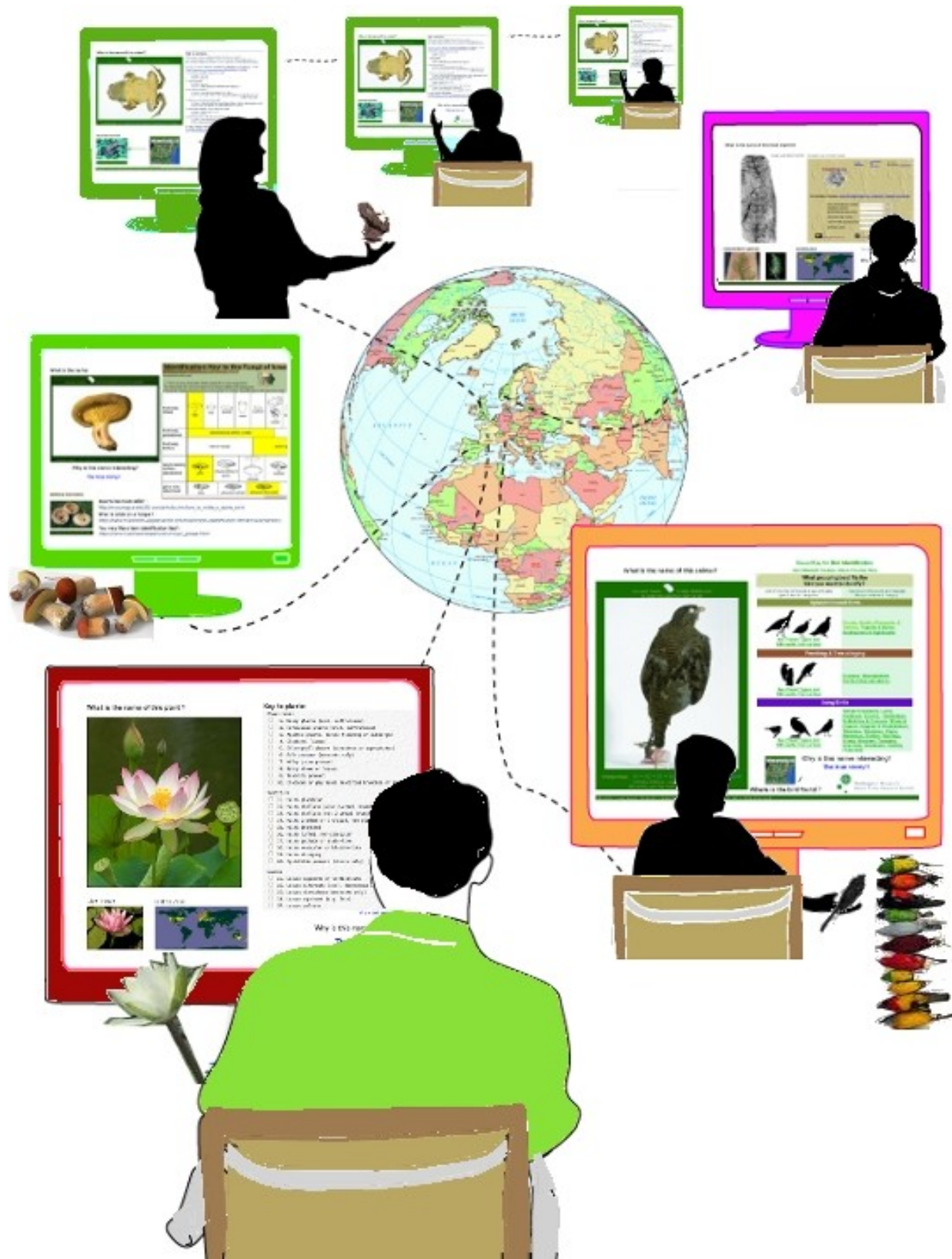


# The Taxonomic Driving Licence



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The '**Taxonomic driving license**' is an online user-friendly way to introduce more people to the satisfying feeling of deep learning taxonomy and to involve them in a structured procedure of identification. It also encourages people to examine taxonomy further and to investigate other branches of science.


Each online gaming level is made of uploaded animated images or video clips of the organisms where you'll find the identification key characters. The newcomers may choose 'cheating codes' that expose the key characters if they get stuck. Deep learning can be completed by hand-drawing the organism with the key-characters highlighted or by creating a local key yourself.

