The Tortoise Trust
The Jill Martin Fund for Tortoise Welfare and Conservation
(Registered Charity number 1123430)
BM Tortoise, London, WC1N 3XX

A comparative analysis of indoor housing systems for terrestrial tortoises

PART TWO

Wooden Vivarium

The Geko (Luby, China) Vivarium Tortoise Kit

www.tortoisetrust.org

Wooden vivarium with sliding glass doors

Model: The Geko 36” tortoise kit

Note: This vivarium is actually manufactured by the Shanghai Luby International, Co., Ltd in China and is sold under various other names around the world, both as a flat-pack for home assembly or as pre-assembled by the dealer. It is imported into the UK by BHA Enterprises Limited, of Stapleford Barn, Leicester, LE14 2XF and trading as “Geko Reptile Accessories” via the website www.gekozone.co.uk

The unit measures 91 cm in length, by 40 cm deep, by 45 cm high. There are two sliding glass doors measuring 45 X 26 cm at the front resting in plastic rails. There is a narrow ventilation gap at the top of the rear, measuring 88 cm long X 55 mm high. This is filled with a piece of hard plastic sheeting which has numerous small holes drilled in it.

The vivarium outfit was supplied with a 60 watt household reflector lamp for basking, a ceramic and metal fixture (more on this shortly), a 24 inch “10% UV-B” fluorescent tube and controller , a wooden “Habba Hut”, a 10 L bag of “Chipsi” brand “Extra” medium size hardwood chip substrate, an electronic temperature controller and timer marked “ATC-300A”, an unbranded, unmarked heat pad of uncertain wattage, a small water dish and what was amusingly described as an “authentic plastic plant”. A general tortoise care book “A Pet Owner’s Guide to the Tortoise” by Simon Girling was also included.

Fig. 1. The plug as fitted to the lamp fixture.

Any amusement at the “authentic” plastic vegetation was short lived as we examined the quality of the lamp housing. The quality of this is so poor, and the standard of workmanship so shoddy that we are astonished that the distributor feels able to sell it in the UK. We immediately detected some extremely serious, potentially fatal, wiring defects:

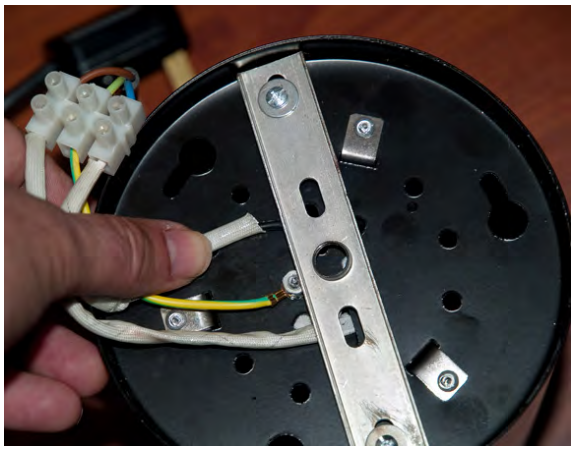
1) Despite being intended for a 60 watt lamp, a 13 AMP fuse was fitted rather than the correct 3 AMP fuse.

2) The flex clamp on the plug was not even in use, resulting in stresses potentially disconnecting the ground/earth connection within the plug.

These two faults alone would fail this product on a PAT (Portable Electrical Appliance Test). As we continued our examination, further dangerous faults were detected:

1) The lamp holder was wired with incorrect polarity, resulting in the OUTER collar of the ES-holder being “live”. The correct wiring ensures that the inner, smaller, and less accessible central terminal is live and the large outer collar is neutral.

2) The heat resistant sheathing to the terminal block was too short. This meant that single core flex carrying 230 volts was in direct contact with the metal lamp housing, which would become extremely hot in use. Furthermore, the edges of the metal were badly finished and sharp, adding to the danger that the entire lamp housing could easily become “live” (figs. 2 and 3)



