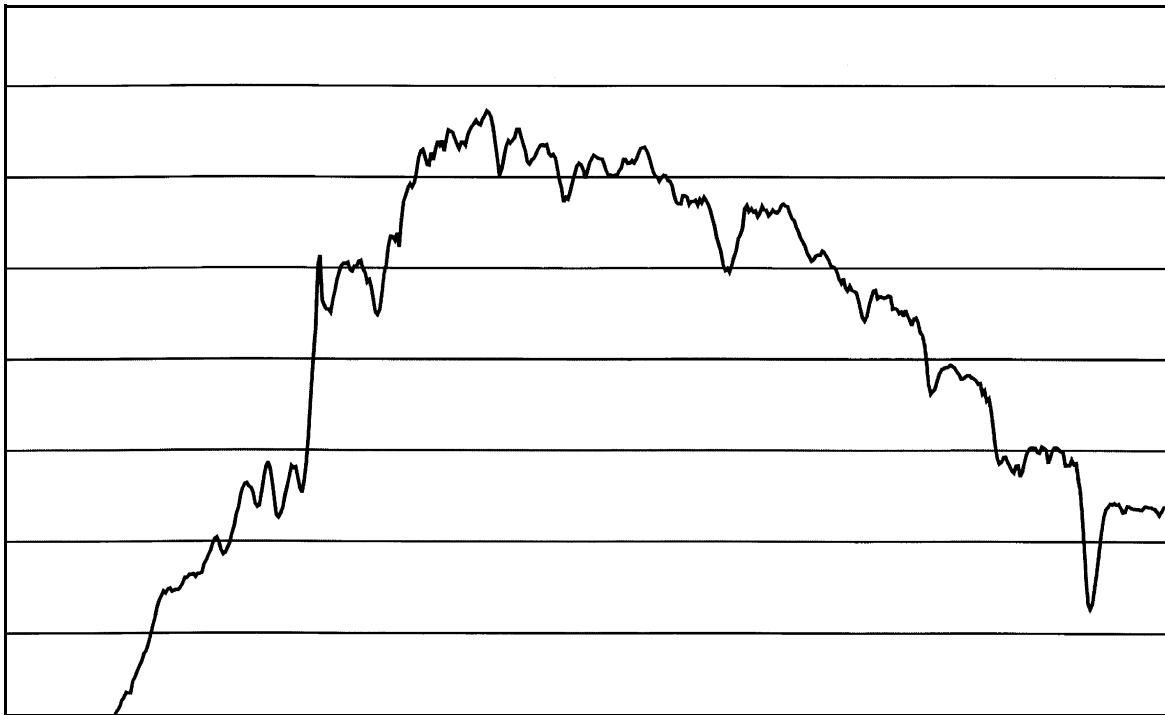


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UV-lamps for Terrariums: Their Spectral Characteristics and Efficiency in Promoting Vitamin D ₃ Synthesis by UVB Irradiation	Jukka Lindgren	1
Book Review: <i>North American Watersnakes: A Natural History</i> by J. Whitfield Gibbons and Michael E. Dorcas	Harry Waller	10
Unofficial Minutes of the CHS Board Meeting, December 17, 2004		10
HerPET-POURRI	Ellin Beltz	12
Herpetology 2005		15
Chicago Herpetological Society Income Statement: January 1, 2004 – December 31, 2004, and Balance Sheet, December 31, 2004		18
Advertisements		19

Cover: Irradiance of the Sun as a function of wavelength. See article within by Jukka Lindgren.

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UV-lamps for Terrariums: Their Spectral Characteristics and Efficiency in Promoting Vitamin D₃ Synthesis by UVB Irradiation

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Abstract

Sufficient irradiation within a narrow sub-band of the UVB range is a prerequisite for the photosynthesis of vitamin D₃ in skin. Although radiation below wavelength of 300 nm (nanometers) promotes photosynthesis of vitamin D₃, radiation above 300 nm destroys vitamin D₃ that has been already synthesized in skin tissue or nutritionally obtained. Furthermore, skin temperature has a significant effect on the pace of vitamin D₃ synthesis. In a terrarium, the required UVB-radiation has to be artificially produced with dedicated lamps. In the study, the characteristics of light produced by fourteen different models of UV and full spectrum lamps specifically designed for terrarium use were measured over a range of 250–800 nm. As a reference, the spectrum of natural sunlight was also measured when the sun was at its highest point of elevation in the southern sky of Finland. The proportion of radiation energy that takes part in the photosynthesis of vitamin D₃ was determined and the D₃ Yield Index was calculated. Significant differences as large as a thousandfold were found in the D₃ Yield Indices. The resulting conclusion is that UVB radiation as a percent of the total radiation figure does not necessarily give a true indication of a lamp's capability to maintain cutaneous production of vitamin D₃.

Exclusively herbivorous reptiles like lizards and tortoises cannot obtain sufficient vitamin D₃ solely from their natural diet. Nevertheless, vitamin D₃ is fundamental to ensure normal functioning of many organs. In addition to regulating calcium metabolism, vitamin D₃ also acts as a hormone in organ development. Active vitamin D₃ also takes part in the functioning of the immune system. Furthermore, it controls build-up of bone matter and also appears to be important for female fertility (Jones et al., 1998).

In plants, the large proportion of D-vitamins consists of vitamin D₂ (ergocalciferol) that is not absorbed very well by the intestinal system. Vitamin D₃ (cholecalciferol) promotes calcium metabolism much more efficiently, but fresh plants are almost completely devoid of it. Only sun-dried plants, like hay for instance, contain small amounts of vitamin D₃ (J. Raulio, pers. com.). Herbivorous animals must compensate for this deficiency by photosynthesizing vitamin D₃ by ultraviolet light.

Vitamin D₃ is photosynthesized in the skin of terrestrial vertebrates and birds by the action of UVB radiation on 7-dehydrocholesterol (7-DHC). This steroid is most sensitive to radiation in the range of 270–305 nm (MacLaughlin et al., 1982) (see Figure 1). This range coincides with the lowest wavelengths of sunlight that can actually penetrate the atmosphere, the lower limit of the active range being 290 nm. When absorbed by a 7-DHC molecule, the UVB photon opens the ring structure of the molecule and converts it to a precursor of vitamin D₃ (preD₃). Subsequently, this is thermally isomerized slowly, over several days, to cholecalciferol that is the actual vitamin D₃.

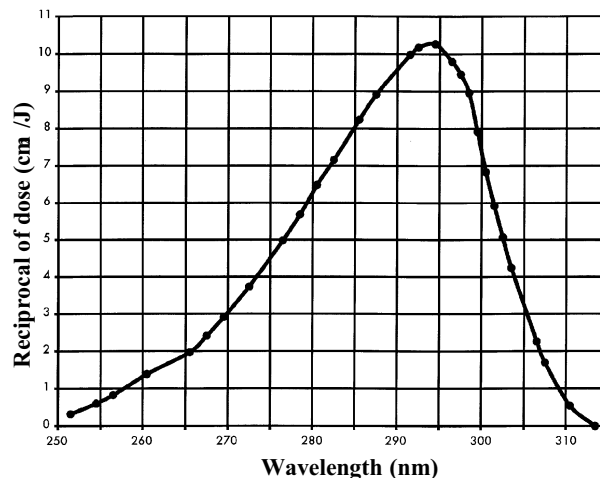


Figure 1. Action spectrum of 7-DHC to preD₃ conversion.

Vitamin D₃ is transferred to the liver by the vitamin D binding protein, where it is transformed to calcidiol [25-hydroxycholecalciferol, 25[OH]D₃]. Calcidiol is then transferred to the kidneys, which in association with parathyroid hormone, further convert it to calcitriol [1,25-dihydroxycholecalciferol, 1,25[OH]₂D₃]. A recent study carried out in the University of Tampere (Lou et al., 2003) suggests that both of these metabolic products have their own significant role in the operation of the organic system: calcidiol acts as a hormone and controls for instance cell division, whereas calcitriol takes part in the calcium/phosphate regulatory mechanism and is thereby the actual active substance while controlling the cal-

cium level of blood serum. It increases absorption of calcium and phosphate through the wall of small intestine and also controls their transfer from bone matter to plasma. Calcitriol also decreases the amount of calcium and phosphate secreted in urine. Since calcitriol receptors have been found in various tissues, it apparently also has several other tasks within organs. For the sake of simplicity, calcidiol and calcitriol are by common consensus called vitamin D, even though a more accurate name for calcidiol would be hormone D.

If excess preD₃ is formed in the skin it is further photo-isomerized by UVB irradiation to lumisterol and tachysterol. This rapid reaction is photo-reversible: radiation isomerizes tachysterol back to preD₃, although at a slower rate, and further to lumisterol. Being the least photosensitive product, lumisterol is finally accumulated to plasma. These reactions act as a natural regulation mechanism, preventing excessive synthesis of vitamin D₃ under strong UVB irradiation.

The spectral characteristics of light in the UVB/UVA range are an important factor in vitamin D₃ photosynthesis. While 7-DHC is sensitive to irradiation up to 315 nm, cutaneous vitamin D₃ that has been photosynthesized or obtained nutritionally is destroyed by radiation up to 330 nm (Webb et al., 1989). This makes any radiation in the range 315–330 nm highly undesirable for the synthesis of vitamin D₃.

The skin temperature also plays a very important role in the synthesis of vitamin D₃. This was established in a study with green iguana (*Iguana iguana*), common frog (*Rana temporaria*) and human skin samples (Holick et al., 1995). In vitro tests showed that a temperature increase from 5°C to 25°C accelerated thermal isomerization of vitamin D₃ by eight. In a separate study with human and chicken skin at even higher temperatures (40°C), the tendency remained the same.

To ensure that this complex chain of reactions in a reptile's skin can be completed, sufficiently high irradiation at wavelengths 270–315 nm is required, while higher wavelengths (315–330 nm) should be avoided. The skin temperature must also be high enough. Low UVB irradiation below 315 nm or too low a body temperature of a cold-blooded (poikilothermic) animal might create an undesirable situation where new vitamin D₃ is no longer produced in the skin at the time the radiation starts destroying cutaneous vitamin D₃.

Under this hypothesis, non-equatorial herbivorous animals should be susceptible to vitamin D₃ deficiency. The detrimental effects of photodestruction of vitamin D₃, as described above, may however be alleviated by the equilibrium seeking properties of many biological processes (J. Ball, pers. com.). It is possible, for instance, that the membrane enhancement of the production of vitamin D₃ (Holick et al., 1995) may automatically compensate for the reduced radiation.

It should be noted that the theory and research discussed above relate to human skin. However, the chemistry of the skin of terrestrial vertebrates is similar enough to that of human to justify the theory to be extrapolated to reptiles as well. Human osteoporosis caused by UVB deficiency is well documented in Nordic countries, but this is yet to be demonstrated in wild reptiles.

In conclusion, to ensure sufficient vitamin D₃ synthesis, a terrarium must be fitted with efficient artificial lighting with broad-spectrum UVB lamps and temperature must be kept sufficiently high in the basking area. More specifically, the radiation in the region of short wavelengths must reach far enough.

Over recent years, there have been numerous research papers written on the quality of lamps designed for terrarium use. Some studies have included only a few lamps, while some studies cover lamps of which many are no longer available (e.g., Ball, 1995). This makes evaluation of lamps difficult, as there are no comparable results available for current models. For this study, as large as possible selection of lamps available in Finland was obtained. Some lamps that are not locally commonly available were also included, either because they were especially interesting or had received contradictory reviews elsewhere.

Several papers have focused only on the percentage of UVB radiation. As cutaneous vitamin D₃ synthesis is only sustained in an extremely narrow band within the crossover of UVB and UVC, the full UVB-range irradiance figure alone does not tell the whole truth about the ability of a lamp to promote vitamin D₃ production. More detailed information is required.

For the purpose of this study, the D₃ Yield Index was developed to indicate the amount of radiation that can actually participate in the photosynthesis of vitamin D₃. A plain index number such as the Yield Index used here shows this in an unambiguous manner. The calculation method for the index was devised in such a way that it can be easily adapted to any reference. Within the framework of this study, the index value is based on radiation energy of the sun in midsummer noon in Finland. Measuring the sunlight with compatible equipment at the equator would enable the index to be adjusted for use as a universal baseline.