Collaborate networking with other participants who works online with the same identification improves a living learning process. Likewise, the online facility is developed collaboratively between photographers, experts, didactics and informatics experts, and several research institutions are ready to be involved.

**Step 1.** The first the newcomer meet is a motivating real life story (an appetizer that highlight aesthetic, environmental, forensic or useful information that may have created great inventions) . From here it gives access to beginner, medium or expert level of identification (step 2). Some weaker students may bypass and step to finding their own stories related to a species, draw the species or create a simple key themselves – through the small images-links in the bottom.

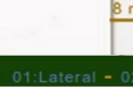
Why is this name interesting?      A real life story :-)

Use your mouse over the image to control the rotation.



Enlarge image:   01:Lateral   -   02:Dorsal   -   03:Ventral   -   Labels

**Additional information**



Animal voice: YES


How to invent moisturizing cremes and ointments?

A creepy clammy animal or is it just brilliant and cool? Certain animals have suction discs on its toes and can climb trees. But it is hot in tropical Africa where they live, so it's at least important to be adapted to drought to survive: When the animal is sweating, uric acid is secreted to the skin of the animal. Uric acid binds moisture and protects well against excessive dryness. Uric acid is abundant in moisturizing creme, and the fabricators of cream may have got their idea from this family of animals. If not, they could have got the idea for free by learning about the animal. Uric acid is an acid that protects against harmful bacteria, when they got a wound. This way - through thousands of years- these animals have adapted to drought and prevented illness; that way they have got more kids and a surplus to take good care of their kids compared to unadapted relatives that could not sweat uric acid. The unadapted extincted, if they did not adapt in another way.

If you say - these animals are creepy and has clammy feet - I'll say, they are cool survivors - without they even know how brilliant they are :-).

**What is the name of the animal?**

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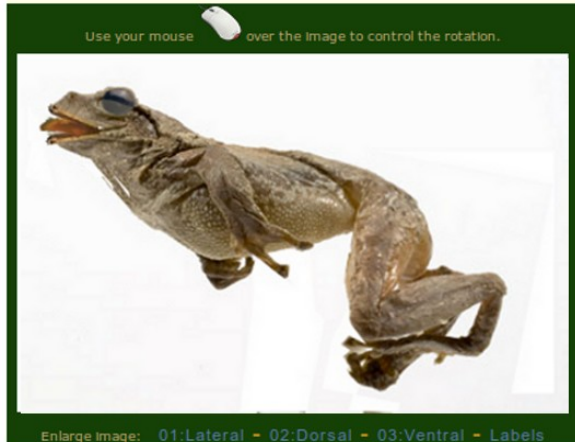
**Zoological Museum**  
Natural History Museum of Denmark



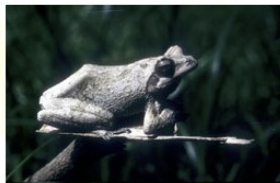
## The Taxonomic Driving Licence

**Step 2.** If the newcomer chooses the beginner level they'll find extreme easy keys. Even such 'Key to animals' (as seen in appendix 3) or 'Key to the Invertebrates' are needed among adult people. They'll fast find through these – but they'll find them highly useful especially when they need to draw the key characters from the memory afterwards. If anyone gets stuck 'Cheat-codes' are available that point to the key characters. Typical Phylum (or Subphylum) are found:

What is the name of this animal?



Additional information



To Enlarge live animal, click the image!

Animal voice: YES



Estimated African distribution:

### Key to animals:

Choose one or two options below to find your animal:

(A.) Animal with a vertebra – go to A. (Key to living vertebrates) or  
(B.) Animal without a vertebra – go to B. (Key to living invertebrates)

A. Key to classes of living vertebrates (Subphylum *Vertebrata*) – from:  
[http://www.ento.csiro.au/education/key/couplet\\_01.html](http://www.ento.csiro.au/education/key/couplet_01.html)

1. Both fins and gills present in adults

- (a) Yes – go to 2
- (b) No – go to 4

2. Jaws present

- (a) Yes – go to 3
- (b) No – Class *Agatha* (lampreys and hagfish)

3. Skeleton has bone

- (a) Yes – Class *Osteichthyes* (bony fish)
- (b) No (cartilage only) – Class *Chondrichthyes* (cartilaginous fish – sharks and rays)

4. Skin is naked, larvae have gills

- (a) Yes – Class *Amphibia* (amphibians: frogs, toads, salamanders, etc)
- (b) No (hair, feathers, or scales present) – go to 5

5. Skin has feathers, front limbs are wings

- (a) Yes – Class *Aves* (birds)
- (b) No – go to 6

6. Skin has hairs, milk glands produce milk for young

- (a) Yes – Class *Mammalia* (mammals)
- (b) No (skin has scales) – Class *Reptilia* (reptiles)

B. Key to living invertebrates:

Animals without a vertebra and commonly with endo-skeleton (like bones)  
go to: [http://www.ento.csiro.au/education/key/couplet\\_01.html](http://www.ento.csiro.au/education/key/couplet_01.html)

Why is this name interesting?

