO). We analyzed scats (n = 26) identified by DNA analysis and found the diet composed of large-sized food items (72.7% PFO) and medium- and small-sized food items (27.3% PFO). We compared diet analyses of scats identified by the 2 methods and found a significant difference between diets. Diet composition of scats identified by...
traditional field methods consisted of larger-sized food items (92.8% PFO) than found in scats identified by DNA analysis (72.7% PFO). We found no difference in Mexican wolf diets among years, between seasons or between packs.

We compared diets of Mexican wolf (n=26) and coyote (n = 21) scats identified by DNA analysis and found a significant difference in diet composition. Mexican wolf diet consisted primarily of large-sized food items (72.7% PFO), while coyote diet was more variable and composed of more medium- and small-sized food items (63.4% PFO). We compared the diet composition of Mexican wolf scats identified by traditional field methods (n = 251) and DNA analysis (n = 26) to that reported in previous North American gray wolf diet studies (n = 7) and found a difference. Mexican wolf diet consisted primarily of large-sized food items (90.6% PFO) which differed from summer- and carcass-based diets previously reported for North American gray wolves. We compared diet analysis of Mexican wolf scats identified by DNA analysis (n = 26) to previous North American gray wolf diet studies and found a difference. Diet composition of Mexican wolf scats identified by DNA analysis differed from 2 of the 7 gray wolf diet studies. Our results suggest that reintroduced and wild-born Mexican wolves consumed more large-sized food items than sympatric coyotes or North American gray wolves.

Presentations


Thesis/dissertations

Awards and honors
Janet Reed received the Clarence Cottam award for best presentation at the 38th Annual meeting of the Texas Chapter of the Wildlife Society
Summary of activities and findings
The loss of native grasslands, coupled with the continued fragmentation and degradation of the few remaining patches, has had a dramatic negative impact on most grassland bird populations in North America. In 1997 Conservation Reserve Program (CRP), CRP participants were required to re-seed 51% of all existing CRP land with native grasses, and all new CRP contracts with at least 90% native grasses. However, the value of native seeded CRP land in providing both breeding and wintering habitat for obligate grassland birds has not been assessed in the Southern High Plains. We initiated a study to assess the value of native seeded CRP fields as grassland bird habitat by 1) investigating summer and winter avian species diversities and abundances, 2) determining the influence of vegetation structure on grassland bird use, and 3) assessing nesting density and reproductive success. During the 2001 and 2002 breeding season (May through June), 13 and 12 species of birds were observed on the study plots, respectively. Species number, richness, and total abundances of birds did not vary significantly between cover types or between years. The grasshopper sparrow (Ammodramus savannarum), Cassin’s sparrow (Aimophila cassinii), mourning dove (Zenaida macroura), and western meadowlark (Strunella neglecta) accounted for more than 95% of all observations for the two years. All species except the western meadowlark showed strong associations based on CRP cover type. Eight species were found nesting on CRP study sites, and a total of 118 nests were located and monitored. Grasshopper sparrow (n = 36), Cassin’s sparrow (n = 28), and morning dove (n = 45) accounted for 92.4% of all nests found. Nesting densities varied between year and between cover types for these species. Mayfield estimates of nesting success did not differ significantly with cover type or between years. The western meadowlark, savannah sparrow (Passerculus sandwichensis), and horned lark (Eremophila alpestris) were the only species that comprised greater than 5% of the total detected individuals and were the species included in further analyses. Meadowlarks were ubiquitous in winter CRP type use, but savannah sparrows and, to a lesser extent, horned larks, demonstrated preferences for native plots. During the breeding season these bird species are primarily insectivorous. Therefore, breeding season habitat selection may be based on vegetative structure rather than composition. During the winter when the birds are feeding primarily on seed, CRP grass composition may be more important and a basis for selection.
Publications