The results indicate significant variation in the capability of different lamps to promote the photosynthesis of vitamin D₃. They range from half of that of natural sunlight in Finland to virtually nil. On this basis, it is clear that the design of UV lamps for terrarium use must focus more precisely on the UVB range that produces vitamin D₃ (i.e., 280–304 nm).

Materials and Methods

Fourteen lamps of various makes and models were obtained for testing purposes (see Table 1). A Zoo Med ReptiSun 5.0 unit which had been used for 10 months was also included because it could provide general information about the declining of UV radiation of a high-quality lamp over a long period of time. Some of the lamps included (e.g. True-Light) are so-called full spectrum lamps and because of this, their irradiance in the UVB range will not be at the same level as actual UV lamps. Naturally this has to be accounted for when evaluating the results.

As a reference, the spectrum of the sun was also measured. The measurement was made when the sun was at its highest point of elevation in the southern sky of Finland and natural UV radiation is strongest. Measurement was made in Raisio, 8 km northwest from Turku (60°29'19"N, 22°10'4"E).

Table 1. General information.

Product	Power (W)	Manufacturer	Notes
Reptisun 5.0 UVB	14	Zoo Med Laboratories, Inc	
Reptisun 5.0 UVB (used)	15	Zoo Med Laboratories, Inc	10 months used, 12 hrs / day
Reptistar	30	Sylvania	
Reptilight	36	Narva	
Repti Glo	40	Rolf C. Hagen Corp.	
Life-Glo	40	Rolf C. Hagen Corp.	Opening to concentrate and direct light beam
Exo-Terra Repti Glo 2.0	40	Rolf C. Hagen Corp.	
Exo-Terra Repti Glo 5.0	40	Rolf C. Hagen Corp.	
Exo-Terra Repti Glo 8.0	40	Rolf C. Hagen Corp.	
ESU Reptile Super UV Daylight	40	Energy Savers Unlimited Inc.	
ESU Reptile Desert 7% UVB	40	Energy Savers Unlimited Inc.	Reflective foil to concentrate and direct light beam
Active UVHeat	100	Wild Inside	Type "Flood," E27 socket
True-Light	36	"Manufactured for AD-Lux Oy"	full spectrum lamp 5500 K
True-Light Daylight 6000	15	"Manufactured for AD-Lux Oy"	full spectrum lamp 6000 K, E27 socket
Sun	—	—	Location: Raisio, Finland; 60°29' 19"N, 22°10' 4"E, alt. 27 m. June 27, 2001, 13:08 EET DST. No clouds. UV-Index 5.6. Sun's elevation 52° 32'

The lamps to be measured were borrowed from retailers or purchased for personal use. Anja Kairisalo kindly donated the 10-month-old ReptiSun 5.0 unit. Rolf C. Hagen Inc. provided their own models: Exo Terra Repti Glo models 2.0, 5.0 and 8.0, as well as Reptile Super UV Daylight and Reptile Desert 7% UVB, the latter two being manufactured by Energy Savers Unlimited.

As there was only one unit of each lamp, the statistical reliability of the measurements is weak (sample = 1). Nevertheless, it represents quite well the situation of a consumer purchasing a new lamp. When buying only one unit, the chance of consumer getting a faulty unit is the same as in this test. To eliminate obvious errors, all exceptional, inconsequent or otherwise suspicious measurement data was confirmed with the manufacturers.

All new lamps were preconditioned by using them in a normal terrarium lighting fixture for 100 hours, 12 hours a day. Prior to actual measurements, each lamp was preheated for 30 minutes to allow it to reach its nominal working temperature and to ensure lamp stability.

Measurements were made by Suomen Aurinkosimulaattori Oy/Solar Simulator Finland Ltd. The spectroradiometer used for all measurements was IL700A Research Radiometer, manufactured by International Light Inc., Newburyport, Massachusetts, USA. The measuring head used was an S-20 photomultiplier PM271D. The spectroradiometer is being calibrated on a yearly basis by wavelength and sensitivity. In order to control wavelength calibration, the device is quick-calibrated by measuring a HeNe laser's known wavelength of 633 nm before each session. Wavelength measuring accuracy is ± 3 nm.

Measurements of spectral irradiance were made in a free field, at a distance of 30 cm from the surface of the lamp.

Fluorescent lamps were measured at their center point, perpendicular to the longitudinal axis of the lamp. In case the lamp had a fixed reflector or a particular aperture, the measurement was made from the main direction of radiation. Lamps with a European E27 socket were measured from the direction of base longitudinal axis at a distance of 30 cm from the face of the lamp.

Numerical analysis and spectrum diagrams of measured data were made with Microsoft Excel 2000. Measurement data shows measured irradiance (mW/m^2) at one nanometer resolution between 250–800 nm, 551 data points in all. These were imported to an Excel spreadsheet, converted to $\mu\text{W}/\text{cm}^2$, and irradiances on different wavelength ranges were integrated. Because of the lack of a fixed standard determining the boundaries of UVA, UVB and UVC ranges, the ranges commonly used in current literature were adopted. Due to quantized nature of measurement data, the following limits were used in analyses: UVA 320–399 nm, UVB 280–319 nm and UVC 250–279 nm. Visible light is taken to be between 400–749 nm, and near infrared to be 750–800 nm.

The basis for the calculation of the D_3 Yield Index was the action spectrum of 7-DHC to $\text{pre}D_3$ conversion in human skin. The index was calculated in the 252–313 nm range by weighing the irradiance at each wavelength in accordance with the action spectrum. The effective irradiances thus obtained were summed over this range, and this value was finally adjusted to the reference by a suitable multiplication factor, resulting in the final D_3 Yield Index.

Results

General information about the measured samples is listed in Table 1. Besides brand name, model, manufacturer or retailer,

Table 2. Distribution of light in the UV range.

Product	UVA		UVB		UVC	
	$\mu\text{W}/\text{cm}^2$	%	$\mu\text{W}/\text{cm}^2$	%	$\mu\text{W}/\text{cm}^2$	%
Reptisun 5.0 UVB	48	31.9%	10	6.8%	0	0.0%
Reptisun 5.0 UVB (used)	40	31.3%	8	6.6%	0	0.0%
Reptistar	59	31.2%	12	6.1%	0	0.0%
Reptilight	37	23.2%	7	4.4%	0	0.0%
Repti Glo	4	1.7%	1	0.6%	0	0.0%
Life-Glo	3	0.9%	1	0.3%	0	0.0%
Exo-Terra Repti Glo 2.0	1	1.0%	1	0.3%	0	0.0%
Exo-Terra Repti Glo 5.0	33	21.2%	5	3.4%	0	0.0%
Exo-Terra Repti Glo 8.0	65	35.6%	8	4.2%	0	0.0%
ESU Reptile Super UV Daylight	7	5.7%	1	1.0%	0	0.0%
ESU Reptile Desert 7% UVB	38	26.2%	0	0.3%	0	0.0%
Active UVHeat	296	22.6%	16	1.2%	0	0.0%
True-Light	19	11.9%	1	0.5%	0	0.0%
True-Light Daylight 6000	2	1.3%	0	0.0%	0	0.0%
Sun	3403	8.1%	118	0.3%	0	0.0%

and nominal power, any additional information that may affect the results is given.

In Table 2, irradiances as microwatts per square centimeter and percentage proportions of UVA, UVB and UVC from total irradiance are listed. Using equivalent values given by manufacturers, general comparisons to other models outside this test can be done. However, it has to be certified that the UV ranges have been specified with identical ranges: UVA 320–399 nm, UVB 280–319 nm, and UVC 250–279 nm.

Table 3 shows irradiances in the UVB range. Separate values have been calculated for the wavelength range that mainly contributes to vitamin D₃ photosynthesis (UVB-1, 280–304 nm) and for the range above it (UVB-2, 305–319 nm) that may potentially destroy vitamin D₃. Bernard (1995) calls this range 290–300 nm “D-UV,” but in order to maintain consistency with the naming conventions (UVA, UVB, UVC), the subranges of UVB are designated here UVB-1 and UVB-2. The ability of a lamp to efficiently produce vitamin D₃ can be evaluated by comparing values in Table 3. The higher the irradiance of UVB-2 is in comparison to UVB-1, the higher the probability that UVB-2 radiation will start destroying cutaneous vitamin D₃.

Table 4 lists the D₃ Yield Index of the target and the percentage of UVB from total output for comparison. While calculating D₃ Yield Indices, the lack of accurate data made it impossible to take into account the above-mentioned possibility that weak radiation in the UVB-1 range, combined with strong radiation in the UVB-2 range, may cause photodestruction of vitamin D₃. Thus, if a lamp has a high UVB percentage but a weak D₃ Yield Index, it might suggest destruction of vitamin D₃. In this case it will be necessary to closely examine the spectral curve of the lamp at UVB/UVA crossover point in order to evaluate the situation.

Discussion

This kind of extensive study brings forward many kinds of test results. Some of the measured lamps are obviously meant for a different purpose than being a sole light source of a terrarium. Measurement results of these lamps need to be handled as a separate group. For example, the UV spectrum of so-called full spectrum lamps and actual UV lamps cannot be compared. The lamps belonging to the former group are meant to produce visible light with as natural and uniform a spectrum as possible. Their UV radiation—if any—is merely the by-product of any fluorescent lamp. This type of lamps should never be considered as the only light source for an animal requiring UV light. Equally, it can be said that lamps designed for maximum UVB radiation are not directly comparable with regular UVB fluorescent lamps. It should also be borne in mind that the sunlight used as reference has been measured at Finnish latitude (at summer solstice, when the sun is at its highest point of elevation). The natural habitat of most terrarium animals is further to the south, where the radiation coming from the sun penetrates the atmosphere almost vertically and thus has to pass through a much thinner layer of ozone and air. This has a major effect on the shortest wavelengths of UV irradiation reaching the surface of the earth. In these measurements, the reference sun appears exceedingly weak, especially in the UV range, when compared to the situation in the natural habitat of many terrarium animals. Another issue that may affect the D₃ Yield Index is the fact that the spectrophotometer’s sensitivity had to be reduced during the measurement of reference sunlight because the total radiation flux of the sun was higher than that of the lamps by a factor of over 200. This results in a situation in which the sensitivity of the sensor might be insufficient in the extreme low end of the spectrum. This may cause the spectrum curve to fall off too early. Measurement with a specialized UV meter might have obviated this

Table 3. Irradiance in the UVB-1 and UVB-2 ranges

Product	Irradiance $\mu\text{W}/\text{cm}^2$	
	UVB-1 280– 304 nm	UVB-2 305– 319 nm
Reptisun 5.0 UVB	2.057	8.232
Reptisun 5.0 UVB (used)	1.717	6.663
Reptistar	0.497	10.982
Reptilight	1.302	5.825
Repti Glo	0.089	1.052
Life-Glo	0.083	0.863
Exo-Terra Repti Glo 2.0	0.000	0.467
Exo-Terra Repti Glo 5.0	0.635	4.659
Exo-Terra Repti Glo 8.0	0.780	6.914
ESU Reptile Super UV Daylight	0.014	1.103
ESU Reptile Desert 7% UVB	0.000	0.443
Active UVHeat	0.815	14.647
True-Light	0.030	0.693
True-Light Daylight 6000	0.000	0.003
Sun	0.000	117.699

problem, but that would have been impractical within the scope of this study.

Distribution of UV light

When comparing the distribution of ultraviolet light in the UVA, UVB and UVC regions, the strong emphasis of UVA can be seen in all results (see Table 2). Many of the lamps have over 30% of their total radiation in the UVA range. Although this may be detrimental to vitamin D₃ synthesis, according to some reports it might have a positive effect on reptile behavior (Gehrmann, 1994). There is not much research material available on this subject. Human studies have given contradictory results. In humans it has been found out that UVA can cause eye damage (for example yellowing of the lens of eye), premature aging of the skin, and changes to the immune response. Because of this, excessive amounts cannot be recommended for animals either. In any case, the UVA irradiance of all lamps measured is only about 1–2% of that of the sun, hardly a cause of concern in that respect.

A few lamps clearly stand out from the rest with their almost total lack of ultraviolet light. Of these, True-Light lamps are obviously not UV lamps, although their retailer has sometimes recommended them for this purpose. The lamp models Repti Glo, Life-Glo, Exo-Terra Repti Glo 2.0, and ESU Reptile Super UV Daylight, emit only a few percent of their radiation in the UVA range, with even less in the UVB range. Active UVHeat lamp also stands out with its rather low percentage of UVB radiation; this is, however, a bit misleading, since the nominal power of this lamp is significantly higher than that of any other. Although its irradiance in UVB region is quite high, this is still not a proof of its high capability to promoting photosynthesis of vitamin D₃, as shown later.

