DANUBE CRESTED NEWT (*TRITURUS DOBROGICUS*)

by Dušan Jelić

Range

The species is present in two disjoint areas associated with lowland area of the Danube and its tributaries. The first area includes the basin of the Danube and its tributaries in the Pannonian plain. It extends from the east of the Czech Republic, Austria and Slovenia through Slovakia, Hungary, eastern Croatian and northern Bosnia and Herzegovina to the west of Ukraine and Romania. In the south-east it is found till the beginning of Đerdap canyon in Serbia. The second area covers also the lowland basin of the Danube, but downstream of the Đerdap canyon. It stretches across the north of Serbia, Bulgaria and Romania to the south of the Danube Delta and the extreme southeast of Ukraine and Moldova. Lowland distribution area of Danube crested newt is surrounded by hilly areas populated by other species of crested newts group (*T. cristatus, T. carnifex, T. macedonicus, T. arntzeni*). In the contact zones there are wide zones of hybridization.

Distribution in Croatia

In Croatia this species inhabits lowland areas of the Danube basin, Sava basin downstream of Velika Gorica, Drava River downstream of Varaždin and lowland area of the eastern Croatia between the lower stretches of rivers Drava and Sava. In central Croatia it constitutes a hybrid zone with the Italian crested newt. Hybrids are known from Turopolje, Odransko polje, Žutica, Lonjsko polje etc.

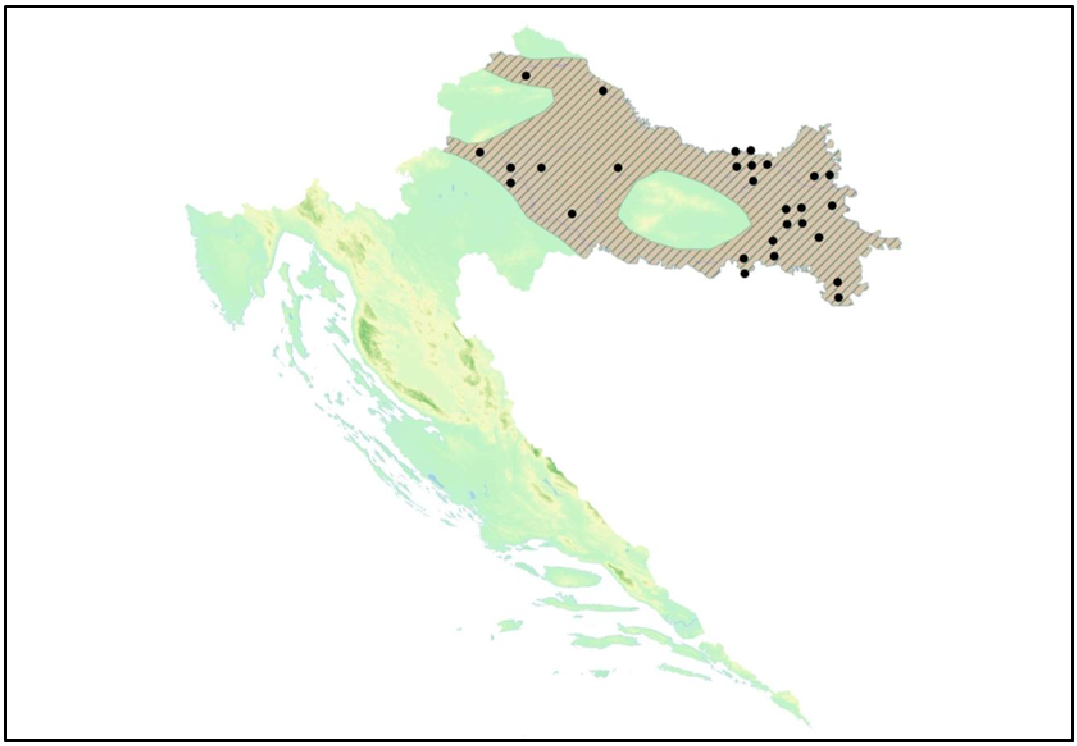

Figure 1. Distribution of *Triturus dobrogicus* in Croatia

Habitat

From the whole crested newt group (*Triturus cristatus* complex), this is the most aquatic species (morphologically) which spends most time in water. Danube crested newt inhabits floodplains and wetlands of lowland rivers, backwaters, oxbows, ponds, lakes, canals and ditches. This species is also found in still waters which dry up during some part of the year, and can be found in habitats where fish are present. They inhabit lowland areas up to about 300 m a.s.l..