Presentations


Thesis/dissertations
Summary of activities and findings
The northern goshawk (*Accipiter gentilis*) is a large, forest-dwelling raptor generally associated with mature deciduous, coniferous or mixed forests. Diet studies of individual goshawk populations are necessary to understand their food habits in different regions and forest conditions. We used time-lapse video recording systems were used to collect food habits information for northern goshawks in Minnesota during the breeding seasons of 2000-2002. A total of 4,801 hours of video footage allowed detection of 652 prey deliveries among 13 goshawk nests. Prey diversity and diet equitability indices were low, and there was high dietary overlap among nests. Red squirrels (*Tamiasciurus hudsonicus*) were the dominant prey species (31%), accounting for more than double the other dominant prey species, which included Eastern chipmunks (15%), American crows (6%), snowshoe hares (5%), or ruffed grouse (5%). Mammals accounted for 61% and birds accounted for 39% of biomass delivered to goshawk nests. The mean number of prey delivered/nestling/day and the biomass delivered/nestling/day decreased with brood size. The proportion of red squirrels and Eastern chipmunks in the diets was consistently high throughout the breeding season. Ruffed grouse and snowshoe hares experience population fluctuations that follow a 10-year cycle. Thus, the observed frequency of grouse and snowshoe hare delivered to nests in the study area may not represent the proportional use of these species throughout their population cycles. Regardless, our study is similar to other goshawk diet studies, which found sciurids dominating goshawk breeding season diet. However, our study was conducted during the breeding season and does not represent goshawk prey use during the non-breeding months.

Presentations


Thesis/dissertations
Project title: Managing invasive yaupon holly in the Post Oak Savannah ecological region of Texas

Unit project number: TPW 5
Principal investigators: Brad Dabbert
Students and staff: Stephanie Dupree (MS)
Period of performance: 9/01 - 8/03
Funding source: Texas Parks & Wildlife
Location: Gus Engeling Wildlife Management Area

Summary of activities and findings
Yaupon (Ilex vomitoria) is a common understory plant in the Texas Post Oak Savannah. Yaupon density has increased in the understory of the Post Oak Savannah, likely because of fire suppression. The strong sprouting ability of the plant has limited the long-term control of mature plants with prescribed burning or cutting. Consequently, management efforts to reduce yaupon density and restore the flora and fauna of the Post Oak Savannah will require the use of herbicides, likely combined with fire or mechanical treatments. Prior to our studies, the recommendation for managing yaupon was an individual plant treatment (IPT) of 25% Remedy in diesel to the lower 12-18” of the trunk during the growing season. Although this treatment has resulted in very high levels of control, little research has been conducted on other treatment options that may be more cost effective. Our objective was to develop alternative treatment options for managing yaupon. At Gus Engeling WMA, we evaluated three management techniques (herbicide application, mechanical removal plus herbicide, and prescribed burning + herbicide). Twenty five replicates of each treatment were applied between 16 & 20 July 2001. Herbicide treatments were IPT basal applications of diesel alone, or 5, 10, 20, and 25% concentrations of Garlon 4 delivered in diesel. Mechanical plus herbicide treatments were cut only with a chain saw, or cut and apply diesel, 5, 10, 20, or 25% Garlon 4 in diesel. Prescribed burning plus herbicide treatments were burn only, or burn and apply diesel, 5, 10, 20, or 25% Garlon 4 in diesel. Prescribed burning plus herbicide treatments were applied to areas that had been burned 6 or 18 months before application. Mortality (no living plant tissue visible) was estimated 7 months after treatment application. All treatments including diesel or herbicide effectively killed yaupon. Spraying or cutting and spraying with 5-25% Garlon 4 resulted in >90% mortality, whereas spraying or cutting and spraying with diesel resulted in 68 and 84% mortality, respectively. Burning and spraying with 5-25% Garlon 4 resulted in >90% mortality except in trees treated 18 mo. post fire with 5% Garlon 4(76%). Burning and spraying with diesel averaged 62% (56 & 68%) mortality. Yaupon is a plant that can be readily controlled in most situations. We have provided several alternatives for managing yaupon, each of which could be tailored to a specific management situation.

Presentations
Awards and honors
Brad Dabbert, Tenure Granted, February 2002, Texas Tech University
Brad Dabbert, Promoted to Associate Professor, September 2002, Texas Tech University
On-going Research-Aquatic
Project title: Establishment of a new research program on fish reproductive development (puberty) at the Texas Cooperative Fish and Wildlife Research Unit

Unit project number: RWO 51
Principal investigators: Reynaldo Patiño
Students and staff: Neil Crouch (PhD)
Period of performance: 9/02 - 8/04
Funding source: USGS/BRD
Location: Texas Tech University