Table 4. D₃ yield index.

Product	D ₃ yield index	UVB %
Reptisun 5.0 UVB	439.3	6.8%
Reptisun 5.0 UVB (used)	367.7	6.6%
Reptilight	283.7	4.4%
Exo-Terra Repti Glo 8.0	190.2	4.2%
Active UVHeat	165.3	1.2%
Reptistar	157.5	6.1%
Exo-Terra Repti Glo 5.0	150.8	3.4%
Repti Glo	22.4	0.6%
Life-Glo	19.5	0.3%
ESU Reptile Super UV Daylight	11.2	1.0%
True-Light	9.2	0.5%
Exo-Terra Repti Glo 2.0	2.2	0.3%
ESU Reptile Desert 7% UVB	0.5	0.3%
True-Light Daylight 6000	0.0	0.0%
Sun	1000.0	0.3%

When evaluating the proportion of UVB radiation only, Zoo Med ReptiSun 5.0 and Sylvania Reptistar stand out. Over 6% of their total irradiance is in the UVB range. Narva Reptilight and R. C. Hagens Exo-Terra Repti Glo, models 5.0 and 8.0, make up another group with their 3–4% UVB proportion. The rest of the lamps produce only extremely small amounts of UVB.

Health hazard of UV irradiation

The Finnish Ministry of Social Affairs and Health has issued decree No: 1474 (Dec. 16, 1991) with regard to the maximum exposure to non-ionizing radiation. According to this decree, the biologically weighted effective energy density of ultraviolet radiation on eye or skin must not exceed 50 J/m² per day.

The UV radiation of Active UVHeat exceeds this figure and it may therefore constitute a health hazard. At a distance of 30 cm, the limit is reached in 40 minutes; at 1.5 m, in 390 minutes. In the home, the Active UVHeat lamp must be shielded so that its light is screened from the areas where there are people for long periods of time. The terrarium must have a shaded area available for all animals at all times. The same risk is present also with other high output UV lamps. With other lamps, the estimated safe exposure time at 30 cm distance is about 1.5 h. A single sheet of window glass secures adequate protection from harmful radiation. Such glass filters 22% of UVA and 96% of UVB radiation (Gehrmann, 1987).

D₃ Yield Index

The percentage of total output in the form of UVB radiation has often been taken as an indicator of the ability of a lamp to maintain vitamin D₃ photosynthesis in the animal skin. According to research made on human skin, the issue is not as simple as that. MacLaughlin et al. (1982) showed that the action spectrum of vitamin D₃ photosynthesis is extremely

narrow (see Figure 1). Vitamin D₃ production takes place mainly in the wavelength range 295–300 nm, while the UVB range is generally specified 280–320 nm. This difference is significant especially at the top of the range, where vitamin D₃ production ceases, but photodestruction by longer wavelength radiation still continues. This makes the use of UVB irradiance figure by itself a poor indicator of the effectiveness of the incident light in photosynthesizing vitamin D₃ in animal skin.

Use of the D₃ Yield Index as a basis for evaluation of UV lamps gives a possibility to compare very different types of lamps with consistent criteria. The D₃ Yield Index turns the attributes of a spectrum curve, that are otherwise difficult to compare, into an easily manageable and understandable form even for a novice keeper; they indicate with an unambiguous value the efficiency of a lamp to promote photosynthesis of vitamin D₃ and by that, indirectly ensure sufficient level of calcium metabolism.

Because the action spectrum for vitamin D₃ photodestruction was not available, it was not possible to evaluate the effect of this process on the D₃ Yield Index. More research is needed to resolve this. An in situ analysis of 7-DHC and its reaction products is also required to confirm their relation to the D₃ Yield Index.

It should also be noted that the formula for calculating the D₃ Yield Index has not been tailored to compensate for power differences between lamps. Therefore, in case there are two otherwise identical lamps the one with higher nominal power receives a higher index figure, proportional to the power difference.

The D₃ Yield Indices calculated on the basis of the measurements of this study illustrate the fact that the percentage of UVB from total irradiance is not necessarily directly related to the capability of a lamp to promote vitamin D₃ photosynthesis. Most clearly this can be seen in the case of Sylvania Reptistar; although 6% of its radiation is UVB, its D₃ Yield Index is only mediocre. When examining the spectrum of this lamp (published elsewhere in this magazine), it can be seen that its irradiance is almost zero in the range 290–300 nm, which is the most important range for the index.

Similarly misleading, but in the opposite direction, is the UVB proportion of Active UVHeat: only 1% — yet its D₃ Yield Index is approximately the same as for Sylvania Reptistar. In this case, the proportion of total radiation in the form of UVB is extremely small, but total irradiance is very high. The fact that the total irradiance of Active UVHeat is many times higher, 1308 $\mu\text{W}/\text{cm}^2$ as opposed to Reptistar's 188 $\mu\text{W}/\text{cm}^2$, makes the percentage comparison alone look insufficient.

Of all the lamps measured, the best contributor to vitamin D₃ photosynthesis in skin is Zoo Med ReptiSun, with a D₃ Yield Index of 439. This result can be considered especially noteworthy for the fact that the lamp in question is only a 14 W unit, while other units in the study have a nominal power of 30–40 W. The spectrum of ReptiSun begins very low in the UVB range and the spectrum curve rises steeply. In the most sensitive wavelength for vitamin D₃ synthesis, 295 nm, for example, the radiation of ReptiSun is already 1.8 times stronger than that of the next best lamp.

The second best lamp, a Zoo Med ReptiSun unit that had been used for 10 months, does not show remarkable weakening of UVB radiation. While examining the full spectrum, it can be seen that the irradiance of the lamp has dropped constantly throughout the whole spectrum. This means that the UVB radiation of a lamp does not cease abruptly, as is sometimes suggested, but seems to get gradually weaker along with the visible light. On this basis a recommendation to replace the UV lamp twice a year due to alleged fading of UVB radiation is at least to some extent unwarranted. The conclusion is of course based only on one individual lamp; differences due to manufacturing tolerances etc. are entirely possible. A detailed research with a larger sample would be required to confirm this issue.

The next best lamp, Narva Reptilight, is also very efficient in promoting vitamin D₃ synthesis with a D₃ Yield Index of 284. Additionally, its spectrum is exceptionally beneficial; radiation at 315–335 nm range which potentially destroys vitamin D₃ is very low.

Next comes a group of four lamps, the results for which are rather equal. Their D₃ Yield Indices are already less than half of that of the best product. In this group, the case of Sylvania Reptistar is interesting. Even though its irradiance in UVB range is the third highest of all tested units, its D₃ Yield Index is only modest. Its spectrum curve starts to rise only at about 300 nm; therefore, the main proportion of its radiation is concentrated in the UVB-2 and UVA ranges, in which strong irradiation is known to be detrimental to the production of vitamin D₃.

Another sample that attracts attention in this group is Active UVHeat. The spectrum of this lamp is almost a pure line. In the wavelengths where radiation exists, it is very strong. In other areas radiation is at the same level as for the 14 W ReptiSun unit. There is only one single peak in the UVB-1 range, at 302–304 nm — this establishes the D₃ Yield Index of this lamp at a reasonable level. However, its spectrum has another peak, over 10 times higher, at 313 nm, and beyond that generally rather high irradiance values which may contribute to photodestruction of existing vitamin D₃ in skin.

The rest of the measured lamps are disappointing in their D₃ Yield Indices. Even the best (Rolf C. Hagen Repti Glo and Life-Glo) of these units have an index figure that is only 5% of that of the ReptiSun unit. Lamps in this group cannot be recommended for use as UV lamps with a purpose to promote vitamin D₃ photosynthesis in skin.

Both True-Light units also belong to this group, and apparently their purpose is not to be actual UV lamps. They are full-spectrum lamps that presumably have not had the amount of UVB radiation as one of their main design criteria; instead they are intended to have as constant and natural a spectrum in visible light as possible.

The Reptile Desert 7% UVB, manufactured by Energy Savers Unlimited (ESU), turned out to be a disappointment. Despite its name, the unit only produces 0.3% UVB radiation and its D₃ Yield Index is only 0.5.

The sunlight that was measured as a reference is in its own

league, and naturally the result would only get better if measured closer to the equator: the D₃ Yield Index of the sun (1000) is over twice to that of the best of all the units tested. Due to the manifold radiation strength of the sun across the entire visible spectrum, its proportion of UVB is only 0.3%.

When examining the results of the reference sunlight it has to be kept in mind that most reptiles kept in terrariums originate from areas far south of Finland. Therefore, the radiation of the sun measured in Finland is not an appropriate reference for determining adequate strength of UVB radiation, except for evaluating the light supply for domestic outdoor enclosures. Realistic reference can only be obtained by measuring the radiation of the sun in the natural habitat of the animal. To verify the results published here, and to establish a common baseline, it would be necessary to do an analogous measurement with compatible equipment near the equator.

However, the D₃ Yield Index of the sun should not be considered as an absolute target figure since the irradiation measured here can only be achieved in a short time frame at noon in midsummer. Artificial lighting produces a uniform level of radiation during the time lamps are switched on. In the morning and evening, and during seasons other than summer, the radiation from sun penetrates the atmosphere in an inclined angle due to the lower elevation of the sun. An effectively thicker layer of ozone filters more ultraviolet light, and consequently the relative strength of UVB radiation of the sun decreases rapidly. This is naturally equally applicable to all parts of the globe.

The sensitivity of the measurement device had to be reduced during the measurement due to the strong radiation of the sun in the visible range. This may have led to a premature cut-off at the very beginning of the spectrum that may affect the D₃ Yield Index of the sun.

In conclusion, there are distinct differences in the suitability of different lamps to promote vitamin D₃ photosynthesis in skin. In many cases, the percentage of UVB stated by the manufacturer is so close to measurement values that any differences are most likely caused by variations in calibration and spectral sensitivity of measurement equipment. However, in some cases larger discrepancies were found. For this reason, the UVB percentage given in the retail packages of products should be looked upon with appropriate reservations.

Acknowledgements

I would like to thank Dr. James Ball (Milan, Michigan) and Dr. William Gehrmann of Texas Christian University for reviewing this manuscript and for their valuable comments during its preparation. Dr. Pekka Mäenpää of Kuopio University reviewed the Finnish terminology of this article. Senior researcher Tapani Koskela of the Finnish Meteorological Institute gave valuable information to support measurements of the sun. Wide ranged advice given by Dr. Jarmo Perälä of the University of Helsinki was also of great help while writing this article.

This project was made possible by funding granted by the Herpetological Society of Finland. Rolf C. Hagen Inc. supported significantly the expensive measurements and also donated several units for measurements.

AD-Lux Oy, Faunatar Oy and Tampereen Akvaario- ja Lintuliike Oy kindly lent lamps for measurements. Anja Kairisalo donated the used Zoo Med ReptiSun unit.

I wish to express my heartfelt thanks to my wife Sini, whose patience and mental support have been of indispensable help during this project spanning over more than four years and during which I have often essentially neglected my family.

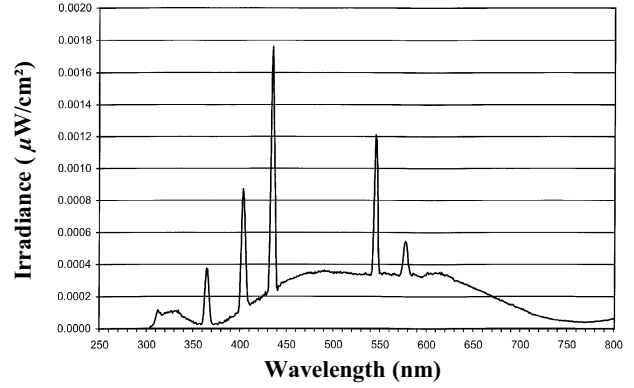
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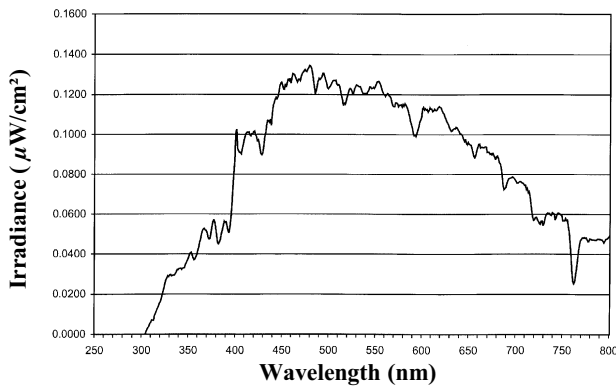
Appendix

The graphs reproduced in this appendix appeared in a separate article in *Herpetomania* 13(3-4). No English translation is available for this second article, which contains additional details about the testing. These graphs show irradiances as a function of wavelength, based on the spectroradiometer measurements, as described in the text, for the Sun and the 14 products listed in Table 1.

