Excerpted from

Identification guide of Invasive Alien Species of Union concern

Support for customs and/or surveillance on the identification of IAS of Union concern

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Comments which could support improvement of this document are welcome. Please send your comments by e-mail to ENV-IAS@ec.europa.eu.

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Xenopus laevis

African clawed frog, Common clawed frog, Smooth clawed frog, Common platanna

Synonyms
Bufo laevis (Daudin, 1802),
Pipa laevis (Merrem, 1820),
Pipa bufonia (Merrem, 1820),
Xenopus boiei Wagler 1827,
Xenopus laevis laevis Parker 1936

Species ID
Kingdom: Metazoa
Phylum: Chordata
Class: Amphibia
Order: Anura
Family: Pipidae
Genus: *Xenopus*
Species: *Xenopus laevis*

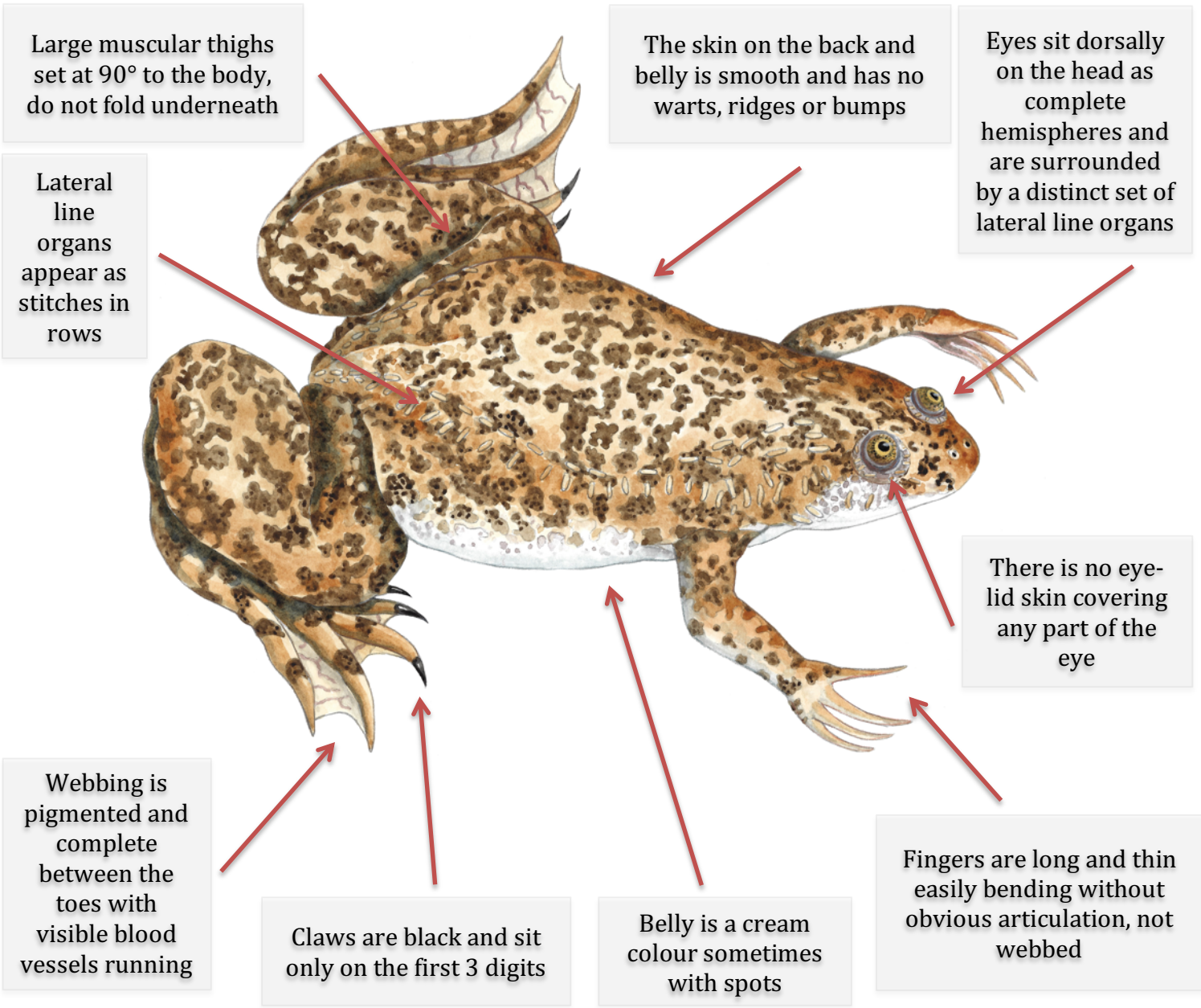
Size:

- Females are up to 13 cm from snout to vent, and their weight is up to 175 g.
- Males can reach 10 cm, and weigh up to 80 g.

