

# BIAWAK

Volume 1 Number 1 - August 2007



ISSN: 1936-296X

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# BIAWAK

*Quarterly Journal of Varanid Biology and Husbandry*

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## **INTERNATIONAL VARANID INTEREST GROUP**

[www.varanidae.org](http://www.varanidae.org)

The International Varanid Interest Group is a volunteer-based organization established to advance varanid research, conservation, and husbandry, and to promote scientific literacy among varanid enthusiasts. Membership to the IVIG is free, and open to anyone with an interest in monitor lizards and the advancement of varanid research. Membership includes subscription to *Biawak*, a quarterly journal of varanid biology and husbandry, and is available online through the IVIG website.

**ARTICLES**

Husbandry and Reproduction of the Black Water Monitor, <i>Varanus salvator komaini</i> .....Q. DWYER AND M. PEREZ	13
Observations on the Stomach Contents of a Road-killed Perentie, <i>Varanus giganteus</i> in Western Queensland .....S. MACDONALD	21
Notes on the Occurrence of <i>Varanus auffenbergi</i> on Roti Island .....R. DEL CANTO	24
Dizygotic Twinning in the Blue Tree Monitor, <i>Varanus macraei</i> .....R.W. MENDYK	26
Captive Breeding of <i>Varanus exanthematicus</i> .....J. COIRO	29
Rough-scaled Sand Boa ( <i>Eryx conicus</i> ) Predation on a Bengal Monitor ( <i>Varanus bengalensis</i> ) .....D. BHARDWAJ	34
Feral Iguana Attacks <i>Varanus salvator</i> at Sungei Buloh Wetland Reserve .....C.E. KIAT	35
<b>EDITOR'S NOTE</b> .....	3
<b>OBITUARIES</b> .....	4
<b>TRANSLATIONS</b> .....	37
<b>NATURAL HISTORY NOTES</b> .....	39
<b>DISTRIBUTIONAL NOTES</b> .....	41
<b>CURRENT RESEARCH</b> .....	42
<b>RECENT PUBLICATIONS</b> .....	45
<b>INSTRUCTIONS FOR AUTHORS</b> .....	47

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**On the Cover: *Varanus griseus griseus***

The specimen illustrated on the cover and contents page of this issue was photographed by **Guy Haimovitch** ([whoisguy@gmail.com](mailto:whoisguy@gmail.com)) in the Western Negev Desert, Israel, near the Israel-Egypt border at 1000 h on 14 April 2007. The juvenile *V. g. griseus* was discovered within a small crevice in the ground, retrieved for photographing, then subsequently released.



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# EDITOR'S NOTE

Biawak 1(1): 3

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## New Beginnings....

The inception of *Biawak*, which is a common word used for “monitor lizard” throughout much of south east Asia, marks a new chapter in the study of *Varanus*. During the 1990’s, a rising popularity in monitor lizards among herpetological enthusiasts led to the publication of several varanid serials. These publications, which included *VaraNews*, *Dragon News*, *Varanids*, *Nieuwsbrief van de Nederlandse Doelgroep Varanen*, and *Monitor*, each published a multitude of articles and notes pertaining to the biology and husbandry of monitor lizards, and served as important informational resources for professional and amateur varanid enthusiasts at the time. Sadly, due to the expensive printing and postage charges associated with the production of these serials, their distributions were often limited, and the publications themselves typically did not last long.

With the development and expansion of the internet, the exchange of information has never before been as accessible, efficient, or inexpensive. Where costly postage and printing charges once hindered the widespread distribution of previous varanid serials, the internet now facilitates the rapid distribution of such a publication to enthusiasts worldwide, at no cost. Distributed electronically, *Biawak* is intended to reach all enthusiasts and researchers worldwide, in a coordinated effort to help unify the study of monitor lizards in the field as well as in captivity.

The success of this publication depends entirely on the participation and involvement of its audience, and article submissions are encouraged from all enthusiasts, regardless of scientific or educational backgrounds. Tragically, in a great loss to science, countless observations of both wild and captive varanids, as well as captive reproductive events, go unreported each year. Such accounts, no matter how trivial or insignificant they may seem, hold value; and it is through documenting such information that the study of monitor lizards is able to progress. For those interested in contributing to *Biawak*, included within this issue is a guideline for authors to follow when writing and submitting material.

The International Varanid Interest Group was established to advance varanid research, conservation, and husbandry, and to promote scientific literacy among varanid enthusiasts worldwide. In addition to publishing the quarterly journal *Biawak*, the IVIG seeks to further facilitate the exchange of information through establishing numerous online varanid literature resources, and by educating enthusiasts about scientific literature and its importance in research.

*Biawak* and the IVIG website, [www.varanidae.org](http://www.varanidae.org), is an entirely volunteer and non-profit seeking venture. Members of its editorial board have graciously donated their own time, money, and efforts in hopes of furthering the study of monitor lizards. The IVIG is currently seeking volunteer assistance with various aspects of its operations. Editorial reviewers for *Biawak* are needed, and are typically experts in the field of varanid biology or husbandry. Bilingual individuals are needed for minor translational assistance with submissions when the author’s primary language is not English. A website developer is also needed to assist with the development of the IVIG website and the literature resources to be contained within. If interested in volunteering to assist with the production of *Biawak* or the development of the IVIG website in any way, please contact the editor.

After many months of planning and preparation, we are proud to make *Biawak* available to varanid enthusiasts worldwide.

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# OBITUARIES

Biawak 1(1): 4-12

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## Remembering Mark K. Bayless (1960 – 2006)

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A tremendous loss to the varanid community occurred on 1 November 2006, when Mark Kristian Bayless passed away in Berkeley, California at the age of 46. Despite having battled a chronic respiratory infection which limited his travel and extraneous physical activity for much of his adulthood, Mark led a productive life. Tragically, Mark's ailments finally caught up with him in October 2006, when complications from diabetes placed him in a coma, from which he would not recover.

Mark was born in San Francisco, California on 16 July 1960, and lived his entire life in the Bay Area, residing in the same house since his childhood. Most recently, he worked as the science resource person at King Junior High School in Berkeley, and taught for the Hopkins Early Childhood Education Center and the Berkeley Public Library. Mark was very involved with his neighbors and his community, and had myriad friends ranging from derelicts and dead-beats to artists, respected professionals, and academics.

Mark's residence in Berkeley could have easily been mistaken for a natural history museum, as it was filled with an impressive collection of artifacts, specimens, photographs, literature, and miscellanea of many subjects. Some of the more obscure items in his house included harpoons, whale baleen, scrimshaw,



Figure 1. Mark in his 20s, posing with a Desert Iguana (*Dipsosaurus dorsalis*).



Figures 2 & 3. Interior views of Mark's residence

antiquarian books on geology, and Danish war medallions. Mark also collected personally signed correspondence from Queen Elizabeth II of England, to whom he had been writing to since his younger years.

Although deeply fascinated with cetacean and pinniped biology, cryptozoology, the Titanic disaster, and dinosaurs, having compiled an extensive collection of literature pertaining to each subject, Mark was best known for his profound interest and devotion to monitor lizards, especially those belonging to the African subgenus *Polydaedelus*. Albums containing thousands of monitor lizard photographs lined book shelves in his house, and jars containing pickled monitors, body parts thereof, and their parasites were also scattered about the house. Mark also possessed an impressive collection of articulated varanid skulls and skeletons, as well as many frozen specimens.

In his never-ending search for information pertaining to monitor lizards, Mark had amassed undoubtedly the largest single collection of varanid literature in the world. In addition to some of the more common and easily-accessible varanid literature, Mark's impressive library also included many obscure and antiquarian publications which date back several hundred years (e.g., Linnaeus, 1766; Laurenti, 1768; Bosc, 1792; Shaw, 1793), and countless observational accounts and notes which he attained through writing thousands of letters seeking first-hand varanid information from individuals all over the world. Perhaps even more impressive than Mark's library, was how he graciously shared it with anybody who expressed a common interest in monitor lizards, spending countless hours photocopying articles and book excerpts to mail to inquiring varanid enthusiasts from all over the world.

In addition to amassing an unbelievable collection of *Varanus*-related literature and material, Mark was also a prolific writer, having authored and coauthored more than sixty varanid publications which appear in various scientific journals, herpetological society newsletters, bulletins, and hobbyist magazines.

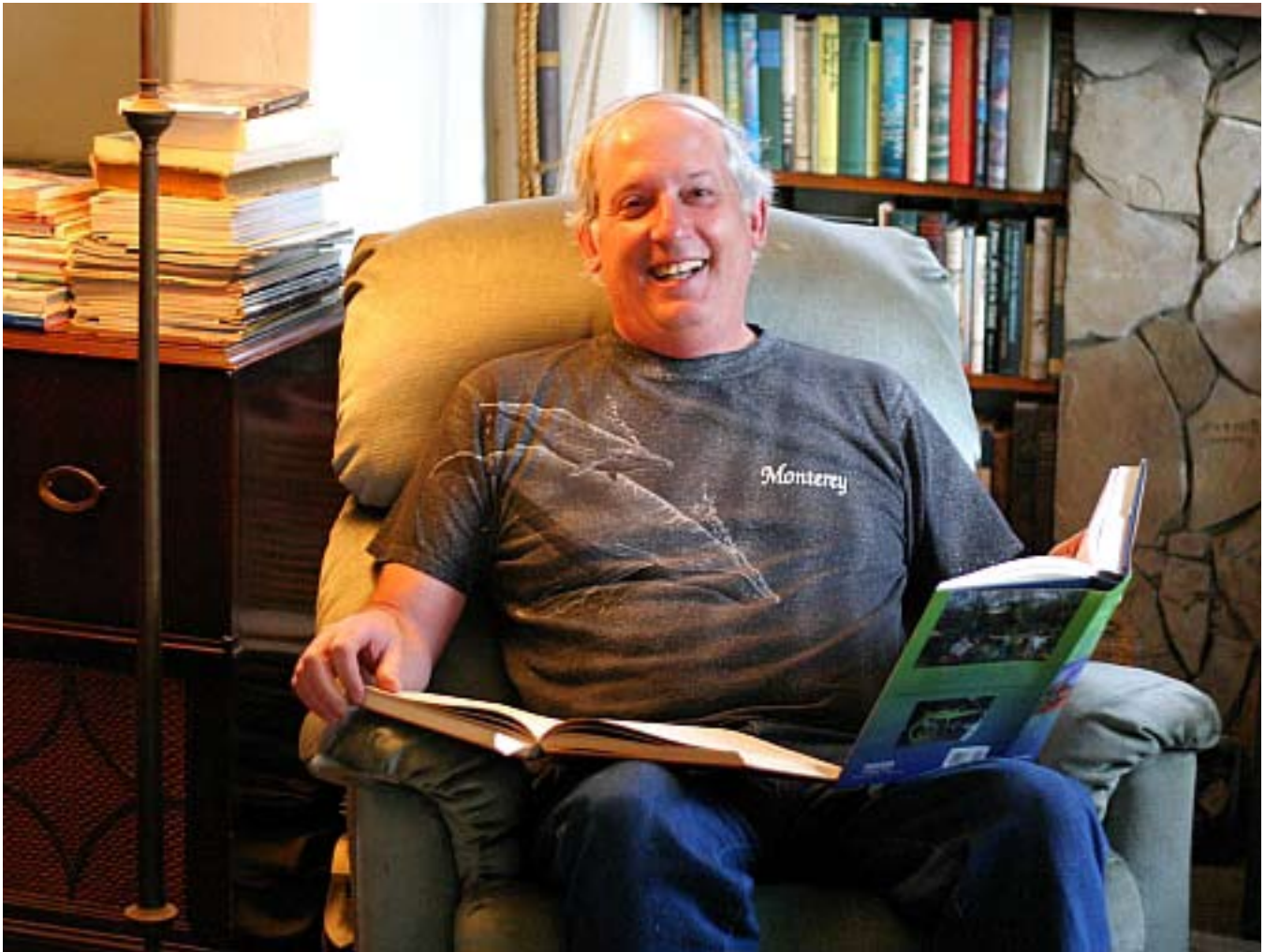


Figure 4. Mark at his residence in 2006

Some of his more prominent works include an extensive review of the zoogeography of the subgenus *Polydaedelus* (Bayless, 2002), a coauthored historical review of *Varanus* in the Philippines (Bayless and Adragna, 1997), and a report on the reproductive biology of *V. exanthematicus* (Bayless, 1994). His most recent published works included a book on *V. exanthematicus* (Bayless, 2006), and a report on the breeding behavior of *V. salvadorii* in captivity (Waterloo and Bayless, 2006). Mark was always in the process of writing something new, and sadly, many of his works were never completed due to his untimely death. Some of his unfinished works include an annotated bibliography of *Varanus*, an extensive review of the biology and natural history of *V. rudicollis*, and a report on an undescribed monitor belonging to the *V. indicus* species group.