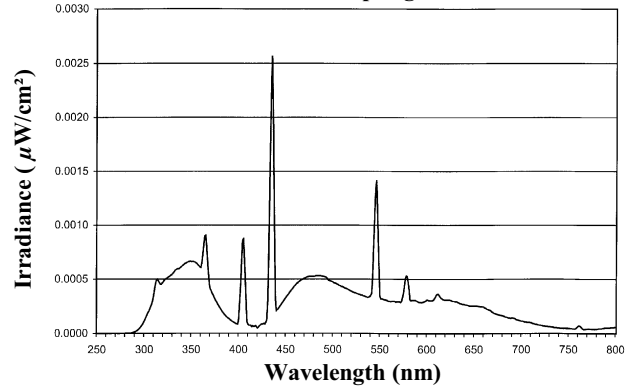
ESU Reptile SUPER UV Daylight



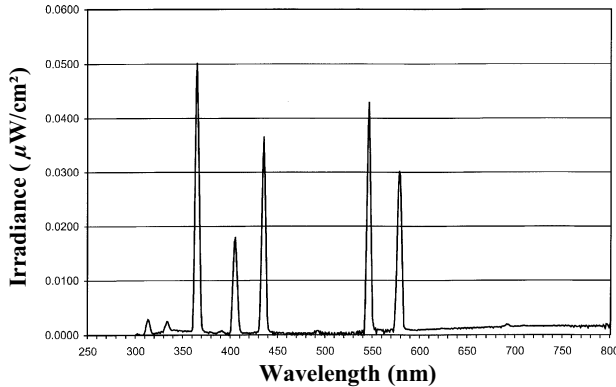
The Sun, 27 June 2001, 13:08 Eastern European DST from Raisio, Finland (60°29'19"N, 22°10'4"E)



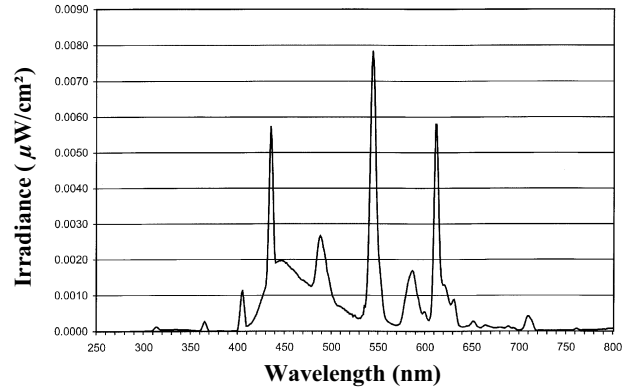
Narva Reptilight



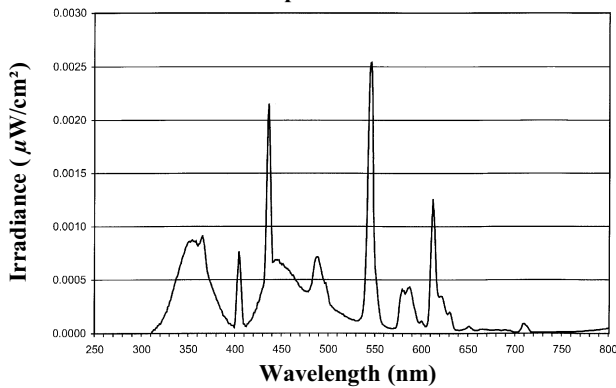
Active UVHeat



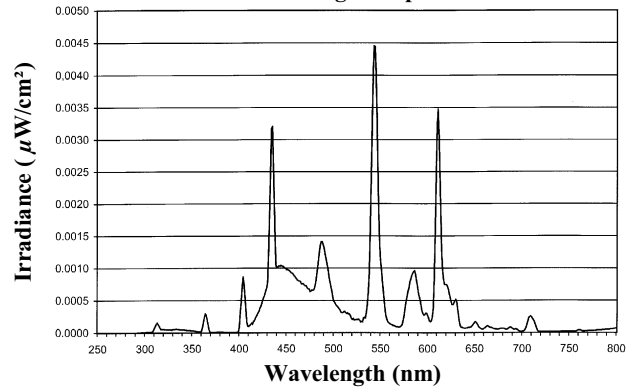
R. C. Hagen Life-Glo



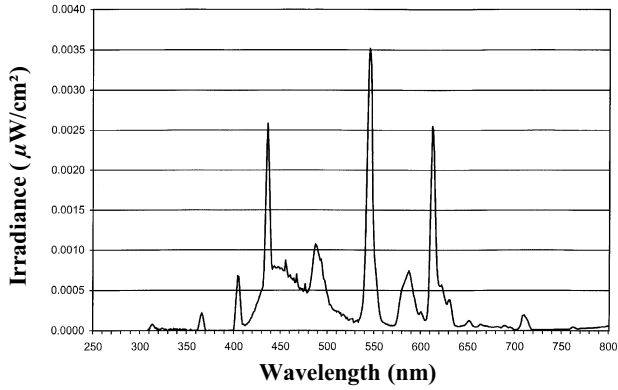
ESU Reptile Desert 7% UVB



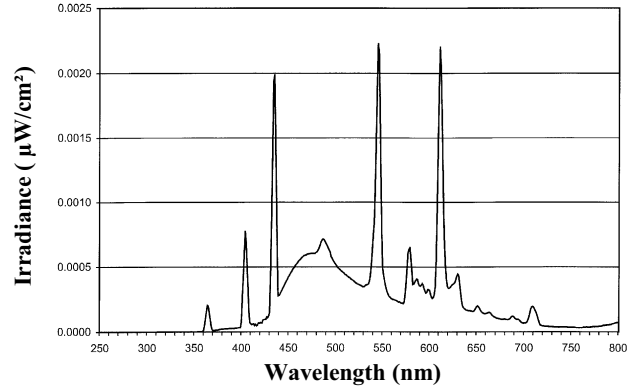
R. C. Hagen Repti-Glo



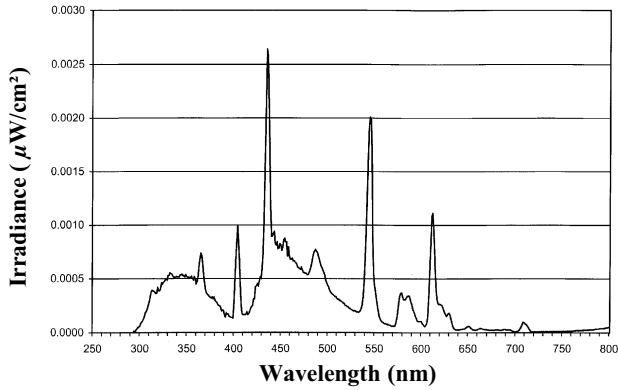
R. C. Hagen Exo-Terra Repti-Glo 2.0



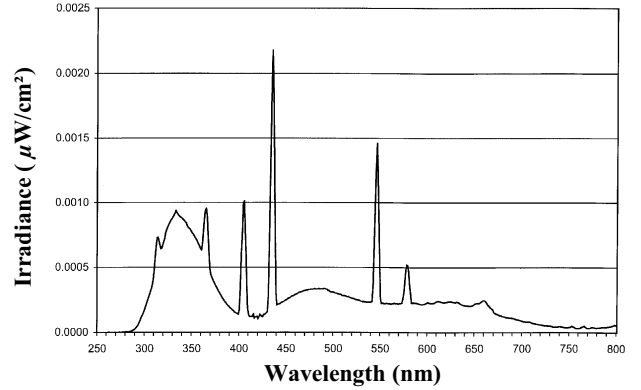
True-Light Daylight 6000



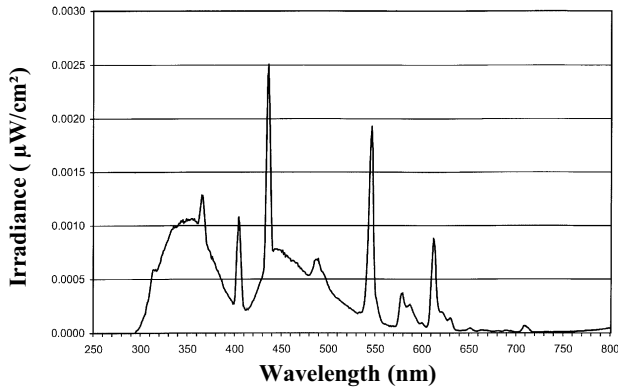
R. C. Hagen Exo-Terra Repti-Glo 5.0



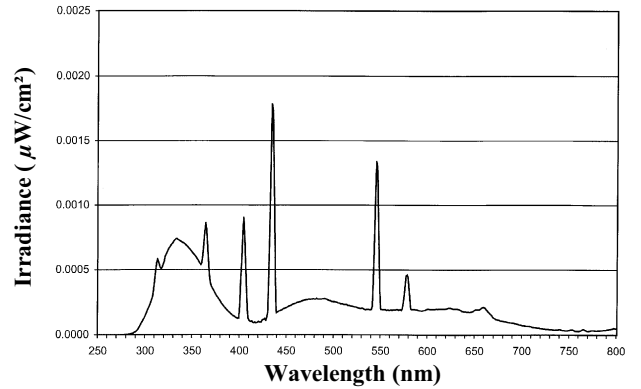
ZooMed ReptiSun 5.0 UVB



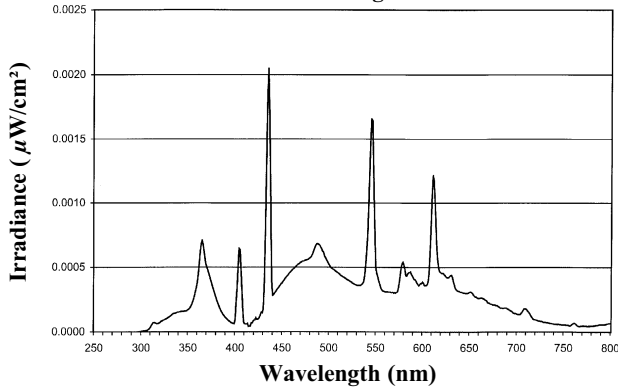
R. C. Hagen Exo-Terra Repti-Glo 8.0



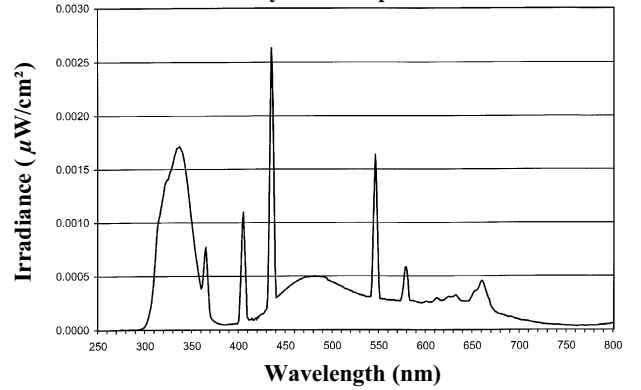
ZooMed ReptiSun 5.0 UVB (10 months used)



True-Light



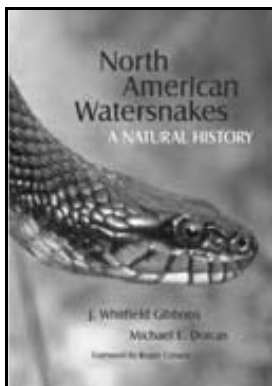
Sylvania Reptistar



Book Review: *North American Watersnakes: A Natural History* by J. Whitfield Gibbons and Michael E. Dorcas. 2004. 496 pp. Univ. Oklahoma Press. ISBN: 0-8061-3599-9. \$49.95

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Chicago, IL 60626

Here it is. Everything you want to know about the natural history of the North American watersnake. It has the herpetological seal of approval with a foreword by Roger Conant. That's always a good start.