Adults feed on all different invertebrates that can be swallowed. In the water they usually feed on insect larvae and adult aquatic insects, crustaceans, annelids, molluscs, frog eggs and tadpoles. On land, they eat arthropods, molluscs and annelids. The larvae initially feed on zooplankton (cladocerans and copepods), and as they grow they choose larger prey as adults.

National classification of habitats: A.1.; A.2.2.; A.2.3.2; A.2.4.; A.2.7.; A.3.1.; A.3.2.; A.3.3.; A.4.1.; A.4.2.1.; C.2.; D.1.1.1.; E.1.; E.2.; E.3.; I.2.1.; I.8.2.; J.4.3.; 1.2.; J.4.3.1.3.; J.4.3.1.5.; J.5.2.

NATURA 2000 codes: 3130; 3140; 3150; 6440*; 6450*; 6510; 9160; 91E0*; 91F0; 91H0*; 91L0; 91M0; 9260

Phenology and population biology

The Danube crested newt has a gracile body with elongated trunk and short legs, in comparison to the other crested newt species, which is considered an adaptation to the life in water and can be long up to 13 - 16 cm. Males are smaller than females and during the breeding season they develop extremely jagged crest which extends from the top of the head all along the middle of the back. Dorsal side is brown to reddish-brown with dark brown to black spots. Abdominal side is orange with black spots and patterns that can merge to form a black band. Ventral side of the head is black with small white dots stretching all the way to the trunk unlike the Italian crested newt where the white dots are less pronounced. In females and juveniles a yellow stripe can sometimes be expressed down the middle back.

In March, Danube crested newts migrate from terrestrial habitats into the water because of breeding. They stay in the aquatic phase up to six months, which is the longest period among crested newts. Males migrate from the land into the water every year while females may skip a year and do not migrate. After breeding they migrate back to the land to overwinter. In the terrestrial phase they spend the day time and dry seasons hidden under tree stumps, branches, rocks, etc. In the water they are usually hidden in the vegetation at the bottom (deeper parts of the pool). Their activity increases at night and during wet periods on land. Females lay about 100 - 200 eggs during 2 - 3 weeks. They reach sexual maturity at about 3 years of age, with a known life span (in nature) of 5 to 9 years

Pressures and threats

The main cause of threat to the Danube crested newt is destruction of suitable. It inhabits areas that are of great interest for the humans due to their agricultural potential. Because of melioration interventions for extension of agricultural land, suitable habitats for this species change and/or disappear very fast. These interventions are construction of accumulations, dams and artificial waterways, as well as regulation and draining of lowlands that then prevent regular flooding along the river plains. Naturally such floods are needed to create and maintain suitable habitats for this species. In some areas traffic can also affect the newt population if habitat is fragmented by roads. A big problem in ponds where newts breed is restocking with both allochthonous and autochthonous fish species, which feed on newt eggs and larvae. The newts are also threatened by agriculture because chemicals such as pesticides can end up in their terrestrial or water habitat and affect their ability to survive (especially of eggs and larvae).

Conservation measures

Responsible agriculture; spreading awareness about the importance of conserving floodplains for humans but also for the complex ecosystems with high biodiversity of which this species is an integral part. It is necessary to protect habitats important for breeding of Danube crested newts and prohibit allochthonous fish restocking. Restoration of puddles and ponds and popularizing of building of small stagnant pools/ponds (e.g. through subsidies) among local people. Build tunnels for newts (and other amphibians) under the roads where their migrations occur or to close these roads during the migration period. Continue with research in order to get a better knowledge on the current distribution of and threats to this species in Croatia for its effective protection.

National legislative protection

T. dobrogicus is strictly protected species in Croatia according to Nature Protection Act (National Gazette 70/05; 139/08; 57/11).

Annexes of the Habitats Directive

Triturus cristatus is listed on Annex II and IV; subsequently, both *T. carnifex* and *T. dobrogicus* are also treated as listed on Annex II and IV.

Red List

Global: near threatened NT (Arntzen i sur. 2009)

Croatia: near threatened NT B2b(ii, iii) (Jelić et al. 2012)

MONITORING PROGRAMME FOR THE CONTINENTAL BIOGEOGRAPHICAL REGION

Danube crested newt is found only in Continental biogeographical region of Croatia; therefore, monitoring programme is developed just for this region. For surveillance approach we have chosen field mapping, monitoring on plots and unsystematic data gathering. Field mapping will be used to collect additional data to fill in the large gaps within the current records. Monitoring on plots will be used to collect data on range, population and habitat status of Danube crested newts in Croatia.