General description:

The African clawed frog inhabits water at all life stages.
Adults have smooth skin ('laevis' is smooth in Greek) interrupted by lateral line organs in rows that resemble stitches. This frog looks much flatter and fatter than other frogs with muscular thighs held at 90° to the body. Large webbed feet have prominent black tips on the first three toes that are hard keratinous claws ('xeno-pus' is Greek for strange foot). Eyes are hemispherical on the top of the head (surrounded by lateral line 'stitches'), the mouth is large and slightly recessed below the nose. The back can have a number of different pattern types (or patternless) but is generally dull brown to olive in colour. The belly is always lighter, often immaculate cream, but occasionally spotted. Arms are thin and hands have long fingers that appear to bend easily without obvious articulation. Unlike other frogs, African clawed frogs are usually in water. Females are larger than males, are more rotund and have prominent cloacal labia between the hind limbs, absent in males.
Tadpoles have large heads with long tentacles coming from the lower corner of the mouth and lateral eyes. Their skin is almost transparent. Their long tails taper to a filamentous tip and they constantly swim in midwater. During development they grow from 0.4 to around 7.0 cm, with back legs appearing before the front legs.
Eggs are 1 – 1.3 mm across with white and black poles and a thin jelly layer when newly laid. As they develop the dark embryo can be seen through the jelly. Eggs are laid singly, not in strings or clumps. A non-swimming larval stage is fixed to a substrate by an oral sucker and can wriggle free into the water.