The introduction gives a general description of the three North American watersnake genera — *Nerodia*, *Regina* and *Seminatrix*— and their overall ranges. They then get to the point by breaking things down into two sections. The first is “Watersnake Biology.” All aspects of their biology are covered, with charts and graphs scattered throughout. The text is academic and a little dry, but it covers everything. Remember, this is a natural history not a keeper's manual.

Part two is the species accounts. The first pages here are of colored range maps broken down by counties. These are great. You'll definitely want these on your next herping vacation. There are maps for *Nerodia* in Mexico, Canada and Cuba as well. They are color coded by county, based on museum, literature, or state program records and personal observations.

The remainder of this book goes into detailed accounts of fourteen of the watersnake species in North America. Each is right to the point and all are equally detailed. Habitat, size, diet, etc., are all included and discussed at length. There is

also a section in each account for “Predation, Parasitism, and Defense.” Anyone interested in bringing home a watersnake will want to double-check this section. It's good too that they include a very brief mention on captive maintenance and conservation. These reptiles have long been misunderstood and abused. The photo in Section One titled “Snake bounty hunters” says it all.

The authors mention throughout that there are areas of information and study that haven't been explored. They hit this home in the last chapter “Research Opportunities with North American Watersnakes.” I always think back to just a few decades ago when I couldn't find any detailed information about snakes. Now with books like this we're getting a lot of answers. There are still a lot more we need to get. This book tries to open the way to more research and fact finding in the future.

I know the one big question left. Are there any color plates of the snakes? Yes! Sixteen pages with six images each. Well printed, beautiful shots of all the species. This is always the true test of a good reptile book. It passes with flying colors.

The last fourth of this work is reference notes and bibliography.

Every zoo keeper, professional herpetologist, zoology student or watersnake enthusiast will want this volume in their collection. Excellent maps, thorough species accounts, plenty of graphs and charts, nice illustrations and photos. It's not a book for young herpetoculturists. It is the complete reference for serious herpetologists.

Unofficial Minutes of the CHS Board Meeting, December 17, 2004

Lori King called the meeting to order at 7:35 P.M. Board members Matt Campbell and Ed Rzewnicki were absent.

Officers' Reports

Recording Secretary: Melanie Aspan read the minutes of the November 12 board meeting and the minutes were accepted.

Treasurer: Jim Hoffman presented the November balance sheet and noted that through the end of November our income continues to exceed our expenses. Jim also noted that the cricket revenue has been removed from the Adoptions restricted fund as discussed.

Membership Secretary: Mike Dloogatch reported that the membership count for November was 670. Mike also reported that we have received a request for an exchange membership

from the Herpetological Society of Finland whose publication is entitled “Herpetomania.” Steve Spitzer moved to initiate an exchange membership with the Finnish Herpetological Society. Betsy Davis seconded the motion. The motion passed with Jim Hoffman abstaining and all others in favor.

Publications Secretary: Betsy Davis reported another request for an “extinct” CHS publication and reported that she has generated a standard response to this kind of request pointing the inquirer to the CHS website.

Sergeant-at-arms: Brian Jones reported 31 attendees at the November general meeting.

Committee Reports

Shows: Jenny Vollman announced a change in additional

Notebaert days. The new dates are December 26 and 30. Jenny also mentioned that the Arlington Family Pet Show booth space issue has yet to be resolved regarding whether or not the additional half-booth space price can be discounted satisfactorily.

ReptileFest: Linda Malawy reminded everyone about the next meeting taking place at her home on January 8 at 10:00 A.M. She also mentioned that we now have postcards to send out advertising the 2005 'Fest. Steve Sullivan reported that hammering out the budget is top on the list of things to do along with more discussion regarding whether or not a raffle or auction should be incorporated into the program. Steve also covered some insurance options regarding specific exhibitors at ReptileFest and advertising options. Steve also requested addresses for any groups that may be interested in receiving ReptileFest literature.

Library: Steve Sullivan offered for viewing the DVD *Snakes of New England: Shed the Myth*, which was sent to him by Fossorial Films, LLC, for the library.

Herp of the Month: December's Herp of the Month will be skinks; January's will be North American herps; February's Herp will be Geckos; March's herp will be bearded dragons; April's herp will be turtles. Sean Bober intends to come up with a balloting system that will be reusable each month.

Short Presentation: December's presentation will be on the marbled salamander and will be given by Ron Humbert.

Raffle: Ron Humbert reported that there are still 69 10-gallon aquariums waiting to be raffled off along with some screen tops and various other items.

Adoptions: Linda Malawy announced donations totaling \$140 for the month.

Nominating Committee: Lori King extended a special thank-you to this year's committee of Ron Humbert, Zorina Banas, Sean Bober, Jim Hoffman and Linda Malawy.

Grants: Lori King inquired about the number of proposals received. Mike Dloogatch responded that 5 have been received so far.

Conservation: Lori King distributed the first pictures of the Grand Cayman blue iguana hatchlings released into the wild. Lori also noted that a check for \$150 has been received as a result of Ron Humbert and Steve Spitzer's Brownie education session. It was agreed that this check should be equally split between the *Cyclura* fund and the massasauga fund.

Chicago Wilderness: Ron Humbert and Steve Spitzer reported on their experience at the Chicago Wilderness Congress. The pair expressed their belief that the CHS should become more involved as a member of Chicago Wilderness and perhaps look into becoming presenters at next year's event.

Old Business

State Reptile/Amphibian: Ron Humbert announced that the tiger salamander and painted turtle are both still leading in their respective categories. Ron also mentioned that Lt.

Governor Pat Quinn would be holding a press conference on the "campaign," December 27, 1:30 P.M., at the Thompson Center.

Board meeting venue: Steve Spitzer has reserved the 2005 CHS Board Meeting dates with North Park Village, but no contract has yet been drawn up for our signature.

Field Museum Parking: Jenny Vollman reported that the Field Museum has confirmed receipt of our paperwork. Jim Hoffman will follow up with receiving payment.

AV Equipment: Jim Hoffman presented the newly purchased laptop and projector. Jim reported that the final purchase price was approximately \$3,000.

Board Meeting Dates: Board meeting in 2005 have been scheduled as follows: 1/14, 2/11, 3/18, 4/15, 5/13, 6/17, 7/15, 8/19, 9/16, 10/14, 11/18, and 12/16.

Esther Lewis Memorial: At the November board meeting Linda Malawy had suggested some sort of memorial to Esther Lewis, but action was postponed until December. Mike Dloogatch moved to rename the CHS Library the Esther Lewis Memorial Library. Steve Spitzer seconded the motion. After some discussion regarding the alternate option of naming one of the CHS grants for Esther instead, Linda Malawy moved to table the vote pending further thought. Betsy Davis seconded the motion to table. Linda and Betsy voted in favor. Mike, Steve, Melanie, Brian, John and Jenny voted against and Jim abstained so the motion to table was not passed. Regarding the motion to rename the Library: Mike, Steve, Melanie, Brian, John, Jenny and Jim voted in favor. Linda and Betsy voted against; the motion passed by a vote of 7 to 2.

New Insurance Carrier: Linda is continuing to investigate our options.

ReptileFest Profit Donation: The prospect of setting aside a specific dollar amount or percentage was discussed, but no consensus was reached.

New Business

Springbrook Nature Center "Winter Fest": Ron Humbert announced that this year's Winter Fest would again feature "Hibernating Herps." The event will take place January 16 from 12 to 4 P.M.

2004 Awards: Brian Jones will gather the needed information in order to present the awards at the January general meeting.

Ideas and Suggestions

Steve Spitzer suggested investigating Herp-related Internet groups to spread the word on Reptile Fest.

The meeting was adjourned at 9:54 P.M.

Respectfully submitted by Melanie Aspan, Recording Secretary.

HerPET-POURRI

by Ellin Beltz

Before and After

Being a geologist, I watched with interest as twin-tailed Comet Machholz came nearer and nearer. Both its green and ion tails were scheduled to cross Earth's plane December 26, 2004. I learned later during the passage the heavy particles flipped the tails. The one that pointed "up" now points "down" and the reverse [http://skyandtelescope.com/observing/objects/comets/article_1423_1.asp, from Teri Radke]. Looking for any atmospheric effects, like the fireballs that were spotted in Indonesia in December, I was online within hours of when the magnitude 9.0 earthquake occurred off the coast of Sumatra and its associated tsunami at about 8 A.M. local time on December 26, 2004 [<http://earthquake.usgs.gov/eqinthenews/2004/uslav/>]. I thought about all the coastal areas, all the researchers, all the people in harm's way and emailed everyone I could think of to see if they were all good. The first reply came back barely eight hours later at 6:05 P.M. PST December 26. I received a reply from Janaki Lenin and Romulus Whitaker, long associated with the Madras Crocodile Bank and Snake Farm: "We are well. The sea came into Croc Bank and there is some damage—no crocs escaped however. Today will probably be clean-up day. The sea left a muddy slush on everything including plastic bottles, and other debris. Thanks for your concern. But thankfully the night didn't bring another one as we feared. Crazy we have a nuclear reactor close by which had to be shut down so we aren't sure how long the electricity will last. Best, J." The reactor they refer to in Kalpakkam, India's atomic town, is described as "a graveyard after tsunamis. . . . The still soggy earth, showing the scars of the Sunday tsunami, is littered with smashed cars, glass and mortar from broken homes and strewn footwear. A smashed-to-pulp sea turtle is ignored by even the crows. All but a handful of its residents have fled." The plant itself was unaffected by the tsunami. [*International News Alliance*, December 29, 2004] We now know that multiple waves, some described as 30 feet or more high crashed into coastlines around the Indian Ocean unprotected by any form of tsunami warning system. In addition, the timing of the quake on two holidays, Christmas and Boxing Day, reduced the speed and efficiency of attempts by earthquake researchers to reach governmental agencies in Asia. [*New York Times*, December 31, 2004]

Traditions pay off for indigenous peoples

Several news reports indicated that Andaman and Nicobar indigenous island groups, feared completely wiped out as waves overtopped much of their shallow islands, in fact survived far better than expected. "On the island of Simeulue, reached by an aid flight late last week, they remember a tsunami of 1907 when the island, not far from the epicentre of last week's quake, suffered thousands of deaths. Locals never forgot the disaster and it helped them to survive when they felt the quake on Boxing Day. 'It became part of the folklore that as soon as we feel a quake we must run to high land,' said . . . a district administrative leader. 'It was clear that trouble was coming. The force of the quake was so strong we suspected a big tsunami would follow. Our local lore reminds us of the

danger we live with every day.'" Listening to tradition saved the majority of the 70,000 people on the island. [*London Times*, January 2, 2005] Unfortunately for many others around the Indian Ocean, technology that detected the quakes in Vienna, Hawaii and many other places was unable to sound a warning to save nearly 100,000 people who were in lowland areas when the tsunami waves struck.