A real life story

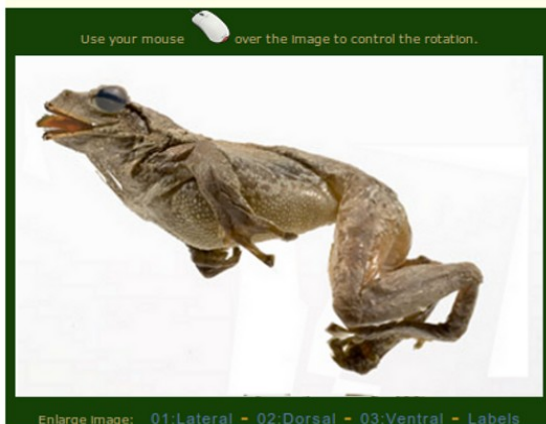


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**Step 3.** From step 2 (or 1) you'll find another easy level (typically to Subphylum or Order level). All can follow as major visible characters are used.

What is the name of this animal?



Additional information



To Enlarge live animal, click the image!

Animal voice: YES



Estimated African distribution:

### Key to Reptiles and Amphibians :

Skin with scales (larvae without gills) ----- go to 1. Reptiles  
Skin without scales (larvae have gills) ----- go to 2. Amphibians

#### 1. Reptiles:

Body with 4 legs ----- go to A.  
Body without legs ----- Snakes  
(Juveniles that are only 5-10 cm may be poisonous as their 2 m long parents. Species are highly variable in colour, hence careful identification is required to handle the poisonous ones with care.)

A. Body without a shell ----- go to B.  
Body with a shell covering 4 legs, a head and a tail ---- Turtles  
(Juveniles of some species are only a few centimeters long, while adult sea turtles can be over a meter)

B. Body with without a shell, 4 legs with claws and they have external ear openings: ----- Lizards

#### 2. Amphibians:

Longer hind legs than front legs ----- go to C.

Long-bodied, and long tailed. Their front and hind legs are about the same length, no scales, no claws, no external ear openings, moist, soft skin, ----- Caudata (Salamanders and Newts)

C. Short-bodied with long hind legs, short front legs and no tail as adults. ----- Anurans (Frogs and Toads)

Why is this name interesting?


A real life story



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**Step 4.** From step 3 (2 or 1) you'll find the medium level (typically suborder or even family level). Few from the Taxonomic Driving License gets further – and even so far (another term than 'beginner' will be chosen in the TDL. The point is to get through the beginner level in a LONG row of organisms to achieve the Taxonomic Driving License. Even sound-keys of birds and frogs may exist. Specialist levels are given in the perspective section for the Expert Certifications paper in the appendix.

Use your mouse  over the image to control the rotation.



Enlarge Image: [01:Lateral](#) - [02:Dorsal](#) - [03:Ventral](#) - [Labels](#)

Choose the description that best fits the animal of interest.

A. Pupil, no external eardrum, males have external copulatory organ ("tail"), no dorsolateral ridges :  
----- Leiopelmatidae (Tailed Frogs)

B. Vertical pupil, small external eardrum, many small warts but no large parotoid glands, one black horny 'spade' under edge of each hind foot, no dorsolateral ridges:  
----- Scaphiopodidae (Spadefoots)

C. Squat, relatively short legs, pupil never vertical, external eardrum, rough warty skin, large parotoid glands, two hard projections on each hind foot, one larger than the other, no dorsolateral ridges ----- Bufonidae (Toads)

D. Small, slim-waist, relatively long legs, pupil never vertical, external eardrum, may have enlarged toe pads, no parotoid glands, no dorsolateral ridges, no larger than 6 cm body length:  
----- Hylidae (Treefrogs)

E. Robust body, pupil never vertical, prominent external eardrum, no enlarged toe pads, no parotoid glands, well developed webs on hind feet, may have dorsolateral ridges :  
----- Ranidae (True Frogs)

 Animal voice: YES



Estimated African distribution:

## A real life storrry



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When ready a test-site will be available at: <http://scientific.dk/taxonomiclicenses>.