During the field surveys it is recommended to gather data on *Lissotriton vulgaris* and *Ichthyosaura alpestris* as well whenever possible. This is because these three species often appear in the same habitat and share their ecological niche. All surveys should be planned and done in cooperation with public institutions for protected areas of each county, and with valid permissions from the Ministry of Environment and Nature protection. All the surveyors need to be experienced in distinguishing newt species.

Field mapping

Objectives

Current knowledge of this species distribution/presence is still very scarce and systematic field mapping should be done throughout this biogeographic region. In this way further data could be gathered and incorporated into the monitoring programme for further reporting periods. New localities for which are prove to be of significant importance should be amended as sites for future monitoring on plots. New localities can be added only by removing one of the monitoring localities that proved to be unsuccessful or not possible to monitor. Localities can only be exchanged one for one to maintain the number of total monitored localities. This changes need to be elaborated by the working group in the final report.

Field work instructions

All the investigators in the field should be able to determine *T. dobrogicus* and distinguish it from other newt species. For determination purposes we recommend to refer to Arnold (2004). Areas in hybridization zone with *T. carnifex* should be investigated only by experts.

Investigators – should have at least 1 year of herpetological experience and pass the training organized by monitoring coordinator

Experts – should have 3 year herpetological experience and experience in working with crested newt species; also need to pass the training held by monitoring coordinator

Mapping needs to be done during the *T. dobrogicus* breeding time and its later aquatic phase, from the beginning of April till the end of May. All newt species are more active during night; therefore all mapping needs to be done during the night time if the habitat structure and security of the staff allow it. During night newts are easily visible in shallow waters. All the localities should be inspected during daytime before night visits because of security reasons. If this is not possible, than daytime mapping should be done. During the research only adult animals and larvae are recorded and special care should be taken not to disturb or destroy newt eggs hidden in the vegetation. All animals should be returned back to water as soon as all the data has been recorded.

Investigators just need to confirm the species´ presence in the surveyed UTM cell, so as soon as this is done they can move to the next locality in new UTM cell. If no animals are recorded investigator should find other suitable habitats within the same UTM cell. If newts are not found in two days (of a mapping effort) that person should move to the next UTM cell. Visual observation should be applied first and if newts are not found water needs to be checked by the hand net.

Digital photographs should be taken to confirm the newt identification.

Sampling design

Inside the surface defined as the area of distribution in Figure 2. in the Continental biogeographical

region 30% of the not confirmed UTM 10x10 km cells should be inspected per year (first 3 years of first reporting cycle) for possible newt presence in ponds, small lakes and slow parts of rivers. The total number of not confirmed UTM cells is around 150, which means that 50 of them need to be visited each year (by two persons for two days maximum). This in total makes up 200 man days per year (600 man days in total). Defining the good quality habitats for each UTM should be done by the monitoring coordinator and investigators because this can significantly reduce the amount of work.

Characteristic for chosing good quality habitats:

- Slow moving or still water
- Rich submerged vegetation
- Availability of deeper parts for hiding (>1m)
- Small abundance or no fish present
- Non-permanent water bodies are more favourable