As a well-respected author and researcher, Mark was invited as a guest speaker to numerous herpetological society meetings and symposia, and gave yearly talks at Northern California Herpetological Society, Bay Area Reptile Society, and North Bay Herpetological Society meetings. Perhaps one of Mark's last public appearances was at a talk given with Ben Aller on *V. dumerilii* at a North Bay Herpetological Society meeting in early 2006.

During the 1990s, Mark played instrumental roles in the publication of several varanid newsletters. During its publication, he served as an editorial reviewer for *VaraNews*, a bimonthly newsletter published by the Varanid Information Exchange (VARANIX). Shortly after the discontinuation of *VaraNews*, Mark became involved with the bimonthly newsletter *Dragon News*, published by the Northern Ohio Varanid Association (which later became the International Varanid Association), where he served as vice president

and contributing editor between 1996 and 2000. In 1997, Mark also served as the research coordinator for the newsletter *Varanids*, published by the Varanid Society. Most recently, he helped co-found the varanid journal *Biawak*, although his untimely passing prevented any further involvement or contribution to the journal.

Although Mark lacked an academic background, this did not deter him from contributing to the study of monitor lizards. Mark's passion and dedication to varanids for more than two decades has demonstrated that enthusiasts of all educational and scientific backgrounds are capable of helping advance varanid research. His contributions, whether it's his written works, his role in the publication of the several varanid serials of the 1990s, his guest talks and presentations, or his personal correspondence, have been influential to nearly all varanid enthusiasts worldwide. Few can ever match Mark's enthusiasm and devotion to monitor lizards, and certainly nobody will ever share his personality, or have the same twisted sense of humor. Mark was a great friend, colleague, and mentor to many, and will be missed.

### Literature Cited

- Bayless, M.K. 1994. Zur Fortpflanzungsbiologie des Steppenwarans (*Varanus exanthematicus*). Salamandra 30(2): 109-118.
- \_\_\_\_\_. 2002. Monitor Lizards: a pan-African check-list of their zoogeography (Sauria:Varanidae: Polydaedalus). Journal of Biogeography 29: 1643-1701.
- \_\_\_\_\_. 2006. Savannah Monitors. T.F.H. Publications, Neptune City. 128p.
- Bayless, M.K. and J.A. Adragna. 1997. Monitor lizards in the Philippine Islands: A historical perspective (Sauria:Varanidae). Asia Life Science 6(1-2): 39-50.
- Bosc, L.A.G. 1792. *Lacerta exanthematica*. Actes de la Societe d'Histoire Naturelle de Paris 1(1):25.
- Laurenti, J.N. 1768. Specimen medicum exhibens synopsis reptilium emendatum cum experimentis etwa venena et antidota reptilium austriacorum. Wien. 56p.
- Linnaeus, C. 1766. Systema Naturae. Holmiae, *Laurenti Salvii*.
- Shaw, G. 1793. Zoology and Botany of New Holland and the isles adjacent. J. Sowerby, London. 33p + 12 PL.
- Waterloo, B. and M.K. Bayless. 2006. Notes on the breeding behaviour of the Crocodile Monitor (*Varanus salvadorii*) in captivity. Herpetological Bulletin. 98: 2-6.



## A Bibliography of *Varanus* Publications by Mark K. Bayless

- Adragna, J.A., M.K. Bayless and A. Roslokken. 1996. A varanid visit to Washington. *VaraNews* 4(4): 5-6.
- Attum O., R.L. Earley, M. Bayless and P. Eason. 2000. The agnostic behavior of Bosc's monitor (*Varanus exanthematicus* Bosc, 1792) in captivity. *The Herpetological Bulletin* 73: 22-26.
- Bayless, M.K. 1987. Little Dragons...Monitor lizards as Pets. *Best of Pets*, September: 8-9.
- \_\_\_\_\_. 1991. A Trip from Africa. *VaraNews* 1(5): 5-8.
- \_\_\_\_\_. 1992. Mom, can I have a dragon for a pet? *Northern Nevada Herpetological Society* 3(2): 4-6.
- \_\_\_\_\_. 1992. The Necropsy and internal Anatomy of a white-throated monitor lizard (*Varanus albigularis* Daudin, 1802). *VaraNews* 2(1): 5-6.
- \_\_\_\_\_. 1992. Notes on the reproductive behavior of the Nile monitor lizard, *Varanus niloticus* Linnaeus (1766). *VaraNews* 2(4): 5-6.
- \_\_\_\_\_. 1992. African Varanids: Diets in captivity and in the wild. *VaraNews* 2(5): 2-3.
- \_\_\_\_\_. 1992. Reproductive notes on the black roughneck monitor lizard (*Varanus rudicollis* Gray, 1845). *VaraNews* 3(2): 3.
- \_\_\_\_\_. 1993. The Savannah Monitor (*Varanus exanthematicus*) in Africa and in your home. *The Iowa Herpetological Society* June: 2-4 [Reprinted in *International Reptile Breeders Association (IRBA), Monitor* 1(2):1 0-12, 1994].
- \_\_\_\_\_. 1993. Summary on the *Varanus*-related papers presented at the 1993 HIS Symposium. *VaraNews* 3(4): 1-2.
- \_\_\_\_\_. 1994. The Papuan Monitor Lizard of New Guinea (*Varanus salvadorii* Peters & Doria, 1878): Notes on its mystique. *VaraNews* 4(2/3): 6.
- \_\_\_\_\_. 1994. Zur Fortpflanzungsbiologie des Steppenwarans (*Varanus exanthematicus*). *Salamandra* 30(2): 109-118.
- \_\_\_\_\_. 1995. Dumeril's Monitor Lizard A look at an uncommon monitor lizard (*Varanus dumerilii* Schlegel, 1839). *Iowa Herpetological Society News*, January: 3-4.
- \_\_\_\_\_. 1995. Mailbag: Savannah monitors, CHIAC, Frilled Lizards. *Reptiles* 3(8): 4.
- \_\_\_\_\_. 1995. Letters to the Editor. *Reptilian Magazine* 3(5): 12.

- \_\_\_\_\_. 1996. Bibliographie zum Thema Papuawaran (*Varanus (Papuasaurus) salvadorii* Peters & Doria, 1878). Monitor (DGHT) 4(2): 38-40.
- \_\_\_\_\_. 1996. Lizard IBD? Reptiles and Amphibian Magazine 42: 10, 12.
- \_\_\_\_\_. 1996. Letters to the Editor. Reptilian Magazine 4(8): 21.
- \_\_\_\_\_. 1997. Notes and Records: The distribution of African monitor lizards (Sauria: Varanidae). African Journal of Ecology 35: 374-377.
- \_\_\_\_\_. 1997. Care sheet for the savannah monitor lizard (*Varanus exanthematicus* Bosc, 1792). Dragon News 1(2): 7-9.
- \_\_\_\_\_. 1997. The monitor lizards of Africa - A pan African checklist Part I: Algeria. Dragon News 1(2): 11-12.
- \_\_\_\_\_. 1997. Varanids around the World. Dragon News 1(3): 3.
- \_\_\_\_\_. 1997. The monitor lizards of Africa - A pan African checklist Part II: Angola. Dragon News 1(3): 7-10.
- \_\_\_\_\_. 1997. The Roughneck monitor lizard (*Varanus rudicollis*). Chicago Herpetological Society Bulletin 32(12): 250-252.
- \_\_\_\_\_. 1997. The monitor lizards of Africa: A pan african checklist Part III: Benin. Dragon News 1(4): 3.
- \_\_\_\_\_. 1998. The monitor lizards of Africa: A pan African checklist Part IV: Botswana. Dragon News 1(5): 4-8.
- \_\_\_\_\_. 1998. The monitor lizards of Africa: A pan-African checklist Part IV: Cabinda. Dragon News 2(1): 9.
- \_\_\_\_\_. 1998. Captain James Cook and Lizard Island: A Goanna Haven. Reptile and Amphibian Magazine 53: 46-47.
- \_\_\_\_\_. 1998. The Artrellia: Dragon of the Trees. Reptiles 6(6): 32-47.
- \_\_\_\_\_. 1998. Croc Monitor Correction. Reptiles 6(7): 6.
- \_\_\_\_\_. 1998. Morocco's Desert Monitor. Reptiles 6(7): 70-75.
- \_\_\_\_\_. 1999. *Varanus gouldii horni*: Twins. Dragon News 2(3): 4.
- \_\_\_\_\_. 1999. The monitor lizards of Africa: A pan African checklist Part VI: Cameroon. Dragon News 2(3): 5-9.

- \_\_\_\_\_. 2000. Giant lizards, Salamanders, Snakes and Turtles. *Fate* 53(11): 25-27.1
- \_\_\_\_\_. 2001. The Black Roughneck Monitor: Malaysia's Tree Lizard. *Reptile & Amphibian Hobbyist* 6(9): 8-16.
- \_\_\_\_\_. 2002. What's in their name? African Monitor Lizards (*Varanus: Polydaedalus*). *Varanid Quarterly* (European Varanid Association) May: 13-14, 18.
- \_\_\_\_\_. 2002. Monitor Lizards: a pan-African check-list of their zoogeography (Sauria: Varanidae: Polydaedalus). *Journal of Biogeography* 29: 1643-1701.
- \_\_\_\_\_. 2004. The Local Names of Pacific Monitor Lizards (Sauria: Varanidae), of Oceania & Indo-Malaysia, excluding Australia. *Micronesica* 37(1): 49-54.
- \_\_\_\_\_. 2004. Book Review: *Dragons in the Dust: The Paleobiology of the Giant Monitor Lizard Megalania*. Life of the Past. By Ralph E. Molnar. *The Quarterly Review of Biology* 79(4): 411.
- \_\_\_\_\_. 2005. Book Review: *Varanoid Lizards of the World*. (Edited) By Eric R. Pianka, Dennis R. King and Ruth Allen King. Bloomington (Indiana): Indiana University Press. \$89.95. xiii + 588p + 32 Pl; ill.; index. ISBN 0-253-34366-6. 2004. *The Quarterly Review of Biology* 80: 249-250.
- \_\_\_\_\_. 2005. Begin with a Bosc's. *Reptiles USA – 2006 Annual*, 11: 116-122.
- \_\_\_\_\_. 2006. Savannah Monitors. T.F.H. Publications, Neptune City. 128p.
- Bayless, M.K. and J.A. Adragna. 1997. Monitor lizards in the Philippine Islands: A historical perspective (Sauria:Varanidae). *Asia Life Science* 6(1-2): 39-50.
- \_\_\_\_\_ and \_\_\_\_\_. 1999. The Bangaii Island Monitor. Notes on distribution, ecology, and diet of *Varanus melinus*. *Vivarium* 10(4): 38-40.
- Bayless, M.K., G.C. Akani and L. Luiselli. 2003. Daudin's Monitor (*Varanus ornatus*, Daudin 1803) and its association with Ubani (Bonny Island), Southern Nigeria. *Herpetological Bulletin* 83: 2-6.
- Bayless, M.K. and B. Aller. 2004. Dumeril's Monitor Lizard (*Varanus dumerilii*). *Reptiles* 12(3): 42-46.
- Bayless, M.K. and Q. Dwyer. 1997. Notes on the Peach-Throated Monitor. *Reptile and Amphibian Magazine* 47: 26-30.
- \_\_\_\_\_. 2002. A New Guinea Mystery: Blue-tailed Monitors. *Reptiles* 10(2): 76-82.
- Bayless, M.K. and R.J. Faust. 1996. Nile monitors. Ecology, morphology and husbandry. *Reptiles* 4(11): 68-83.
- Bayless, M.K. and R. Huffaker. 1992. Observations of egg deposition and hatching of the Savannah monitor (*Varanus exanthematicus* Bosc, 1792) in captivity. *VaraNews* 3(1): 5-6.