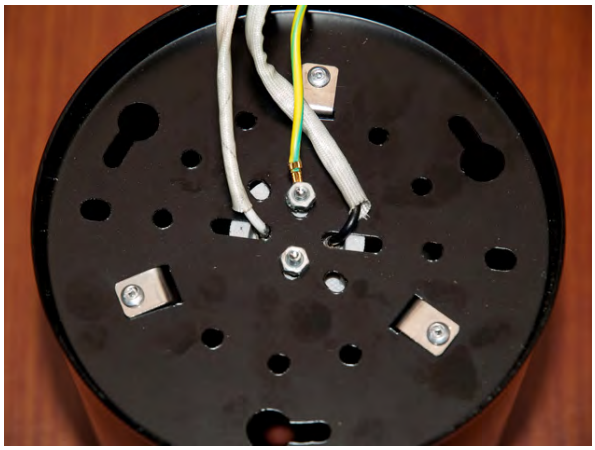
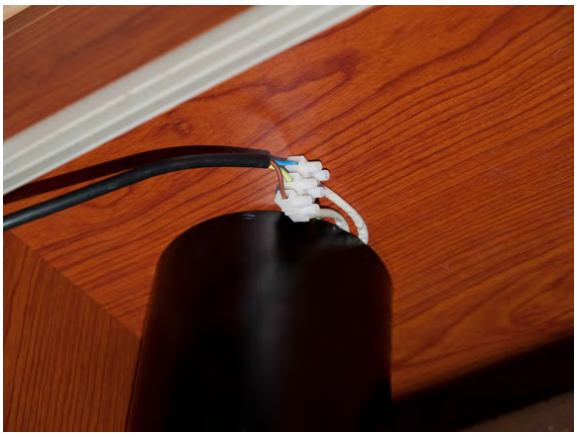


Fig. 2 and 3. The heat sheathing is too short and the cable is in direct contact with hot, sharp metal parts.



The badly translated, minimal instructions supplied with this fixture refer to “mounting surface (if it is concrete wall)” suggesting that this was never designed for vivarium use in the first place or ever designed to be mounted on a flat, flammable surface. This tended to be confirmed as we attempted to fit the holder in place. There is no safe way for the cable to exit! This is completely unacceptable (Fig 4):

Fig. 4 There is no safe flex exit on the lamp fixture. The result is potentially lethal.

We also noted that there were no instructions supplied whatsoever relating to the heat pad or any guidance on safe use. **This is a very serious omission, as unless used correctly heat pads can generate unsafe temperatures very easily.** They should never, for example, be used under deep layers of insulating substrate. Animals have been severely burned and house fires started as a result of such misuse. No such warning was included here. The heat pad also has no markings stating the voltage ranges it is intended for, or the wattage rating (Fig 5)

Fig. 5. The heat pad was supplied with zero instructions and no markings indicating rating.

It is a legal requirement to supply adequate instructions with this type of equipment:

"Where the safe use of the equipment relies upon the user being aware of any particular characteristic, suitable information or instruction booklets should be provided. The instructions should be given in English. " (Electrical Equipment Safety Regulations, 1994)

We were so appalled at the extraordinarily dangerous state of this product, and the complete lack of adequate instructions on proper installation and safe use that we have made a formal complaint to Trading Standards, who enforce the electrical safety regulations on consumer items sold within the UK.

We began the tests (after taking extra precautions against fire and electric shock) by installing the heat pad and the basking lamp at one end of the vivarium and by installing the temperature controller so that it would (hopefully) regulate the heat pad. We placed two sensors at each end of the vivarium to record both temperature and humidity. We placed a third sensor in the middle of the unit at the exact position of the temperature controller probe. A layer of the “Chipsi” hardwood substrate was spread out in the base of the unit.

We found the ATC-300A timer and temperature controller extremely difficult to set up. It relies upon a “press and hold” system to adjust the settings. It is easy to get this wrong and it is not always clear if the correct temperature has in fact been set. A simple, clear dial-type controller would be much more intuitive and safer in this critical application.

It should be noted that on-off type thermostats should not be used with incandescent lamps. If it is necessary to control the temperatures with these there are three acceptable methods 1) Increase the height of the lamp 2) Use a dimmer 3) Reduce the power (wattage) of the lamp itself.

The controller as supplied, then, is not suitable for use in controlling the temperature achieved with the main heat source. It is suitable only for use with the heat mat.

The first results we obtained revealed the temperature and humidity under the basking lamp:

