DATES TO STUDY THE LIFE CYCLE OF SPANISH AMPHIBIANS.

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The reason of the present notes is to contribue to the study of th life cycle, habits and ecological behaviour of some amphibians of the NE. Spanish and Baleares territory. MERTENS and MÜLLER have ranged the 35 different forms of amphibians of the Iberish and Baleares fauna in dozen genera, which have been represented by 21 species and divided into 23 subspecies. Sixteen of these species and subspecies, are endemic and properly of the dry Spain. Fourteen forms are represented in NE. of Spain (MERTENS, 1925-27) and four cited by BOSCA fron Baleares isles. The present study resumes the biological observations of 9 of these species in field, some times completed by laboratory experiments. The methods are explained in foregoing works (BALCELLS, 1954 and 1955).

Salamandra salamandra hispanica, WOLTERSTORFF, 1937, (s. MERTENS and MULLER, 1941), (=S. s. taeniata, part. DÜRINGEN, s. MERTENS, 1925-27 and ANGEL, 1946). Terra typica: Barcelona, Distrib. NE. E and S, of Spain. It lives in humidity forest. In Santa Fe del Montseny (1.000 m, s/M.), brings forth young in october 1954. In laboratory one female gave 50 tadpoles and in her oviduct there were 40 specimens in embriology period. In winter and spring in the shady rills of mountains -Coll Formic 800 m. s/M. (Montseny), on March 3 of 1954; Montnegre, 600 m. s/M., III, 17, 1952, and Vidrá, 800 m. S/M. IV, 17, 1954-, there are specimens in larval stadium, between 32 to 40 mm. long, which in laboratory gives adults in june, nourished with filamentous algas and ostracods, with 18º C., of average temperature.

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Triturus marmoratus marmoratus, LATREILLE.- Spawnig females of the marbled newt were in Balanyá (Plana de Vich, Barcelona, 300 m. s/M.) on April 10, 1954. Their head and body is 53 to 58 mm. long and the length of tail is 61 to 70 mm. The males have the tail-crest little reduced in middle June. The egg laying continued in laboratory until April 26, with 17º C of average temperature and the 8 females laid 99 eggs. The spawnig animals glue the eggs on the objects of the ground. The egg emergence takes place on the 19 th day with 17º C of average temperature. The embryo lays straight in the egg and its organic differentiation in the emergence time is less than the other ones of the Triturus cristatus (s. BOULENGER 1910 and SMITH, 1951). In this period there are few gills; the length of the white tail is 2 mm.; the yolk mass is very apparent, light green with two dark lateral bands. The dorsal part is yellow with dark stains. The total length of the youngs, collected in the rills and pools of Matagalls and Plá de la Calma (Montseny mountains, 700 m. and 800 m. s/M.) in August 1943, is 39 to 43 mm.

Alytes obstetricans boscai, LATASTE.- I must confirm (MERTENS) that the obstetricans or accousheur toad is one of the most abundant species in NE of Spain. In the gardens of Barcelona I have observed always the males with the small packet of 120 to 150 eggs in spring: April 1942, and April 27, 1953 in the University gardens, already eyed and very advanced embryos. During the day, this toad lives beneath the stones or in the little caves in the ground clay; however the spawn time takes place during many months as in the same pools, rills and time, we can observe tadpoles of 14'5 to 42'5 mm. of total length: On September 20, 1953 in Tona, (300 m. s/M. in Plana de Vich, NW of Montseny mountains); in the following year the same is observed in Gualba and Campins (SE of Montseny, 500 m. s/M. on May 2), the larves are 19 to 38 of the total length, which proced from eggs of the former tear; and in the Pirineos of Barcelona: Montgrony mountain and Castellar d'en Huch, 1.300 m. s/M. on September 12 of 1953, there are also tadpoles of 22 to 40 mm. of total length. MARGALEF collected on

July 29, 1951, on Monte Urbía, Aranzazu, (Guipuzcoa, 1.100 m. s/M.), the recent residues of an egg packet. In Sant Bartomeu of Vidrá, 1.000 m. s/M. I observed the new tadpoles in June and July.

The metamorphosis ended the following year, and the tadpoles spend the winter in the pools and rills: Sant Bartomeu of Vidrá: March 3, 1951' February 28 of 1953 and March 21 of 1954; between Figaro and Aiguafreda, (south to Montseny, 300 m. s/M.) on February 9 of 1951.