Summary of activities and findings
This ongoing pilot study aims to acquire basic information about the regulation of fish reproductive development (puberty) in small laboratory fish. The information obtained will be used to enable the development of grant proposals to conduct full studies on the same subject. Ultimately, the goal of this project is to establish laboratory models for screening environmental contaminants (endocrine disruptors) that affect the reproductive fitness of fishes in their natural habitat.
Project title: Risk based approaches for improved toxic chemical management for integrated environmental and human health issues - Zebrafish study/Phase V (2002-2003)

Unit project number: OA 41
Principal investigators: Reynaldo Patiño
Students and staff: Sandeep Muhki (PhD), Tim Capps (MS), Felix Rodriguez (undergraduate), Monte Brown (undergraduate), Darelyn David (undergraduate)
Period of performance: 12/98 - 12/03
Funding source: Department of Defense through the Texas Tech University Institute of Environmental and Human Health
Location: Texas Tech University

Summary of activities and findings
Perchlorate is a chemical heavily used and widely distributed at military installations. It has been detected in surface and ground water in many states including Texas, Arizona, Utah, Nevada, and California. The ultimate goal of this research is to assess the impacts of perchlorate exposure on sensitive components of ecosystems. A more immediate goal is to determine the effects of perchlorate on the health and reproductive fitness of fishes. To achieve these goals, it is first necessary to develop reliable biomarkers of perchlorate exposure. Perchlorate is well known to disrupt thyroid gland function in animals by reducing the amount of iodide that is available for the production of thyroid hormones. These hormones are essential for embryogenesis, development, and normal function of adult animals. Among the currently available biomarkers of perchlorate exposure, thyroid follicle cell hypertrophy is widely used. However, in an earlier phase of this study, we observed that fish (zebrafish) exposed to perchlorate experienced a remarkably high degree of formation of small blood vessels (angiogenesis) among the thyroid tissue. Therefore, the specific objective of the present phase of this study is to evaluate the potential for angiogenesis as a more reliable and sensitive marker of perchlorate exposure than hypertrophy. An additional objective is to assess effect of perchlorate on other potential target tissues, such as the kidney.

Our animal model was the zebrafish (pre-pubertal at the onset of perchlorate exposure). The concentrations of perchlorate used were 0, 0.01, 0.1, 1, and 10 ppm. Zebrafish samples were taken four times during the 12-week exposure (2, 4, 8 and 12 weeks), and twice after termination of the exposure (4 and 12 weeks) to assess recovery. Growth patterns (length, weight, condition factor) and incidence of angiogenesis and hypertrophy in the thyroid tissue were determined. Growth data are currently under analysis. Histopathological analysis of thyroid tissue showed that at 2 weeks of exposure, only angiogenesis was evident in the 0.1, 1 and 10-ppm groups. At 12 weeks of exposure, angiogenesis was evident in the 0.1-to-10-ppm groups and hypertrophy in the 1-to-10-ppm groups. Marked residual effects on angiogenesis and mild effects on hypertrophy were apparent at 4 weeks of recovery in the 1-to-10-ppm groups. At 12 weeks of recovery, residual effects were observed only for angiogenesis in the 10-ppm group. In conclusion, angiogenesis is indeed a more sensitive and longer lasting indicator of perchlorate exposure and thyroidal effects in zebrafish. This observation
needs confirmation in other fish and non-fish species before the use of angiogenesis as marker of perchlorate exposure can be generally recommended.

In a separate exposure of adult zebrafish to 18 ppm perchlorate for 8 weeks, we observed a higher incidence of kidney macrophage aggregates relative to control fish. The occurrence of macrophage aggregates in tissues is considered an indication of potential damage. This observation indicates that tissues other than the thyroid gland may also be affected by perchlorate and raises further concerns about the general health of fish exposed to perchlorate in the wild.

**Publications**

**Presentations**

**Thesis/dissertations**
Summary of activities and findings
In aquaculture, the expansion and diversification of cultured species are to a large degree dependent on the reliable and adequate supply of fingerlings. Improved strategies for fish production and growth maximization are also issues of interest in fisheries management. A better knowledge of the basic physiology of ovarian maturation and ovulation (egg production) would therefore greatly facilitate the development of new and improved reproductive technologies. The specific goal of this research program is to define the hormonal mechanisms by which egg production is regulated in fishes. Our previous USDA-funded research has yielded a novel framework for this type of research. This new framework will be applied and tested during the course of the present research.