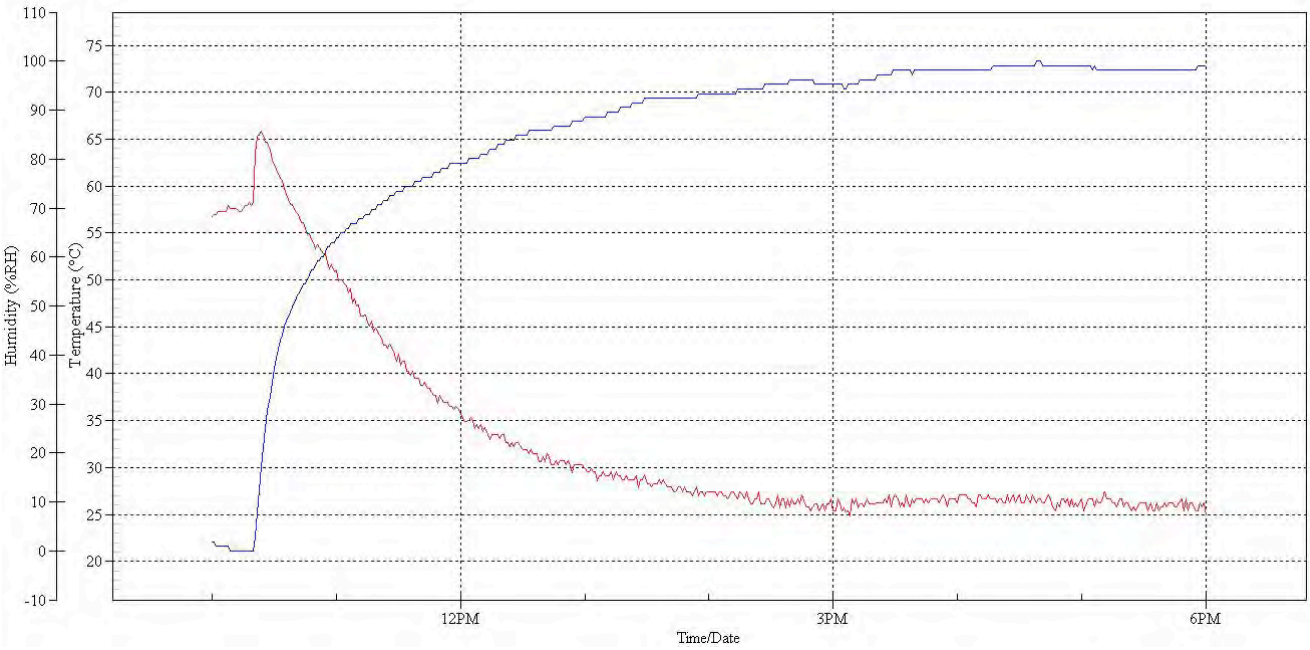


Fig. 6 *The temperature attained an astounding 73.32 ˚C (164 ˚F).*

The temperatures recorded here are the highest we have ever seen in a vivarium to date and are far above the level at which severe burns and death from overheating will occur. These temperatures are excessive in the extreme and are inherently unsafe. The maximum temperature in a tortoise vivarium should never exceed 40 ˚C for the reasons set out in detail in Part One of this comparison.

Although the lamp supplied only has a rating of 60 watts, it is positioned very close to the surface of the substrate (25 cm) and therefore produces an extreme localised ‘hot spot’ beneath it. In our opinion, if a tortoise became inverted or immobilised in that area, it would suffer fatal overheating within a few minutes.

The far (cooler) end of the unit did exhibit a significant gradient compared to the oven-like basking position, but the temperature here was still far too high (Fig. 7):

