



Photo 2: Public Hearing and Education for local folk and school children © Yosapong Temsiripong

1 km range that shows 20% MKA survival index and eight crocodiles were never seen again. This indicated either more effort was needed for monitoring or the area is not suitable. However, there was no report from the villagers downstream whether or not they found crocodiles swept towards the village.

The local folks in the village have been our partner. Public hearing and education was carried out in early 2004 to make certain that escaped crocodiles outside the protected area will not be captured (*see photo 2*). Since the villagers live next to the park border line, they used to see and capture juvenile crocodiles swept away with the water in the valley but will not be frightened by the crocodiles if seen again. Instead, they promised to capture and hand in the escaped crocodiles to the rangers. The villagers have seen the increase of eco-tourists since the crocodiles were brought back to the areas. The training for wildlife rangers was completed in mid 2004, the rangers were trained to understand natural history of crocodile, the importance of crocodiles in the ecosystem, safe handling of all-sized crocodiles, survey techniques, and field data collection. To avoid serious genetic manipulation, DNA testing with microsatellite techniques was done by the Kasetsart University in 2004. The microsatellite result was confirmed by a former Karyotype technique and the problem of hybridization in captive-breeding was solved. Dr. Parntep Ratanakorn, DVM, performed a health check-up for all captive-raised crocodiles to guarantee disease-free animals for release. Acclimatization of released crocodiles was carried out for three months before their release in February 2005 and October 2006. Released individuals showed excellent survival skills such as finding and capturing preys, seeking shelter, and avoiding natural predators including humans. On 21st October 2006, the second set of 10 captive-raised juvenile crocodiles were released in the same area (Wang Mon pool) and all crocodiles were equipped with a microchip for identification. The monitoring program was conducted by a graduate student at Kasetsart University and involved setting up camera traps along the pool and creek. Because radio-telemetry studies affect the survival rate of crocodiles (refer to a study done by Dr. Ruth Elsey in Louisiana, USA), we decided not to use this technique.

Because the design of this pilot study did not include

either radio-telemetry techniques or camera traps, the results of the survival rates may be inadequate, but the public acceptance and continuation of the project for yearly releases will ensure the re-establishment of a crocodile population from a re-introduction program in the long term. Once this project is permitted by the government to release crocodiles in the public lake such as Bung Borapet in Nakornsawan Province, the Thai Siamese crocodile population will never be depleted again.

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Re-introduction of American alligators in Louisiana, USA

The Louisiana Department of Wildlife and Fisheries (LDWF) has developed wise management programs for one of the state's most valuable resources - the American alligator (*Alligator mississippiensis*). Over the years, carefully designed research projects led to successful "sustained use" harvest programs of wild sub-adult and adult alligators, as well as alligator eggs which can be collected by licensed alligator farmers or "ranchers" from suitable wetland habitats statewide. These programs benefit the many Louisiana citizens who elect to participate in them, including private landowners, alligator trappers, alligator farmers and their employees, alligator buyers, dealers and others. In 2005, the value of just the raw alligator hides and meat was approximately US\$ 40 million.

The alligator programs are loosely categorized into the wild harvest program and the farming/ranching program. In addition to these, there is a nuisance alligator program to handle human-alligator conflicts and an active research and monitoring program, which is important to ensure that our harvest programs are indeed conservative and not detrimental to the wild population of alligators. One of the most important (as well as time consuming and labor intensive) parts of the alligator program involves the mandatory re-introduction of alligators from farms to the wild. Many landowners choose to participate in the egg ranching program, wherein conservative egg quotas are set by LDWF for selected wetlands, upon detailed review



Photo 1: Re-trapped farm-reared alligator



Photo 2: Re-trapped alligator at nest site

of annual nesting survey results. Alligator farmers/ranchers are allowed to collect eggs from the wild (which helps avoid natural mortality factors such as flooding, predation and desiccation), but they must later replace the portion of juvenile alligators to the wild that the LDWF estimates would have survived on their own, had the eggs not been collected.

Extensive research now suggests this is about 14 percent of the eggs hatched. Thus, the alligator farmer may keep 86 percent of the hatchlings obtained from collected eggs, grow these to harvestable size and sell the valuable hides and meat. The other 14 percent must be released back to the wetlands from which the eggs were collected within two years of collection, when the alligators are between three and five feet (91.4 cm – 152.4 cm) in length. The egg “ranching” program was initiated in 1986, with the first re-introductions being made in 1988. Initially, the LDWF required that 17% of the number of eggs hatched be re-introduced to the wild, but studies indicated good survival of the re-introduced juvenile alligators (*see photo 1*). Thus, starting with the 2000 year egg permits (re-introductions to be made in 2001 or 2002), the return requirement was decreased to 14% of the eggs hatched. The exact quantity to be re-introduced depends on the average size of the alligators released; with a lesser quantity being required if the alligators are larger, and more being needed if the alligators are smaller, as presumably larger alligators have a better chance of survival.

This program allows landowners to capture an economic benefit from the alligator nests on their marshes, which encourages them to maintain healthy wetlands (perhaps rather than converting the wetlands for other land use practices) and benefits numerous other species such as waterfowl, furbearers, fisheries organisms, etc.