- Bayless, M.K., R. Huffaker and O. Maercks. 1994. Notes on the egg deposition and incubation of the Argus monitor (*Varanus gouldii horni*, Gray 1838) in captivity. *VaraNews* 4(1): 5 [Reprinted in: Nebraska Herpetological Society Newsletter, 2003, Spring, 22(2): 5-6].
- Bayless, M.K. and L. Luiselli. 2000a. A review of the predation upon African monitor lizards (Varanidae). *Bulletin Societe Herpetologique Francais* 95: 67-74.
- \_\_\_\_\_ and \_\_\_\_\_. 2000b. The Ecological distribution of monitor lizards (Reptilia, Varanidae) in Nigeria. *Miscel-lania Zoologica* 23(1): 1-8.
- Bayless, M.K. and G. Naclerio. 1993. A report on *Varanus* on New Caledonia. *VaraNews* 3(3): 1-2.
- Bayless, M.K. and B. Pierson. 2003. *Varanus niloticus* (Nile Monitor). Captive adult feeding on ants. *Herpetological Bulletin* 85: 28-29.
- Bayless, M.K. and T. Reynolds. 1992. Breeding of the savannah monitor in captivity (*Varanus exanthematicus* Bosc, 1792). *Southwestern Herpetological Society* 22(1): 12-14.
- Bayless, M.K. and L.-A. Simmons. 2000. Notes and Records: Tick parasites on the rock monitor (*Varanus albigularis* Daudin, 1802) of Tanzania, Africa. *African Journal of Ecology* 38: 363-364.
- Bayless, M.K. and R.G. Sprackland. 2000a. The Taxonomy of Africa's Savannah & Cape Monitor Lizards. *Reptiles* 8(6): 76-85.
- \_\_\_\_\_. 2000. The Taxonomy of Africa's Savannah and Cape Monitor Lizards. *Reptiles* 8(7): 40-47.
- Bayless, M.K., K.H. Switak and R.W. Patterson. 2002. First verified observation of the Rock Leguaan (*Varanus albigularis* Daudin, 1802) in Kgalagadi Transfrontier Park, Republic of South Africa; with notes on flora and fauna. *Bulletin of the Chicago Herpetological Society* 37(4): 65-66.
- Dwyer, Q. and M.K. Bayless. 1996. Notes on the husbandry and reproductive behavior of the Argus monitor (*Varanus gouldii horni*). *Advances in Herpetoculture* 1: 81-85.
- \_\_\_\_\_. 2001. The peach-throated monitor: notes on husbandry and reproductive behavior. *Reptile and Amphibian Hobbyist* 7(1): 18-24.
- Erickson, G.M., A.de Ricqles, V.de Buffrenil, R.E. Molnar and M.K. Bayless. 2003. Vermiform Bones and the Evolution of Gigantism in *Megalania* - How a Reptilian fox became a lion. *Journal of Vertebrate Paleontology* 23(4): 966-970.
- Faust, R.J. and M.K. Bayless. 1996. Nile monitors: Ecology, Morphology and Husbandry. *Reptiles* 4(11): 68-83.
- Hartdegen, R.W. and M.K. Bayless. 1999. Twinning in lizards. *Herpetological Review* 30(3): 141.
- Speer, R.J. and M.K. Bayless. 2000. The first report of mangrove monitor twins in captivity: the remarkable reproduction and disappointing result. *Reptiles* 8(5): 30-31.

- Tsellarius, A.Y. and M.K. Bayless. 1999. Desert Monitor Monograph Anyone? *Dragon News* 2(3): 13.
- Waterloo, B. and M.K. Bayless. 2006. Notes on the breeding behaviour of the Crocodile Monitor (*Varanus salvadorii*) in captivity. *Herpetological Bulletin*. 98: 2-6.
- Williams, R. and M. Bayless. 1998. Tick removal behavior by a White-Throat Monitor Lizard (*Varanus albigularis*) (Sauria: Varanidae). *Bulletin of the Chicago Herpetological Society* 33(5): 101-102.

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# ARTICLES

Biawak 1(1): 13-20

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## Husbandry and Reproduction of the Black Water Monitor, *Varanus salvator komaini*

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### Introduction

The Water Monitor (*Varanus salvator*) is one of the most widely distributed of all monitor species, ranging from Sri-Lanka and eastern India across southeast Asia (including southern China) to the Philippines and throughout much of Indonesia as far east as Ceram (Gaulke and Horn, 2004). Because of its extensive distribution, not surprisingly, this species shows substantial geographic variation in scalation and coloration, and several subspecies have been described.

The last major revision of *V. salvator* was that of Mertens (1942). Over the years, the status of certain subspecies of *V. salvator* has been controversial. Some authorities have argued against the validity of some, or, for the elevation of others to full species status, but the general consensus is that the *V. salvator*



Figure 1. Head detail (male). Photo courtesy of Luis Pulido

group is in need of modern taxonomic revision (Gaulke and Horn, 2004).

The color and pattern of the various populations of *V. salvator* varies geographically. In general, juveniles have a distinctive pattern, but in some populations the pattern becomes obscured with age. Some populations, however, are darker than others, and dark or melanistic individuals have been reported from Thailand (*komaini*; Nutphand, 1987), the Togian Islands in Indonesia (*togianus*; Mertens, 1959), and from Nicobar and the Andaman Islands (*andamanensis*; Deraniyagala, 1944); in the latter population, however, juveniles are reported to show a distinctive pattern (Kala, 1998). Additionally, some populations of *V. salvator nuchalis* from the Philippines display two distinctive color phases, one colorful and the other dark, but both morphs are sympatric on the islands of Panay and Negros, where the pale color is the most abundant. The opposite is true on the islands of Masbate, Ticao, and Boracay, where a dark or nearly melanistic form predominates (Gaulke, 1991; Horn and Gaulke, 2004).

The Black Water Monitor was described as a separate subspecies (*V. salvator komaini*) by Nutphand (1987), from small islands and areas near the coastline in southwestern Thailand. Nutphand distinguished this subspecies from its closest relative, *V. salvator*, by its shorter adult length, black coloration throughout the body (no spots or bands), and a grayish-purple tongue; however, his description indicated only minor scutellational differences between the taxa.

Since its description, *komaini* has been regarded as a subspecies of *V. salvator* by some authorities or as an invalid taxon by others. Information on the status of *komaini* in Sprackland (1992) added to this confusion, as on page 128 he states that “Preliminary information suggests that it (= *komaini*) may or may not be a subspecies of *Varanus salvator*,” yet on page 130 he indicates this taxon (as *Varanus salvator komaini*) as a *nomen nudum*.

The purpose of this report is not to question the taxonomic validity of *V. s. komaini*, but to present husbandry and reproductive information on this highly unusual monitor. The animals discussed here purportedly are from Kukup, in Johore, Malaysia, on the southwestern tip of the Malay Peninsula.

### Captive Care and Housing

In June 2005, an adult pair of Black Water Monitors was purchased from a reptile dealer in Florida, who had imported them from Malaysia the previous year. The monitors were placed in a large, uncovered, outdoor enclosure with a total area of 46.3 square meters. The area of the enclosure consists of 38.5 square



Figure 2. Male basking  
Photo courtesy of Louis Pulido



Figure 3. Tongue detail (male)

meters of land and 7.8 square meters of spring-fed water (37 cm deep), with an abundance of aquatic vegetation (water hyacinths and water lettuce). Freshwater shrimp, crayfish, and numerous frogs native to Costa Rica also occupy the pond, but we have not observed the monitors feeding on these animals. The soil of the enclosure is high in clay, and the monitors used this medium to dig an extensive and interconnected tunnel system. The enclosure is secured by a 2 m high block wall with a smooth finish and a one-meter deep footing, so as to prevent escape by tunneling. Hollow logs, tree stumps, and vegetation provide additional cover. The monitors were fed 1 or 2 medium-sized rats approximately every three days, and occasionally, their diet was supplemented with *Tilapia*, sardines, and a meat-based gelatin. In time, the male adjusted to the presence of people and began feeding out of caretakers' hands. In contrast, the female has remained shy and enters a burrow or the water upon the first sight of danger.

Reptilandia is located in an area of tropical rainforest, 10 km from the coast in southwestern Costa Rica, at an elevation of 500 m above sea level. The Pacific south of Costa Rica has distinctive dry (January to mid-April) and rainy (May through December) seasons, with temperatures in our area varying from the low 20s (night time low) through the high 30s °C throughout the year. Precipitation is approximately 3000 mm per year, with the wettest month usually October and the driest February.

In contrast to conditions in this region of Costa Rica, the Malay Peninsula experiences wet equatorial weather, with monsoon rains blowing from the South China Sea from November to February. The average annual rainfall in this area is 1778 mm, with an average temperature of 25.5-27.8 °C.

The monitors are most active from 0600 to 1000 h on sunny days, and often climb palm trees in their enclosure to bask. On overcast days, however, they remain active and outside their burrow throughout the day, and out of the water. The female nearly always shelters in her burrow, whereas the male often sleeps and shelters in the water.

### Reproductive Activity and Nesting Behavior

Once the monitors were placed in the enclosure, we failed to observe any reproductive activity. On 2 October 2005, however, the female began excavating a hole during the late afternoon. For the next couple of days, she dug holes at various locations in the enclosure, and during heavy rains on the afternoon of 5 October, she excavated a deeper and more extensive hole and continued digging until about 2000 h. At



Figures 4 & 5. The author (Q.D.) retrieving eggs





Figure 6. First clutch



Figure 7. Second clutch

approximately 0500 h the following morning, she resumed digging, and later that morning she deposited six eggs in the burrow and covered them with three dense clumps of grass before re-filling the hole with loose dirt. The depth of the burrow was ca. 30 cm. The eggs were retrieved and placed in an artificial incubator, using peat moss as a medium. Incubation temperatures were maintained at ca. 29 °C. Although the eggs appeared fertile, eventually, the clutch failed to hatch. We suspect that the high clay content of the soil suffocated the eggs, or, that the monitors were not sufficiently acclimated to captivity to produce viable eggs.

### Incubation and Hatchlings

A second clutch, this one of 12 eggs, was deposited on 14 September 2006. Nesting behavior was similar, and the eggs were immediately retrieved. This time however, we rinsed as much of the clay off the eggs as possible before placing them in a medium of moist perlite. The container with the eggs was placed in an artificial incubator at temperatures of approximately 25-26 °C. Seven eggs went bad during the first few months, but the remaining five eggs looked healthy, were swelling, and showed no discoloration. At full term, the eggs measured 7 cm in length and 3.9 cm in width. The first hatchling pipped after 240 days, and after 12 h we assisted the hatchling out of its egg. The lizard, however, underwent an umbilical hemorrhage, which we promptly closed with surgical staples, and subsequently applied antibiotic cream to the area. Over the next four days, the remaining four hatchlings pipped and emerged without assistance, each waiting 48 h before completely emerging from the egg. The neonates were housed individually, and within one week started feeding on sardines and newborn mice. Their size ranged from 12 cm SVL and 29 cm total length, to 13.5 cm SVL and 30.5 cm TL. Surprisingly, the coloration of all neonates was entirely black, like the adults, except for a trace of faint spotting on the venter. Interestingly, the eyes were reddish-brown and the tongue purplish-blue.

A third clutch consisting of 12 eggs was deposited on 27 January 2007 and as of 30 May 2007, all appear healthy. With all three clutches, the female constructed her nest in the same location in spite of the many options available in her spacious enclosure.



Figure 8. First hatchling *Varanus salvator komaini* pipping



Figure 9. Hatchling in hand



Figure 10. Hatchling in tree



Figure 11. Detail of tail prehensility in hatchling *V. salvator komaini*

## Discussion

This is the first report on the reproduction of *V. s. komaini* in captivity. The incubation time falls within the range reported for other subspecies of *V. salvator* (Kratzer, 1973; Bowers, 1981; Ettling, 1992; Harrison and Burchfield, 1992; Graham, 1994; Schmitz, 1994; Horn and Visser, 1997; Ott, 1997; Herrmann 1999), which is surprising, because our incubation temperatures were considerably lower than the average indicated by these authors (i.e., an average temperature of 29 °C with an average incubation time of 242 days). We incubated our eggs at 25–26 °C and experienced an incubation time of 240 days.

The black coloration of the neonates differs from that reported for other subspecies of *V. salvator*. It remains to be seen, however, if the lack of an ontogenetic color change in *V. s. komaini* will hold true for other populations of *V. salvator*, or if it will help solidify the taxonomic standing of this unusual lizard.