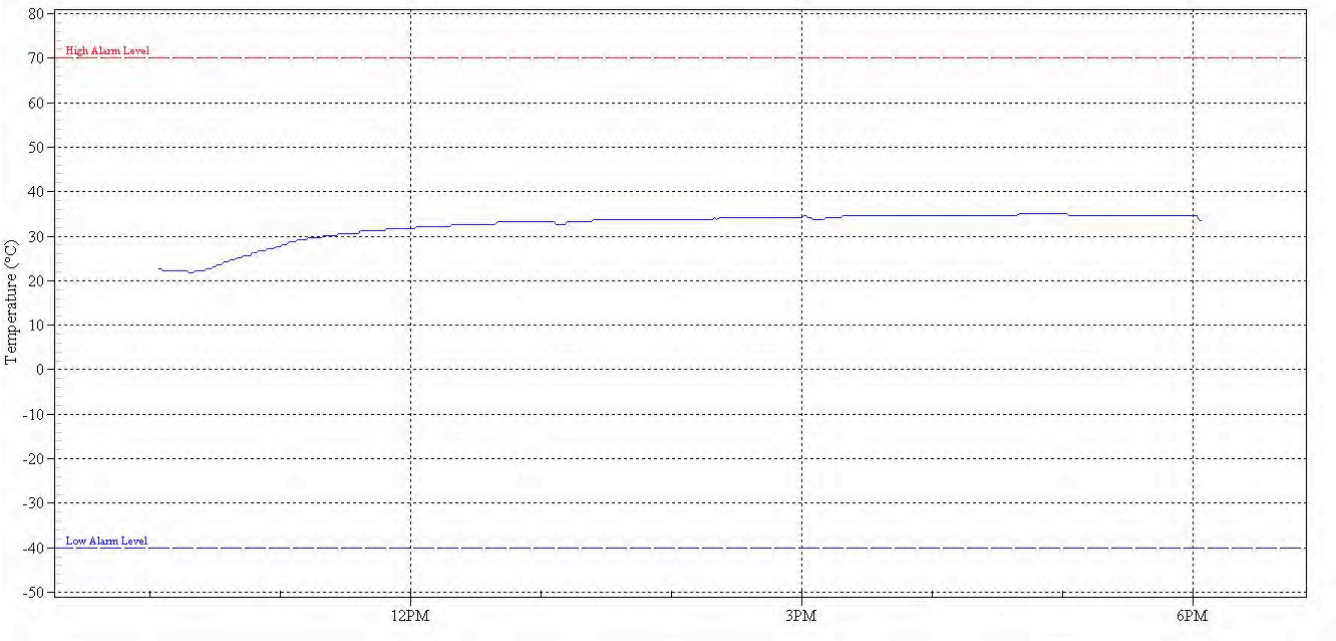


Fig. 7 The ‘cool’ end of the vivarium soon rose to over 30 ˚C, peaking at 34 C.

It is obvious that ventilation (air flow) within this vivarium is almost non-existent. The narrow grille with holes drilled is entirely inadequate. There is no lower level opening to permit active convection to occur. This is extremely poor basic design. It is essentially a sealed box apart from a very small opening at the top on the rear wall. There is no route at all for fresh, cool air to enter the lower levels of the unit. Running this vivarium is like running a convection room heater with the air inlets at the base blocked off. It overheats - and for exactly the same reason. In our opinion, it is grossly inhumane to confine any animal within housing as badly designed as this.

The next test we conducted was to establish the temperatures generated using a) The heat pad alone and b) the basking lamp alone. The first stage of this test also sought to establish the effectiveness and reliability of the supplied temperature controller. This was installed as suggested on the instruction sheet, in the centre of the vivarium, on the rear wall, just above the substrate.

At 5.45 a.m. we switched on the heat pad and placed a data logger on the surface of the substrate (Fig. 8):

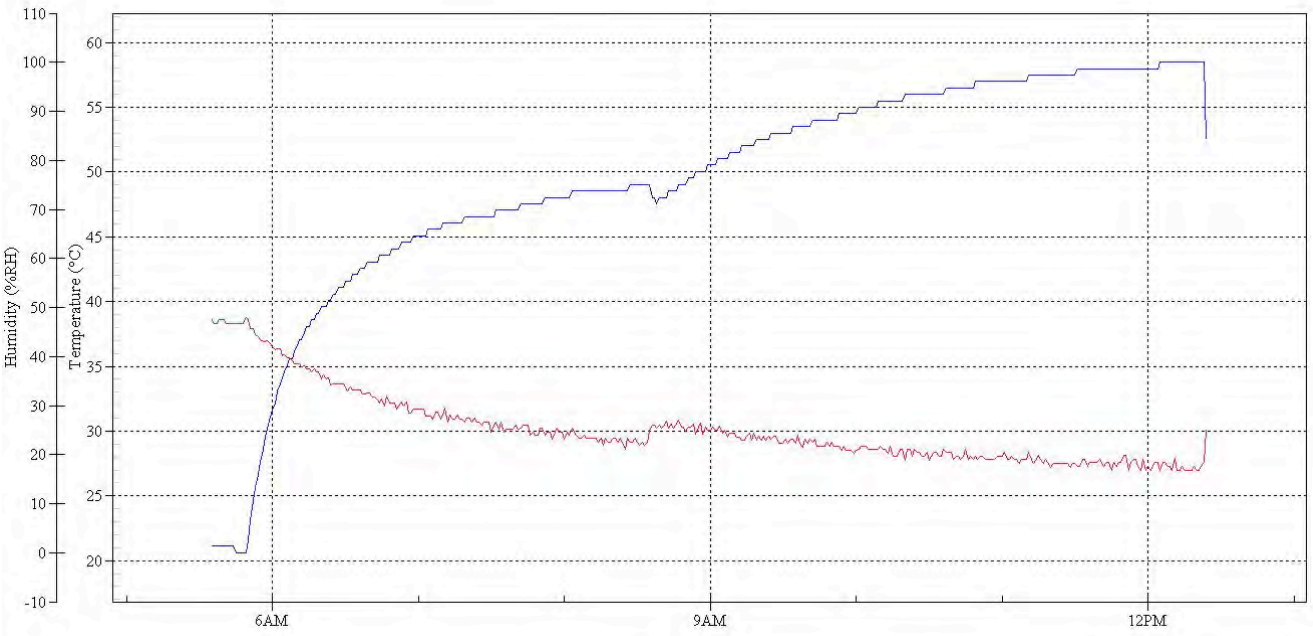


Fig. 8 Temperatures recorded using the heat pad without basking lamp.

