

## RECENT DEVELOPMENTS IN KANAB AMBERSNAIL RESEARCH AND MANAGEMENT

Lawrence E. Stevens

Research and monitoring of endangered Kanab ambersnail (KAS; *Oxyloma haydeni kanabensis*) since 1996 has produced much new information. Several lines of research and monitoring have been pursued, as indicated below.

**1) KAS monitoring at Vaseys Paradise (VP), Grand Canyon (V. Meretsky):** Dr. Meretsky has monitored KAS at VP seasonally in 1998, beginning in March. This GCMRC contract generates information which will be used to predict the impacts of a 1999 planned flood on KAS host plant habitat and the population. She is also analyzing potential deer mouse predation on KAS. She and L. Stevens have been monitoring Niobrara ambersnail (NAS; *O.h. haydeni*) at Indian Gardens in Grand Canyon, and in 1999 she proposes to monitor the NAS population at -9L Spring through a project funded by Reclamation in Salt Lake City.

**2) Discovery of new KAS populations in Kanab Canyon near Kanab, UT (V. Meretsky):** Dr. Meretsky discovered a previously unknown metapopulation of *Oxyloma* consisting of at least 9 subpopulations in Kanab Canyon near Kanab, UT in August 1998. The type locality for KAS("the Greens") in Kanab Creek was apparently eliminated by groundwater withdrawal. Therefore, the genetic identity of the type KAS population may have been lost; however, the new subpopulation sites bracket the type locality. Dr. S.K. Wu of the University of Colorado has concluded that the new populations are KAS; and M. Miller and P. Keim analysis of mitochondrial DNA demonstrate no genetic variation among these populations. Although additional genetic research is warranted, it appears that at least 3 populations of ambersnails morphologically identified as being KAS presently exist. The KAS recovery plan calls for at least 10 self-sustaining populations before the taxon can be downlisted.

**3) KAS second population establishment (Arizona Game and Fish Department and the National Park Service):** AGFD and NPS have engaged in a fast-track program to establish new secondary populations of KAS at three Grand Canyon springs. Three populations were established in apparently suitable, of-river habitat in Grand Canyon in the fall of 1998, in accord with NEPA (an NPS EA with a FONSI) and the 12-step State plan for population restoration. Monitoring has been initiated, but the definition of successful establishment has yet to be defined.

**4) KAS refuge population at the Phoenix Zoo (M. Demlong):** The Phoenix Zoo, AGFD and Reclamation have partnered using CUP funds to allow the Phoenix Zoo to attempt to raise captive KAS populations. At present, 3 populations have been introduced at: Keyhole Spring (Mile 47.5R), Royal Arch Creek (Mile 116L), and Lower Deer Creek Spring (Mile 136R). Holding tanks (terraria) have been constructed and habitat has been established, failed once, and reestablished. KAS from VP are to be placed in the tanks in the near future.

**5) KAS genetic and morphological taxonomy (L. Stevens and P. Keim):** This one-yr project began in September 1998, and is designed to compare the morphology and mitochondrial DNA among the various subspecies, species and genera of the landsnail family, Succineidae, with emphasis on *Oxyloma haydeni kanabensis*. The results of this project may clarify: (1) whether or not the Vaseys Paradise ambersnail population should be considered to be *O.h. kanabensis*; (2) whether the numerous described Alberta (Canada) are, in fact, KAS; and (3) how genetically related southwestern KAS are to southwestern NAS. Resolution of these taxonomic issues may provide sufficient new information to stimulate the Service to revisit its policy concerning VP and KAS in general. Genetic and morphological information is expected to be produced in the spring of 1999, with a panel of experts convened to review that information by early summer 1999. This project has been delayed considerably by slow permitting by the Service.

**6) KAS - NAU greenhouse and Glen Canyon Dam experiments (L. Stevens and P. Price):** In September 1998, 50 KAS each were stocked into nine 1.0 x 0.5 m terraria in the spillway at the base of the dam as Phase III. This three-phase project was designed to: (1) determine the effects of host plant variation on KAS growth and fecundity in the NAU laboratory; (2) determine the potential for establishment of KAS host plants in a quasi-natural setting (Glen Canyon Dam); and (3) evaluate life history variables (winter mortality, size-related survivorship, and host plant impacts on growth and fecundity) in a quasi-natural field setting at Glen Canyon Dam. The results are intended to provide data for a life history model of KAS, as well as to learn more about second population establishment in a controlled, quasi-natural setting. Thus far, the KAS have survived and have begun reproducing in the terraria. As expected, survivorship is lower on *Nasturtium*, but growth rates are higher there.