## Acknowledgements

The authors wish to thank Louis W. Porras for reviewing and giving valuable guidance on this paper.

## Literature Cited

- Bowers, M. J. 1981. Malayan water monitor. San Antonio Zoo Newsletter 7 (2): 1–2.
- Deraniyagala, P. E. P. 1944. Four new races of the “Kabaragoya” lizard, *Varanus salvator*. Spol. Zeyl. 24: 59–65.
- Deraniyagala, P. E. P. 1961. The water monitor of the Andaman Islands: a distinct subspecies. Spol. Zeyl. 29: 203–204.
- Ettling, J. 1992. Captive breeding news: Malayan water monitors. Varanews 2(6): 1.
- Gaulke, M. 1991. Systematic relationships of the Philippine water monitors as compared with *Varanus s. salvator*, with a discussion of dispersal routes. Mertensiella 2: 154–165.
- Gaulke, M. and H-G. Horn. 2004. *Varanus salvator* (Nominate Form). Pp. 244–257 In E. R. Pianka, D. R. King, and R. A. King (eds.). Varanoid Lizards of the World. Indiana University Press, Bloomington and Indianapolis.
- Graham, K. 1994. Summary of *Varanus salvator* reproductive data at the Sedgewick County Zoo. Varanews 4(1): 2.
- Harrison, C. S. and P. M. Burchfield. 1992. The reproduction and husbandry of the water monitor *Varanus salvator* at the Gladys Porter Zoo, Brownsville. International Zoo Yearbook 31: 124–130.
- Herrmann, H. 1999. Husbandry and captive breeding of the water monitor at the Cologne Aquarium. Mertensiella 11: 95–102.

- Horn, H-G. and M. Gaulke. 2004. *Varanus salvator* (subspecies). Pp. 258–271 In E. R. Pianka, D. R. King and R. A. King (eds.). *Varanoid Lizards of the World*. Indiana University Press, Bloomington and Indianapolis.
- Horn, H.-G. and G. J. Visser. 1997. Review of reproduction of monitor lizards *Varanus* spp. in captivity II. *International Zoo Yearbook* 35: 227–246.
- Kala, N. 1998. Captive breeding of *Varanus salvator andamanensis* Deraniyagala, 1944. *Hamadryad* 22: 122–123.
- Kratzer, H. 1973. Beobachtungen über die zeitigungsdauer eines Eigeleges von *Varanus salvator* (Sauria, Varanidae). *Salamandra* 9(1): 27–33.
- Mertens, R. 1942. Die Familie der Warane. Dritter Teil: Taxonomie. *Abh. Senckenberg. Naturf. Ges.* 466: 235–391.
- Mertens, R. 1959. Liste de warane Asiens und der Indo-australischen inselwelt mit systematischen Bemerkungen. *Senck. Biol.* 40: 221–240.
- Nutphand, W. 1987. Mangkorn Dam black monitor. *J. Thai Zool. Center* 2(15): 51.
- Ott, T. 1997. Nachzuchtergebnisse von *Varanus salvator*. *Elaphe* 5(4): 6–11.
- Schmitz, R. 1994. Hoezo... een ei is geen ei. *Dieren* 11(4): 100–103.
- Sprackland, G. S. 1992. *Giant lizards*. TFH Publications, Inc., Neptune City, New Jersey.

## Observations on the Stomach Contents of a Road-killed Perentie, *Varanus giganteus* in Western Queensland

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On 6 January 2007 at approximately 0830 h, an adult Perentie (*Varanus giganteus*) was found on a bitumen section of road (22° 33' 19.88" S, 142° 43' 32.97" E) approximately 38 km southwest of Winton, Queensland. It had evidently been hit and killed by a car that morning. The specimen was dissected on the side of the road to determine its stomach contents. On entering the coelom, the outline of a small goanna was visible in the Perentie's stomach. The stomach was then opened to reveal an adult Black-headed Goanna (*V. tristis*) in a relatively undigested state, and a slightly more digested adult Ridge-tailed Monitor (*V. acanthurus*). All three *Varanus* spp. specimens were identified using Wilson's (2004) *Varanus* key.

The *V. tristis* was then dissected to find what appeared to be a Bynoe's Gecko (*Heteronotia binoe*) and a tail of a skink (*Ctenotus* sp.) in the stomach. These remains were sufficiently masticated and digested, which made confirmed field identification impossible. Masses, sizes, and sexes were not recorded for any of these three specimens, all of which were left at the roadside.

*Varanus giganteus* can attain lengths exceeding 2 m and masses of up to 17 kg (Pianka, 1994). Despite being the largest extant native terrestrial predator in Australia, *V. giganteus* has received little attention in the literature. Most studies and observations of this species have taken place on Barrow Island off the



Figure 1. Road-killed *Varanus giganteus*



Figure 2. Partially digested *V. acanthurus* retrieved from the stomach of a *V. giganteus*



Figure 3. *V. tristis* retrieved from the same *V. giganteus*

Table 1. Previously published reports (not exhaustive) of *Varanus giganteus* diet

Dietary items reported	Reference
Sea turtle hatchlings	Green et al., 1986
Will capture and eat conspecifics, and also eat road-killed conspecifics, as well as snakes, sea turtle eggs and hatchlings and other lizards	King et al., 1989
50% of prey items were lizards	James et al., 1992
A <i>V. giganteus</i> ate a <i>V. gouldi</i> approximately 20% of its mass	Pianka, 1994
Reported to consume dragon lizards, rodents, gulls	Losos and Greene, 1988

coast of Western Australia, where *V. giganteus* occurs at higher densities than on mainland Australia (King et al., 1989).

Several studies on this species have mentioned diet (Table 1). Vertebrates appear to be an important part of the diet of *V. giganteus*, with other lizard species being consumed frequently. *Varanus giganteus* is known to prey upon other *Varanus* species, including conspecifics.

### Literature Cited

- Green, B., D. King and H. Butler. 1986. Water, sodium and energy turnover in free-living Perenties, *Varanus giganteus*. Australian Wildlife Research 13(4): 589-595.
- James, C.D., J.B. Losos and D.R. King. 1992. Reproductive biology and diets of goannas (Reptilia: Varanidae) from Australia. Journal of Herpetology 26(2): 128-136.
- King, D., B. Green and H. Butler. 1989. The activity pattern, temperature regulation and diet of *Varanus giganteus* on Barrow Island, Western Australia. Australian Wildlife Research 16(1): 41-47.
- Losos, J.B. and H.W. Greene. 1988. Ecological and evolutionary implications of diet in monitor lizards. Biological Journal of the Linnean Society 35(4): 379-407.
- Pianka, E.R. 1994. Comparative ecology of *Varanus* in the Great Victoria Desert. Australian Journal of Ecology 19(4): 395-408.
- Wilson, S. 2005. A field guide to reptiles of Queensland. Reed New Holland. Sydney, Australia.



## Notes on the Occurrence of *Varanus auffenbergi* on Roti Island

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The Peacock Monitor *Varanus auffenbergi*, is a poorly known monitor lizard endemic to the Indonesian island of Roti (Sprackland, 1999). A brief mention of “*V. timorensis*” on Roti by Schmutz and Horn (1986) represents the only published account on the ecology of *V. auffenbergi*. Virtually all that is known about this species has come from observations of individuals maintained in captivity. During two visits to Roti in August 2004 and 2005, I was able to observe between 75 and 100 *V. auffenbergi* in the wild.

*Varanus auffenbergi* ranging in size from ca. 25 to 40 cm in total length were observed in the villages of Nemberala, located on the southwestern coast, and Boha, the southernmost village on Roti. All searches were limited to within 1 km of the coastline. *Varanus auffenbergi* were relatively easy to find during the early morning hours before sunrise, sheltered beneath fallen palm fronds and limestone rocks, including those used in fences surrounding villagers’ homes. *Varanus auffenbergi* were primarily encountered in Lontar Palm (*Borassus flabellifer*) plantations, and searches in other habitats including forested areas revealed no monitors. *V. auffenbergi* were occasionally seen basking and climbing on the trunks of palms, as well as moving amongst their crowns between 1000 and 1230 h. Plantation workers were able to capture several monitors from the crowns of palms, and many villagers informed me that these monitors are commonly found in the crowns of palms. Lontar palms in the plantations measured ca. 8 to 10 m in height, with each trunk spaced out by ca. 15 m. In many places, the fronds from neighboring palms overlapped, allowing the monitors to move between palms. Little vegetation occurred beneath or between the palms. *Varanus auffenbergi* were extremely skittish, and fled upon their discovery. Therefore, it was rare to encounter them basking, when compared to the number of individuals which were found beneath rocks and palm fronds.



Figure 1. Map of Roti and adjacent islands

While visiting Pulau Ndao, a small island situated off the southwestern coast of Roti, in August 2005, I observed a small female monitor (ca. 40 cm TL) of the *V. timorensis* species group which more closely resembled *V. timorensis* than *V. auffenbergi*. This animal was very similar to *V. timorensis* in its markings, but possessed a pallid yellow coloration instead of the grey and white typically associated with *V. timorensis*. It was initially seen basking in a small tree, and then quickly retreated to a hollow cavity within the tree upon its discovery. The locals on Pulau Ndao claim that these monitor lizards live inside hollow trees, unlike *V. auffenbergi* on Roti, which inhabit the crowns of Lontar palms.

My field observations are consistent with Schmutz and Horn's (1986) brief account of "*V. timorensis*" in coastal areas of Roti. Limestone rocks and walls appear to be favorable sites for *V. auffenbergi* on Roti, as well as *V. timorensis* on Timor, and both species have been found beneath fallen palm fronds. Although *V. timorensis* has been reported to shelter within Lontar palm stumps (Schmutz and Horn, 1986), only *V. auffenbergi* is known to inhabit the crowns of these palms.

### Literature Cited

- Schmutz, E. and H-G. Horn. 1986. Der Lebensraum von *Varanus (Odatria) t. timorensis*. Salamandra 22(2.3): 147-156.
- Sprackland, R.G. 1999. A new species of Monitor (Squamata: Varanidae) from Indonesia. Reptile Hobbyist 4(6): 20-27.

## Dizygotic Twinning in the Blue Tree Monitor, *Varanus macraei*

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Numerous reports of twinning exist for oviparous reptiles (e.g., Curtis, 1950; Carpenter and Yoshida, 1967; Eckert, 1990; Kinkaid, 1996; Tucker and Jazen, 1997; Hartdegen and Bayless, 1999; Platt et al., 2001). Among varanid lizards, twinning has been reported for several species: *Varanus indicus* (Speer and Bayless, 2000), *V. semiremex* (Jackson, 2005), *V. mertensi* (Eidenmüller and Stein, 1991), *V. gouldii* (Hartdegen and Bayless, 1999), *V. ornatus* (K. Levinger, pers. comm.), *V. kordensis* (Jacobs, 2002), and *V. panoptes horni* (Bayless, 1999). Additionally, Krauss and Horn (2004) report an instance of triplets in *V. varius*. I hereby report an instance of twinning in *V. macraei*.

A wild-caught pair of adult *V. macraei* was maintained since November 2003. On 30 March 2005, the female (31 cm SVL) laid her fourth consecutive clutch of eggs since 15 June 2004. The clutch consisted of five eggs, which were deposited in a nest box filled with dampened coconut husk and sphagnum moss at a temperature of 30 °C. All five eggs were of equal mass (11.3 g) and similar dimensions (see Table 1). The eggs were removed from the nest box and partially buried in fine vermiculite mixed with water to a ratio of 1:1 by weight within a 2 L plastic container, and placed inside an incubator maintained at 28 °C. After eight days of incubation, a fuzzy white fungus began to grow on the shell of egg #2. This egg quickly deteriorated and was discarded. The remaining four eggs incubated for the remainder of the term.

After 211 days of incubation, each of the four eggs began to grow a fungus and were no longer deemed viable. Dissection of the first three eggs revealed dead, late-term embryos, each with varying amounts of residual yolk remaining. The remaining egg contained two dead late-term embryos. Although noticeably smaller than the other late-term embryos (see Table 2), both twins were fully-developed. The twins differed in their dorsal patterning, and the presence of two distinct yolk sacs determined the twinning was



Figure 1. Dead late-term *Varanus macraei* embryos. Twins on right.



Figure 2. Twin embryos.