The end of the metamorphosis takes place between the end of August and October, and it is influenced by the altitude and exposition: SE Montseny: Gualba and Campins, 500 m. s/M. stage 29 of KOPSCH on August 28 of 1954. NW of Montseny: Tona, 300 m. s/M. stage 30 of KOPSCH, on September 26 and 28 of 1954. S of Pirineos Mountains: Montgrony, 1.300 m. s/M. 29 KOPSCH'S stage, on September 12 of 1953.

The temperature and noutrition possibilities influenced the development activity and the size of the adult and tadpoles however, the development is very slow, nevertheless in the last stages of metamorphosis as the 27 to 30 KOPSCH'S stages. Transported into laboratory in February 1951, and March 1953, with 17º C of average temperature, the tadpoles reached the different KOPSCH'S stages in the following times:

	Figaro-Aiguafreda	Vidrá
Dates of collection in the field.	February 9, 1951	March 8, 1953
KOPSCH'S stage of collection dats.	20 (1)	20 (1)
Date of 26 KOPSCH'S stage (2)	March 30, 1951	April 19, 1953
Date of 29 KOPSCH'S stage (3)	April 19, 1951	April 30, 1953
Date of 30 KOPSCH'S stage (4)	May 3, 1951	May 15, 1953

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(1) The total lengt in winter is 55 mm.
(2) The anterior legs appear
(3) The tadpole commences to leave the water
(4) Young and tailless adult.

The augmentation of development activityo adult stage takes place until 30º C of constant temperature and the accomplishmend of the life cycle is possible, but when the temperature amounts this value, the tadpole resistes many days, but before the death, its size decreases and exhibits a movement and anormal activity; with low temperatures, also manifests a little reduction of its size. Thi phenomenon explains the smaller size of the south specimens of this subspecies (MERTENS, 1925), which it is also influenced by the presence of accesible and organic food. The following table resumes the observations:

Localities and dates	Temperature.	Organic substance abundant in water.	Size of tadpoles: Total length	Size of tadpoles: Greatest largeness.	KOPSCH'S stage.
Vidrá 1.000m.s/M. Febraury 28,1954	Cold	Very abund.	55 mm.	11 mm.	20
Urbía, Aranzazu (Guipuzcoa,1100 m. s/M.	Cold	-	44 mm.	13 mm.	25
Vidrá, 1000 m.s/M. April-May 1953	Cold	Very abund.	53 mm.	10 mm.	26
Gualba and Campins 500 m. s/M. August 28 of 1954	Cold	Very abund.	(head and body length) 23 mm.	12 mm.	29
Montgrony and Castellar d'en Huch 1.300m.s/M. Sept. 12 of 1953.	Warmer in summer, (1)	Very poor abundance	16 mm.	8 mm.	29
Tona, 500 m. s/M. Sept.28 of 1954	Warm in summer (2)	Poor	14 mm.	7 mm.	29
"	"	"	19 mm.	9 mm.	30
Laboratory	17ºC of average temperature	-	18 mm.	8 mm.	30

(1) Sun exposition and continental climate.
(2) The climate is also very continental.

Pelodytes punctatus, DAUDIN.- I heared its breeding croaking in Santa Maria de Besora (Barcelona, 866 m. s/M.) on February 28, 1954. It croaks and spawns, near this place, in Sant Quirse de Besora, 575 m. s/M. in March 22 of 1954. PUENTE collected one female in spawnig time in Nuestra Señora de Estívaliz (Alava, 610 m. s/M.) on April 26 of 1953.

Its uppermost development temperature is 30º C, but it can to develop also with 7º C constant temperature, With 33º C, the tadpoles resistes many days. The emergence from the egg cluster takes place during the 11 little advanced KOPSCH'S stage, (=17 POLLISTER'S and MOORE'S stage), and it is anterior that of the Rana temporaria, the tail is reduced to a little pivot, and the larves fix on the inmerged objects, by the secretion of the oral sucker.

With 8º C of constant temperature, the development time until 20 POLLISTER'S and MOORE'S stage is more than 20 days. The differential time of development between 8º and 17º C of average temperature is of one month, when the tadpoles are in the 18 KOPSCH'S stage. The eggs transported into laboratory with 18 C of average temperature, the emergence took place on March 22 of 1954. The 20 KOPSCH'S stage (presence of the posterior legs) took place on April 12; the 27 KOPSCH'S stage (anterior legs) tooks place on May 31; the 30 stage on June 3. The total time between emergence from the egg cluster and water emergence in adult form, is 73 days with 18º C of temperature average.