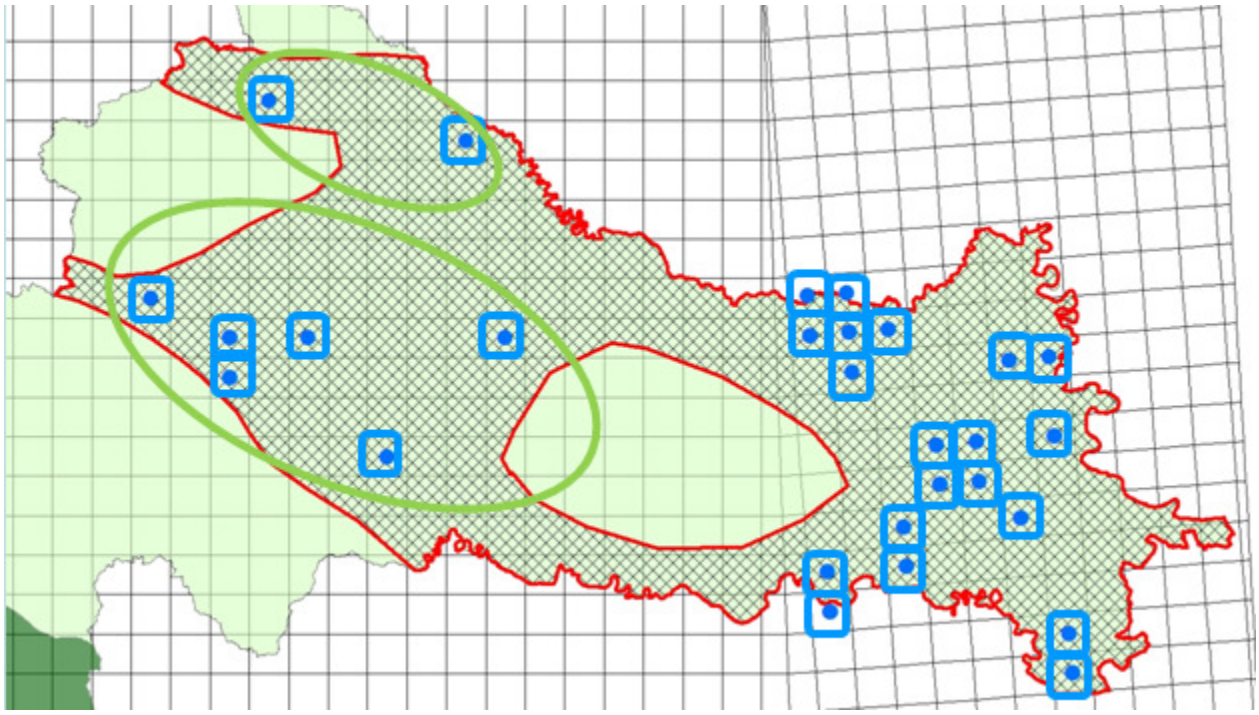

Figure 2. Distribution of Danube crested newt in the Continental region of Croatia (dashed); dashed empty UTM cells should be checked during mapping; monitoring localities are marked with blue points; hybridisation zone encircled with green lines

Data forms

Data form for inventory of amphibians and reptiles should be used (Appendix I., taken from Handbooks for Inventorying and Status Monitoring Janev Hutinec 2008). During the mapping, investigators only need to record the PRESENCE/ABSENCE data. This means that even localities where newts were not found should be recorded in the protocol. Only basic habitat characteristics should be recorded (coordinates, size, vegetation).

Monitoring on plots

Objectives

Main objective is to develop the long term population monitoring based on one selected locality per UTM 10x10 km cell inhabited by this species. This will enable to get basic population trends already after the first two monitoring cycles. The methodology is developed in a way that it is simple and can be applied both by experts and trained non-experts. Training: monitoring coordinator should hold two-day training for all the surveyors with covering monitoring programme in full and practical application of the methodology in the field.

Field work instructions

Just relative population size estimate is needed for estimation of the state of the population at the selected locality. All adult and juvenile individuals shall be recorded. For adults it is needed to determine their sex.

Investigators – should have at least 1 year of herpetological experience and pass the training.

Characteristic for chosing good quality habitats:

- Slow moving or still water
- Rich submerged vegetation
- Availability of deeper parts for hiding (>1m)
- Small abundance or no fish present
- Non-permanent water bodies are more favourable

At each locality two methods will be used:

1. Linear transects with netting - 30 m^2 need to be filtered by the hand net at 300 m of selected habitat (Fig. 3.). That means that if average net size should be around ~0,4x0,4 m = net surface of 0,16 m^2, than we need ~190 strokes to filter 30 m^2. The length of the strokes should be around 0,5 m. Important is that deeper parts of the water body are also covered if possible (this does not refer to rivers and lakes deeper than 2 m).

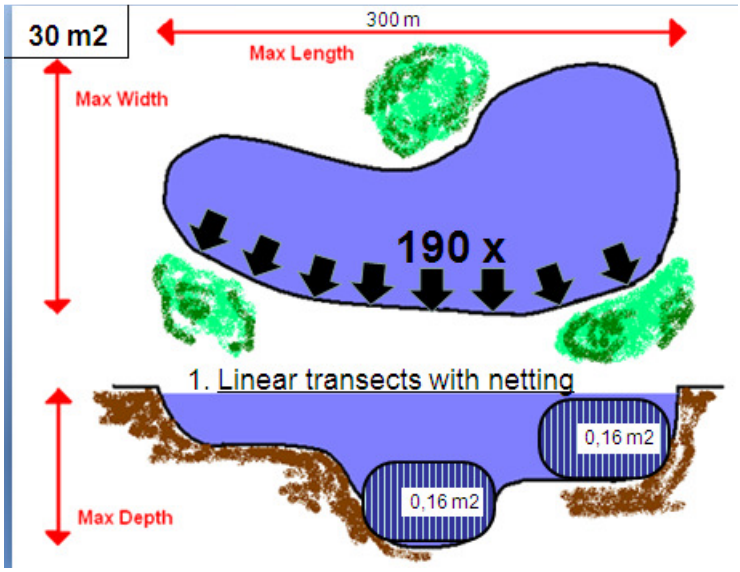

Figure 3. Schematic representation of the methodology for linear transects with netting