The temperature rose rapidly to 30 ˚C by 6.00 am, and passed 50 ˚C by 9.00 am. By 12.00 p.m. a temperature in excess of 59 ˚C was recorded. These are completely unsafe and unacceptable temperatures in any tortoise accommodation. The temperature controller was set to a temperature of 30 ˚C. Unfortunately, as would be obvious to anyone who has any background whatsoever in either physics or the practicalities of vivarium operation, the remote probe of the controller is so thermally isolated from the item it is supposed to be controlling (the heat pad) that it has almost no effect whatsoever.

To control a heat pad, any thermostat sensor needs to be thermally coupled to it, or at least placed in very close proximity to it.

The second part of this test established the temperatures achieved at the basking site using just the lamp, with the heat pad disconnected (Fig 9):

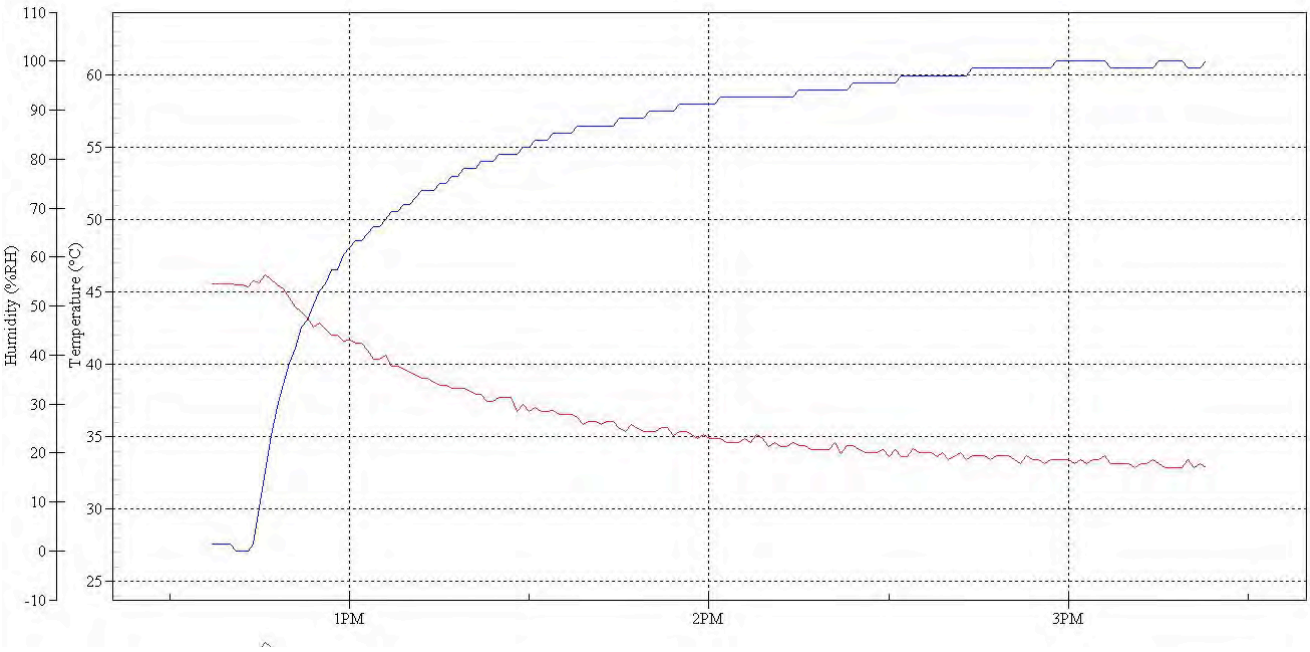


Fig. 9. Dangerously high temperatures built up quickly at the basking site.

Within 30 minutes, temperatures rose to approximately 48 ˚C, and peaked at 62 ˚C by 3.00 p.m. Humidity at the site fell from an acceptable 55% to circa 15%.

This is clear evidence that the fundamental design of this vivarium is seriously defective to the point of proving potentially lethal to any inhabitant.

1) There is insufficient convection to prevent excessive temperatures building up.
2) The basking lamp is too close to the level of the substrate.

In addition, the design and operation of the temperature controller is poorly thought out and its proper use is not adequately explained.