**7) Kanab Ambersnail Work Group (KAWG) activities:** The KAWG is a non-affiliated, cooperating group of scientists and managers interested in issues surrounding *Oxyloma*, and potentially other mollusks in the Southwest. This group has been meeting on at least a quarterly basis for the past four years, and has developed information and strategies that may be used by the various agencies responsible for managing KAS and NAS. The minutes of each KAWG meeting are compiled and available to any interested party.

this document  
was developed  
after this  
meeting

## Kanab Ambersnail Workshop

### Purpose and Objectives of the Workshop

Current biological opinion regarding Kanab Ambersnail (*Oxyloma kanabensis*) in Grand Canyon involves a single population of snails that inhabit Vaseys Paradise. Fish and Wildlife Opinion for this snail was issued in 1994. Since that time, monitoring of the population at Vasey's Paradise has taken place regarding habitat availability population dynamics of the population. In addition collection efforts outside of Grand Canyon have been made to determine the relationship of this population to other taxa. Both genetic and morphological studies of these other populations have been conducted or on going. The results of these studies suggest that the Vaseys Paradise population have traits that are similar to other populations sampled.

In light of these preliminary findings, it has been recommended that a chaired workshop be convened that clarifies issues concerning population genetics, species definitions and approaches concerning conservation biology of this species. The purpose of the symposium would be to provide the Fish and Wildlife Service adequate information to deliver a Biological Opinion concerning the Vaseys Paradise population relative to the Kanab Ambersnail species as a whole. A result of this workshop will be to provide the Adaptive Management Program associated with the Glen Canyon Dam and the Colorado River ecosystem an understanding of how to better manage for Kanab Ambersnail in its own right and in relationship to other resources within the ecosystem. The effectiveness of this workshop and subsequent management actions relies on the support of the Adaptive Management Working Group and Technical Work Group concerning the purpose and objectives of the workshop. In particular, that Fish and Wildlife Service participate and consider the opinions and information provided by the panel participants when it formulates the Biological Opinion for Kanab ambersnail in Grand Canyon.

Specific Questions for the panel are being formulated and refined (see attached).

### Workshop Dates

A suggested time frame for the Workshop is late May-early June, 1999. This is based on the current status of genetic projects and data availability, and availability of workshop members. Current recommendations for BHBF from GCMRC are that flows should not go beyond 44K cfs, and therefore do not affect previous B.O. statements. Holding a panel prior to May will likely not lead to any further clarification concerning species issues or conservation efforts regarding secondary population establishment efforts.

### Workshop Make-up

The panel should be composed of:

**Fish and Wildlife Representatives (2)** – a regional representative and a staff member familiar with population designation and population conservation issues.

**Malacologist (2)**- systematists familiar with the Succinidea and the population dynamics, reproductive biology, geographic distribution and variation found within this group.

**Population Biologist (2)**– scientists familiar with population genetics and conservation genetics.

**Biologists (2)** - Scientists knowledgeable about the species itself and its reproductive/life history requirements and population variation (inter and intra population).



DEC-03-98 THU 11:47 AM BUREAU OF RECLAMATION

FAX NO. 5243858

P. 03/06

The following questions were reviewed by Debra Bills then provided to Barry Gold on December 1, 1998.

**TONY MORTON'S** suggested questions for KAS review panel:

**STATEMENT:** KAS taxonomy has been based on internal and shell morphology, and is being revisited through molecular genetic techniques. Within Grand Canyon, KAS has apparently been restricted to Vaseys Paradise. No KAS have been detected at more than 100 other Grand Canyon springs surveyed from 1991 through 1997. This suggests that the Vaseys Paradise KAS population, like many southwestern spring species, is a Pleistocene relict which has become restricted in distribution as Holocene climate dried out. Genetic dissimilarity with other Oxyloma haydeni populations in the Colorado River drainage further supports this contention (Miller et al. in press).

**QUESTION:** Does it make any difference whether we base jeopardy and take on the species using morphology or genetics? For example, if the Three Lakes, Kanab Canyon and Vaseys snails all appear to be the same morphologically, should we treat them that way? What if the genetics analyses prove inconclusive (although we do know the Three Lakes snails are genetically different than the Vaseys snails)? Is it necessary, or appropriate, to be ultra-conservative and consider the populations distinct?

**STATEMENT:** The following is the proposed definition of establishment of a 2nd population of Kanab ambersnail proposed by FWS on July 2, 1998:

The establishment of a new wild population of the Kanab ambersnail can be considered successful when:

- (1) the population densities, fecundity, and recruitment are similar to those of the parent population at Vasey's Paradise;
- (2) habitat remains suitable while accomodating environmental uncertainties including changes in weather, food supply, predators, and other factors; and
- (3) the trend of population growth must be positive or at equilibrium with the available habitat for a certain period of time, perhaps three (3) years.

**QUESTION:** Does this definition seem to fit with current knowledge about population viability for snails, or similar species? Would it be appropriate to discuss population establishment in terms of trends, ranges, or bottom-line conditions?