2. Newt traps - 25 traps should be set up per 100 m of habitat at the selected locality and left over night. Traps should not be set up on the same place where the linear transect was done. Traps can be

made from plastic bottles and placed in the water so they cover different parts of habitat (Fig. 4.): a) equally distributed in 100 m / or pond and b) different depths.

IMPORTANT NOTE: all the traps need to be set up correctly so that there is an air bubble inside them so that trapped newts can breath; traps should not be left unchecked longer than 10-12 hours. All the caught individuals need to be returned to the exact location of finding.

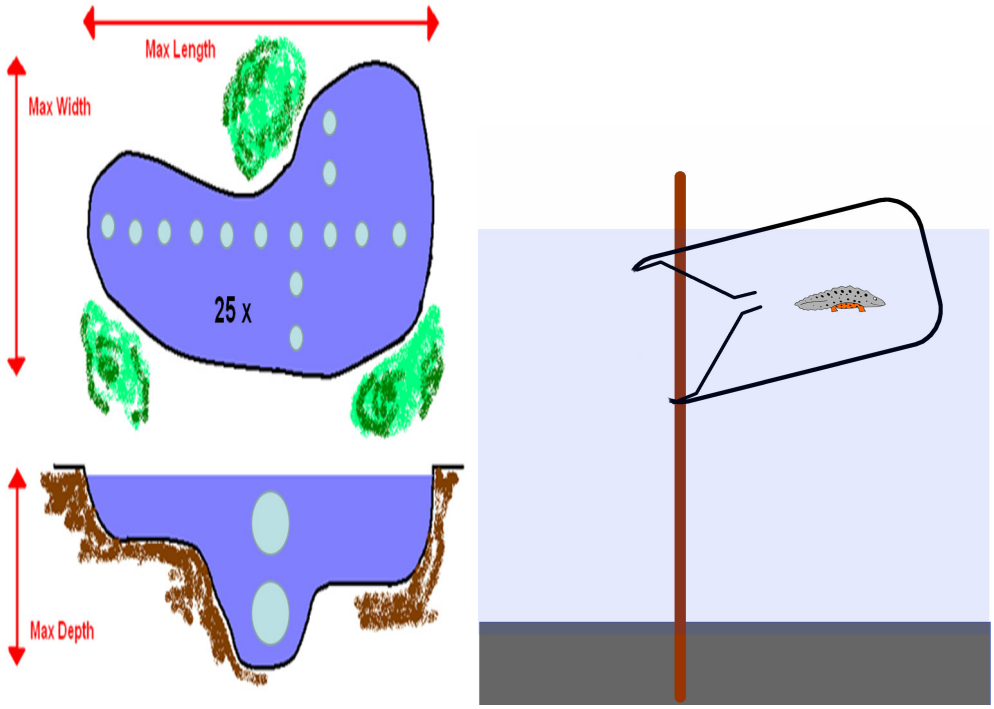

Figure 4. Schematic representation of the methodology for newt trapping: a) equally distributed, b) at different depths and c) schematic of positioning in water to leave air for breathing

It is recommended that always the same person puts up traps and the other does hand net transects.

When to use this methods:

- Transects should be surveyed during stable weather conditions between April and May
- During day for linear transect with netting and during whole night for traps

Sampling design

Monitoring in the Continental region should be done in 26 already known UTM 10x10 km cells on localities as suggested in Table 1. The whole survey should be made by two persons but each method is applied only once per locality. Survey should be done every second year (three times in the six-year period). In one day it is possible to visit 2 sites and apply both methods, which means that in total 13 working days are needed per monitoring year and 39 working days in a 6-year period.