Figure 3. Packaging of twin embryos inside the egg

dizygotic. Judging from the physical condition of each individual, the first three embryos had likely died shortly before dissection of the eggs, based on the lack of decomposition, and fluidity within each egg. The twin embryos had clearly died several days before dissection of the egg, as the skin of both individuals had begun to deteriorate, and the contents of the egg smelled foully. The inner membrane of the egg was desiccated, and the dorsum of each twin was fused to the interior of the egg shell. The cause of deaths is unknown, although incubation difficulties resulting in late-term deaths were also experienced in both previous and subsequent clutches laid by the same female *V. macraei*, suggesting flaws in the incubation technique.

Table 1. Clutch Measurements

Egg #	Mass (g)	Length (cm)	Width (cm)
1	11.3	4.5	2.2
2	11.3	4.3	2.1
3	11.3	4.4	2.2
4	11.3	4.5	2.0
5*	11.3	4.4	2.1

\* indicates egg containing twins

Table 2. Late-Term Embryo Measurements

No.	SVL (cm)	TL (cm)	Total Length (cm)
1	8.1	12.8	20.9
2	8.5	13.6	22.1
3	8.2	12.9	21.1
4*	7.2	10.1	17.3
5*	7.5	10.6	18.1

\* indicates twin embryos

**Literature Cited**

- Bayless, M.K. 1999. *Varanus gouldii horni*: twins. Dragon News 2(3): 4.
- Carpenter, C.C. and J.K. Yoshida. 1967. One-egg twins in *Agama agama*. Herpetologica 23: 57-59.
- Curtis, L. 1950. A case of twin hatching in the Rough green snake. Copeia 1950: 232.
- Eckert, K.L. 1990. Twinning in Leatherback sea turtle (*Dermochelys coriacea*) embryos. Journal of Herpetology 24(3): 317-320.
- Eidenmüller, B. and R. Stein. 1991. Zwillingsanlage bei *Varanus mertensi* (Glauert, 1951). Salamandra 27(4): 282-283.
- Hartdegen, R.W. and M.K. Bayless. 1999. Twinning in lizards. Herpetological Review 30(3): 141.
- Jackson, R. 2005. The poorly known Rusty Monitor *Varanus semiremex*: history, natural history, captive breeding and husbandry. Herpetofauna 35(1): 15-24.
- Jacobs, H.J. 2002. Zur morphologischen Variabilität der nominellen Smaragdwaran-Taxa *Varanus prasinus* (H. Schlegel, 1839) und *V. kordensis* (A.B. Meyer, 1874), mit Bemerkungen zur Erstzucht des Letzteren. Herpetofauna 24(137): 21-34.
- Kinkaid, J.F. 1996. *Psuedechis colletti* (Collett's Blacksnake). Twinning. Herpetological Review 27(1): 26
- Krauss, P. and H.-G. Horn. 2004. Triplet Lace Monitors (*Varanus varius*) hatching from one egg. Reptiles Australia 1(4): 14-15.
- Platt, S.G., T.R. Rainwater and S.T. McMurry. 2001. Twinning in Morelet's Crocodile (*Crocodylus moreletii*) and a brief review of twinning in crocodylians. Herpetological Natural History 7(2): 181-185.
- Speer, R.J. and M.K. Bayless. 2000. The first report of mangrove monitor twins in captivity: the remarkable reproduction and disappointing result. Reptiles 8(5): 30-31.
- Tucker, J.K. and F.J. Jazen. 1997. Incidence of twinnings in turtles. Copeia 1997: 166-173.

## Captive Breeding of *Varanus exanthematicus*

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### Introduction

Despite being one of the most frequently imported monitors occurring in the pet trade, there has been limited documentation on the reproduction and behavior of *Varanus exanthematicus* in captivity (Bayless and Huffaker, 1992; Bayless and Reynolds, 1992; Reinshagen, 1993; Bayless, 1994; Bennett and Thakoordyal, 2003; Wesiak, 2006), and true captive breedings are not common or consistently achieved (Bennett and Thakoordyal, 2003). *Varanus exanthematicus* is threatened in many parts of its range by habitat loss or degradation, exploitation by the leather industry, (Coborn, 1994), and collection for the pet trade. Captive reproductive efforts would help reduce the demand for wild-caught *V. exanthematicus*, as well as increase the quality of the animals available to the pet trade, where captive-bred offspring would be more likely to thrive and reproduce than wild-caught imports (Bennett and Thakoordyal, 2003). I hereby report on the captive breeding and reproductive behaviors of *V. exanthematicus*.

### Acquisition and Sex Identification

During the summer of 2001, two neonatal *V. exanthematicus* were acquired from separate reptile dealers. The male and female initially weighed 28 g and 22 g, respectively, and both animals were estimated to be within 5 to 7 weeks in age. Upon acquisition, each monitor was separated, bathed in a 3% virosan solution, treated for amoebic and tapeworm infestation using recommended dosages of Droncit® (Praziquantel) and Metronidazole, and remained in quarantine until after their follow-up treatments.

Visual sex determination of *V. exanthematicus* can be difficult, although maintaining this species in captivity for ten years has allowed for easier detection of subtle sexually dimorphic characters, even in neonates. The male possesses a very robust head with a more pronounced hump towards the end of its snout when compared to the more slanted and pointed snout of the female. Another difference is observable in tail base thickness: the male possesses a distinct ventral groove which, in sexually mature males, lies between pronounced hemipenal bulges; the female possesses a flatter tail base. A third observable dimorphic character is the difference in coloration between sexes. The bright golden-yellow tones of the male drastically differ from the darker, duller brown shades of the female. The author has observed this difference in all offspring raised to maturity, so color may be a reliable indicator for visual sex determination in *V. exanthematicus*.

### Husbandry

For the first 4 months, the monitors were kept in separate clear plastic boxes, measuring 48 x 24 x 32 cm. Ventilation holes were drilled around each side of the boxes, and layers of moist paper towels were used as substrate to retain a humidity level of 70 % to ensure proper shedding and growth. Heat was provided by a strip of 12 watt heat tape positioned under each box. A diet consisting of medium-sized crickets and meal worms dusted in Repti-cal calcium (*T-Rex Products, Inc.: California, USA*) and Nekton Rep vitamin

supplement (*Günter Enderle: D-75177 Pforzheim, Germany*) was offered twice daily. Additionally, a small pink mouse coated in calcium powder was offered every three days. Weights were recorded weekly, with an average increase of two grams per week per animal.

At six months of age the juveniles were moved to separate glass aquaria measuring 144 x 48 x 96 cm. A temperature gradient with a basking temperature of 57° C, ambient air temperature of 34° C, and a cool end temperature of 28° C, was maintained by using full-spectrum Power Sun (*Zoo Med Laboratories, Inc.: California, US*) UVA/UVB 160 watt flood lamps in addition to under-tank heat tape. Automatic timers maintained a 13:11 photoperiod, coinciding with the natural photoperiod in New Jersey during summer months. As the natural photoperiod decreased, automatic timers were adjusted to decrease the photoperiod. Substrate consisted of a combination of two parts fine sand, one part coarse grit, one part soil, and one part cypress mulch and/or coconut husk fiber, and was offered at a depth of 10.2 cm. Hissing cockroaches were incorporated into the diet, and small pink mice were replaced with pink rats and small fuzzy mice.

By approximately one year in age, the male had developed pronounced hemipenal bulges at the tail base, and had grown to 61 cm in total length and weighed 3.63 kg. The female measured 50.8 cm, and weighed ca. 3.1 kg, with a noticeably heavier stomach and saddles than the male. No lethargy was observed in either animal, and both maintained high levels of daily activity comprised of digging, climbing, and feeding.

At 13 months of age, and three weeks into the fall season of 2002, the pair was introduced together into a glass aquarium measuring 192 cm x 72 cm x 80 cm. Meanwhile, construction started on a custom enclosure. Formal introduction resulted in immediate breeding behaviors by the male, consisting of a series of head jerks, using the snout to nuzzle the neck, tympanic membranes, and the underside of the female's tail base. No copulation was observed during this time. The female began to stay in burrows, but all of her burrowing activities ceased. Separation of the pair led to a disruption in the behavior of the male; he became very agitated and restless upon the female's removal.

In late July 2003, the pair was moved to a custom enclosure measuring 213 x 152 x 122 cm, with a substrate depth of 40 cm. Once introduced into the larger enclosure, the female's diet was supplemented with an increase in calcium via ground turkey, offered daily until her weight peaked at 2.76 kg.

### **Copulation and Oviposition**

On 3 September 2003, an overall temperature drop of 9° C and a 5 h decrease in photoperiod were initiated. Ambient temperatures were maintained at 30.8° C with a cool end of 26.7° C, and basking temperatures remained at 52°. Daily food offerings were reduced to 3 times weekly for both monitors. In mid-October a rain cycle created by a standard hand-held garden mister was introduced, lasting no longer than three minutes per session, for two sessions every other day. Ambient humidity levels were maintained at ca. 90 %, for the next five weeks.

Initial copulations were observed in late November. A series of rhythmic head jerks by the male were observed, and consistent clawing of the female's lower saddles and tail base had led to small abrasions and scabbing from above, but with no ill effects to her health. The duration of copulation ranged between 25 min to 4 h. The male would position himself atop the female's back, proceeding to claw with his rear limbs until she would raise her tail. Alternation of the hemipenes was observed during copulation; however, the animals did not separate. The male would evert the second hemipenis while clawing the female with his alternate rear limb, and would then insert the second hemipenis after he removed the first. The female was very placid during this time, resting with her eyes closed, and expending energy only to raise and lower her tail.

Copulations were observed from November 2003 to March 2004 in weekly intervals. Shortly after



Figure 1. Copulation



Figure 2. Gravid Female

copulations ceased, the female became very aggressive towards the male, who was therefore removed and placed in a separate enclosure. Ambient temperatures and photoperiod were returned to their original settings, and all misting was ceased. Whole prey items were offered to the female twice daily for the next 4 weeks. Hard boiled eggs were offered every other day with calcium-fortified insects. By sixteen days after the last observed copulation, the female's lower abdomen had become increasingly distended. Physical activity in the female decreased, with all activity restricted to a single corner of the enclosure which would eventually become the site of oviposition. Feeding behavior in the female ceased four days prior to egg deposition.

On the evening of 7 April 2004, the female became very restless, and began excavating a deep hole in the substrate. When completed, the chamber measured ca. 19 cm in depth. The female backed over the opening, and began to deposit her eggs. By 0300 h on 9 April, exactly 36 days after the last observed copulation, the female had deposited 28 eggs, which averaged 4.5 x 3 cm and weighed an average of 12.28 g (total clutch mass 343.72 g).

After depositing the eggs, the female covered the clutch with substrate, leaving a small depression above the chamber. Once the female resumed her normal feeding regimen, she gained 450 g in 14 days.



Figure 3. Oviposition



Successive clutches of 30 and 20 eggs were laid 32 and 55 days after the initial clutch, respectively. Large clutch sizes are common for *V. exanthematicus*, and reports of clutches consisting of more than 40 eggs exist (Bennett and Thakoordyal, 2003).

### Incubation and Neonatal Care

The eggs were removed from the nest site later that morning, and candling revealed no visible blood vessels which would have indicated fertility. The eggs were partially buried in a 2:1 mixture of vermiculite to perlite, mixed with water to a 1:1 ratio by weight, inside a plastic container measuring 48 x 32 x 24 cm. The box was placed in a custom-built incubator and maintained at 30.3° C. The incubator lid was opened every five days to allow for gas exchange. Candling at 21 days revealed that all 28 eggs were fertile.

The initial clutch began to hatch after 158 days on 6 September 2004, and by the next day, all 28 eggs had successfully hatched, revealing visibly healthy hatchlings. The two subsequent clutches hatched after 156 and 160 days, respectively. Despite containing all viable eggs, only 18 eggs from the third clutch successfully hatched, with the remaining two embryos dying full-term and fully developed.



Figure 4. Clutch beginning to hatch



Figure 5. Hatchling emerging from egg



Figure 6. Captive-bred *Varanus exanthematicus*

Hatchling weights from the three clutches varied between 7.32 and 12.7 g (mean 9.2 g). Hatchlings averaged a snout to vent length of 8.1 cm, and were separated into groups of three and housed in the same plastic enclosures used for the parents when younger. Hatchlings began feeding as early as 12 days after emerging from their eggs, or 3 days after the last of the yolk within the gut had been absorbed. All offspring were eventually sold after each individual had fed consistently for three weeks.