Wildlife as threat

- The *New Kerala* reported that Tamil Nadu fishermen were now worried not only about the "wrath of the tsunami" in the form of more waves but of snakes and scorpions said to be floating on the surface of the sea. [December 27, 2004]
- A survivor on an isolated southern Indian island described swimming from high ground where they were safe but had nothing to eat through crocodile "filled water to reach safety. The man describes the swim as 'hide-and-seek' with crocs that were busy feasting on corpses of humans and animals." [WSTM Syracuse, New York, from Associated Press, Port Blair, India, December 31, 2004]

Wildlife threatened

- "Endangered sea turtles were also casualties of the tsunami, with the monster waves possibly hastening their extinction. . . . At least 24 turtles swept up by the waves have been found on the shores of Phuket Island [Thailand], some dead, others with cuts, scrapes and broken shells. But the titanic wave also swept away about two dozen endangered olive ridley turtles that were part of a breeding program which had been increasing their numbers. . . . In the tsunami-affected region, the olive ridley breed only on the Andaman Sea coast and nearly became extinct in Thailand, because their eggs were smuggled for food. Their numbers fell from 5,000 nests 50 years ago to fewer than 200 today. The breeding program had allowed the olive ridley with its broad heart-shaped shell to start a comeback, but it has now been dealt a serious blow." The director said, "The environment has changed, with debris and garbage strewn on the seashore and sediment in the sea. These are not good conditions for turtles to lay eggs." [*San Jose Mercury News*, January 8, 2005]
- "A Sri Lankan conservationist . . . wipes a tear as he stands over a patch of sand and broken wire mesh, the only surviving incubation pit of his hatchery for endangered sea turtles. Twelve days after giant tsunami waves destroyed the hatchery, washing away 20,000 eggs, seven rare green turtles and \$500,000 worth of research equipment, [he] is still trying to come to terms with the loss." An estimated 30,000 people died in Sri Lanka that day. "Elsewhere in the Indian Ocean, concern has mounted over the future of the great leatherback turtles who used to nest on the sandy beaches of Great Nicobar Island in the southern stretch of the Nicobar archipelago. 'The beaches are all gone, they won't be able to nest here,' said Harry Andrews, director of the Andaman and Nicobar Islands Environmental Team." [Reuters, January 7, 2005]

- Beaches around the Indian Ocean were just removed and as noted by the Sri Lankan conservationist many eggs were just ready to hatch. What effect the apparent loss of this cohort will have versus the loss of fishing boats and fishermen will have over the long term remains to be seen.
- Even before the tsunami, turtle landings were down. The *Malaysia New Straits Times*, December 21, 2004, reports “Landings from the endangered leatherback turtles in the State fell by more than half this year, and the reptiles laid less than a quarter of the eggs compared with last year. According to the Turtle and Marine Ecosystem Center, the number of leatherbacks that came to nest dropped from 14 last year to six this year. . . . Last year [2003], besides the 14 leatherbacks, 1,485 green turtles and six hawksbills were spotted. . . . In 2002, there were three leatherback landings and none in 2001. . . . Despite the drop in the leatherback turtle landings, the total number of turtle landings in Terengganu increased from 1,505 in 2003 to 3,096 this year, with most of them being green turtles. . . . Of turtle landings this year, besides the leatherbacks, 3,062 were green turtles, three olive ridley and one hawksbill. . . . In 2002, the center recorded 2,885 green turtle landings, six hawksbill, three leatherbacks and two olive ridley. . . . Although this was an encouraging sign, the number of turtle landings was still below expectation. In the 1970s and 1980s, many turtles could be seen laying eggs, including the leatherbacks and hawksbills, but due to poaching, the number dwindled over the years.”

Wildlife as savior

I have to just run this story the way the *Jakarta Post* (Indonesia) told it on December 30, 2004: A few survivors of Sunday’s calamity have a snake to thank for being alive. . . . A 26-year-old clothes vendor, said that at about 8 A.M. she was enjoying the holiday in bed when suddenly she saw walls of water, mud, rocks and branches rushing into the neighborhood. People were screaming and running. . . . She was living in a rented house near the coast in Banda Aceh with three friends, [and] dashed up to the second floor of a neighbor’s house and stood on top of a cupboard. But . . . the current swept her and her friends off their perch. As she was drifting, she saw her neighbors, two girls—twins—and their mother. . . . She can swim, [and] managed to help the girls. She saw that their mother was badly injured. “The mother shouted, ‘Please help save my children. Let me be, but please save my children,’” the woman recounted, in tears. As she struggled for her own life and that of the twins, she said a large snake as long as a telephone pole approached her. She and the nine-year-olds rested on the reptile, which was drifting along with the current. “Thank God, we landed on higher ground where the water level was only about a meter deep. The twins, who were badly injured, were safe.” The woman said she then slapped her face to make sure she wasn’t dreaming. “God still loves me,” she said, adding that she would never forget the tragedy.

The world still turns

And with us are the usual dumb, dumber and dumbest people, many of whom are just simply not happy unless they also put a

reptile in their lifestyle. Here are a few of my favorites that I found while I was searching far more serious news in the past few days. I’d love to subtitle this section, “What part of dangerous don’t you get?”

- *Arab News* from Jeddah, Saudi Arabia, reports that a man will enter an enclosure with 25 snakes and 25 scorpions. This stunt is a warm-up to an effort to get into the Guinness Book of World Records with a stunt using nearly four times that many “Saudi cobras, Egyptian cobras, desert snakes and vipers.” No one seems to have told him that the previous holder of most snakes lived with for longest time or whatever they call it, died of a snakebite. [December 29, 2004] A few days earlier on December 20, the same paper reported, “People in Al-Namas area are talking about a snake that has achieved notoriety because it is addicted to sniffing paint. . . . The snake crawls for 500 meters from his hiding place to the paint shop and stays there for 30 minutes before unsteadily slithering back again to his hiding place. The owner of the paint shop said that he does not mind the snake sniffing the fumes every day because its appearance is publicizing his business.”
- A Red River Parish, Louisiana, man died after being bitten by one of his pet timber rattlesnakes in the back of his pawn shop while feeding it a rat by hand. He had trouble breathing, drove himself to a clinic, was transferred to a hospital, but died later in the evening. [KTBS3, Shreveport, Louisiana December 22, 2004]

Brilliant new acronym

Writer Kim Atienza in the *Philippine Star*, December 25, 2004, deserves great kudos for introducing a brilliant new acronym to the world of herpetology. She writes an animal answer column.

Q. “I saw a feature on [TV] many years back on a python that ate a man! My boy loves snakes. Is he in danger of being eaten? Snakebite”

A. “I saw that feature too and was amazed that the python was able to ingest a human being! Snakey [my pet snake] and I have always stressed the reality of SFEs or Stupid Feeding Errors when taking care of reptiles. Almost blind, snakes rely on their forked tongue to sniff potential prey; basically anything warm, that moves and smells like a food item—chicken or rodent. You smell like rat and handle Snakey, you will get bitten. Men getting eaten by snakes are a very, very, very rare occurrence because they are too big for most pythons. Although snakes are able to unhinge their jaws to swallow prey much bigger, humans are just too large! The unfortunate [man] was at the wrong place at the wrong time. He was out hunting and probably smelled like fowl or wild boar and was foolhardy enough to hunt a gigantic reticulated python. The snake thought he was prey and the poor man ended up Snakey’s dinner!”

Alligator in boot brings book

A 34-year-old man pleaded guilty to trying to “sell a dangerous alligator from the boot of his car in an Edinburgh car park. . . . [He] kept the animal in the bath of his flat on the 15th floor of a tower block in Leith, [and] was caught after trying to sell the creature to undercover police officers. They

expected to find a foot-long alligator but, when the car boot was opened, found themselves face-to-face with a four-foot reptile. [The] Sheriff . . . told [the man], who bought the animal over the Internet, that he was at a loss to impose a sentence to match the 'stupidity and danger' of the offense." [Edinburgh *Evening News*, December 22, 2004, from Ms. G. E. Chow] A few days later, this letter to the defendant appeared in the London *Sunday Times*: "Take heart. You are not the first and won't be last to get pulled up by the Society for the Prevention of Cruelty to Animals . . . when you were found guilty of animal cruelty at Edinburgh Sheriff Court. . . . In some circumstances my sympathies reach out to poor unfortunates like yourself, who are the victims of this animal welfare crowd. . . . In your case, though, I'm obliged to keep my kind feelings in check, simply for the fact that the beast in question was a 4-foot alligator, which was discovered in the boot of your car only when you attempted to sell it on. (I was relieved to see that these days you are driving a large family saloon, rather than one of those little Smart cars.) You had come by the beast, you explained, by way of a man you had met on the Internet, and then in person at [a] service station on the M8 where you completed your purchase for a hefty £250. Surprisingly, given the actual dimensions of the alligator, it was only when you returned to your flat on the 15th floor of a Leith tower block that you realized the size of the problem you had bought into and the threat it posed to your well-being. Apparently, you had been expecting a little nipper. What you had on your hands (and in your bath) was a stone or two of snap-happy spectacled cayman, the female of a breed which has been known to prey on piranha fish. Presumably you spent many a morning in June performing your ablutions alone and in your en-suite shower. Nevertheless, it is to your credit that you displayed an obvious desire to make the creature feel at home, bearing in mind that its natural habitat is the Amazon basin in tropical South America rather than the subarctic conditions which prevail on the banks of the Forth. . . . I can offer only condolences for the loss of an animal that could have brought you so much joy. Rest assured, these are not crocodile tears. With feeling, Mike" [December 26, 2004]

I've reported this story for too many years

Yet another sea turtle has been sucked into the intake at a power plant, this one at the Progress Energy power plant near St. Petersburg, Florida. Their *Times* reports, "By the time the juvenile turtle was seen by utility workers, its shell was chewed, battered and punctured and the animal was fighting for its life. But thanks to the Clearwater Marine Aquarium, which picked up the turtle after it was found, there is a good chance that, some day, it might be swimming in the wild again." The intakes have manatee-proof barriers, but smaller animals get sucked in all the time. The director of guest programs at the Aquarium said that once in the intake, turtles are rolled and tossed around "like a washing machine. They get beat up. It's not a pretty thing." He added, "We're working with them to find a solution." [December 20, 2004]

Busted but in a new way

A 28-year-old Brooklyn man was charged with allegedly trying to sell an endangered radiated tortoise from Madagascar to an

undercover officer. What's new about this tale is that he posted the animal for sale on kingsnake.com, where the ad was spotted by law enforcement. The tortoise now lives at the Bronx Zoo. [Newsday, December 23, 2004]

Believe it or not—it seems a bit big

On December 29, the London, UK Press Association reported: "A snake measuring more than 19 foot long and weighing almost 16 stone was found inside a factory in Brazil. Terrified employees fled the sugar and alcohol plant in Sertaozinho. Firemen were called and took the giant anaconda snake—measuring six meters and weighing 100 kilos—to a nature reserve." A firefighter said "It wasn't very hard to capture the snake because it was so fat it had difficulty moving."

The people have spoken

Some of them have spoken more than once, but never you mind voting irregularities, according to the Lt. Governor of Illinois [<http://www.LtGovernor.il.gov>], the final results of public voting for the state's official amphibian and reptile are as follow:

Amphibians:

- Eastern tiger salamander—19,217 votes (51%)
- Gray treefrog—10,591 votes (28%)
- American toad—8,140 votes (21%)

Reptiles:

- Painted turtle—16,742 votes (45%)
- Common gartersnake—11,925 votes (32%)
- Eastern box turtle—8,581 votes (23%)

It was noted that very rarely does the legislature not approve this sort of thing, so we might assume that the tiger salamander and the painted turtle are now assured of the honor, joining 17 symbols including the monarch butterfly, white-tailed deer, bluegill, cardinal and Tully monster.

Thanks to everyone who sent in clippings in the past 3 weeks. I promise you will see your contributions in an upcoming column! And thanks to Wes von Papineau for many of the articles above. You can contribute, too. Send the actual page of newspaper or magazine (it doesn't weigh much) to: Ellin Beltz, POB 1125, Ferndale, CA 95536 with your name on each piece. Then allow for my lead time and read your *Bulletin!*



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RATS AND MICE

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Herpetology 2005

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

CAECILIAN ECOLOGY

D. J. Gower et al. [2004, African J. Herpetology 53(2): 183-190] studied the ecology of the sympatric caecilians *Boulengerula boulengeri* and *Scolecophorus vittatus* in Nilo Forest Reserve in the East Usambara Mountains, Tanzania. Three sampling methods (timed digging, pitfall trapping and casual visual encounter surveys of the forest floor) yielded 85 *B. boulengeri*, found only by digging soil, and 23 *S. vittatus*, mostly collected above ground. The difference between these taxa in the proportions of captures above and below ground is statistically significant and seems to indicate different ecologies. *B. boulengeri* is interpreted as predominantly a burrower in soil, and *S. vittatus* as an animal spending more time than *B. boulengeri* above ground. Niche separation appears to be correlated with some morphological differences. The vast majority of all vertebrate specimens dug from the top 300 mm of soil were *B. boulengeri*, and this species appears to be more abundant than *S. vittatus* in East Usambara forest soils. As an abundant endogeic animal, *B. boulengeri* may play an important role in the ecology of forest soils.