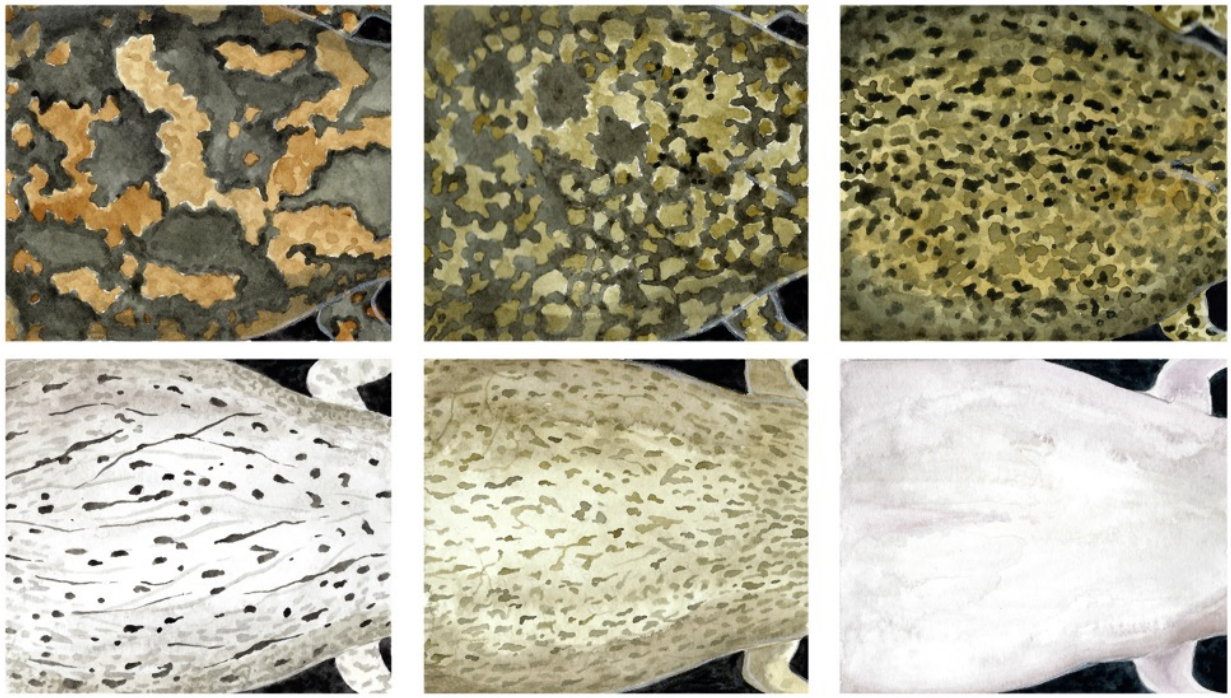
Adult distinctive characteristics



Some common patterns

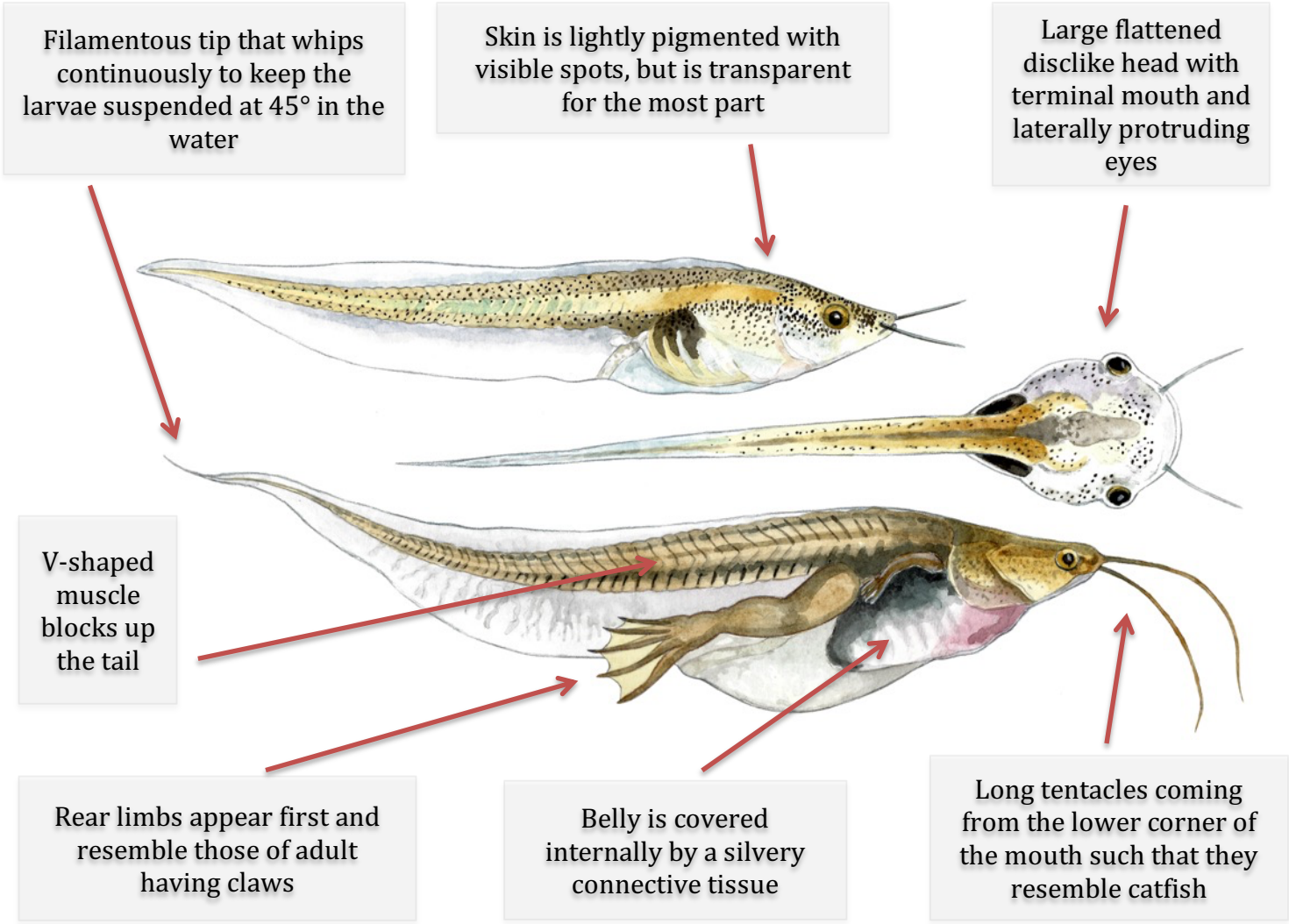
Dorsal and ventral patterns and colours vary greatly between individuals. Variation in colour ranges from nearly black, through grey to brown, and from olive and dull green. The apparent colour of individuals will change within hours with lighter colours and patterns more evident when they are left in a white container. Dorsal patterns range from large regular rosettes that can be light or dark, to immaculate individuals that appear to be patternless, with everything in between. Some patterns appear to be bi-colour while others have three or more distinct pigment groups. Together with the overall colour, patterns become more prominent on animals left in light containers. Ventrally, most animals are an immaculate cream to white. Spotted bellies are not unusual, with spots being anything from a very fine grey with poorly defined edges to clear black spots and even lines. Spots are sometimes confined to the legs or belly, but are usually across the entire ventral surface. Ventral spots often merge together to from blotches or small lines. A feature of wild caught animals is that their bellies often carry scars from movement overland or predation attempts.

Dorsal patterns



Ventral patterns

Tadpole distinctive characteristics



General description of tadpole

Tadpoles have large, flattened disclike heads with terminal mouths and laterally protruding eyes, and tails that taper to a filamentous tip that whips continuously to keep the larvae suspended in the water at 45°. Tadpoles have long tentacles coming from the lower corner of each the mouth such that they resemble catfish, while the eyes sit posterior to the tentacles. The skin is lightly pigmented with visible spots, but is transparent for the most part, with v-shaped muscle-blocks visible up the tail. The belly is covered internally by a silvery connective tissue that can be easily seen if they are inverted. All features become more prominent as the larvae grow to a large size (up to 7 cm from mouth to tail tip). Rear limbs appear first and resemble those of adult having claws. Forelimbs emerge well down the larval body in the late stages of metamorphosis. All larvae are mid-water suspension feeders and so are always in water.

General description of eggs

Eggs are laid singly or in small groups (2-5) most commonly onto hard surfaces within the water including rocks, plants and any suitable structures. They are 1 – 1.3 mm across. When newly laid they have white (below) and black (above) poles, with a thin jelly layer. As they develop the white pole disappears and the forming embryo can be seen through the jelly. Eggs are not laid in strings or clumps. Note that in the laboratory, hormone stimulated females will lay large quantities of eggs (up to 3 000) in one place but without connective jelly between eggs, and these may resemble a clump while those in the field are very scattered.
Eggs have no specific diagnostic features. DNA analysis may be needed in case of doubt.

General description of larvae

After hatching, the larvae do not swim, but have an oral sucker that is used to fix to a substrate. If disturbed, these larvae can wriggle rapidly to escape, but do not 'swim'. Development from larvae to tadpole is rapid. Four days after laying, the larvae will transform into the free-swimming tadpole described above.