Numerous studies with teleosts have addressed the regulation and mechanisms of oocyte maturation, but largely at the exclusion of ovulation. A smaller but still considerable number of studies have focused on ovulation, and ignored maturation. Consequently, little is known about the mechanistic linkages between these two events. New information already obtained from this ongoing study indicates that the pituitary reproductive hormone, luteinizing hormone, regulates the acquisition not only of oocyte maturational competence but also of ovulatory competence. We tentatively conclude that maturation and ovulation are closely integrated and overlapping events that are best viewed conceptually and experimentally as parts of a functional whole. The results of this study are expected to advance current knowledge of the mechanisms controlling egg production, and this enhanced knowledge is in turn expected to lead to the design of better reproductive technologies.

Publications
Patiño, R., Yoshizaki, G., and Thomas, P. In press. Regulation of maturational and ovulatory competencies in teleost ovarian follicles. Fish Physiology and Biochemistry.

Presentations
Project title: Development of aquaculture techniques for the indigenous species of southern Mexico, *Centropomus undecimalis*: sex determination and differentiation and effects of temperature

Unit project number: OA 48
Principal investigators: Reynaldo Patiño, Kevin Pope, Wilfrido Contreras
Students and staff: To be arranged
Period of performance: 6/03 - 7/04
Funding source: USAID through Oregon State University
Location: Tabasco, Mexico

Summary of activities and findings
Artisanal fisheries based on the capture of wild populations are the primary source of fish for the food market in southern Mexico. Because of its geographic and hydrological features, this region also has been considered one of the most promising in Mexico for the development of aquaculture. Although native fishes are deeply embedded in the culture of the region and constitute important food staples for its people, to date most aquacultural programs have relied primarily on non-native species such as tilapias and carps. These exotic species have escaped the confines of aquacultural farms and are now reported to have invaded biologically sensitive areas such as The Pantanos de Centla Biosphere Reserve (Tabasco), the most important wetland system in southeastern Mexico. The impact of these exotics on the ecological viability of the area remains largely unexplored but is likely to be considerable. This proposed work is based on the premise that the development of aquaculture of indigenous species is preferable for the region in the context of both market acceptability and ecological compatibility.

Species of “robalo,” or snook, are among the most important indigenous fish species along the Mexican coastline of the Gulf of Mexico. The robalo blanco, or common snook (*Centropomus undecimalis*) are caught in relatively greater numbers and enjoy a high market value. However, there is an overall national trend for diminishing catch volumes, a situation that has led to concerns for the health of the regional snook fisheries and to calls for improved management practices. The natural range of common snook extends from North Carolina to Brazil, and therefore the status of natural snook populations is also of international concern.

It has been reported that female snook are larger than males of the same age class, especially in younger fish. This observation suggests that females have an intrinsically faster growth rate than males. In many fishes, population sex ratios can be manipulated by manipulating water temperature at a critical early age. The ultimate objectives of this project are to (1) determine if sex ratios of common snook can be changed in favor of females by manipulation of water temperature or application of exogenous sex steroids (estrogen), and (2) confirm if growth rate is associated with gender. As a first step to achieve these objectives, the immediate objective of this study is to describe the process of gonadal formation and sex differentiation in common snook. A technical workshop on fish culture and biology, with emphasis on snook, will also be conducted at the Universidad Juarez Autonoma de Tabasco, Mexico.
On-going Research-Terrestrial
Project title: Comparative effects of global climate on ecosystem nitrogen and soil biogeochemistry in the U.S. national parks

Unit project number: RWO 32
Principal investigators: John Zak
Students and staff: Traesha Robertson (PhD), Erin Walker (MS), Heath Grizzle (MS), James Campbell (MS), Amber Nagy (MS), Jennifer Resinger (MS)
Period of performance: 9/99 - 8/04
Funding source: USGS/BRD
Location: Pine Canyon Watershed Big Bend National Park

Summary of activities and findings
Specific Objectives - 1. continue to quantify long-term change in hydrologic, nutrient, and precipitation along the Pine Canyon watershed gradient at Big Bend National Park, 2. continue monitoring long-term trends in soil N status, 3. examine spatial and temporal change in subsurface soils water chemistry and flow to quantify N export and response to change in soil temperature and moisture, 4. evaluate long-term trends in soil microbial activity, soil microbial biomass and functional diversity, and provide biological parameters for measuring ecosystem stability and response to disturbance, 5. assess spatial and temporal patterns in decomposition rates; 6. in conjunction with the other watershed sites that are part of the larger investigation, Big Bend will provide the data necessary to help assess impact of changes in forest structure alone and in combination with environmental changes (atmospheric inputs, global climate) on the function of forested watersheds (biogeochemistry and nutrient retention); and, 7. provide management recommendations concerning human impacts on Park watersheds.