Table 1. Monitoring sites in 26 UTM 10x10km cells in Continental region

Ime vrste	Lokalitet	UTM
Triturus dobrogicus	Slavonski Brod, općina Klakar, Bara Dvorina ili selo Klakar	BQ79
Triturus dobrogicus	Ruščica kod Slavoskog Broda - kanal uz cestu	BR70
Triturus dobrogicus	Novo Selo, velika lokva uz cestu, Osijek, Donji Miholjac	BR76
Triturus dobrogicus	stara ciglana, Osijek, Donji Miho jac	BR77
Triturus dobrogicus	Široki dol	BR85
Triturus dobrogicus	Donji Miholjac, u kanalu kod Rakitovice	BR86
Triturus dobrogicus	Donji Miholjac ~ 1,6 km SE (bara Bajer)	BR87
Triturus dobrogicus	Beravci-Berava	BR90

Triturus dobrogicus	Budrovci ribnjak ili Strizivojna	BR91
Triturus dobrogicus	Valpovo - Ladimirevci (na putu uz kanal Vučica)	BR96
Triturus dobrogicus	Drenvci- ciglana, kompleks bara	CQ37
Triturus dobrogicus	Drenovci, selo Vrbanja, kanal uz cestu, I-HR, Županja, Gunja	CQ38
Triturus dobrogicus	Zokovica-ribnjak	CR02
Triturus dobrogicus	Dopsin-Lipovac	CR03
Triturus dobrogicus	Kešinačka Šuma	CR12
Triturus dobrogicus	Laslovo (ada) ili Paulin dvor	CR13
Triturus dobrogicus	selo Rokovci, kanal uz cestu na rubu sela, I-HR, Vinkovci	CR21
Triturus dobrogicus	Kopački rit, Mali Sakadaš - kanal blizu prijavnog centra	CR25
Triturus dobrogicus	Vera (ada) ili Klisa (Daljski kanal)	CR33
Triturus dobrogicus	nasip Dunav-Drava izmeu Sakadaša i Podunavlja	CR35
Triturus dobrogicus	Turopolje, lokva uz cestu izmeu Selca i Veleševca	WL95
Triturus dobrogicus	Turopoljski lug, Kanali u šumi kod sela Pešćenica	WL96
Triturus dobrogicus	Žutica, kanali	XL16
Triturus dobrogicus	Lonjsko polje, kanali u Čigoču ili kanali uz nasip Trebeža	XL33
Triturus dobrogicus	Jasenovača	XL66
Triturus dobrogicus	Gabajeva greda	XM51

Data forms

Standard protocols for monitoring of herpetofauna should be used (Appendix I., taken from Janev-Hutinec 2008) and number of adult (male and female) and juvenile individuals captured should be recorded. Other species of newts are also recorded. Terrestrial and aquatic habitat quality should be recorded in a buffer of 50 m around the water body, accept for the major disturbances and threats that should be noted and explained even if present in wider area (>50 m).

Unsystematic data gathering

Unsystematic data gathering will provide additional data source from public, from amateurs to professionals. Collected information will ensure additional records on the Danube crested newt range.

Field work instructions

No need for special instruction

Data forms

Data form for inventory and mapping of amphibians and reptiles should be used (Appendix I., taken from Handbooks for Inventorying and Status Monitoring Janev Hutinec 2008).

EVALUATION OF THE CONSERVATION STATUS COMPONENTS

Range

Further work needs to be done on distribution of the Danube crested newt in Croatia because there are still some localities where this species could be present and its finding could increase the currently known extent of occurrence. Data gathered through the field mapping needs to be plotted in 10x10 km UTM grid by marking all cells where Danube crested newts were confirmed. In order to evaluate

the range as favourable the number of confirmed UTM cells (checked through monitoring or new added through field mapping) should remain the same or increase (mappings done in the first two years). According to the environmental parameters and mobility of the Danube crested newt the gap closure to join confirmed UTM cells together, should be 30 km. Newts are very mobile species and streams and large rivers can help them spread over large distances (specially Drava, Sava and Danube).

Favourable Reference Range (FRR) for the Danube crested newt in Croatia can be considered the same as the current extent of occurrence (should remain the same).

Population

Proposed population unit is number of mature individuals but with special note that number of recorded larvae should also be stated. Trend of a population will be calculated based on 3 counts per locality (in all six years) that should provide sufficient evidence on population stability, decline or increase.

Data analysis:

- Hand netting data from all the counts should be analyzed to give RELATIVE average of adult individuals and larvae per 30 m^2 – this should then be recalculate to relative average of adult individuals and larvae (density) per 100 m^2 for comparison – comparison of density through three counts will give estimate of population trend
- Trapping data from all the counts should be analyzed to give RELATIVE average of adult individuals and larvae per effort of 25 traps – this should then be recalculated to relative average of adult individuals and larvae (density) per one trap – comparison of results through three counts will give estimate of population trend
- Final estimate of trend is given based on the results of two independent methods (hand net and trapping)

Based on field experience it can be said that minimum number of individuals per locality (two methods, 100 m each) should be >2, and everything more than 10 could be considered as good result.