Between different species of *Xenopus*, larvae have no specific diagnostic features. DNA analysis will be needed to distinguish between species within the genus *Xenopus.*

Identification in the field

Adults – distinctive characters

African clawed frogs are principally aquatic, but it is unusual to see them in the water as they often disturb the sediment of ponds turning the water muddy and turbid. On hot days, especially early mornings and evenings, adults will surface to take a gulp of air. Heads can be seen for a fraction of a second breaking the surface, and sometimes a foot as the animal quickly turns and swims to the bottom. Tadpoles also breathe at the surface, and this may attract predators such as gulls.

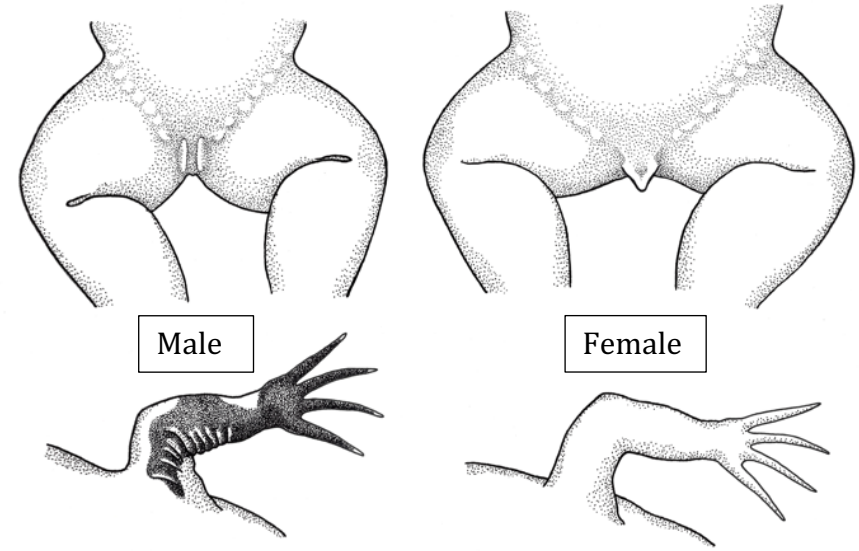
Many adults in trade are albinos, so there is the possibility of albino populations in the wild, as has happened in China.

Adults move overland during rainstorms, and appear to be skidding on their bellies with flailing legs (especially when seen crossing roads). If picked up, they are extremely slippery and will kick with the hind limbs and usually escape. If harassed sufficiently, they will exude a white slime that will froth up into a white foam in water: this is toxic to these and other animals and they may die after long periods of exposure. Animals which move overland commonly have scars on their bellies.

Tadpoles, juveniles and occasionally adults can be caught when dip netting or seining in small water bodies. Because adults are moving around under water, they may become trapped if you are using minnow traps, fyke nets or other submerged traps for newts, fish or turtles. They will also float to the surface if using electrofishing equipment. If trapped with other species of their own size or smaller, they will attempt to eat all other species. If they are trapped without any access to air, they will drown. None of these techniques is sufficient to prove absence of African clawed frogs at any site, for which the best advice is to use environmental DNA (eDNA) in relevant water bodies.

Sexual differentiation
Females are larger than males and up to 13 cm from snout to vent. Females are fat and usually gravid with eggs. Between the hind limbs, females have prominent cloacal labia that are prominent and easily seen from above. These become pinkish-red when they are ready to lay eggs.

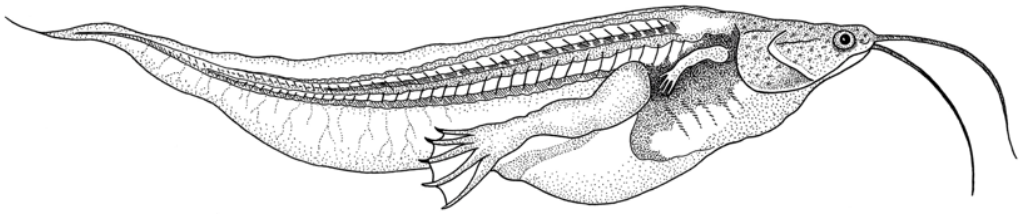
Males are smaller, but can reach 10 cm. Males have parallel sides and lack cloacal labia so that no protuberance can be seen between the hind limbs. When sexually active, males have thicker arms with dark keratinized 'gloves' on the inner surface which are tacky to touch. When males and females are from the same cohort, males are around 2/3 the size of females, and look thinner. When ages and sizes are mixed, this difference is not obvious.



Calling
Adults call underwater and are usually not heard. When calling, the calls sound like a very quiet metallic buzz that modulates, appearing to come and go, emanating from the water. Males will sometimes call when kept in a bucket. It is unlikely to be confused with the call of any other European frog.