We are continuing to evaluate impacts of changes in precipitation amounts on the soil microbial and nutrient dynamics within the Sotol-Grasslands in Pine Canyon. We have completed two seasons of water additions to our plots in the grasslands. Winter watering changes the rates of nitrogen mineralization, while summer watering has no impact.

Publications

Presentations

Soil Properties: Potential Impacts on Desert Plant Communities in Big Bend National
### Project title:
Fire application to saltcedar-dominated riparian areas: Prescription development, hazardous fuels reduction, and ecosystem response

<table>
<thead>
<tr>
<th>Unit project number</th>
<th>RWO 39</th>
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<tr>
<td>Principal investigators</td>
<td>Carlton Britton</td>
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<tr>
<td>Students and staff</td>
<td>Brent Racher (PhD)</td>
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<td>Period of performance</td>
<td>1/02 - 1/04</td>
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<tr>
<td>Funding source</td>
<td>Bureau of Land Management</td>
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<td>Location</td>
<td>Chaves County, New Mexico; Lubbock, Texas</td>
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### Summary of activities and findings
In areas where saltcedar is a widespread problem such as the Pecos River Valley, land managers often utilize fire to prevent a saltcedar stand from becoming too thick, allowing better recreation areas, viewing of wildlife, or handling of livestock. This project will be set-up to analyze three major objectives. The first is to determine the best phenological stage to burn saltcedar in order to receive the highest mortality, reduce the canopy the greatest, and have the best herbaceous response following the fire. Second, re-apply fire five years following initial burning treatments, and determine the phenological stage to burn to receive the highest mortality, reduction of canopy, and herbaceous response. Third, determine burning prescriptions and blackline widths in order to safely burn saltcedar stands. Studying fire behavior in saltcedar stands will also aid in understanding what to expect when there are wildfires. Completing these objectives will provide the prescribed burning management options for land owners/managers that will best suit their situation (i.e. reduction of saltcedar, increased grazing capacity, etc.). This project and its results will also provide a demonstration area for viewing and descriptive data to interested parties.

### Presentations


### Thesis/dissertations
Summary of activities and findings
Some species of diurnal raptor have been shown to be associated with prairie dog colonies. However, most studies conducted on raptor-prairie dog associations have focused on the winter season, and little information exists for migratory periods or on breeding grounds. Diurnal raptors pose a potential strike threat to aircraft, especially in low-level flight. Prairie dog control has therefore been proposed as a method of reducing the risk of bird-aircraft collisions. However, due to habitat loss, sylvatic plague, and wide-scale eradication programs, black-tailed prairie dogs have been found to warrant protection as a threatened species under the Endangered Species Act, but are precluded by other, higher priority issues. Thus, assessing the value of lethal control of prairie dogs and identifying non-lethal alternatives is important. We addressed this question with two study components. Component one of this study was initiated to assess the potential effectiveness of a prairie dog control program as a means of reducing bird-aircraft strike risks. Objectives of component one were to 1) assess seasonal patterns of raptor presence at grassland sites occupied by prairie dog colonies and grassland sites unoccupied by prairie dogs and 2) to use this information to assess the potential effectiveness of prairie dog control as a method to reduce risk of bird-aircraft collisions. Objectives of component two were to 1) assess the efficacy of visual barriers as a non-lethal method of prairie dog control, and 2) to evaluate different materials used as visual barriers. We found species-specific and seasonal differences in raptor presence at prairie dog colonies compared to non-colonized grasslands. We determined that each possible control situation is unique and needs to be assessed individually. For example, in our rangeland study site, control of prairie dogs may lead to an increase in Swainson’s hawks and strike risk. In contrast, control of prairie dogs in our agricultural study area may lead to a reduced presence of ferruginous hawks and reduced strike risk. Prairie dog control in either study area would have no discernible effect on red-tailed hawks or strike risk. We found that visual barriers were not effective in reducing the spread of prairie dog colonies. However, galvanized roofing material was a more resilient material and required less maintenance compared to traditionally used silt fencing.

