SAFEGUARD OF A SPADEFOOT TOAD (Pelobates fuscus) POPULATION: A FRENCH EXPERIENCE

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SAFEGUARD OF A SPADEFOOT TOAD (*Pelobates fuscus*) POPULATION: A FRENCH EXPERIENCE.

Christophe Eggert & Robert Guyetant

SUMMARY

One of the last French population of spadefoot toad (*Pelobates fuscus*) was studied during four years. About 489 different adults (188 females, 301 males) were caught and marked with transponders. Implantable transmitters and fluorescent pigments were used in various toads to test microhabitats preferences. Areas without or with low sized vegetation were mostly used. New ponds of various structures were created and almost immediately colonised by toads. Ages of individual were estimated using skeletochronological methods. Population viability will be modelled under various planned management actions.

Key words: spadefoot toad, *Pelobates fuscus*, age, population dynamic, habitat, radiotelemetry

RIASSUNTO

Una delle ultime popolazione francesi di rospo della vanga (*Pelobates fuscus*) è stata studiata per 4 anni. Circa 489 differenti adulti (188 femmine e 301 maschi) sono stati catturati e marcati con transponders. Con l'impianto di transmittenti e luso di coloranti fluorescenti sono state testate in vari rospi le preferenze di microhabitat. Le aree senza o con bassa densità di vegetazione sono le più usate. Nuovi stagni di diversa struttura sono stati creati e quasi immediatamente colonizzati dai rospi. L'età degli individui è stata stimata con metodi scheletrocronologici.

INTRODUCTION

The spadefoot toad (*Pelobates fuscus*) is a secretive nocturnal fossorial species living in friable sandy soils (Nöllert, 1990). Populations are declining in major part of their distribution area (Nöllert, 1997, Kuzmin, 1999), and the species is one of the most endangered amphibians in France, suffering a recent strong regression (Lescure, 1984; Parent, 1985; Dubois, 1998). Current French populations are localised in North-eastern region (Lacoste & Durer, 1999). Since 1986 (Dubois, 1998) the isolated population in Central France was endangered (pers. obs.). Mainly because of his very secretive behaviour (nocturnal activity, weak under water breeding call, cryptic coloration.) spadefoot toad population biology is not well documented. Protective measures sometime failed to produce expected results (König, 1992, Bitz, pers. comm.) and therefore further knowledge of toads ecology is essential to improve protective measures efficiency.

In Lorraine region a remnant isolated population was rediscovered in 1985 some kilometres far from a previously known spadefoot toad frequented area (Vanderhaege, 1979). This population living in a 350 hectares protected area, mainly under high voltage lines and breeding in four close ponds, was examined since 1996 to plan effective conservation measurements.

Here we present age structure changes and some of the most useful results concerning terrestrial habitat use and pond management.

MATERIALS AND METHODS

Individuals were caught mainly during breeding migration using drift fences and pitfall traps and marked with transponders (photo 1). The third toe of the right forelimb was removed and utilised for genetical and skeletochronological (age estimation) analysis (see Eggert & Guyétant, 1999). Terrestrial habitat uses were observed using radiotelemetry (implantable transmitters) and fluorescent powder (see Eggert et al., 1999 for technical procedures). Terrestrial habitats availability was estimated by random sampling (Eggert, *submitted*) in the frequented area.

New 250 m^2 breeding sites were created: two in 1997 and two other in 1998. Bentonite liner was used to secure water in one of those and plastic liner in the others. Ponds excavations were performed in selected places in order to increase the numerosity of the population within the protected area.

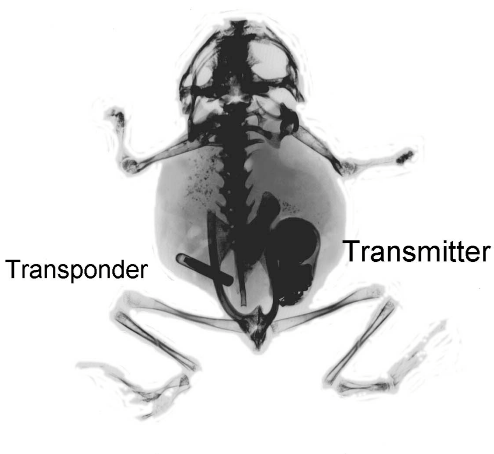

Photo 1
Radiography of a toad showing the transponder and an implantable transmitter. Radiographie d'un pélobate montrant le transpondeur et l'émetteur implantable.