Our final set of temperature measurements shows the far (cool) end of the vivarium, first with the heat pad only in operation (until 1.00 p.m.) then with the basking lamp only in operation (Fig. 10):

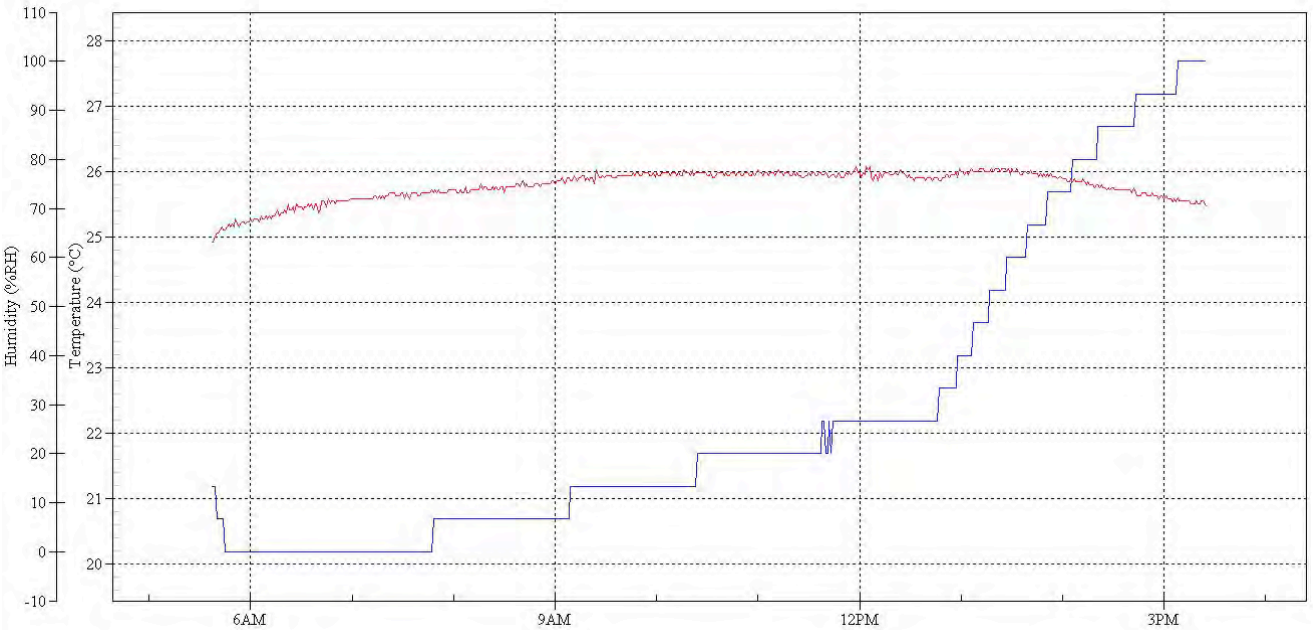


Fig. 10 The temperatures away from the basking site with different heaters

This graph reveals the minimal impact of the heat pad upon general ambient temperatures within the unit. An increase of only 2 ˚C was achieved over 6 hours. Even though the heat pad was generating local temperatures of 59 ˚C, this did not translate to a general heating effect. Only when the basking lamp was substituted at 1.00 p.m. did temperatures really begin to rise. Most of the heat generated by the heat pad is trapped by the substrate, resulting in an extremely high, very localised hot spot. The same applies to the basking lamp, though to a lesser extent. It also generates a very localised, extreme hot spot. We measured the range of this hot spot and found that it decreased from 62 ˚C to 47 ˚C at 20 cm off beam, to 39 ˚C by 25 cm, and to 30 ˚C at 40 cm.

It should be noted that these temperatures were all recorded at substrate level. A tortoise has a domed shell that is taller than this, and will therefore bring it into even closer contact with the lamp. We deemed this unit so dangerous to use that we did not at any time place a tortoise inside it to gather additional data, but simple physics dictate that it could potentially attain even higher temperatures than those noted here. It would not, of course, survive the experience.

There is a very wide range of humidity levels present within the unit. From 15% to 80%. It would be preferable if a more moderate, stable level in the 45-55% range was available throughout the majority of the habitat.

We have considerable concerns about the hardwood (Beech) substrate supplied (Chipsi Extra). This type of material, if ingested, is particularly dangerous. The bag we received was very dry and was full of extremely sharp splinters, capable of piercing human flesh. It is not something we would wish to see a tortoise maintained on. It would be especially dangerous to any male tortoise. In our opinion, use of such a substrate for tortoises may

well contravene the Animal Welfare Act (2006) in that there now exists a duty to “protect from pain, suffering, injury and disease”. **We believe that this substrate is quite obviously unsafe and that using it places the animal at serious risk of trauma injuries.**

Any wood-based substrate is also at high risk of contamination and proliferation with mould spores. It is not natural for a tortoise to live on wood chips and no such substrate will provide the micro-climate tortoises require.