Presentations


**Thesis/dissertations**

Summary of activities and findings
Northern pintail (*Anas acuta*) have been declining since the late 1970s in a contrasting trend to other species of waterfowl. A possible hypothesis for this decline is low winter survival and declining wintering habitat quality and quantity. We are investigating survival, movements, and habitat use of female pintails wintering in the Playa Lakes Region (PLR) of Texas. In an unprecedented effort, birds captured and radio-transmittered in the PLR will be followed throughout migration and nest initiation by other researchers throughout the midcontinent region of North America. During the 2002-2003 field season, greater than 400 pintails were captured and measured. We outfitted 155 females with radio transmitters and monitored the birds from 15 Oct. through 15 Feb., when migration occurred. Habitat condition were excellent for the 2002-2003 field season. Cumulative survival for the wintering period was 93%. All but 1 of the 8 mortalities occurred during the pintails hunting season. Movement data indicated that pintails feed out playa wetlands prior to field feeding. Structural measurements varied based on age/sex class, temporally, and geographically. The second field season will start in October 2003.

Presentations
Project title: Influences of landuse change on distributions of falconiforms and strigiforms in Texas: An historical analysis with projection to 2030

Unit project number: RWO 52
Principal investigators: Clint Boal
Students and staff: Dorothy Tinkler (PhD)
Period of performance: 1/03 - 12/03
Funding source: USGS/BRD
Location: Texas Tech University

Summary of activities and findings
To understand the impact that agricultural and urban expansion will have on ecological processes it is necessary to first investigate historical agricultural and urban expansion. This historical model can then be used as a predictive model to determine where habitat fragmentation will occur over the next 30 years so management guidelines can be established. To accomplish this we are evaluating the temporal and spatial characteristics of landscape, land cover and land use. In addition, we are investigating the consequences of agricultural expansion on birds of prey across Texas. Three main factors can be identified as causing declines in raptor numbers. All of these are associated with expanding human population and increased conversion of natural vegetation to cropland and urban areas. They are 1) restriction and degradation of habitat, 2) environmental contamination and 3) persecution by humans. Currently, we have completed quantification of the percentage of natural habitat, urban habitat and farmland for all Texas counties for each year of the Census of Agriculture. These data have been interpolated to estimate percent coverage of each of the three classes between census years. The actual and estimated data have been used to create a series of maps from 1850 to 1997, which illustrate the conversion of natural cover to farmland and urban cover in successive years. The percentage of farmland from the census has been regressed and a predictive model has been generated for each county. These models will be used to predict the percentage of farmland in each county in the year 2030. Distribution maps for Texas raptors from field guides back to 1925 have been digitized and the area of each of these distributions has been quantified.
Project title: Playa lakes as habitat reserves for prairie dogs

Unit project number: TPW 8
Principal investigators: Clint Boal
Students and staff: Alison Pruett (MS)
Period of performance: 9/01 - 8/04
Funding source: Texas Parks & Wildlife (TPW 8), Texas Cooperative Fish and Wildlife Research Unit
Location: Southern High Plains of Texas, Texas Tech University

Summary of activities and findings
Playa lakes play a significant role in the lives of many wildlife species. These lakes provide greater than 160,000-ha of wetlands, while occupying just 2% of the total landscape in the Southern Great Plains. Due to intensive agricultural practices in the Texas Panhandle and surrounding regions, playa lakes have become one of the last areas of native habitat and refuge for many wildlife populations. No studies, however, have been made to assess the value of playa lakes as habitat for the black-tailed prairie dog (Cynomys ludovicianus). The importance of assessing the relationship between playa lakes and black-tailed prairie dogs is multi-faceted. Prairie dogs are restricted to less than 5% of their historical range and have been found warrant listing as federally threatened species. In 2002, we initiated a study to examine the value of playa lakes as habitat reserves for black-tailed prairie dogs. The objectives of our study were to assess 1) black-tailed prairie dog colony distribution, colony sizes, and population of colonies the Southern High Plains of Texas, 2) associations of black-tailed prairie dog colonies with playa lakes, and 3) diversity and abundances of small mammal and avian species associated with prairie dog colonies at playa lakes. Location of prairie dog colonies is complete and we are now using GIS applications to qualitatively assess colony area sizes and distribution within each county. Raw population counts have been completed at each colony but we are developing a model to more accurately estimate population sizes from the counts. Small mammal and avian surveys have been completed, but these data are in the process of being analyzed.