A collection of insect specimens, including butterflies, beetles, and other insects, displayed on a light-colored card with a grid of small white labels, mounted in a wooden frame.



## The Taxonomic Driving Licence

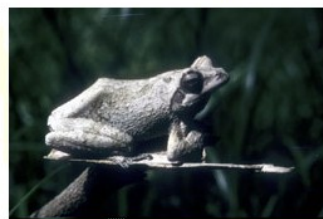
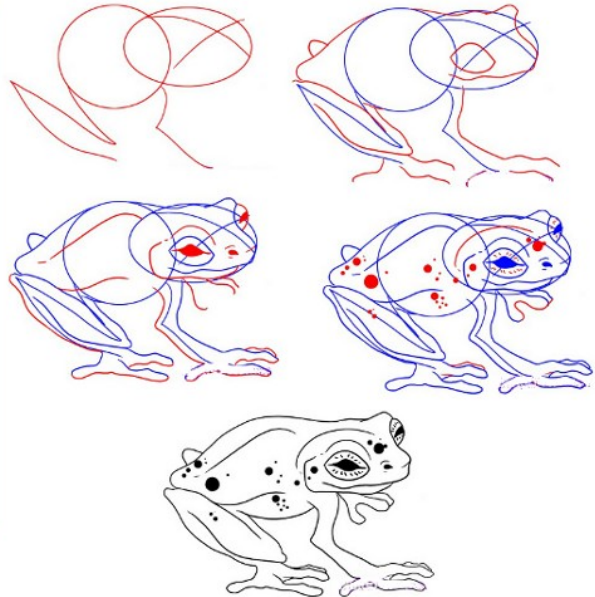
Many societies, museums, biology classrooms or private owners can provide specimens to study, and the student can easily bring organisms of their own and find related keys in the 'Taxonomic Driving License' program.

**Step 5.** To deep-learning the key characters, we have developed different facilities: Drawing typical characteristics and add the key-characters (non-bookish students that gave up may return after this step). For students that want to avoid drawing graphical manipulation on the computer is an option too.

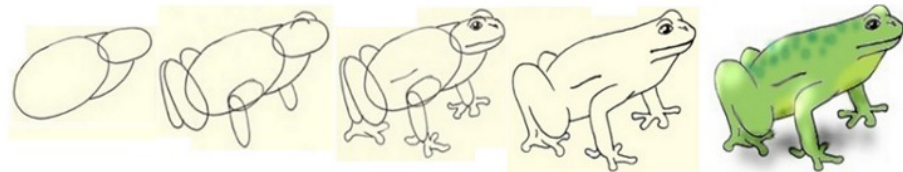
What is the name of this animal?



How to draw this animal:



To Enlarge live animal, click the image |



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## WHY introduce Taxonomic certifications?

### “Taxonomic driving-licenses”

This would be the primary level and include a certification in multiple taxa. These general certificates would be aimed for motivation at the beginning level concerning children in the age 10-16 years and taxonomist not wanting to specialize or those at the very early levels of becoming a career taxonomist.

The first certification level, could potentially start from the 10/11yrs of age where students are entering into the ISCED 2 (International Standard Classification of Education). In the 15/16yrs of age the ISCED level 3 is applicable, particularly for those students who have chosen to go deeper in biology. The development process can be followed at <http://scientific.dk/taxonomiclicenses>.

### “Expert certification”

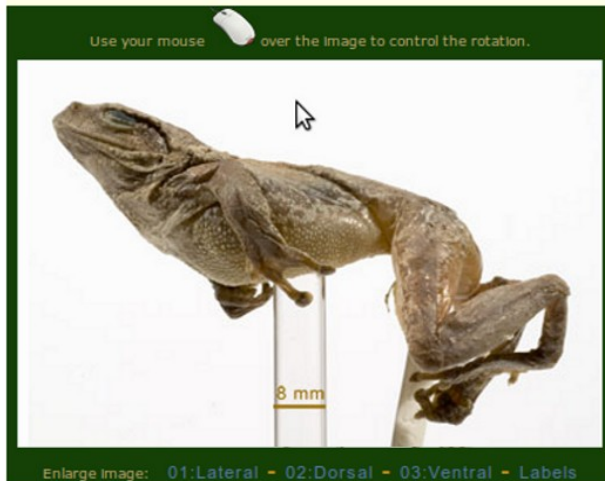
The next level will be the expert certification that is under development. It is described so far at <http://www.wikigenes.org/e/art/e/32.html>

## The Taxonomic Driving Licence

The stories are easy to translate to national languages e.g.,

A Danish version:

Hvorfor er DENNE frø interessant? En virkelig historie :-)



Additional information



To Enlarge live animal, click the image.