### **Acknowledgements**

I would like to thank Frank Retes for his continued support, advice, and assistance. I would also like to thank the editors of *Biawak*, for their interest in my captive breeding efforts with *V. exanthematicus*, and for review of this article.

### **Literature Cited**

- Bayless, M.K. 1994. Zur Fortpflanzungsbiologie des Steppenwarans (*Varanus exanthematicus*). Salamandra 30(2): 109-118.
- Bayless, M.K. and R. Huffaker. 1992. Observations of egg deposition and hatching of the savannah monitor (*Varanus exanthematicus* Bosc, 1792) in captivity. VaraNews 3(1): 5-6.
- Bayless, M.K. and T. Reynolds. 1992. Breeding of the savannah monitor lizard in captivity (*Varanus exanthematicus*). Herpetology 22(1): 12-14.
- Bennett, D. and R. Thakoordyal. 2003. The Savannah Monitor Lizard: The Truth About *Varanus exanthematicus*. Glossop, England: Viper Press.
- Coborn, J. 1994. *Savannah Monitors*. Neptune City, New Jersey. TFH Publications, Inc.
- Reinshagen, S. 1993. Pflege und Zucht von *Varanus exanthematicus*. Monitor 2(2): 7-9.
- Wesiak, K. 2006. Zur Pflege und Nachzucht des westafrikanischen Steppenwarans, *Varanus (Polydaedalus) exanthematicus* (Bosc, 1792). Elaphe 14(3): 21-34.

## Rough-scaled Sand Boa (*Eryx conicus*) Predation on a Bengal Monitor (*Varanus bengalensis*)

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While investigating the source of disturbance for many loud and excited birds at ca. 1130 h on 14 July 2000, I observed the predation of a Bengal Monitor, *Varanus bengalensis* (ca. 1 m total length TL), by an adult Rough-scaled Sand Boa, *Eryx conicus* (ca. 1 m TL), near the village of Gunsli, in the northwestern Indian district of Rajasthan. Capture of the lizard by the snake was not witnessed. With its teeth, the *E. conicus* grasped the *V. bengalensis* by the head and coiled tightly around its torso. The *E. conicus* began to swallow the monitor head-first after constricting it for ca. 35 min. The boa took ca. 30 min to consume the lizard, and then slowly retreated to a burrow beneath a nearby bush and disappeared.

The site where my observations were made consisted primarily of local grasses and *Capparis decidua* shrubs, and was located between a road and a non-irrigated agricultural field of Pearl millet, *Pennisetum typhoides*, with some scattered Sorghum, *Sorghum vulgare*.

Although documentation of Bengal Monitor predation by snakes exists (Mash, 1945), this account represents the first reported predation of *V. bengalensis* by *E. conicus*. Despite my observations, given their nocturnal habits, sand boas are not likely predators of diurnal Bengal Monitors.

### Literature Cited

Mash, P. 1945. Indian Python (*Python molurus*) preying on Monitor Lizard (*Varanus monitor*). Journal of the Bombay Natural History Society 45(2): 249-250.



Figure 1. A *Varanus bengalensis* is preyed upon by a Sand Boa (*Eryx conicus*)

## Feral Iguana attacks *Varanus salvator* at Sungei Buloh Wetland Reserve

CHUA ENG KIAT

Asian Water Monitors, *Varanus salvator*, which can grow to over 2 m in total length (TL), are common at the Sungei Buloh Wetland Reserve in northwestern Singapore. They are often seen swimming in the mangroves, basking on muddy banks, and wandering onto walkways and paths of the reserve. Although native to central and South America, feral Green iguanas, *Iguana iguana*, have been encountered previously in botanical gardens in Singapore (pers. observ.), this is my first sighting of one at the Sungei Buloh Wetland Reserve.

While visiting the Reserve one morning in December 2005 at ca. 0800 h, I observed two large *V. salvator* of unknown sexes, each measuring ca. 1.6 m TL, sunbathing on an open mound near the edge of a lily pond. At 0800 h most of the lily pond was shaded, however by ca. 0700 h the mound on which the *V. salvator* were basking becomes the first location around the pond to be reached by sunlight. Therefore, the mound's location makes it a good basking spot for monitor lizards during the morning hours.

Shortly after noticing the two *V. salvator*, I observed an adult male iguana (ca. 1.2 m TL) atop a tree at the far end of the pond (Figure 1). By ca. 0830 h, I noticed that the iguana had descended from its treetop position and had traveled ca. 15 m through moderately dense undergrowth to the mound where



Figure 1. (top left)  
Male *Iguana iguana*  
basking in tree

Figures 2. (top right) &  
3. (far left) Iguana  
approaches basking  
*Varanus salvator*

Figure 4. (left) Dewlap  
of Iguana extended



Figure 5. Iguana mounts *V. salvator*



Figure 6. Iguana biting the neck of the *V. salvator*

the two *V. salvator* were basking (Figures 2 & 3). Shortly after the iguana's arrival, one of the two basking *V. salvator* left the mound and retreated to nearby vegetation. Over the next 10 to 15 min, very little movement or activity by the lizards was observed. The iguana's dewlap was fully extended during this time (Figure 4).

Despite direct eye contact made with the iguana, the remaining *V. salvator* continued to bask atop the sunlit mound. No head shaking or head bobbing behavior by the iguana was observed. The iguana's posture soon gave way to physical confrontation involving the iguana climbing onto the monitor's back (Figure 5). The *V. salvator* slightly repositioned itself several times in an effort to get the iguana off its back, although no sudden movements were made by the monitor. Despite the persistent and aggressive advances made by the iguana, the *V. salvator* never assumed an aggressive or defensive posture and continued to bask atop the mound. The iguana then began biting the nape of the *V. salvator* (Figure 6), and after ca. 10 to 15 min, the confrontation ended when the *V. salvator* slowly retreated to nearby vegetation. The iguana proceeded to bask atop the mound for at least 15 min after the monitor had left the area.

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# TRANSLATIONS

Biawak 1(1): 37-38

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Mitsch, H. 1936. Warane. Wochenschrift Aquarien und Terrarien Kunde 33: 595-597.

## Monitors

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The size restraints of the home compels most herpetoculturalists to be content in keeping appropriately smaller captives; therefore, one often does not see large terrariums or large animals belonging to herpetoculturalists; I am referring to crocodylians, tegus, monitors and iguanas. If one only had room, these aforementioned reptiles are very interesting terrarium captives. Concerning crocodylians and tegus, I refer to my articles: Wochenschrift Aquarien und Terrarien Kunde 1935 (38) and 1936 (3). With these other articles already having been published, I want to describe my experiences with monitors.

In my possession, I keep and have kept respectively, *Varanus griseus* (Desert Monitor), base color yellow with dark cross bands. In older individuals, the colors are not as bright as in the juveniles. Length: 85 cm. Distribution: North Africa, Arabia [Arabian Peninsula], Persia [Iran] to northeast India.

*Varanus varius* (Lace Monitor) Coloration is blue-grey with black double banding. Length: 125 cm. Distribution: Australia.

*Varanus salvator* (Water Monitor) Coloration black with cross rows alternating in yellow round flecks, yellow and black striped lips. Distribution: India, Sunda Islands, Philippines, South China. Length: 110 cm.

*Varanus dumerilii* (Dumeril Monitor) Coloration is light brown with dark brown bands and temporal stripe. Distribution: Borneo, Sumatra. Length is seldom over 1 m. (fig. 1).

There is unfortunately little to say about the set up of the enclosure; because the monitor's great power, plants or other delicate items within the enclosure are out of the question. For the Lace Monitor, Water Monitor and Dumeril Monitor, sand and strong climbing branches will suffice. There must also be a large and strongly built water tank. In the case of the Desert Monitor, the set up is the same, but climbing branches are not needed; they will not be used. Fine sand for use with the Desert Monitor is not practical. In the beginning when using sand, the enclosure was cloudy, resulting from often thick dust clouds that the burrowing of the Desert Monitor created, which often hindered the view inside the terrarium. A Desert Monitor seldom drinks or never drinks. Constructing a large filled pool of water is something a Lace and Water Monitor will happily make use of. It should be understood that the air temperature should be high, from 29° to 32° C; accordingly, the water temperature should not be under 25°C. For the creation of thermal gradients, the substrate is heated and sunlight is also used for heating. While the Desert Monitor feels good at 30° to 35° C, the other three are satisfied at 27° to 29° C.

At first, I had a Desert Monitor and I must say, his length of 85 cm did not impress me, but I quickly learned otherwise. I let him out of his transport case, let him check out his new home and shut the terrarium

door immediately after he entered. What was to happen, only lasted seconds, but was an in-depth lesson for me. Barely in the terrarium, he turned about and delivered a bite on the hand. The bite was not from bad husbandry. I have been bitten, nipped, scratched often over the year from my charges, but I had never had such a marking of my hand- in hindsight, I now have developed a tolerable relationship, in which I take his behavior into consideration. There is rarely a large tame Desert Monitor. It is like the smallest little thing will disturb their peace and one must then admire the unbelievable courage in which it will attack anything. The cleaning of the enclosure can be done with great caution, but must look out and keep the hands and face out of danger. Feeding goes with caution accordingly. Every food item will first be aggressively and strongly shaken here and there and killed. For prey items, they consume: birds, large lizards, and later repeatedly took raw fish. Grasshoppers are curiously disdained.

Now, I will go to the Australian Lace Monitor and the Water Monitor. Learning an important lesson from the Desert Monitor, I gave myself a note of caution working with the Lace monitor, but here also, I eventually paid to learn a lesson. Barely in the terrarium, there were hisses, mouth gaping, and a battle with the tail; the rattling of the terrarium panes took only a second; the panes broke. So nothing else remained for me; all panes had to be replaced by mirror glass, because 2 mm glass is not strong enough for a guy like this. He was very agitated the first night. I laid an ornamental cork pipe as a hollow log in the enclosure, which he immediately moved into. He immediately saw that it was not long enough and that the posterior end of his body was exposed and was able to be seen. During the day, he later always laid on his climbing branch alertly observing the surrounding area. His contribution as a display animal at first had much to be desired. As prey items he took: mice, lizards, birds and even little tortoises (*Testudo hermanni*)!

In the interim, I kept Water Monitors, but there were no more terrariums available. I kept him with the Lace Monitor and remained cautiously at the terrarium, to be able to report on both of them. The Lace Monitor straightened itself up and greeted the Water Monitor with hisses and mouth gaping during which he stiffened and stretched out his limbs, then I only saw a wild fight. My job was to separate the fighters, only to fail at first. In retaliation, I received a tail lash, which was certainly not meant for me. The impacts were that of a flogging. In the end, I lost my patience and I succeeded in separating the two rabid fighters. I will not comment on how my hands looked! I will always remember the fight from my scarred hands. The terrarium had to be partitioned and each side houses one of the enemy combatants. There has certainly been a more peaceful existence, but they can not be compared to the loving contact with my tegus, because I remember biting and beatings so well. The prey items for the Water Monitor is as stated: mice, fish, frogs, and occasionally ground meat.

In closing, something about *Varanus dumerilii*: this species is rarely on the market and if and when it is, it is 50 to 75 cm in length, so it is very good and suitable for the beginner monitor keeper. My specimen lived peacefully in a terrarium and spent his days in burrowing holes and devouring large portions of mice. Other food has until now been refused. His behavior is characterized as peaceful, as much as one could consider a monitor as "peaceful".

Is it plausible for enthusiastic herpetoculturalists to keep such animals with lengths over 1 m in terrariums, or will terrariums occupied by monitors always be the subject of derogatory information against them? I have a beautifully planted Anole terrarium that will catch your eye much more quickly than a monitor terrarium. Brand it a new way of thinking, but the higher intelligence of the monitors more than makes up for their abrasive behavior and the terrarium without plants.