Tadpoles
In the field, tadpoles can be seen in schools in open water. Generally, they all face the same direction and hang in the same 45° orientation. They filter phytoplankton from the open water and do not graze substrates like other European tadpoles. Schools rapidly disband when disturbed, and individuals can swim rapidly in all directions. Individuals have prominent tentacles which make them distinct from all other European tadpoles. But some people confuse them with catfish. They have large, flat, disclike heads, with large terminal mouths that lack dentition (unlike European tadpoles which have rows of teeth for grazing) and long tails that taper into a filamentous flicking tip. This is unlike most other European tadpoles that either have rounded tails or tails that do not taper. If removed from the water, the skin is lightly pigmented, but they appear mostly transparent, unlike European tadpoles

which are black or brown. The tail has a deep fin which appears to rise out of the body just behind the head, and extends below the body forward of the vent (when viewed from the side). The tail is nearly three times the length of the body. All features become more prominent as the larvae grow to a large size (7 cm from mouth to tail tip). Rear limbs appear first and resemble those of adult having claws. Forelimbs emerge well down the larval body in the late stages of metamorphosis. African clawed frogs metamorphose at 1 to 1.5 cm from tadpoles whose bodies are 25% larger.



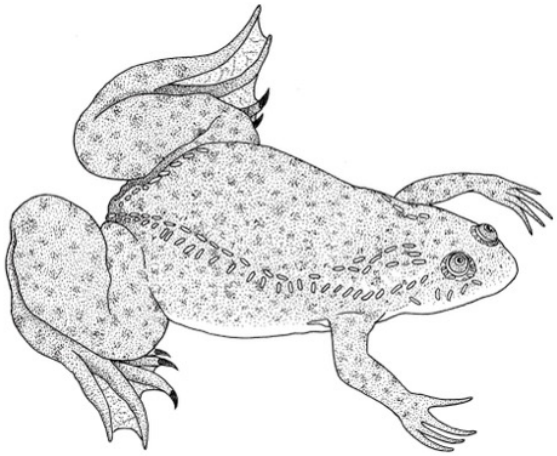
Other species of *Xenopus* have very similar tadpoles that cannot be easily distinguished to species level. DNA analysis may be needed in case of any doubt between tadpoles of different species within the genus *Xenopus*.

Eggs

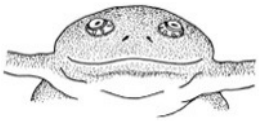
Eggs are laid singly or in small groups (2-5) most commonly onto hard surfaces within the water including rocks, plants and any suitable structures. They are 1 – 1.3 mm across. Eggs are not laid in strings or clumps, unlike other European toads and frogs. Eggs are laid when the water temperature is above 20° C, and so are typically in Europe from May to September. Large females can lay up to 3 000 eggs and so when they are present, they are numerous and may be stuck all over appropriate substrates within the water.

Some newts also lay eggs singly, and these could be confused. Single newt eggs tend to be wrapped within folded leaves. Inspection of the developing embryo inside might resolve any doubt. Otherwise, DNA analysis may be needed if doubt persists.

Infield similar species - *Adults*



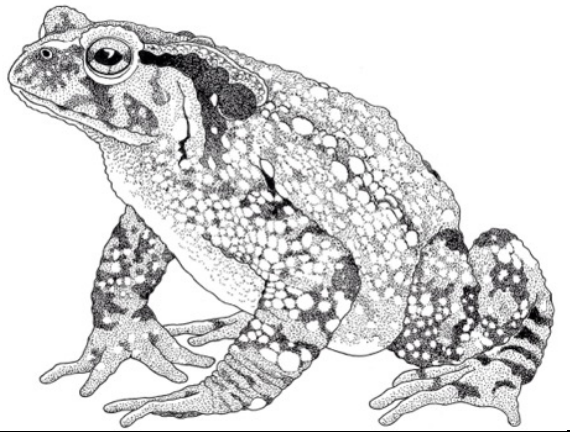
African clawed frog (*Xenopus laevis*)

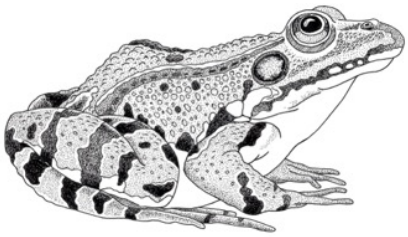


- Smooth skin
- Eyes on top of head without lids
- Do not fold limbs under body, but rest on belly
- Can jump but land on belly

European Toads (e.g. *Bufo bufo*)

- Warty skin
- Eyes with prominent lid
- Sit up propped by forelimbs
- Tend to walk with occasional hop



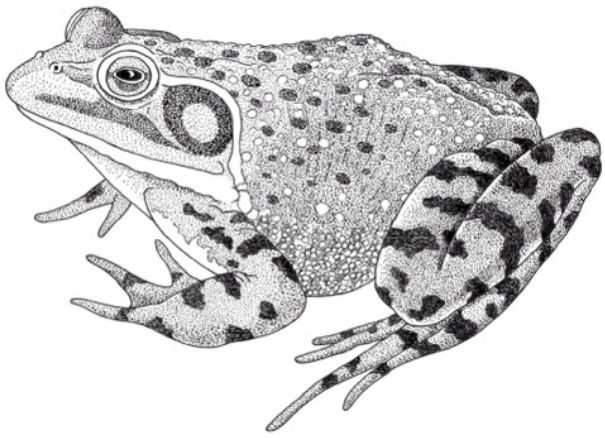


European Frogs (e.g. *Pelophylax* sp.)