RESULTS

During the four years of the study about 489 distinct adults (188 females, 301 males) were caught. Breeding population age structures reveal that males average age increase during the study (Tab. 1). This is mainly the effect of an over-representation of two age classes observed since 1996 (see Eggert & Guyétant, 1999).

Tab. 1.
Mean age estimation of adults spadefoot toads entering in breeding ponds.
Estimation des ages moyens des adultes fréquentant les mares de reproduction.

Year	Age range, Mean age (SD, N) Males	Females
1996	2-7, 2.83 (0.84, N=18)	2-10, 5.00 (1.70, N=26)
1997	2-6, 3.25 (1.01, N=89)	2-11, 4.14 (1.71, N=56)
1998	2-7, 3.93 (0.96, N=76)	2-12, 4.64 (1.76, N=51)
1999	2-6, 4.39 (1.08, N=59)	2-8, 4.38 (1.08, N=59)

Older individuals were estimated to reach 12 years for females and 7 years for males. Youngest adults were two years for both gender but female sexual maturity was mainly reached at three years old.

Tracking toads with fluorescent pigments and implantable transmitters reveal a strong preference for open areas, particularly with little or no vegetation (Fig. 1), e.g. place with moss, young heath or low-density grass.

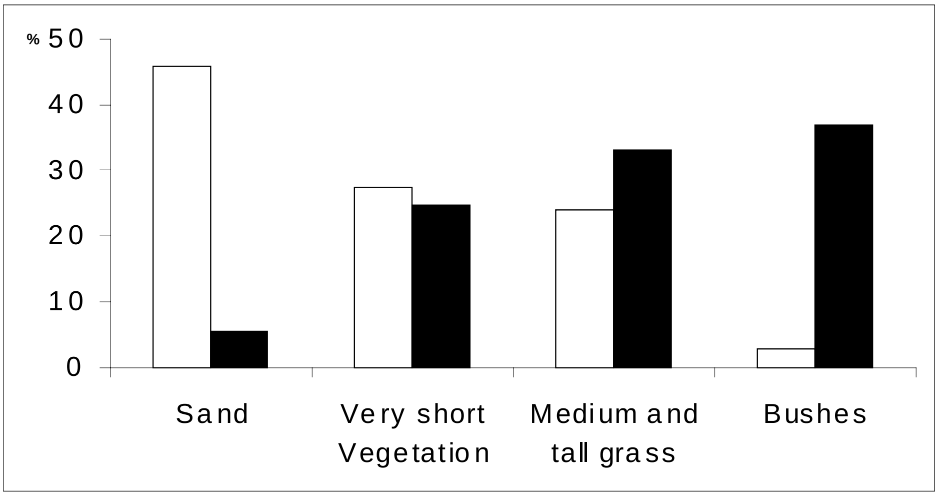

Fig.1.
Habitats availabilities (black bars) and habitats rates toad occurrence (open bars). (Adapted from Eggert, *submitted*).
Disponibilité des habitats (en noir) et fréquentation par les pelobates (en blanc). De gauche à droite: sable, végétation rase, herbes moyennes à grandes, arbustes.

Areas without vegetation were mostly used, but we always observed toad close to vegetation border. This could be due to the decline of preys away from vegetation areas.

Only a small part of the females laid eggs during breeding period (e.g. 17% in 1997), and about 3 to 5% of the eggs produce metamorphs. Toadlet size distribution greatly varied between ponds (Fig. 2).