Favourable Reference Population (FRP) for Danube crested newt in Croatia can not be set up now because there are no data on population numbers.

Habitat for the species

Danube crested newt spends part of its life in aquatic and part in terrestrial phase and therefore uses a wide variety of habitats. Aquatic breeding and nursering habitats are especially important for this species and special attention should be given to record the state and threats there. Both aquatic and surrounding terrestrial habitat quality should be noted in the protocol.

Standard protocol for monitoring of herpetofauna in Croatia (published by SINP) that is used for Danube crested newt also contains parameters for habitat monitoring. These parameters will be used to describe the habitat quality and to compare among surveys. This data is just basic but habitat quality trend can also be estimated from them.

Gathered data from all 3 visits should be compared separately for aquatic and terrestrial habitats. All the data entered in the protocol needs to be compared from the first to the third visit and given the grade of 1. Unfavorable (decreasing quality), 2. Stable (not perfect but not decreasing), 3. Favorable (good quality habitat). At the end, general state for aquatic and terrestrial habitat needs to be recorded:

1. Unfavorable – if any of the parameters is unfavorable,
2. Stable – if no unfavorable and more than 40% parameters is stabile ,
3. Favorable – if no unfavorable and more than 60% parameters is favorable

Future prospects

For the analysis of future prospects of Italian crested newt all three parameters of range trend, population trend and habitat trend should be taken in account. Here is the proposed scheme to this:

Range:

Actual range (also FRR) : _____ km^2

Actual status: + (increasing)/ - (decreasing)/ = (stable)/ X (unknown)

Future trend:

Future status:

Future prospects:

Population:

Actual population:

FRP:

Actual status:

Future trend:

Future status:

Future prospects:

Habitat for the species:

Actual habitat:

Future trend:

Future status:

Future prospects:

Conclusion:

Parameter	Future Trend	Future Status	Prospects
Range			
Population			
Habitat			
Future Prospects			

References

Arnold, E.N. (2004): A field guide to the reptiles and amphibians of Britain and Europe. Harper Collins Publishers Ltd., London. 288 str.

Arntzen, J.W., Bugter, R.J.F., Cogalniceanu, D. & Wallis, G.P. (1997): The distribution and conservation status of the Danube crested newt, *Triturus dobrogicus*. Amphibia-Reptilia 18: 133 - 142.

Arntzen, J.W. & Wallis, G.P. (1999): Geographic variation and taxonomy of crested newts (*Triturus cristatus* superspecies): morphological and mitochondrial DNA data. Contributions to Zoology 68: 181 - 203.

Arntzen, J.W., Kuzmin, S., Jehle, R., Denoël, M., Anthony, B., Miaud, C., Babik, W., Vogrin, M., Tarkhnishvili, D., Ishchenko, V., Ananjeva, N., Orlov, N., Tuniyev, B., Cogalniceanu, D., Kovács, T., Kiss, I. (2009): *Triturus dobrogicus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on 27. studenog 2012.

Cogalniceanu, D. & Miaud, C. (2002): Age, survival and growth in *Triturus dobrogicus* (Amphibia, Urodela) from the lower Danube floodplain. Internat. Assoc. Danube Res. 34: 777 - 783.

Crnobrnja-Isailović, J., Džukić G., Krstić, N. & Kalezić, M.L. (1997): Evolutionary and paleogeographical effects on the distribution of the *Triturus cristatus* subspecies in the central Balkans. Amphibia - Reptilia 18: 321 - 331.

Ćaleta, M., Jelić, D., Buj, I., Zanella, D., Marčić, Z., Mustafić, P., Mrakovčić, M. (2010): First record of the alien invasive species rotan (*Perccottus glenii* Dybowski, 1877) in Croatia. J. Appl. Ichthyol. 2010: 1 - 2.

Džukić G. (1995): Diverzitet vodozemaca (Amphibia) i gmizavaca (Reptilia) Jugoslavije, sa pregledom vrsta od međunarodnog značaja. In: Biodiverzitet Jugoslavije. Biološki fakultet, Beograd. 562 str.

Drechsler, A., Bock, D., Ortmann, D., Steinfartz, S. (2010): Ortmann's funnel trap – a highly efficient tool for monitoring amphibian species. Herpetology Notes, 3: 13 - 21.