The Geko vivarium was supplied with an unbranded 24” 18 watt UV-B fluorescent lamp marked T8. We are pleased to report that the starter/controller supplied was the well respected ARCADIA ARC18. This controller is well made and is fully approved in terms of electrical safety.

No instructions for fixing the tube itself or regarding its use were supplied, however. This is yet another serious omission on the part of the manufacturer/importer. At a minimum, instructions on safe and effective distances should be provided, together with advice on recommended hours of exposure and the frequency with which the tube should be changed to ensure continued effective UV-B output.

We measured the UV-B levels generated. At 30 cm we recorded 21 μW sq. cm with a UVI of 1.1. At 10 cm we recorded 95 μW sq. cm with a UVI of 8.1

The typical distance that a tortoise would find itself from the lamp in this vivarium would be from 30-35 cm where on average, an exposure of 18 μW sq. cm would be received. This is extremely low, and is almost certainly inadequate for reliable vitamin D3 synthesis. For Mediterranean tortoises we suggest a typical range of 75-200 μW sq. cm. The UV Index of 8.1 at 10 cm, however, suggests that caution should be exercised if using this tube at closer distances.

We are submitting this tube to Frances Baines of www.uvguide.co.uk for more exhaustive tests.

The surface area within the vivarium available to a tortoise is approximately 88 X 36 cm or 0.31 Sq. M (3.41 sq. feet). This is adequate for hatchlings and very small juveniles but not adequate for adults or larger juveniles.

Fig. 11 We found the “Chipsi” substrate to contain numerous hard, sharp pieces capable of causing injury.

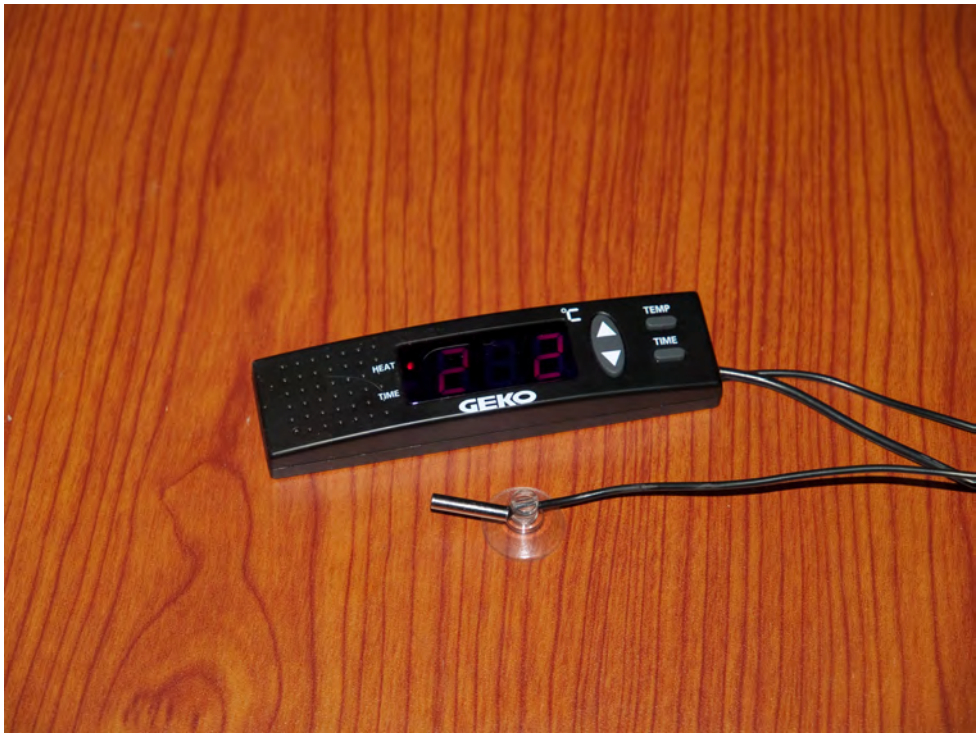


Fig. 12 The temperature controller was confusing to use and difficult to set accurately.

Fig. 12 The small ventilation grille at the rear was completely inadequate to permit effective convection cooling within the vivarium. This contributed to the severe overheating problems recorded in these tests.

Conclusions and key recommendations:

There are two immediate and major concerns with this product. Both concern safety.

•The electrical safety of the product is the worst we have ever seen. We believe that it is totally unacceptable. The failure to fit appropriate fuses, failure to use cable grips, and hot metal in direct contact with wires carrying 230 volts while lacking adequate heat sheathing is astonishing. This type of defect could result in death to the user and risk of fire.