- Bumpy ridged skin
- Eyes with prominent lids
- Sit down with head elevated
- Jump big distances

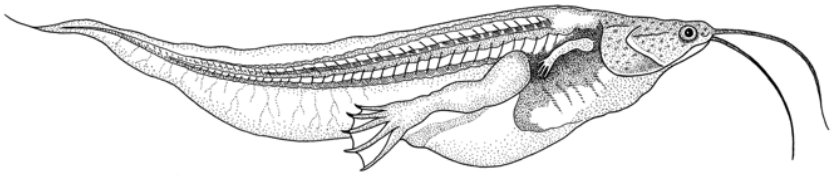
American bullfrogs
(*Lithobates catesbeianus*)

- Bumpy ridged skin
- Eyes with prominent lids
- A prominent tympanum behind the eye
- Sit down with head elevated
- Jump big distances



Infield similar species - *Tadpoles*

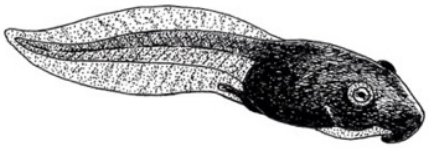
African clawed frog (*Xenopus laevis*)



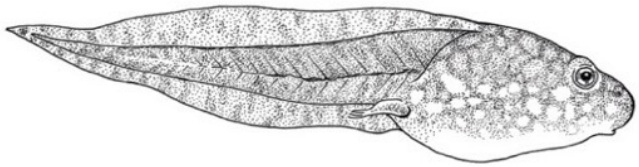
- Tadpoles are usually in schools
- Mid-water suspension feeders
- Have long tentacles
- Nearly transparent

European Toads (e.g. *Bufo bufo*)

- Tadpoles are generally black
- Tails are short
- Often occur together in large numbers
- Form masses on bottom and around vegetation at the water's edge



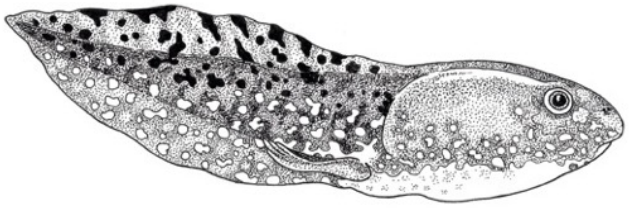
European Frogs (e.g. *Pelophylax* sp.)



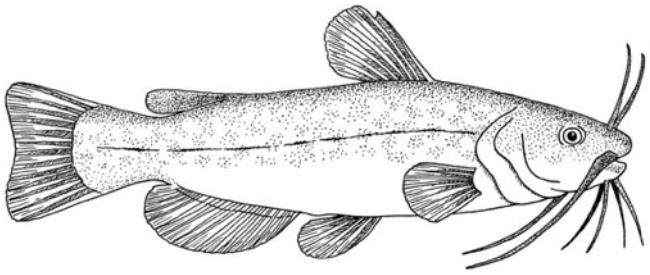
- Tadpoles are generally brown
- Tails are longer
- Often solitary and on bottom of pond

American bullfrogs (*Lithobates catesbeianus*)

- Are well pigmented with green brown above and cream below
- Reach a very large size (13 cm)
- Have mottled tails



Catfish (*Ameilurus* sp.)



- Have multiple tentacles and barbs
- Have prominent caudal fin
- Swim on the bottom of the water body

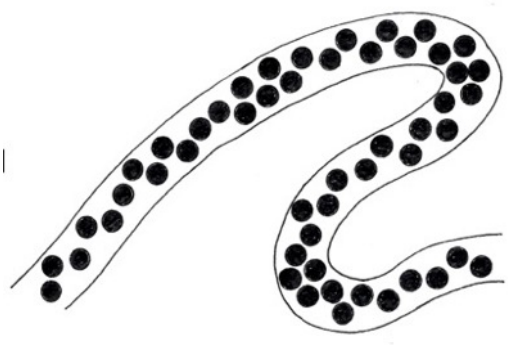
Infield similar species - *Eggs*

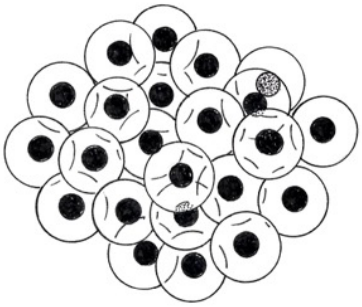
African clawed frog (*Xenopus laevis*)

- Eggs laid singly, sometimes 2-3
- Often attached to hard surfaces
- Jelly swells to twice diameter of egg

European Toads (e.g. *Bufo bufo*)

- Eggs laid in strings
- Black in appearance



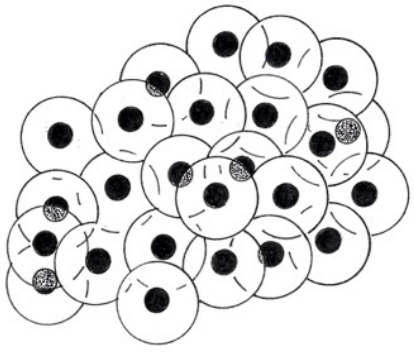


European Frogs (e.g. *Pelophylax* sp.)