SPOTTED TURTLE MOVEMENTS

J. D. Litzgus and T. A. Mousseau [2004, Copeia 2004(4):804-817] note that information about animal movement patterns is critical to understanding their ecology, and such information is essential to the design of conservation plans for threatened species. Using radio telemetry, GPS, and ArcView GIS software, the authors examined seasonal activity, habitat use, movements and home-range size of a southeastern population of spotted turtles (*Clemmys guttata*), a declining species. Data collected over three years revealed an annually repeated pattern of seasonal activity. Habitat use differed annually, seasonally and between the sexes. Home ranges overlapped, and there was an area of concentrated overlap in early spring, indicating an aggregation of turtles, likely for breeding. Individuals showed annual fidelity to home-range areas. Home-range size (calculated using three methods) for males was smaller (~5 ha) than that of gravid females (~16 ha). Movement data did not fully support the reproductive strategies hypothesis. As predicted, gravid females moved greater distances than males during the nesting season. In contrast to the hypothesis, males did not move their greatest distances in spring at which time mating mainly occurs. That males did not make the predicted movements in spring can be explained by the fact that turtles aggregated at this time of year; thus, males do not need to travel to find mates. The current study is important because it provides information on the role of natural ("hurricane-tip-ups") and anthropogenic (powerline rights of way, clearcuts) disturbances in maintaining habitat heterogeneity and the early-successional vegetative communities preferred by spotted turtles. A set of management recommendations is presented.

SALAMANDER ANTIPREDATOR RESPONSES

A. M. Sullivan et al. [2004, Herpetologica 60(4):401-408] note that organisms may reduce the risk of predation by responding to chemical cues from predators. Recent research shows that many species vary their antipredator response depending on the diet of the predator. The authors examined the responses of three plethodontid salamander species (*Plethodon cinereus*, *Eurycea bislineata* and *Desmognathus ochrophaeus*) to chemical cues from a shared snake predator (*Thamnophis sirtalis*). At the time of the study, *E. bislineata* showed overlap in habitat with *P. cinereus* and *D. ochrophaeus*, but *P. cinereus* and *D. ochrophaeus* showed no overlap with one another. Each salamander species was presented with chemical cues from snakes fed *D. ochrophaeus* (TS_{Do}), *E. bislineata* (TS_{Eb}), and *P. cinereus* (TS_{Pc}). *P. cinereus* avoided both TS_{Pc} and TS_{Eb}, whereas *E. bislineata* avoided only TS_{Eb}. Conversely, *D. ochrophaeus* did not avoid any cues from the predator, regardless of the diet of the snake. Analysis of activity data revealed that *P. cinereus* showed higher activity levels when exposed to TS_{Pc} than to the other cues. Individual *E. bislineata* did not vary their activity to the three treatments. Lastly, *D. ochrophaeus*, which did not avoid any of the cues from the predator, were more active in response to TS_{Do} and TS_{Eb} than to TS_{Pc}. These results show that phylogenetically related prey species may use a variety of antipredator behaviors and suggest that discrimination of predator diet-cues may be linked to degree of microhabitat overlap among the different prey species. The study also highlights the importance of using multiple response variables when examining antipredator behavior.

AXOLOTL CONSERVATION

R. A. Griffiths et al. [2004, Herpetological Bulletin 89:4-11] report that although the Mexican axolotl (*Ambystoma mexicanum*) is well known as a popular laboratory and aquarium animal, in the wild it is almost extinct and confined to the remnant canals of Lake Xochimilco on the edge of Mexico City. Loss of habitat, introduced fish, pollution and illegal collection for food and medicines have all played a role in its decline. Capitalizing on its high profile within local culture, a multidisciplinary conservation program is being developed using the axolotl as a flagship species for the wider Xochimilco system. The program is focusing on raising the profile of the axolotl and other species by promoting nature tourism and conservation education within the local community. Complementing these socioeconomic initiatives is biological research on population ecology, survey methods and threat mitigation. The axolotl has been bred in captivity very successfully both in Mexico and elsewhere. However, reintroduction to Lake Xochimilco will not be a realistic option until the threats facing the species have been addressed. Equally, the disease and genetic risks posed by the release of captive bred stock need to be evaluated prior to any reintroduction.

RAT PREDATION ON TERRAPINS

M. Draud et al. [2004, *J. Herpetology* 38(3):467-470] found that the Norway rat (*Rattus norvegicus*) was a major predator on hatchling and juvenile diamondback terrapins (*Malaclemys terrapin*) in a New York population during three years (2001–2003). Rats killed young terrapins by evisceration through the plastron or carapace, exclusively at night, and during two distinct periods: (1) at emergence from nests in August and September; and (2) at emergence from hibernation in April. Predation rates were highest during peak emergence from nests and hibernacula. In the fall, hatchlings were mainly preyed upon within intertidal high marsh vegetation, where hatchlings normally occur after emergence from nests. The authors found no evidence of rat predation on eggs or hatchlings in nests. Predation in the spring also occurred in the intertidal high marsh, but rats killed juveniles in adjacent terrestrial habitats as well. Data from a telemetry study of 24 wild hatchlings was used to estimate rat predation rates. Between 13 September and 22 October 2003, 16 of 24 (67%) radio-tracked hatchlings were killed by rats.

MASSASAUGA REPATRIATION STUDY

R. King et al. [2004, *Herpetologica* 60(4):429-437] note that the use of relocations, repatriations, and translocations as amphibian and reptile conservation strategies has received much debate. In the case of endangered species, their use may outweigh the potential negative consequences. These authors performed an experimental repatriation of the eastern massasauga (*Sistrurus catenatus catenatus*), which has experienced range-wide population declines and extirpations. The experiment included measures to minimize negative conspecific effects to the donor populations as well as interspecies effects on the release and donor sites. Snakes released during late July had lower mortality rates, larger home ranges, and gained more mass than snakes released in early September. The July release cohort also successfully reproduced, while no breeding activity was observed with September release snakes. Results of this study suggest that repatriation *may* be a viable method of restoring eastern massasauga populations. The authors hope the methods and conservation measures used in this experiment will serve as a template for future repatriations.

TOAD POPULATION DECLINES

A. S. Cooke and T. H. Sparks [2004, *Herpetological Bulletin* 88:13-26] used routine counts of common toads (*Bufo bufo*) killed by road traffic to demonstrate synchronous population declines since the late 1980s at three breeding sites in Cambridgeshire [UK]. All factors that might have contributed to the declines were considered in turn. It was concluded that road mortality of adult toads played a significant part at each site, although other factors were also implicated, especially habitat modifications. Local traffic flow was likely to have caused unsustainable losses, and counts decreased more rapidly on the busier roads. The use of counts of dead toads as a monitoring technique is discussed and suggestions made. A data-set of casualty counts needs careful interrogation, with analysis concentrating particularly on counts in the recent past.

COUNTING SALAMANDERS

C. K. Dodd, Jr., and R. M. Dorazio [2004, *Herpetologica* 60(4):468-478] note that a critical variable in both ecological and conservation field studies is knowing how many individuals of a species are present within a defined sampling area. Labor intensive techniques like capture-mark-recapture and removal sampling may provide estimates of abundance, but there are many logistical constraints to their widespread application. Many studies on terrestrial and aquatic salamanders use counts as an index of abundance, assuming that detection remains constant while sampling. If this constancy is violated, determination of detection probabilities is critical to the accurate estimation of abundance. Recently, a statistical approach was developed that allows abundance and detection to be estimated simultaneously from spatially and temporally replicated counts. The authors adapted this model to estimate these parameters for salamanders sampled over a six-year period in area-constrained plots in Great Smoky Mountains National Park. Estimates of salamander abundance varied among years, but annual changes in abundance did not vary uniformly among species. Except for one species, abundance estimates were not correlated with site covariates (elevation, soil and water pH, conductivity, air and water temperature). The uncertainty was so large as to make correlations ineffectual in predicting which covariates might influence abundance. Detection probabilities also varied among species and sometimes among years for the six species examined. So much variation was found in counts and in estimates of detection among species, sites and years as to cast doubt upon the appropriateness of using count data to monitor population trends using a small number of area-constrained survey plots. Still, the model provided reasonable estimates of abundance that could make it useful in estimating population size from count surveys.

HABITAT USE BY WESTERN TOADS

P. E. Bartelt et al. [2004, *Herpetologica* 60(4):455-467] used radio-telemetry to study the movements and habitat use of western toads (*Bufo boreas*) in the Targhee National Forest in southeastern Idaho. Eighteen toads (10 male and 8 female) that bred in a seasonally flooded pond were fitted with radio-transmitters, tracked, and their movements mapped and analyzed with global positioning and geographic information systems. Patterns of habitat selection at micro- and macro-scales were also analyzed by comparing sites used by toads with randomly selected sites. After breeding, two male and six female toads left the breeding pond and used terrestrial habitats extensively. Male and female toads showed different patterns of movement and habitat use, although all toads seemed to behave in ways that reduced loss of body water (e.g., traveling on nights of high humidity). Male toads traveled shorter distances from the pond than females (581 ± 98 m and 1105 ± 272 m, respectively). Female toads used terrestrial habitats extensively and were selective of cover types (e.g., shrub) that provided greater protection from dehydration. Female toads also preferred certain habitat edges and open forests over forests with closed canopies or clearcuts. Information from this study can assist land managers in establishing protective buffers and managing forests for the protection of toad populations.

REPRODUCTION IN THE SMALLEST TORTOISE

V. J. T. Loehr et al. [2004, *Herpetologica* 60(4):444-454] note that the world's smallest tortoise, the Namaqualand speckled padloper, *Homopus signatus*, is inadequately protected, and information on its reproductive ecology can facilitate effective conservation. The authors combined X-ray radiography and ultrasonography to assess the reproductive status of free-ranging female *Homopus signatus signatus* during August–September 2000 ($n = 30$) and September–October 2001 ($n = 29$). Females produced only single-egg clutches but can produce more than one clutch in a season. Most (ca. 75%) of the females were gravid each spring, so *H. s. signatus* probably has a seasonal pattern of egg production. This pattern may be related to the seasonal climate; summers are hot and dry, yet winter rainfall is moderately predictable. Females were gravid from August through October, but further analyses are necessary to characterize the entire reproductive season and quantify clutch frequency. Large females produced large eggs compared to eggs of small females. The smallest gravid female had a straight-line carapace length of 84.1 mm, while the largest female measured 110.0 mm. Compared to gravid females, nongravid females were in poorer body condition (body mass and mass relative to carapace length) only in 2000, when there was lower rainfall and plant availability than in 2001. The difference in body mass approximated the mass of one egg. The low clutch size and fecundity suggest that populations have low intrinsic rates of natural increase. This plus their limited range and specific habitat requirements make *H. s. signatus* vulnerable to anthropogenic impacts.

HABITAT SELECTION BY A PUERTO RICAN GECKO

R. López-Ortiz and A. R. Lewis [2004, *Herpetologica* 60(4): 438-444] studied habitat selection by the litter-dwelling gecko *Sphaerodactylus nicholsi* in the Cabo Rojo National Wildlife Refuge in southwestern Puerto Rico to determine how this small diurnal species exists in an apparently xeric habitat. The 240 ha refuge was divided into 956 quadrats each measuring 50 m × 50 m and 60 quadrats were selected at random to search for geckos. The 60 quadrats yielded 33 discrete locations with sphaerodactylids that were called occupied sites. Occupied sites were located beneath the dense canopies of broad-leaved evergreen trees and were completely shaded. The average area of an occupied site was 103 m². The authors paired each occupied site with a nearby random site and compared relative sphaerodactylid density and habitat variables to determine features important in habitat selection. Occupied sites were in dense shade of evergreen trees and contained trees that produced large seeds or fruits; random sites commonly were exposed to sunlight, either directly or filtered through a thin deciduous canopy. Occupied sites had significantly lower daytime substrate temperatures, more leaf litter, less grass, less bare ground, and an order of magnitude more sphaerodactylids than the random sites. The four random sites with sphaerodactylids also had dense shade. Despite its small size, diurnal habit and apparent vulnerability to dehydration, *S. nicholsi* thrives through selection of the scattered patches of relatively mesic environment within a xeric landscape.

SERENGETI NATIONAL PARK AMPHIBIANS

A. Channing et al. [2004, *African J. Herpetology* 53(2): 163-181] surveyed the Serengeti National Park in Tanzania for amphibians in May 2003. Records were based on the collection of adults and tadpoles, and the recording of male advertisement calls. Literature records, museum records, and field notes from an earlier survey in the 1970s were also used. Twenty-seven species of amphibians were recorded, but more are expected. A distribution map is presented for each species, and a detailed gazetteer lists all known localities in the park where amphibians have been collected. This report is intended to serve as a baseline for future monitoring in this important conservation area.