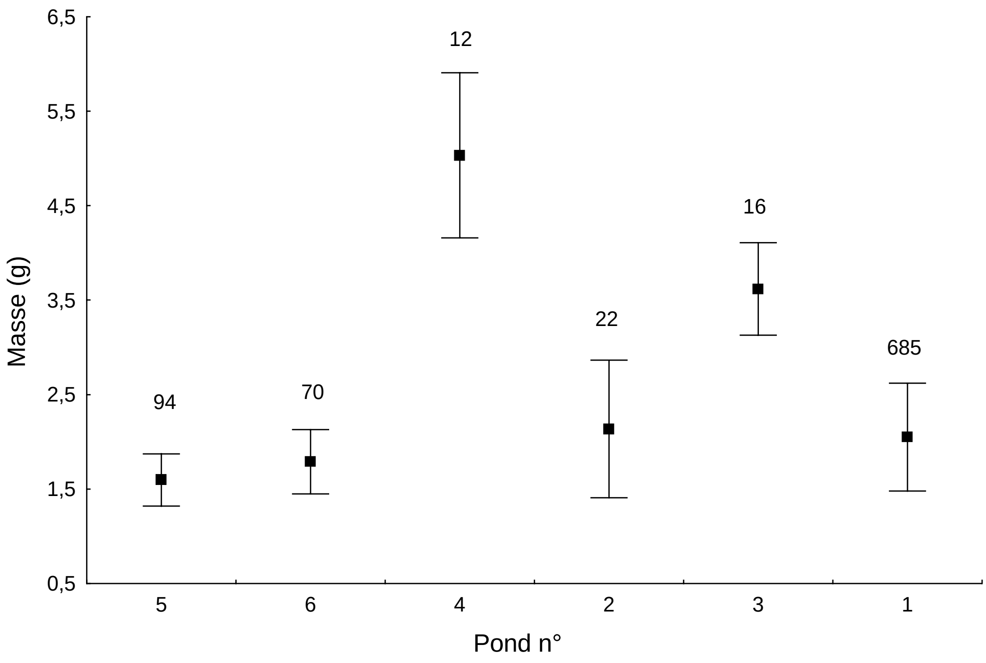

Fig. 2.
Metamorphs masse distributions in distinct ponds (mean, standard deviation). Figures are N values.
Distributions des masses de jeunes à la métamorphose suivant les mares (moyenne, écart-type).

Newly created ponds were colonised by 28.7 to 42% of the breeding males and 23.8 to 30% of the breeding females (Eggert, 2000). Ponds created close (some meters) to a known terrestrial aestivation place were colonised the first year, those situated further (about hundred meters) were colonised the second year. Ponds with bentonite liner do not retain water long enough to allow a normal larval growth.

DISCUSSION

Spadefoot toad populations are known to suffer high population size fluctuations (e.g. in Jehle *et al*., 1995, König & Diemer, 1995) mainly due to interannual variation on the number of metamorphs (Eggert & Guyétant, 1999). To decrease population extinction probability we plan to create more breeding ponds to promote a metapopulation dynamic process. Local extinction probability (due to stochastic disturbance or demographic fluctuations) still remains a great threat for the Lorraine population. Population viability is currently under analysis and modelled under various management options. Estimation by Capture-Mark-Recapture, breeding success and dispersal capacity data were use to model population dynamic.

It is well known that spadefoot toads distribution is limited by local soil texture (e.g. Nöllert, 1990, Kuzmin, 1999) and we observed that also toads avoid shrub-covered places to choose open areas. As vegetation structure naturally evolve to bushes in the study site, in the most overgrown places removal of scrub and rank grassland using mechanical techniques were performed. Attractive open areas (mechanical ground scraping) were created during winter period, when toads burrow deeper through the ground. Moreover those areas were built so to ease toads movement between ponds. As spadefoot toad show to be a poor phylopatric species, terrestrial habitat management should take into account high dispersal rate, so as to lower dispersal cost (e.g. by channelling movements in safe areas or between potential breeding sites). Now vegetation structure evolution is under observation, so as to plan further landscape management. This plan will also integrate other species (e.g. invertebrates and birds) management.

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