- Eggs laid in large mass with jelly greater than egg size
- Egg mass often extends out of water

American bullfrogs (*Lithobates catesbeianus*)

- Spawn in large jelly mass
- Egg mass often extends out of water



Identification in trade

Adult – distinctive characteristics

African clawed frogs are almost always packed as aquarium fish in large plastic bags in water. Invasive populations are on four continents, and are sometimes traded as wild caught animals. Many animals traded are of Chinese origin and are albino. There are also many intermediate forms that look albino but with similar dorsal patterns to wild-type African clawed frogs. Shipments sometimes include individuals dyed with food colouring so that they appear blue, red and yellow. Most animals coming out of China are juveniles (2-3 cm). Juveniles look like miniature adults, but lack characters that differentiate the sexes. African clawed frogs metamorphose at 1 to 1.5 cm from tadpoles whose bodies are 25% larger.

Tadpoles – distinctive characteristics

It is unlikely that tadpoles would be shipped or traded as they are quite fragile and easily succumb to mechanical movements such as water movement. Tadpoles can be superficially confused with catfish, as they swim constantly and have tentacles from the corners of their mouths. But their skin is nearly transparent and larger individuals (> 5 cm) have legs emerging before the tails.

Other species of *Xenopus* have very similar tadpoles that cannot be easily distinguished to species level. DNA analysis may be needed in case of any doubt between tadpoles of different species within the genus *Xenopus*.

Eggs – distinctive characteristics

As hormone stimulated females will lay large quantities of eggs (up to 3 000) in one place, these can be shipped in vials and look like rather non-descript eggs in jelly coats. If there is cause for doubt, DNA analysis may be needed to differentiate between other amphibians.

Colour variants and albinos

Albinos and coloured animals are equally relevant for border control as they fall under the same regulations as wild-type individuals of African clawed frogs.

Similar species in trade

Although, many species of frogs occur in the pet trade, here we are only considering species within the same taxonomic family: Pipidae. All frogs in this family are tongueless, and have flattened bodies with hind legs that do not fold under the body.

There are 29 species of clawed frog (genus *Xenopus*), all from sub-Saharan Africa. The other commonly traded species is the tropical clawed frog (*X. tropicalis*) which is much smaller (4 cm) and has an extra claw on its foot (4 claws). None of the other clawed frog (*Xenopus*) species are regularly traded, although some have been seen in the past and may still be potentially moved. Müller's clawed frog (*X. meulleri*) is slightly smaller (8 cm) than African clawed frogs (*X. laevis*) and looks thinner, with their lungs seen prominently below the skin on the back. Their most distinguishing feature is the long tentacle (nearly as long as the diameter of the eye) below the eye (subocular tubercle). Some smaller species of *Xenopus* have also been seen in the trade. Although these superficially resemble small African clawed frogs (*X. laevis*), they often have orange bellies with prominent black spots. To determine their species, it will be necessary to pass them onto a taxonomist.

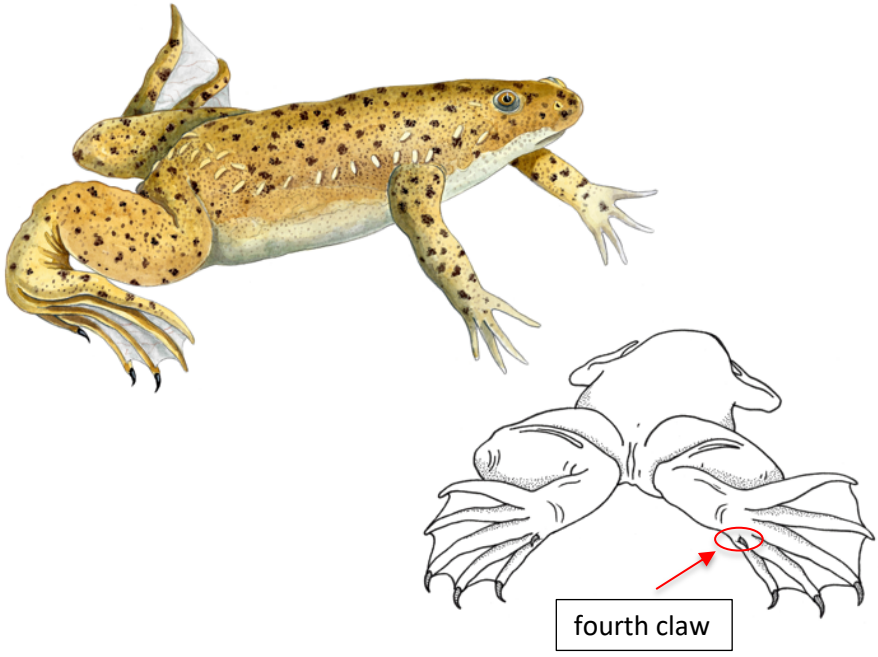
Other species of pipids (same family: Pipidae) are traded, such as the Subana Surinam frog (*Pipa parva*) from South America, and the Zaire dwarf clawed frog (*Hymenochirus boettgeri*) from Africa. Both species have a similar body plan to that of the African clawed frogs, but their eyes appear more lateral on their heads, unlike African clawed frogs where the eyes sit on top of their heads. The Zaire dwarf clawed frog has claws, but with rough skin (compared to the smooth skin of African clawed frogs) and webbing between the fingers of the forelimbs as well as between the toes of the feet. The Subana Surinam frog and several other species of the Genus *Pipa* from South America that may also be traded have a rough skin, have fingers of the forelimbs that end in stars, and lack claws on the toes of the hind limbs.