Presentations

Project title: Estimating Rio Grande wild turkey populations in Texas

Unit project number: TPW 9
Principal investigators: Warren Ballard, Mark Wallace
Students and staff: Matt Butler (PhD)
Period of performance: 9/01/02-8/31/06
Funding source: Texas Parks & Wildlife
Location: Rolling Plains, Texas

Summary of activities and findings
Objectives of study are to develop and evaluate Rio Grande wild turkey population estimation techniques for their ability to predict changes in population abundance at local and regional scales. We hypothesize that useful estimates of Rio Grande wild turkey population trends can be derived. However, different population estimation techniques will result in different abundance estimates. Thus, some population estimation techniques will be better suited to Rio Grande wild turkeys than other techniques.
Project title: Resource partitioning and overlap of a raptor assemblage associated with prairie dog colonies

Unit project number: TPW 10, OA 49
Principal investigators: Clint Boal
Students and staff: Matt Giovanni (MS)
Period of performance: 11/02 - 8/05
Funding source: Texas Parks & Wildlife, USDA Kiowa-Rita Blanca National Grasslands, Texas Cooperative Fish and Wildlife Research Unit
Location: Dallam County Texas, and Kiowa and Rita Blanca National Grasslands in New Mexico and Oklahoma; Texas Tech University

Summary of activities and findings
Breeding populations of ferruginous hawks (*Buteo regalis*) and Swainson's hawks (*B. swainsoni*) are sympatric in many areas of their range, but associations between them are poorly understood. Both species are of large raptors, frequent open country, and are top trophic level predators that forage primarily on small mammals and birds. Given the similarities in size, foraging behavior, and prey use of these three species, it is intriguing that they co-exist as breeding residents in the Northern Staked Plains (NSP) region of Texas. Furthermore, both species are known to be experiencing population declines in many parts of their range. Many researchers believe that ecological communities exhibit predictable structures arising from species interactions, particularly competition for resources. While similarities in diet may have negative influences on some species within a trophic level, differences in habitat use, foraging behavior, and activity periods may permit the coexistence of trophically similar species. Food is a primary ecological factor that limits raptor populations and partitioning of food resources may provide a basis for community structure among coexisting species. Trophic dynamics and the energy transfer associated with predation make predator assemblages a vital component of ecosystem processes. Understanding the resource needs and partitioning between ferruginous hawks and Swainson’s hawks is therefore important for management and conservation plans for the species, but also for conservation of the short-grass prairie ecosystem. To examine resource partitioning between these sympatric raptors we are focusing on nesting habitat and prey use. We are using remote sensing and field measurements to qualitatively examine differences and commonalities in nesting habitat use. We are using time lapse video recording at nests of each species to qualitatively examine prey use, and assess relationships between prey use, prey biomass and prey delivery rates with productivity and nesting success. Data collected during the first field season of this study are currently being analyzed.

Awards and honors
Matthew Giovanni received a two year student membership scholarship to the Cooper Ornithological Society.
Project title: Landscape analyses of a recolonizing of black bear population in Trans-Pecos region of Texas

Unit project number: TPW 11
Principal investigators: Warren Ballard, Ernest Fish, and David Holderman
Students and staff: Mindy Rice (PhD)
Period of performance: 9/1/03-8/31/07
Funding source: Texas Parks & Wildlife
Location: Trans-Pecos Region, Texas