# NATURAL HISTORY NOTES

## *VARANUS CAERULIVIRENS* (Turquoise Monitor). REPRODUCTION

In recent years several new monitors have been described from Indonesia (Ziegler et al., 1999; Philipp et al., 1999; Böhme and Jacobs, 2001; Böhme and Ziegler, 1997; Harvey and Barker, 1998; Eidenmüller & Wicker, 2005; Böhme & Ziegler, 2005; Ziegler, Böhme & Schmitz, 2007). Almost nothing is known of the natural history, ecology, or any biological aspect of these new species. I hereby report on a clutch from one species, *Varanus caerulivirens* (Figure 1), from Halmahera Island, Indonesia. The female is 32 cm SVL (81 cm TL). On 15 September 2002 she laid two perfectly formed eggs. They were relatively longer and larger than those of other *V. indicus*-group (DeLisle, 1996): 67 x 22 mm and 69 x 24 mm (Figure 2). They respectively weighed 20 and 22 g. After 3 weeks it was determined that they were probably not fertile and further attempts at incubation were terminated. Eight months later she laid a further two eggs, of similar dimensions (65 x 21 mm, 66 x 23 mm). No attempt was made to incubate the eggs. This was before the report of Lenk et al. (2005) or Watt et al. (2006) of possible parthenogenesis in isolated female varanids. The female was wild caught and obtained from a commercial importer. She had been in captivity over a year at the time of oviposition.



Figure 1. Female  
*Varanus caerulivirens*



Figure 2. Clutch of *V. caerulivirens*



**Literature Cited**

- Böhme, W. and T. Ziegler. 1997. *Varanus melinus* sp.n., ein neuer Waran aus der *V. indicus*-Gruppe von den Molukken, Indonesien. Herpetofauna (Ger.) 19(111): 26-34.
- Böhme, W. and H.J. Jacobs. 2001. *Varanus macraei* sp.n., eine neue Waranart der *V. prasinus*-Gruppe aus West Irian Indonesia . Herpetofauna ( Ger.) 23(133): 5-10.
- Böhme, W. and T. Ziegler. 2005. A new monitor from Halmahera, Moluccas, Indonesia (Reptilia: Squamata: Varanidae). Salamandra 41: 51-59.
- De Lisle, H.F. 1996. Natural History of Monitor Lizards. Krieger Publ. Co., Malabar, Florida.
- Eidenmüller, B. and R. Wicker. 2005. Eine weitere neue Waranart aus dem *Varanus prasinus*-Komplex von der Insel Misol, Indonesien. Sauria 27: 3-8.
- Harvey, M.B. and D.G. Barker. 1998. A new species of blue-tailed monitor lizard (genus *Varanus*) from Halmahera Island, Indonesia. Herpetologica 54: 34-44.
- Lenk, P., B. Eidemüller, H. Staudter, R. Wicker and M. Wink. A parthenogenetic *Varanus*. Amphibia-Reptilia 26: 507-514.
- Philipp, K.M., Böhme, W. and T. Ziegler. 1999. The identity of *Varanus indicus*: redefinition and description of a sibling species coexisting at the type locality. Spixiana 22: 273-287.
- Watts, P.C., K.R. Buley, S. Sanderson, W. Boardman, C. Cioffi and R. Gibson. 2006. Parthenogenesis in Komodo dragons. Nature 444: 1021-1022.
- Ziegler, T., W. Böhme and K.M. Philipp. 1999. *Varanus caerulivirens* sp.n., a new monitor of the *V. indicus* group from Halmahera, Moluccas, Indonesia. Herpetozoa 12: 45-56.
- Ziegler, T., W. Böhme and A. Schmitz. 2007. A new species of the *Varanus indicus* group (Squamata, Varanidae) from Halmahera Island, Moluccas; morphological and molecular evidence. Mitt. Mus. Nat.kd. Berl. Zool. Reihe 83: 109-119.

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# GEOGRAPHICAL DISTRIBUTION NOTES

## *VARANUS SALVATOR* (Asian Water Monitor). PALAWAN, PHILIPPINES

The Puerto Princesa Subterranean River National Park located in southern Palawan, is a popular tourist destination of the Philippines. Accessing the park involves a short boat ride from Sabang to an enclosed beach area on an isolated part of the island. Visitors are not allowed to access the beach and are guided directly to the entrance of the underground river approximately 50 m inland. Much of the terrain encountered in this particular area of the island is densely forested.

On 6 January 2006, I visited the Puerto Princesa Subterranean River National Park. While waiting for a river guide in the late morning to early afternoon in a small picnic area situated beneath an open wooden hut, several *Varanus salvator* and macaques (*Macaca fascicularis*) were spotted within the picnic area. While the picnic area was open and sandy, the surrounding area was densely forested. As visitors ate their lunches in this area, monitors and macaques began to congregate. As many as six *V. salvator* were spotted in the picnic area at a given time, each measuring more than 1 m in total length.

While the macaques were very active, attempting to get close to a family eating lunch at a nearby picnic table, the *V. salvator* basked in the sunlight. The macaques were seen walking past the monitors and even sitting near them, however despite their close proximity to one another, the macaques and *V. salvator* acted indifferent to each other's presence and did not interact with one another. Due to this park's popularity as a tourist destination, both species were clearly accustomed to the presence of humans and were not bothered unless their personal space was invaded. Despite their presence within the busy picnic area, neither the monitors nor macaques were seen eating any food left behind by humans, however it is likely that this is the reason for them congregating together in the area.

RACHEL FRANCO

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Figure 1. *Varanus salvator* and macaques congregate in a picnic area

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# CURRENT RESEARCH

## Life History Studies of Rosenberg's Goanna (*Varanus rosenbergi*) on Kangaroo Island, South Australia

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Rosenberg's goanna (*Varanus rosenbergi*) once had a wide distribution across the southern portion of Australia. In recent years numbers have declined dramatically due to pressures on habitat, increased road traffic, and increased predation by feral species (cats and foxes in particular). Various sites on Kangaroo Island offer unique opportunities for long term monitoring of individuals living in a variety of intact ecosystems. Rosenberg's goanna is significant to Kangaroo Island as the largest native terrestrial predator.

Some aspects of our long term study include:

- 1) Documenting movements and home ranges. On Kangaroo Island, Rosenberg's goanna are highly mobile from October through April. We have documented that the movements of *V. rosenbergi* are greater than previously reported (Green and King 1978, 1993). Home ranges may be larger than 100 hectares and an individual can use up to 30 different burrows (personal observations).
- 2) Monitoring breeding behavior, including courtship duration and pair fidelity. Courtship, breeding, and egg deposition occurs between December and February. It was once believed that this solitary-living goanna was monogamous during the breeding season. Our observations show that some males court and breed with 2 different females. Using DNA, we are investigating successful parenting and gender of the young.
- 3) Examining temperature and humidity in the termite mound incubation chambers, i.e. the role of *Nasutitermes exitiosus* in the incubation of *V. rosenbergi* eggs. To date, the question about what is happening inside a termite mound, i.e. the daily and seasonal patterns of temperature and humidity, has not been fully resolved because of equipment limitations in the 'hostile' environment of a termite mound. We have developed and are currently implementing techniques for continuously monitoring

environmental conditions both in and outside the mounds during incubation.

- 4) Recording daily and seasonal body temperature fluctuations in free ranging individuals. *V. rosenbergi* are one of the largest Varanid species living the furthest south of the equator. As such, they have adapted to living in a cooler climate. It has been documented that on sunny winter days some individuals emerge wholly or partially to bask (Christian and Weavers 1994). More recent monitoring shows that Rosenberg's goanna can have more than one winter burrow and that some animals move between resting sites during the winter. We have documented that these winter arousals are not solely dependent on air and ground temperatures (Rismiller and McKelvey, 2000). Further studies will reveal more about regulation of body temperature in this species.
- 5) Mark and recapture of young goannas. There is still virtually no information about growth rates of *V. rosenbergi* in the wild and the age of sexual maturity is still unknown. We are in the sixth year of following known aged individuals.

## **Aspects of the Ecology and Conservation of Frugivorous Monitor Lizards.**

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Frugivorous monitor lizards (*Varanus olivaceus* and *V. mabitang*) occur only in lowland dipterocarp forests of the Philippines, one of the most threatened habitats on Earth. The animals are an evolutionary oddity because of their usual diets, and an ecological oddity because they are the only large, frugivorous, vertebrates in the Philippines that are unable to fly. Forest destruction and fragmentation has led to their disappearance from much of their previous range in the last 50 years. There are few competitors for the fruits eaten by frugivorous monitor lizards, and some appear to be evolutionary anachronisms that evolved to be eaten and dispersed by Pleistocene megafauna. Consequently, the lizards are suspected to be important dispersers of these seeds. Because the animals are very shy and easily disturbed, only non-intrusive methodologies are acceptable. These include direct observation from hides, the use of infra-red triggered camera traps, and identification of fecal matter on the forest floor.

This project aims to:

- 1) Develop rapid and accurate methods to determine the presence of frugivorous monitors at sites where they are suspected to exist
- 2) Investigate aspects of the basic biology of these animals (diet, home range size and use, population size and structure and long-term movements of individuals) in forest fragments of varying size and isolation

- 3) Investigate the influence of the animals on the seeds shadows of plants important in the diet and attempt to relate this to the distribution and demography of those species
- 4) Develop realistic strategies for the conservation of giant frugivorous monitor lizards in areas where their extinction is imminent
- 5) Raise awareness of the plight of giant frugivorous monitors in the Philippines and worldwide. Because the animals are very shy and easily disturbed only non-intrusive methods are acceptable.

## **Neurophysiology and Behavioral Ramifications in Varanid Lizards**

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Pineal organs, or third eyes, play important roles in behavior by producing and regulating a variety of neurotransmitters such as serotonin and melatonin. The effects of different light wavelengths and photoperiods is being studied in varanids, lizards with large and distinct epidermal pineal organs.

Hypotheses being addressed include:

- 1) Does light wavelength affect neurotransmitter production and release?
- 2) Does photoperiod affect neurotransmitter production and release?
- 3) Is the pineal endocrine system important in the ability of varanids to physiologically sequester calcium?

Though a variety of studies has shown correlation between photoperiod, light wavelength, and blood calcium levels, it has yet to be determined how varanid calcium physiology operates, i.e., is it strongly light-dependent, as in humans, or can varanids absorb sufficient calcium through digestive processes alone. Preliminary results support the hypotheses that light wavelength is important, but covers a wider band than some literature suggests; that photoperiod is marginally important, so long as light is present; and that increased calcium levels associated with increased photoperiods within certain wavelength exposures increases blood calcium but has little effect on bone density.

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# RECENT PUBLICATIONS

2006

- Jolley, E. and R. Meek. 2006. *Varanus bengalensis* (Bengal Monitor): Unusual behaviour and feeding. Herpetological Bulletin 95: 31-32.
- Waterloo, B. and M.K. Bayless. 2006. Notes on the breeding behaviour of the Crocodile Monitor *Varanus salvadorii* in captivity. Herpetological Bulletin. 98: 2-6.
- Watts, P.C., K.R. Buley, S. Sanderson, W. Boardman, C. Ciofi and R. Gibson. 2006. Parthenogenesis in Komodo Dragons. Nature 444(21/28): 1021-1022.

2007

- Alles, J. and A. Charleson. 2007. The Argus Monitor. Reptiles 15(7): 68-73.
- Arth, S. 2007. Keeping and breeding the Spiny-tailed Monitor *Varanus acanthurus*. Reptilia 50: 28-36.
- Bertelsen, M.F., M. Kjelgaard-Hansen, J.R. Howell and G.J. Crawshaw. 2007. Short-term biological variation of clinical chemical values in dumeril's monitors (*Varanus dumerili*). Journal of Zoo and Wildlife Medicine. 38(2): 217-221.
- Ciofi, C., J. Puswati, D. Winana, M.E. De Boer, G. Chelazzi and P. Sastrawan. 2007. Preliminary analysis of home range structure in the Komodo Monitor, *Varanus komodoensis*. Copeia. 2007(2): 462-470.
- Dedlmar, A. 2007. Keeping and breeding the Blue tree Monitor *Varanus macraei*. Reptilia 50: 25-27.
- Eidenmüller, B. 2007. Small monitors in the terrarium. Reptilia 50: 12-19.
- Jessop, T.S., T. Madsen, C. Ciofi, M.J. Imansyah, D. Purwandana, H. Rudiharto, A. Arifandy and J.A. Phillips. 2007. Island differences in population size structure and catch per unit effort and their conservation implications for Komodo Dragons. Biological Conservation 135(2): 247-255.
- Mashinini, L. 2007. *Varanus albigularis* Hibernation. African Herp News. (42): 17.
- Murphy, J.B. 2007. Notes on iguanids and varanids in a mixed exhibit at Dallas Zoo. Iguana. 14(1): 45-46.
- Pozio, E., C.M. Foggin, T. Gelanew, G. Marucci, A. Hailu, P. Rossi, and M.A.G. Morales. 2007. *Trichinella zimbabwensis* in wild reptiles of Zimbabwe and Mozambique and farmed reptiles of Ethiopia. Veterinary Parasitology 143(3/4): 305-310.
- Reisinger, M. and D. Reisinger-Raweyai. 2007. *Varanus boehmei*: keeping and first breeding in the terrarium. Reptilia 50: 20-24.