•The very poor level of documentation supplied was also unacceptable. A product like this, supplied to its target market of beginners to reptile keeping, needs adequate, clear instructions on how to install it and how to operate it safely. The lack of such instructions with regard to the heat mat, basking lamp and UV tube were particularly worrying. Failure to get this right can result in the injury or death of a tortoise, and certainly with regard to the heat pad, a real danger of fire if overheating occurs. **It is inexcusable not to include sufficient instruction on appropriate use.**

The overall design of the vivarium also gave rise to a number of more general concerns:

- There is extremely poor airflow through this unit. This results in severe overheating occurring within a short space of time and a completely unsuitable environment for the maintenance of any tortoise.

- The extreme temperatures noted are completely unacceptable and could rapidly prove lethal. These are the highest temperatures we have ever recorded in any vivarium.

- These defects are both inherent in the fundamental, closed-box design and are likely to be common to all units of this general type and size fitted with similar lighting and heating equipment.

- The supplied temperature controller is difficult to operate and fails to control the environment adequately.

- The supplied substrate is in our opinion, not safe or appropriate for the maintenance of tortoises.

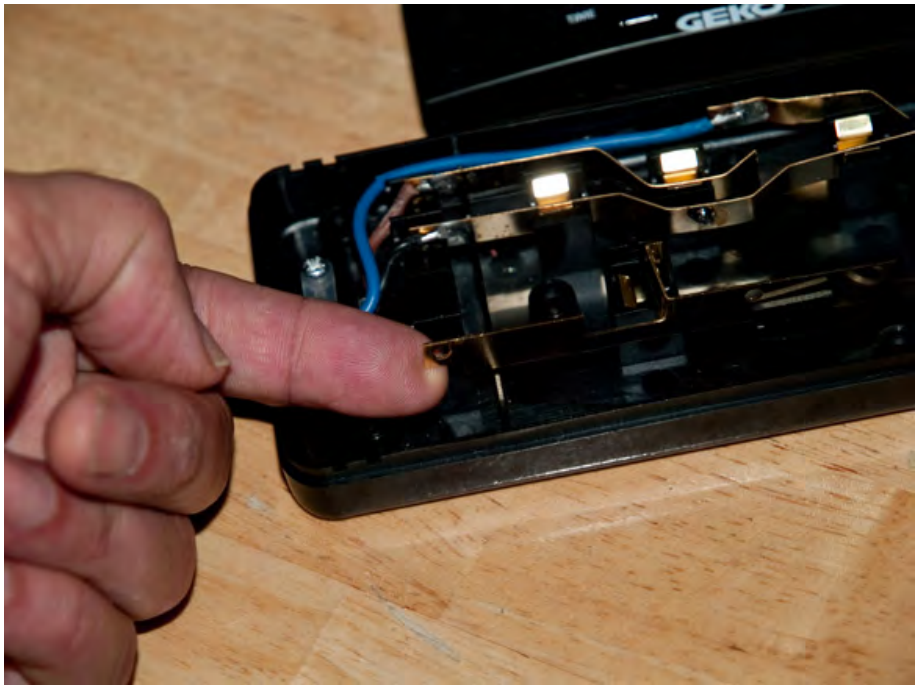
- The UV-B levels achieved are inadequate to ensure satisfactory Vitamin D production.

In our opinion, in its present state, this vivarium is completely unusable. It needs a fundamental re-design. As a minimum, the basking lamp needs to be further away from the floor, and the whole issue of airflow/ventilation/convection needs to be properly addressed.

In addition, the issue of electrical safety, quality control and inadequate instructional material also needs to be urgently reviewed.

Appendix - ATC-300A Controller unit

The ATC-300A controller was further examined and it was found that although a standard 13 Amp 3-prong twin socket was used, the **EARTH (Ground) RAIL WAS NOT CONNECTED.**



There is no warning to this effect, which would lead users to believe that they were using an earthed socket when in fact no such protection was present.

We also had concerns about a very thin, fragile piece of plastic that separated the two positive and negative live rails within the socket. If this broke, there would be an immediate 230 volt short circuit and consequent fire hazard. It is also noted that the cables within the socket are soldered (not fixed with screws) and that the whole socket assembly and the components used seem to be of very poor quality indeed. This controller is being separately retailed for use with aquariums.

The socket is marked “Sunup **EngLand**” (sic) and claims to comply with BS1363/A.

It also states “Maximum **lond** (sic) 13A”.

In our opinion, this socket is unfit for sale.