Summary of activities and findings
Project has the following objectives: 1) to determine, characterize, and map occupied and unoccupied black bear habitat blocks and corridors that potentially link habitat blocks in the Trans-Pecos region; 2) To determine the relative quality of black bear habitat blocks based on size, dominant vegetation, and other relevant factors, and to rank habitats into a hierarchial system; 3) To determine the distribution, phenology, and frequency of mast production for important black bear foods; 4) To identify and characterize human demographics, activities, and anthropomorphic features that might impact habitats important to bears; 5) To analyze frequency and geographic distribution of reliable black bear sightings by sex-age class over time; 6) To determine the status of black bear populations in currently occupied habitats; 7) To determine whether and to what degree black bears occupy the highest quality black bear habitats; 8) To determine the frequency, location, and cause of known bear mortalities and bear-related incidences of depredation; and 9) To estimate the potential carrying capacity for black bears by habitat block and the entire region based on habitat size, quality, and the extrapolation of known bear density information.
Summary of activities and findings
In Crockett County, the following pattern has been observed: the mule deer population has been stable for a number of years, the white-tailed deer population has increased and may now be stable, adult survival for both species is high, predator densities are low, and winter fawn:doe ratios indicate high post-natal fawn mortality. Drought conditions are frequent and deer must compete with livestock for forage. Based on the observed patterns, we hypothesize that fawn mortality is caused primarily by malnutrition in fawns and their dams, rather than by predation, as is the case with other deer herds in many areas of North America (Ballard et al. 2001). Objectives of this study are as follows: To determine condition of adult female mule and white-tailed deer prior to parturition; to determine pregnancy rates of adult mule and white-tailed deer; to determine relative condition of fetuses prior to parturition; to determine condition of fawns at parturition; to determine causes of neonate mortality; to determine patterns of neonate mortality; and to determine quality and composition of deer fawn birth sites.
Unit Activities

Honors and Awards

1. Matthew Giovanni - Two year student membership scholarship to the Cooper Ornithological Society, May 2003.
2. Todd Byerly - Second Place, Student Presentation Competition, Texas Chapter, American Fisheries Society, January 2003.

Publications

Published

of the International Conference on Advanced Technologies in Fisheries and Marine Sciences, Trivandrum, India.


**In Press**


**Submitted**


**Presentations**


Theses and Dissertations


for grassland birds on the southern High Plains of Texas. Masters thesis. Texas Tech University, Lubbock, TX.
**Affiliated Activities**

**Honors and Awards**

1. Janet Reed received the Clarence Cottam award for best presentation at the 38th Annual meeting of the Texas Chapter of the Wildlife Society.
2. Brad Dabbert, Tenure Granted, February 2002, Texas Tech University
3. Brad Dabbert, Promoted to Associate Professor, September 2002, Texas Tech University

**Publications**

**In Press**


**Presentations**

Theses and Dissertations

Reynaldo Patiño was on detail to the National Science Foundation as Program Director for Integrative Animal Biology in the Division of Integrative Biology and Neuroscience, Directorate for Biological Sciences during fiscal year 2003 (1 October 2002 – 30 September 2003). He administered the review process for close to 300 grant proposals submitted to his program and an award budget of $11 million.

Clint Boal was the organizing committee chair for the 2.5 day International Symposium on the Ecology and Management of Northern Goshawks. They symposium was held in conjunction with the 2003 annual meeting of the Raptor Research Foundation in Anchorage, Alaska, 5-7 September 2003, and included 36 oral papers presented by an international slate of researchers. A peer-reviewed proceeding is in progress.

Reynaldo Patiño completed the editing of a Special Issue of *Fish Physiology and Biochemistry* entitled, The Teleost Gonad: Development, Function and Histopathology. This peer-reviewed issue contains seven review articles authored by an invited team of 16 leading experts from Asia, Europe, and North America. The issue is intended for use in research and in the classroom.

Clint Boal was elected to a second term as Board Member of The Wildlife Society’s Urban Wildlife Working Group.

Nick Parker retired from the Unit in March 2003 after serving as unit leader since its establishment in 1988. At the time this report was prepared, the position has not been filled.

Digbo Bolamba, a post-doctoral research scientist, accepted a position as Senior Research Scientist and Laboratory Manager for Ovature Research Inc., San Diego, California. ORI specializes in the development of reproductive technologies for canines and felines for the purpose of endangered species preservation and population control.

Naoki Kumakura joined the TX Coop Unit as a post-doctoral research scientist working with Reynaldo Patiño. The topic of his research is fish reproductive physiology, and his project is a collaborative effort with The University of Texas Marine Science Institute and Tokyo University of Fisheries.

Jodi Martin went to the Louisiana Unit from 1/26-1/29/03 to provide Unit-level administrative training to their new Administrative Assistant, Nancy McGhee.