Approach

The re-introduction of juvenile alligators to the wild requires a seven-person team of biologists and wildlife technicians employed by the LDWF. Alligator farms are located all over the state in remote distant locations. Each alligator to be re-introduced is measured and then permanently marked by cutting out two of the alligator's tail scutes, and two web tags with a six-digit identification number are placed between the toes of the rear feet of the alligator. The sex of each alligator is recorded and the

alligators are placed in heavy burlap bags and then moved to a livestock trailer or a shady spot prior to release. Complex calculations are done to determine how many alligators of that size are required to fulfill the release obligations for each landowner. The alligators are then transported by vehicle and boat to be released in suitable juvenile habitat (small ponds with ample cover and available prey base). Initial indications suggested the experimental program worked successfully, and the program has expanded markedly since inception. Now, a normal re-introduction season from mid-March until late August can involve statewide travel to measure, mark, tag, measure and sack 40,000 to 50,000 alligators, for the trip to the marsh to be released to their wetlands of origin. This compensates for the 350,000 - 400,000 alligator eggs collected from Louisiana's extensive wetlands (some 2,557,000 acres) in most years.

Discussion

Extensive work has been conducted to monitor the fate of the alligators released to the wild, to ensure survival is sufficient to ensure future recruitment and maintain population levels. Thus far, by night-time “tag and release” efforts we have documented growth rates after re-introduction are equal to (or better than) comparable sized native wild alligators matched for size and sex. The accelerated growth rates are sometimes maintained for several years after re-introduction. A food habits study showed they are well able to forage for live prey, despite initially being maintained on dry pelletized feeds provided in captivity. They often consumed larger prey (more mammals and birds) often not taken by native wild alligators until the sub-adult size is reached. Blood samples taken from alligators captured after re-introduction showed comparable plasma corticosterone (stress hormone) levels to those seen in native wild alligators. Thousands of the re-introduced alligators have matured into the adult size classes, and have been taken in annual alligator harvests; including some in the eleven and 12 foot size class. Increasing quantities of farm re-introductions are being harvested in recent years. We have documented successful reproduction by the re-introduced alligators at younger ages than native wild alligators (*see photo 2*). Most importantly, annual coastal nesting surveys show continued high levels of alligator nesting (which is an indication of population level trends) despite utilization of both alligator eggs, and sub-adult and adult alligators taken in autumn harvests.

In the autumn harvest of adult alligators in 2006, one exceptionally large alligator was caught on September 10th. The alligator measured 12' 6" in length (3.81 m) and was noted by the trapper to have been marked by LDWF with a tail notch, and the web tag was still present in the foot. The male alligator had been re-introduced on August 28, 1993 at which time it was 44" in length (1.12 m) about eight miles north of where it was later re-captured. This excellent growth and longevity illustrates how this sustained use program can work successfully.

Some lessons learned have been the importance of selection of appropriate juvenile habitat for release; to enhance survival rates and minimize cannibalism. We also recommend releasing alligators over large areas of wetlands, and releasing reasonable quantities of alligators within one given day. We encourage re-introductions

when weather/environmental conditions are optimum (ample water levels and low salinities in small ponds) and recommend avoiding extreme exposure to heat (use of refrigerated trucks and limited the brief storage times in shaded locations). We also recommend using year-specific tail notches to mark re-introduced crocodilians, to help provide data as to at least the year of re-introduction (if not which specific animal) should the foot web tag be lost with later growth.

Louisiana's "release to the wild" program is a clear example of sustained use management of a resource that would otherwise suffer high losses to natural mortality. This was dramatically illustrated in the summer of 2005, when a record 507, 315 eggs were collected by alligator egg ranchers. Hurricanes Katrina and Rita then caused widespread flooding across the entire coast of Louisiana, and undoubtedly massive egg/embryo losses would have been incurred, had the egg ranching program not been in place.

The LDWF alligator program has evolved from the first small, very limited, wild harvest back in 1972, to the highly regulated multi-million dollar industry it is now. Through the dedicated efforts of many LDWF employees and cooperation with landowners and industry personnel, we hope to continue improving our programs for the future benefit of the state's citizens.

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References

- Elsey, R. M., T. Joanen, L. McNease and N. Kinler. 1992. Growth rates and body condition factors of Alligator mississippiensis in coastal Louisiana wetlands: a comparison of wild and farm-released juveniles. *Comp. Biochem. Physiol.* 103A (4):667-672.
- Elsey, R. M., L. McNease, T. Joanen, and N. Kinler. 1992. Food habits of native wild and farm-released juvenile alligators. *Proc. Southeast. Assoc. Fish and Wildl. Agencies* 46: 57-66.
- Elsey, R. M., V. A. Lance, and L. McNease. 2001. Evidence of accelerated sexual maturity and nesting in farm-released alligators in Louisiana. In: *Crocodylian Biology and Evolution*. G. Grigg, F. Seebacher, and C. E. Franklin (eds). pp 244-55. Surrey Beatty & Sons, Chipping Norton.
- Elsey, R. M., L. McNease, and T. Joanen. 2001. Louisiana's alligator ranching program: a review and analysis of releases of captive-raised juveniles. In: *Crocodylian Biology and Evolution*. G. Grigg, F. Seebacher, and C. E. Franklin (eds). pp 426-41. Surrey Beatty & Sons, Chipping Norton.
- Elsey, Ruth M., N. Kinler, V. Lance and W. P. Moore, III. 2006. Effects of Hurricanes Katrina and Rita on Alligators (Alligator mississippiensis) in Louisiana. pp. xxx-xxx In: *Crocodyles. Proceedings of the 18th Working Meeting of the Crocodile Specialist Group, IUCN – The World Conservation Union, Gland, Switzerland and Cambridge UK.*

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