**STATEMENT:** Rematched historical photographs of Vaseys Paradise (e.g. Turner and Karpiscak 1980:58-59) reveal that vegetative cover has increased greatly at lower stage elevations since completion of Glen Canyon Dam, and that flow regulation by the dam has increased primary

KAS habitat area at Vaseys Paradise, below the pre-dam 10-year flood stage of 125,000 cfs, by more than 40%. Furthermore, all vegetation below the approximate 90,000 cfs stage was scoured by annual pre-dam floods in normal years. The KAS population has survived numerous larger floods both before and after dam construction

**QUESTION:** Given the pre-dam conditions that the snails have been able to survive, and the fact that available habitat has expanded by more than 40% since dam construction, would flows up to 90,000 cfs be considered a threat to the snails as a species, and would an incidental take of more than 10% of occupied habitat be considered cause for alarm?

**STATEMENT:** The 1994 biological opinion states:

The KAS population also has wide seasonal and annual fluctuations. This is the only known population of the Kanab ambersnail in a wilderness setting and the survival of this population is critical to the species (U.S. Fish and Wildlife Service 1994b). Because the lower areas of Kanab ambersnail habitat can be quantified, incidental take will assume to be exceeded if more than 10% of the occupied habitat in Grand Canyon will be inundated by high flows or a controlled flood.

**QUESTION:** Because no other information or justification is given for establishing a 10% limit on take of occupied habitat, does 10% seem to be an appropriate limitation on take of occupied habitat, given the very high pre-dam flows and normally high overwinter mortality of snails (three years of population data indicate that the KAS population undergoes a substantial reduction through over-wintering mortality (Kanab Ambersnail Interagency Work Group 1997b). Natural winter mortality may reduce the KAS population by nearly 50%-75%)). For example, how much of the habitat or how many snails could be lost to all causes and the population still retain the ability to survive and thrive?

**STATEMENT:** The 1994 opinion also states:

Monitoring following flood events will assist in defining the species' response to those events and in refining a take level.

We know that it is taking over 2 years for habitat destroyed in the 1996 Experimental BHBF to rebound.

**QUESTION:** How does the habitat recovery time reflect on the appropriateness of established take limits for KAS?

**STATEMENT:** During the 1996 Experimental BHBF, and as currently drafted in the KAS Contingency Plan, impacts to snails are mitigated by physically moving them out of harms way. During 1996, that meant moving them up above the peak flow stage, but still within Vaseys Paradise. For future actions, that could involve moving snails both higher and to other locations

within Grand Canyon, or completely out of the canyon, to refugia.

**QUESTION:** Is moving an endangered species an appropriate, ongoing method to protect the creatures, or is it an inappropriate precedent, too unnatural?

**STATEMENT:** In the draft 1999 BHBFB biological assessment, it's noted that approximately 68.8 m<sup>2</sup> (10.5%) of the estimated total habitat will be inundated during a 45,000 cfs BHBFB. This value is 0.5% more than the B.O.-specified level of habitat take of 10%. A total of 22.7 m<sup>2</sup> of the habitat lying below the 45,000 cfs stage in the September 1998 survey consists of mixed vegetation patches dominated by horsetail (Equisetum spp.), reed (Phragmites australis) and other species. These patches are little used by KAS, and are extremely resistant to scour, having persisted through the 1996 BHBFB and the high flows of 1997 and 1998. If this area is subtracted, a 45,000 cfs flow would inundate 7.3% of the total habitat.

**QUESTION:** Is it appropriate to distinguish primary and secondary habitats and extent of use, or is it enough to know that the snails use it, therefore it's of critical value?

**GARY BURTON'S** suggested questions for expert panel regarding Kanab ambersnail -  
11/16-17/98

1. Are the genetic variances in the new KAS congregations significant enough differences to change our assessment of the number of known KAS "populations"?
2. If the various KAS congregations do not accomplish genetic exchange, are they separate populations?
3. Can populations outside of AZ contribute to the 10 populations specified for downlisting?
4. What is the natural mode of spread of the species to expand its range - high flows, birds?
  - a. In pre-dam days, how did the Vasey's population recover/reinhabit Vasey's Paradise after extreme high flow events?
  - b. Being a pulmonate species, could high peak flows through the Canyon serve as a significant dispersal mode for the species?
  - c. Could the Vasey's population have been seeded from other locations upstream?
  - d. With high peak flows, could the Vasey's population seed downstream habitats?
5. In attempting to establish new populations, what period of time (persistence) or number of successful generations is reasonable to consider the population a success? Is there a population size requirement.
6. KAS appears to replace its entire population every year. Would there be long-term impacts to the Vasey's population from a 25% population loss in one year?
7. What are the critical biotic and abiotic characteristics of the Vasey's Paradise site that create unique habitat for KAS only at this location in the Canyon?