- Smith, J.G., B.W. Brook, A.D. Griffiths and G.G. Thompson. 2007. Can morphometrics predict sex in varanids? *Journal of Herpetology* 41(1): 133-140.
- Ziegler, T., W. Böhme and A. Schmitz. 2007. A new species of the *Varanus indicus* group (Squamata, Varanidae) from Halmahera Island, Moluccas: morphological and molecular evidence. *Mitt. Mus. Nat.kd. Berl., Zool. Reihe* 83 (2007) Supplement: 109-119.
- Ziegler, T., A. Schmitz, A. Koch and W. Böhme. 2007. A review of the subgenus *Euprepiosaurus* of *Varanus* (Squamata: Varanidae): morphological and molecular phylogeny, distribution and zoogeography, with an identification key for the members of the *V. indicus* and the *V. prasinus* species groups. *Zootaxa* 1472: 1-28.

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# INSTRUCTIONS FOR AUTHORS

## *General Information*

*Biawak* is a peer-reviewed quarterly journal which publishes original articles and notes which pertain to the biology and captive husbandry of monitor lizards, as well as book reviews, historical accounts, veterinary reports, innovative techniques, bibliographies, commentaries, and digests of current varanid research. Papers are of a semi-technical to non-technical nature.

Academics, researchers, zoo personnel, students, private breeders, keepers, hobbyists and enthusiasts from all nations are encouraged to contribute. Papers which discuss biology or captive husbandry should focus exclusively on observations and results, rather than personal persuasions. Opinionated papers should instead be submitted as either commentary or letters to the editor. Assistance with manuscript preparation is available upon request.

All contributing authors must attest that manuscripts and material submitted to *Biawak* are original and have not been published or submitted elsewhere. Submission of a paper to *Biawak* implies that the authors concede to the open-access distribution of the manuscript, including all content contained therein.

## *Submission Categories*

### **Full Length Articles**

Full length articles are typically greater than 500 words, but have no limits on length. Photographs, line drawings, and tables are encouraged as long as they compliment the article.

***Full Length Natural History Articles-*** A broad range of topics which pertain to varanid biology and natural history are accepted, including, but not limited to habitat preference, behavior, reproduction, diet, predation, and activity.

***Full Length Captive Husbandry Articles-*** A broad range of topics which pertain to the captive husbandry of monitors lizards are accepted. Acceptable topics may include, but are not limited to captive reproduction, maintenance, behavior, diet, activity, acclimation, and incubation.

***Full Length Review Articles-*** Review articles may cover a variety of topics which pertain to wild or captive monitor lizards. Articles must use previously published works to support the discussion of a particular subject or topic.

### **Shorter Communications**

Brief accounts typically report on single observations or occurrences. They may be as brief as a single paragraph, as long as they accurately and descriptively describe the nature of the observation. When observing behaviors, human interference should be avoided or kept to a minimum.

***Natural History Notes-*** A broad range of topics which pertain to wild monitor lizards are accepted. Examples may include, but are not limited to behavior, reproduction, diet, predation, and aggression. Details such as date, time of day, location, habitat type, sex, and size of the animal/s observed are important and should be noted when possible.

***Geographic Distribution Notes-*** Reports which document the geographical occurrence of *Varanus* species are accepted. All geographical accounts must report precise locality data, and when possible, latitudinal and longitudinal coordinates should be given. Notes should include the date, time of



day, a description of the habitat, and a description of the animal/s behavior at the time of observation.

***Captive Husbandry Notes***-A broad range of topics which pertain to the captive husbandry of monitor lizards are accepted. Examples may include, but are not limited to behavior, diet, reproduction, and aggression. A brief description of the husbandry and conditions offered may be necessary to accurately describe the nature of the observation.

## **Additional Topics**

***Book Reviews***- Reviews of *Varanus*-related books are accepted. Reviews should critique and evaluate the book on many different aspects, including scientific merit, organization, and presentation.

***Historical Accounts***- Articles which report on the history of *Varanus* maintained in zoological institutions, or the contributions to varanid biology or husbandry made by single individuals are accepted. Additional historical subjects may also be accepted.

***Veterinary Reports***- A broad range of topics pertaining to varanid veterinary medicine and surgery are accepted. Topics may include, but are not limited to diagnoses, treatments, preventative medicine, innovative veterinary techniques, and necropsies.

***Techniques***- Articles which describe new and innovative techniques in the fields of captive husbandry and field research are accepted. Articles should elaborate on the reason for development of the technique, a detailed description of the technique, and a discussion of the results received from utilizing the new technique. Diagrams and photographs which compliment the text are encouraged.

***Bibliographies***- Compiled varanid bibliographies are accepted. Due to the volume of varanid literature, bibliographies must be limited to a particular topic (e.g. Reproduction), species complex (e.g. *Varanus indicus* complex), or species in their scope of coverage.

***Commentaries/Letters to the Editor***- Opinionated letters from readers are accepted. Letters may be formal or informal, and may discuss any topic, issue, or controversy pertaining to the study of wild or captive monitor lizards. Letters may be heavily opinionated, and are thus not to be presented as fact.

***Current Research/Recent Publications***- Researchers are encouraged to submit abstracts of current research or recently published works. Recent publications may include books, journal articles, magazine articles, and newsletter/bulletin articles.

***Requests for Research Assistance***- Varanid researchers are encouraged to place requests for research assistance. Requests may include, but are not limited to funding, graduate students, volunteers, research technicians, specimens, tissue samples, literature, and travel/lodging accommodations.

### ***Style and Format***

All submissions are to be in English, using U.S. spelling and grammar conventions. If English is not the primary language, assistance in preparing the manuscript is available. Manuscripts are accepted electronically (Microsoft Word [.doc] or Rich Text Format [.rtf] files) as email attachments. If contributors are unable to submit papers electronically, hard copies may be submitted instead. The entire manuscript should be double spaced, including all tables, figures, and literature cited. Abstracts of manuscripts are not published in *Biawak* and therefore should not be submitted.

### ***Figures***

- Photographs, images, diagrams, tables and line drawings are encouraged, and accepted as .jpg or .gif files. Physical copies are also accepted if electronic submission is not possible.
- Standard photographic submissions should not be less than 1600 x 1200 pixels (2 megapixels), and submissions for cover photos should exceed 2500 x 3200 pixels (8.5 megapixels).
- Tables are to be submitted as editable Word or Excel files, not as pictures
- Each table should be submitted on a separate page and be double spaced throughout

### ***Units of Measurement*** \*All measurements should follow the International System of Units (SI)

- Time: 0900 h and 24 h; 15 min; 45 s
- Temperature: 28 °C
- Length/Distance: 2.2 cm; 3 m; 18 km
- Mass: 3.2 g; 5.1 kg

### ***Format***

- Articles and notes should be written in the third person narrative when possible. e.g.,

*“Four adult males were captured...”*

Instead of:

*“I captured four adult males...”*

- A period should be followed by a single space
- Do not boldface any portion of the text
- Use italics for Latin names, addresses on title page, and product manufacturers. Do not italicize any other words.
- Do not use professional titles for individuals mentioned in the text or acknowledgements, e.g., Dr., Mr., Mrs..
- Products mentioned within the text should also cite the manufacturer and their location within parentheses. e.g.,  
*“..... A Pro-Mist ® misting system (Pro Products: Mahopac, New York, USA) was used to achieve adequate humidity levels and...”*

### ***Citation of Literature***

- Ensure that spelling, dates, and sources are correct.
- In the text, references are cited with surnames.
  - o Reference with one author: (Pianka, 1969)
  - o Reference with two authors: (Wicker and Eidenmüller, 1995)
  - o Reference with multiple authors: (Enge et al., 2004)
- Organize references chronologically within a series, separated by a semi-colon. e.g., (Pianka, 1969; Bayless, 2002; Ibrahim, 2002)
- Literature Cited is to be arranged alphabetically.
- Examples of proper literature citation formats:

#### ***For an article appearing in a journal, magazine, or other serial publication:***

Gaulke, M., V.A. Altenbach, A. Demegillo and U. Struck. 2005. On the distribution and biology of *Varanus mabitang*. Silliman Journal. 46: 89-117.

#### ***For a book:***

Auffenberg, W. 1988. Gray's Monitor Lizard. University Presses of Florida. Gainesville, Florida.

#### ***For a chapter within a book:***

Sweet, S.S. 2004. *Varanus glauerti*. In E.R. Pianka and D.R. King, Varanoid Lizards of the World, pp. 366-372. Indiana University Press, Bloomington, Indiana.

#### ***For an article found on a website:***

Böhme, W. 2003. Checklist Of The Living Monitor Lizards Of The World (Family Varanidae): <http://www.cites.org/common/cop/12/ESF12i-06A.pdf>. Checklist of CITES Species Compiled by UNEP-WCMC, Convention on International Trade in Endangered Species of Wild Fauna and Flora (Last accessed 31.01.06)

For further information regarding proper citation of references, and acceptable reference material, please consult the editor.

### ***Full-Length Articles***

Full-length articles published in *Biawak* report on varanid biology or captive husbandry, and should include a title, the author's name, the author's address and/or email address, the text, acknowledgements, literature cited, and appendices (if applicable).

- ***Title-*** this should briefly summarize the scope of the article. The title should be centered at the top of the page s. e.g.,

### Notes on the Biology of *Varanus semiremex*

- **Author's Name and Address-** The author's name should be centered below the title and should include all capital letters. The author's address is centered beneath the author's name and should be italicized. The email address is centered beneath the address. e.g.,

AUTHOR'S NAME  
*Author's address*  
Author's email address

- **Text-** Full-length manuscripts should include subheadings, and may include: introduction, materials and methods, results, and discussion.
- **Acknowledgements-** Individuals which assisted in the study or preparation of the manuscript are acknowledged here. e.g.,

*"The author would like to thank \_\_\_ for their assistance in the field; \_\_\_ for providing access to specimens and \_\_\_ for review of this manuscript..."*

- **Literature Cited-** All references mentioned in the text must be listed in the Literature Cited.
- **Appendices-** All charts, tables, and graphs are placed in the appendices after the Literature Cited.

### **Shorter Communications**

For brief accounts, important details to note may include location, date, time of day, habitat type, sex, size and age of the animal(s) observed, and a description of the behavior or occurrence observed. For captive husbandry notes, important details to note may include the origin of the animal(s), duration in captivity, date, time of day, sex, size and age of the animal(s) observed, and a description of the behavior or occurrence observed. Brief natural notes should include a title, text, literature cited, the author's name and the author's address and/or email address.

- **Title-** The title in this section should include the scientific name (in capitalized italics), common name (in parentheses), and a keyword or phrase which best describes the location or nature of the account (all capital letters). e.g.,

*VARANUS VARIUS* (Lace Monitor). CAPTIVE NESTING BEHAVIOR

- **Text-** No subheadings are required for shorter accounts. Content should report on specific observations and findings.
- **Literature Cited-** All references mentioned in the text must be listed in the Literature Cited.

- ***Author's Name and Address***- The author's name (capitalized letters) should be centered below the Literature Cited. The author's address is centered beneath the author's name and should be italicized. The email address is centered beneath the address.

### ***Book Reviews***

Submissions should include the title of the book, the author's name, the author's address, the date of publication, number of pages, publisher, city of publication, the text, the reviewer's name and the reviewer's address. e.g.,

Varanoid Lizards of the World  
Eric R. Pianka and Dennis R. King  
1995. 588 pp.  
Indiana University Press. Bloomington, Indiana.

Text of review

Reviewed by: REVIEWER'S NAME  
*Reviewer's address*  
Reviewer's email address

### ***Techniques***

Diagrams or photographs which compliment the text are encouraged. Submissions are to include a brief title which summarizes the technique being described, the author's name (all in capital letters) and address (italicized), followed by a description of the technique or procedure. e.g.,

A Technique for Acclimating Varanids in Captivity  
AUTHOR'S NAME  
*Author's Address*  
Author's email address

Text of article

Literature Cited (*if applicable*)

### ***Additional Information***

For additional information regarding format, content, submissions, or authoring guidelines, please consult back issues of *Biawak* for reference, or contact the editor.