The tadpoles depreciate the living animals as food; they prefer the macerated lettuce. The most total length of the tadpole in the laboratory was 30 mm. and 8 mm. the greatest largeness; that of the young adult 13'5 mm.. and 4'5 mm. These laboratory specimens are very short (s. ANGEL), they semm be influenced also by anormal or non natural conditions.

Hyla arborea meridionalis, BOETTGER.- I observed the last period of breeding males on April 15 of 1954, in Prat de Llobregat (near Barcelona). The tadpoles of this date were 9 mm. of total length. The spawn was in Barcelona city gardens 20 or 30 days before.

Bufo bufo spinosus, DAUDIN.- In the E parts of Montseny mountain (Gorg Negre and Breda, 300 m. to 500 m. s/M.), were observed breeding animals between April 11 and May 2 of 1954; but in January of the present year, on 23, the breedings animals could be observed also, because the temperature and the very nice weather of this year belong normally to April month. These localities have 12º C of average April temperature. In Santa Fe del Montseny, (1000 m. s/M.) the breeding time is in May. In Banyolas (prov. of Gerona), with a climate like that of Breda, eggs are collected the firts days of May and tadpoles in 24 KOPSCH'S stage, which have 22'5 mm. of total length and 6'5 mm. of greatest largeness.

Bufo viridis viridis LAURENTI (=B. v. balearica, BOTTGER).- It is very abundant in Alcudia and Pollensa (NE of Mallorca), but I have specimens of Ciutadella (Menorca) and it is also very frecuently in all isle of Ibiza (Pitiusas). In the latter place it croakes until the last days of May and in this time it lays in the pools. During the summer its life elapses in the dry ground and generaly it emerges at nigth. In May 1950, I have collected them in marsbes of Ibiza, in the pools of San Antonio, Santa Gertrudis and Salinas. In San Antonio were also tadpoles in 19 KOPSCH'S stage, between 10 and 13 mm. of total length.

Rana temporaria temporaria, L.- This frog lives in Spain only in Pirineos and Prepirineos mountains, and in foregoing works (BALCELLS, 1954 and 1955) it resumes minutely the places where it is cited in our territory.

The dates of emergence from hibernation varies with the temperature, place and year. In the high mountains it takes place after the thaw; but in Vidrá (Spanish Prepirineo) the emergence and spawn take place when the average winter temperature comes up to 4º or 5º C, and the sapwn is interrupted when the temperature comes down. The eggs laid by every female are few in those specimens which are sujected to a very short winter and their behaviour in egg and larval stages is

somewhat different and it is like the behaviour of Rana dalmatina. In laboratory, the metamorphosis may be completed in 54 and 56 days with 18 and 17º C respectively of average temperature. The temperature influences also the size of the tadpoles and young adults.

The application and calcule of parameters of the BODENHEIMER hyperbola and the value of the sum of the efective average temperatures of the months, accounts for the possibilities of the accomplishment of the annual cycle in one determined place. This product: D (T-2) May be greater than K = 845'2. This conclusion explains also the possibilities of the life cycle in the last North. The conclusions of BARTHELEMY and the study of the behaviour of the "common frog", permit us to give the 4º or 5º C January isotherm as the south limit of its distribution in the plain field of France.

Rana ridibunda perezi, SOANE.- The Spanish marsh-frog spawns in May. In the high parts of Mallorca it spawns until May 21: Santuari de Lluch, 550 m. s/M.; near the Puig Major mountain 850 m. s/M.; but the spawn has commenced before, in order that in the pools exist tadpoles until 15 or 16 KOPSCH'S stages in the same time. In Ibiza isle, the spawn is before; there was only larves and tadpoles in the salty marshes on 12 KOPSCH'S stage (= 20 of POLLISTER and MOORE), but the most advanceds were 22 stage of KOPSCH and they have 32 mm. of length.

In Barcelona the sapwn has been observed the first days of May, and the adult frogs emerge the last days of August. In Seva (Plana de Vich, 300 m. s/M.) on September 20 of 1954, were in 29 stage. In winter (February 1954 and January 1955), in Breda geant and abundant tadpoles were collected.

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