AFRICAN “NON-SPITTING” COBRAS

D. G. Broadley and W. Wüster [2004, *African J. Herpetology* 53(2):101-122] analyzed the systematics of the “non-spitting” cobras of southern Africa, paying particular attention to the *Naja annulifera* complex. Multivariate morphometric analyses demonstrate that the taxa *annulifera* and *anchietae* are consistently distinct and homogenous over their respective ranges, and their distributions overlap in western Zimbabwe, with only limited intergradation. Sequences of the mitochondrial cytochrome *b* gene indicate that they are separated by considerable genetic distances. These results suggest that these two taxa are morphologically and genetically distinct evolutionary lineages, and should be considered as two separate evolutionary species, *N. annulifera* and *N. anchietae*.

ARIZONA TREEFROGS

E. W. A. Gergus et al. [2004, *Copeia* 2004(4):758-769] studied geographic variation in allozymes (22 loci), mitochondrial cytochrome *b* gene sequences (575 bp), advertisement calls (pulse rate, call duration and dominant frequency), and snout-vent length among populations of *Hyla wrightorum* and *Hyla eximia* in the United States and Mexico. Calls were only available for *H. wrightorum*, and although populations varied in some advertisement call variables, there was no indication of species level differentiation. Allozyme variation was exhibited among the *H. wrightorum* populations, but no fixed differences were discovered, and the amount of genetic divergence among populations was small ($D_m \leq 0.0643$). Seven mtDNA haplotypes were discovered among the *H. wrightorum* individuals included in this study. A single haplotype (G) was present in the Huachuca Mountains and was found only in this population restricted to southeast Arizona. Neither the Mogollon Rim nor the Sonora populations were exclusive, with some haplotypes in each being more closely related to haplotypes in the other population. Molecular data (allozymes and mtDNA), as well as the advertisement calls, support continued recognition of two species: *H. eximia* in central-southern Mexico and *H. wrightorum*, which consists of disjunct populations in the Sierra Madre Occidental of northern Mexico, the Huachuca Mountains of southeastern Arizona, and the mountains of central Arizona and western New Mexico.

Chicago Herpetological Society
Income Statement: January 1 – December 31, 2004

Income	Expense
Adoptions \$ 4,045.03	Adoptions \$ 1,327.66
Grants 1,180.46	Grants 2,269.20
ReptileFest 25,405.44	ReptileFest 19,710.93
Other CHS Shows 3,062.00	Other CHS Shows 1,075.76
Zoo Trip 916.50	Zoo Trip 1,066.50
Merchandise Sales 2,246.27	Merchandise Sales 1,518.15
Conservation—Massasaugas 556.00	Conservation—Massasaugas 180.00
Conservation— <i>Cyclura</i> 280.00	Conservation— <i>Cyclura</i> 690.00
Conservation—CIG* 363.86	Conservation—CIG 363.60
Membership Dues 15,941.88	Printing / Duplicating 15,234.11
Contributions 332.00	Addressing / Mailing Service 2,416.61
Bulletin Ads 202.00	Bank Fees 76.25
Bulletin Back Issues 400.00	Donations 179.13
Foreign Postage 179.00	Liability Insurance 2,924.00
Interest 143.84	Library 190.77
Raffle 1,005.50	Licenses and Permits 18.00
	Office Supplies 171.98
	Postage 2,927.17
	Speaker Reimbursement 1,849.92
	Telephone 558.68
	Miscellaneous 67.83
Total Income \$56,259.78	Total Expense \$54,816.25

* CIG = Cryptobranchid Interest Group

Net Income \$1,443.53

Chicago Herpetological Society
Balance Sheet: December 31, 2004

Assets

Harris Checking \$ 6,857.06
Harris Money Market 30,108.86

Total Assets \$36,965.92

Equity

Restricted – Adoptions \$ 4,927.95
Restricted – Grants 1,096.00
Restricted – Massasauga 1,157.36
Restricted – *Cyclura* 129.00
Restricted – CIG 49.26
Retained Earnings 28,162.82
Net Income 1,443.53

Total Equity \$36,965.92

Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, 6115 SW 137th Avenue, Archer FL 32618, (352) 495-9024, E-mail: GrmtRodent@aol.com.

For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. We feed our colony a nutritionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. Mice starting from: pinks, \$.17 each; fuzzies, \$.24 each; hoppers, \$.30 each; weanling, \$.42; adult, \$.48. Rats: starting with pinks at \$.45 each, to XL at \$1.80 each. Discount prices available. We accept Visa, MC, Discover or money orders. PO Box 85, Alpine TX 79831. Call **toll-free** at (800) 720-0076 or visit our website: < <http://www.themousefactory.com>> .

For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice available: small newborn pinks up to jumbo adults. Prices start at \$25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For sale: **New book**—*Snakes of Costa Rica* by Alejandro Solórzano, in English/Spanish, 842 color photos, 21 figs. & tables, distribution maps for all species, a must for anyone with an interest in tropical snakes, \$60 + \$5 shipping & handling. Also available, *Biology of the Vipers* (2002, Schuett et al., eds.) Order from Eagle Mountain Publishing, LC, 7705 N. Wyatt Earp Ave., Eagle Mountain UT 84043, (801) 789-4149 tel., (801) 789-4150 fax. E-mail: empub@msn.com. For additional information see www.eaglemountainpublishing.com

For sale: Two 2' Neodesha cages with glass doors, in excellent condition, come with matching hide box and bowl, \$50 per set or \$90 for both. Chicago area only. Call Jim at (847) 534-4980.

For sale: c.b. '03 yellow anacondas, aggressive feeders, perfect health, about 2' long, \$100 each; also c.b. '04 reticulated pythons; beautiful hatchlings already feeding on adult mice. These guys are tiger siblings and are available for \$100/each as well. Personal checks, money orders and Paypal accepted. Out of state shipping available. If you have questions or would like to purchase an animal call Mark Petros, (847) 836-9426 or E-mail ballpython777@yahoo.com.

Herp Tours: Herp Belize! A field trip in search of reptiles and amphibians through some of the most unspoiled places left on earth. Dry season, March 15–24 (reptile focus). Wet season, July 1–10 (amphibian focus). Led by professional herpetologists. Hiking, canoeing, 4×4, boating. Photographic opportunities. Herp in diverse habitats. All inclusive. Catered meals and ice cold drinks. Limited availability. Full day snorkeling on barrier reef. For inquiries and reservations call 011-501-614-3896 (Belize). Email: bfree@direcway.com.

Herp Tours: Why pay more? Travel with the International Fauna Society, a 501 (c)3 not-for-profit organization, and experience the Costa Rican rainforest! Stay at the beautiful Esquinas Rainforest Lodge in the untouched herpetological paradise that is Piedras Blancas National Park. Meet new friends, relax in the naturally-filtered swimming pool or in the lush, fauna-filled tropical garden. Discounts for IFS and Chicago Herp Society members. For details, visit The International Fauna Society website at www.faunasociety.org or E-mail: info@faunasociety.org.

Herp tours: Adventure trips to **Madagascar!** Journey somewhere truly unique to seek and photograph nature on the world's least-studied mini-continent. For maximum herp fun and discovery, join Bill Love as we go where few people will ever venture in their lives. Let his experience assure a comfortable tour finding the most colorful and bizarre species on the planet! Get all the details at Blue Chameleon Ventures' comprehensive new website: < <http://www.bluechameleon.org>> , E-mail: bill@bluechameleon.org, or call (239) 728-2390.

Herp tours: The beautiful Amazon! Costa Rica from Atlantic to Pacific! Esquinas Rainforest Lodge, the Osa Peninsula, Santa Rosa National Park, and a host of other great places to find herps and relax. Remember, you get what you pay for, so go with the best! GreenTracks, Inc. offers the finest from wildlife tours to adventure travel, led by internationally acclaimed herpers and naturalists. Visit our website < <http://www.greentracks.com>> or call (800) 892-1035, e-mail: info@greentracks.com

Reptile Show: Captive-bred only. Monona Community Center, 1011 Nichols Road, Madison WI. Saturday, April 23, 2005, 10 A.M. to 4 P.M., \$4 admission, \$2 under 12. Vendors tables, \$25. Info: wiretilesshows@hotmail.com or (608) 238-2891

Wanted: Female ball pythons, adults preferred but smaller animals also considered. I am a professional breeder specializing in ball pythons and I can assure you that your animal will be provided with excellent care and optimal living conditions. Mark Petros, (847) 836-9426; ballpython777@yahoo.com.

Wanted: I'm looking for my soulmate. I want to settle down to a family before it is too late. But I have this problem. . . . When we get into hobbies and interests: old popular records, jazz and show tunes, and antique electronics are fine, but when I mention turtles, "What, are you crazy?" So maybe this is a better place to look. Please don't try to separate me from my turtles—at least not most of them. If interested, please drop a line to Ellis Jones, 1000 Dell, Northbrook IL 60062, telling a bit about yourself and giving a phone number.

Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: MADadder0@aol.com.

ReptileFest is coming soon and you are invited to be part of the fun! Exhibits by CHS members are the backbone of 'Fest and are a great opportunity for you to share your herpetological knowledge.

The mission of ReptileFest is to educate that herps are good neighbors, both as pets and in the wild; to promote principles of conservation and husbandry; to promote the CHS as a worthwhile group; to give members an opportunity to have fun and grow; and to gain members.

Any exhibit that incorporates these goals has a place at ReptileFest. Some ideas for exhibits include: unique adaptations or morphology, captive color morphs, natural variation, related species, best beginner herps or interesting advanced herps.

If you don't have an animal to bring, or even if you do, consider creating an educational poster. Possible topics might be: What is a herp?; venomous U.S. herps; anatomy; reproduction; herp housing; jobs in herpetology; myths and facts; food and feeding; or herp trivia.

Exhibit at ReptileFest and win prizes from ZooMed



Use your imagination to come up with interesting, educational, and attractive displays. All exhibitors at ReptileFest will be eligible to win prizes from ZooMed laboratories worth up to \$100. Prizes will be awarded for the best display in three categories:

- Best first-time exhibitor: This category is open to anyone who is exhibiting at ReptileFest for the first time.
- People's choice: This category is open to all exhibitors and will be voted on by our visitors.
- Exhibitors' choice: This category is also open to all visitors but is voted on only by other exhibitors.

Details will be posted at ReptileFest.com. If you would like to discuss potential exhibit ideas, or just want to help out at 'Fest, email reptilefest@gmail.com

The Chicago Herpetological Society Presents



ReptileFest

The Nation's Largest Educational Reptile and Amphibian Show

April 2-3 • 10am to 5pm



ReptileFest 2005 is proudly sponsored by:



Hundreds of spectacular reptiles and amphibians
40,000 square feet of exhibits, vendors and activities

Talk with experts and vets about care and handling

Touch or hold giant snakes, tortoises and other amazing animals

Crawl with tortoises

Have your picture taken with cool critters

Enjoy fantastically fun family activities

University of Illinois-Chicago
P.E. Building
901 W. Roosevelt Rd.
(One block west of Halsted), Chicago

Adults \$8.00

Children (3-11) \$6.00

- no animals for sale -

www.ReptileFest.com
has coupons and more info

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, January 26, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Maureen Kearney**, Assistant Curator of Amphibians and Reptiles at the Field Museum of Natural History, will speak to us on “Two Difficult Problems in Herpetology: The Evolution of Worm-lizards and the Origin of Snakes.”

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum — the **Peggy Notebaert Nature Museum**. This beautiful new building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the February 11 board meeting, to be held at the North Park Village Administration Building, 5801 North Pulaski Road, Chicago. To get there take the Edens Expressway, I-94, and exit at Peterson eastbound. Go a mile east to Pulaski, turn right and go south to the first traffic light. Turn left at the light into the North Park Village complex. At the entrance is a stop sign and a guardhouse. When you come to a second stop sign, the administration building is the large building ahead and to your left. There is a free parking lot to the left and behind the building.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info call Lisa Koester, (773) 508-0034, or visit the CTC website: <http://www.geocities.com/~chicagoturtle>.

HERP OF THE MONTH

Each monthly meeting will showcase a different herp. CHS members are urged to bring one specimen of the “Herp of the Month” to be judged against the entries from other CHS members. Prizes will be awarded to the top three winners as follows: 1st place—6 raffle tickets at next meeting; 2nd place—4 raffle tickets at next meeting; 3rd place—2 raffle tickets at next meeting. Here are the categories for the coming months: January—Herps from North America; February—Geckos; March—bearded dragons.

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