Estimated African distribution:

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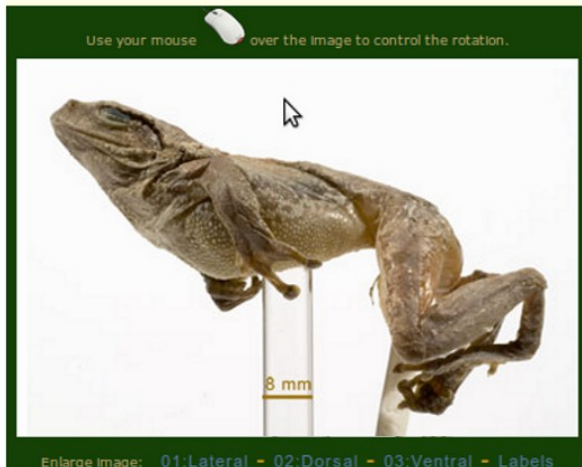
"Klam eller cool - hvad synes du ?" Denne frø har sugeskiver på sine tæer og kan derfor klatre i træer. Men det er varmt i tropisk Afrika, hvor de bor, så det er mindst ligeså vigtigt for at den kan overleve, at den er tilpasset tørke: Når frøen sveder, kommer der urinsyre ud på huden af frøen. Urinsyre binder vandet i huden og beskytter godt imod, at frøerne fortsætter med at tørre ud. Urinsyre findes i store mængder i fugtighedscreme. Om de, der har lavet cremerne har fået ideen fra denne frø, ved jeg ikke, men ellers kunne de have fået ideen helt gratis ved at lære om frøen. Urinsyre minder desuden meget om tis (urin), og det er meget surt, og det beskytter imod at farlige bakterier lever på huden og trænger igennem den. Disse frøer har således igennem tusinder af år tilpasset sig tørke og undgået sygdomme. Når de har det, har de kunne få flere unger og passet bedre på dem end de frøer af denne art, der ikke har tilpasset sig ved at svede urinsyre. Utilpassede frøer er simpelthen uddøde. Så siger du: "Disse frøer har klamme tæer" - så siger jeg "De er geniale til at leve i varme - og så ved de nok ikke engang, hvor cool de er" :-).

Hvad er navnet på dette dyr?



A Swahili version:

Why is this name interesting? A real life story :-)



Additional information



To Enlarge live animal, click the image.



Estimated African distribution:

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Hii frog ni ceepy na clammy - au ni kusiisimua, safi na "cool"? Baadhi ya vyura wana gluing discs tarehe vidole na kupanda miti. Lakini katika joto kitropiki ya Afrika Mashariki ambako wanaishi, ni muhimu ili kuepuka ukame: Wakati vyura ni kutokwa jasho, ni asidi uric secreted kutoka ngozi ya chura. Yanahusu asidi uric unyevu bora na hulinda dhidi utokaji dryness. Katika dawa na katika ulinzi wa jua, watu kutumia uric acidi. Ihakikishe watu wa unyevu cream got wazo yao kutoka familia hii ya vyura? Kama siyo, wangeweza have got wazo, kama walikuwa wameji-funza kuhusu mti hawa vyura. Asid urici i hulinda dhidi ya kudhuru bakteria, wakati vyura got kujeruhiwa. Njia hii kupitia maelfu ya miaka, familia hii ya vyura ilichukuliwa na ukame na maradhi, ina maana kwamba hawa vyura have got zaidi na zaidi na watoto na wanaweza kuchukua huduma nzuri watoto yao, ikilinganishwa na vyura, ambao kazi urici. Ya si-ilichukuliwa got no watoto, lakini wao alikufa - na kisha frog watakuwa mwingine vyura-familia. Kama wewe kusema, vyura ni creepy na ina got clammy vidole - mimi nitasema, vyura hawa ni kusiisimua na poza - na frog haina hata wao kujua jinsi ya kusimamia vizuri kitropiki ya Afrika.

What is the name of the animal?