Most commercial shipments of African clawed frogs are of juveniles (1 to 5 cm) which means that size is not a good predictor of identification.

Zaire dwarf clawed frog (*Hymenochirus boettgeri*)

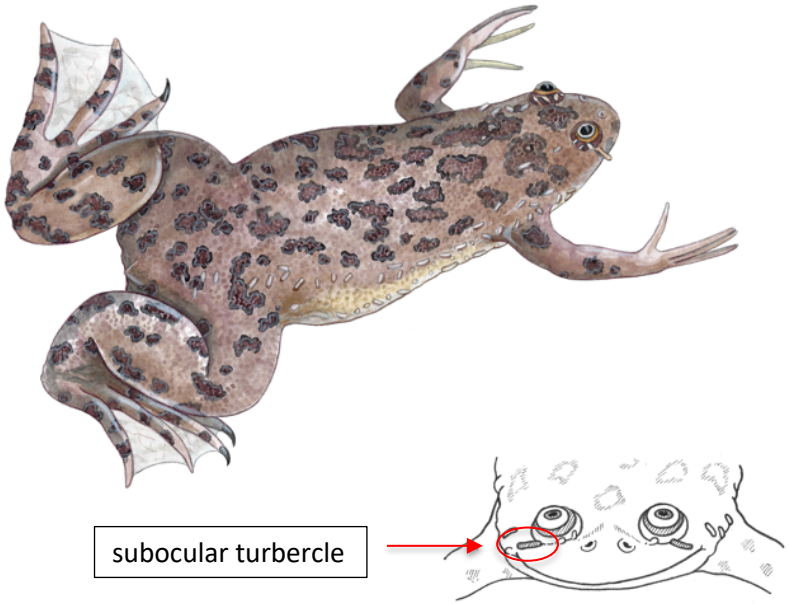
- Size: 3.5 cm
- Webbed fingers
- Rough skin
- Eyes lateral to the head
- Spotted pattern
- Pointed head

Tropical clawed frog (*Xenopus tropicalis*)



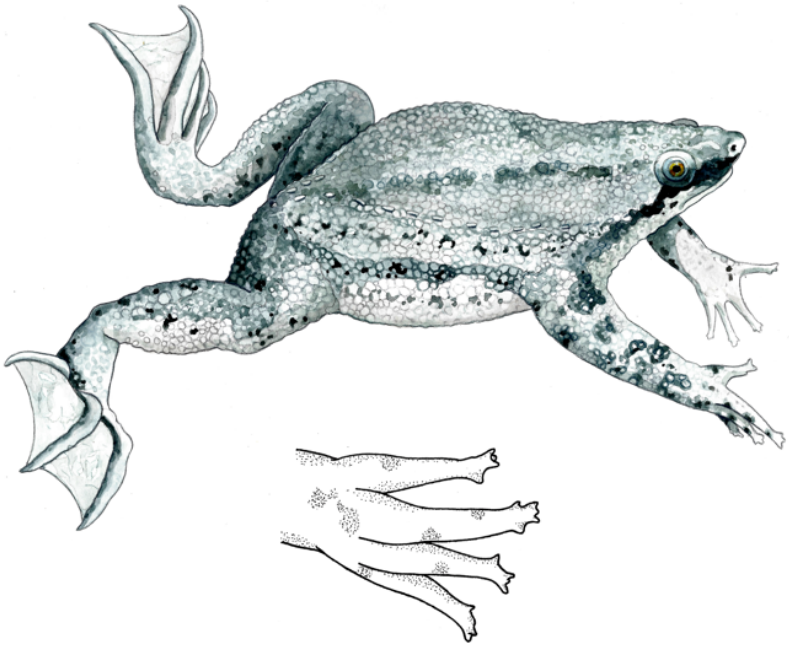
- Size: 5 cm
- An extra fourth claw on the inner side of the hind feet
- Tentacle below the eye is visible
- Skin has a granular quality

Müller's clawed frog (*Xenopus muelleri*)



- Size: 6 cm
- Has a long subocular turbercle that is nearly the same length as the diameter of the eye
- Longer limbs
- Overall flatter

Subana Surinam frog (*Pipa parva*)



- Size: 4 cm
- Lacks claws on hind feet
- Fingers end in stars
- Skin rough

Common names

BG	Африканска ноктеста жаба
HR	Afrička pandžašica
CS	drápatka vodní
DA	Afrikansk sporefrø
NL	Afrikaanse Klauwkikker
EN	African clawed frog
ET	aafrika küüniskonn
FI	afrikankynsisammakko
FR	Xénope lisse
DE	Glatter Krallenfrosch
EL	Αφρικανικός βάτραχος
HU	Dél-afrikai karmosbéka

GA	frog crúbach Afracach
IT	Xenopo liscio
LV	Āfrikas gludā piešvarde
LT	lygioji naguotė
MT	Il-platanna
PL	Żaba szponiasta
PT	rã-de-unhas-africana
RO	Broasca cu gheare africană
SK	pazúrnatka vodná
SL	navadna krempljarka
ES	Rana de uñas africana
SV	afrikansk klogroda

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