Edgar, P. & Bird, D. R. (2006): Action Plan for the Conservation of the Crested Newt *Triturus cristatus* Species Complex in Europe. Convention on the Conservation of European Wildlife and Natural Habitats. 26th meeting, Strasbourg. Council of Europe. 33 str.

Frost D. R. 2011. Amphibian Species of the World: an Online Reference. Version 5.5 (31. siječanj 2011.). Access possible at the website: http://research.amnh.org/vz/herpetology/amphibia/. American Museum of Natural History, New York, USA.

Furtula, M., Ivanović, A., Džukić, G., Kalezić, M. (2008): Egg Size Variation in Crested Newts from the Western Balkans (Caudata: Salamandridae: *Triturus cristatus* Superspecies). Zoological Studies, 47: 585 - 590.

Gasc, J.-P., Cabela, A., Crnobrnja-Isailović, J., Dolmen, D., Grossenbacher, K., Haffner, P., Lescure, J., Martens, H., Martinez Rica, J.P., Maurin, H., Oliviera, M.E., Sofianidou, T.S., Veith, M., Zuidrewijk, A. (eds.) (2004): Atlas of Amphibians and Reptiles in Europe. Réédition. Muséum national d'Histoire naturelle, Paris. 520 str.

Gherghel, I. & Iftime, A. (2009): On the presence of the Danube crested newt, *Triturus dobrogicus*, at Durankulak Lake, Bulgaria. North-Western Journal of Zoology, 5: 209 - 213.

Griffiths R.A. (1996). Newts and salamanders of Europe. T & AD Poyser Ltd., London. 188 pp.

Grossenbacher, K., & Thiesmeier, B. (2003): Handbuch der Reptilien und Amphibien Europas, Band 4/IIA: Schwanzlurche (Urodela) II. Wiesbaden (Aula-Verlag), 450 pp.

Ivanović, A., Džukić, G., Kalezić, M. (2012): A Phenotypic Point of View of the Adaptive Radiation of Crested Newts (*Triturus cristatus* Superspecies, Caudata, Amphibia). International Journal of Evolutionary Biology, 2012: 1 - 9.

Janev-Hutinec, B., Kletečki E., Lazar, B., Podnar Lešić M., Skejić, J., Tadić, Z. & Tvrtković, N. (2006):

Crvena knjiga vodozemaca i gmazova Hrvatske. Ministarstvo kulture, DZZP. 95 pp.

Janev Hutinec, B. (2008): Vodozemci i gmazovi: Priručnik za inventarizaciju i praćenje stanja. DZZP.

Jehle, R., Hödl, W., Thonke, A. (1995). Structure and dynamics of central European amphibian populations: A comparison between *Triturus dobrogicus* (Amphibia, Urodela) and *Pelobates fuscus* (Amphibia, Anura). Australian Journal of Ecology, 20: 362 - 366.

Jehle, R. & Hödl, W. (1998): Pits versus patterns: effects of transponders on recapture rate and body condition of danube crested newts (*Triturus dobrogicus*) and common spadefoot toads (*Pelobates fuscus*). Herpetological Journal, 8: 181 - 186.

Jelić, D., Kuljerić, M., Koren, T., Treer, D., Šalamon, D., Lončar, M., Podnar-Lešić, M., Janev-Hutinec, B., Bogdanović, T., Mekinić, S. (2012): Crvena knjiga vodozemaca i gmazova Hrvatske. Ministarstvo zaštite okoliša i prirode, Državni zavod za zaštitu prirode, Zagreb (in press)

Kalezić, M.L., Cvetković, D., Đorović, A., Džukić, G. (1994): Paedomorphosis and differences in life-history traits of two neighbouring crested newt (*Triturus carnifex*) populations. Herpetological Journal, 4: 151 - 158.

Kinne, O. (2004): Successful re-introduction of the newts *Triturus cristatus* and *T. vulgaris*. Endangered Species Research, 4: 1 - 16.

Litvinchuk, S., Rosanov, J. M., Borkin, L. (1997): A contact zone between the newts *Triturus cristatus* and *Triturus dobrogicus* in the Ukrainian Transcarpathians: distribution and genome size variation. Herpetologica Bonnensis, 1997: 229 - 235.

Litvinchuk, S. N. & Borkin, L .J. (2000): Intraspecific taxonomy and nomenclature of the Danube crested newt, *Triturus dobrogicus*. Amphibia-Reptilia, 21: 419 - 430.

Litvinchuk, S. N. (2005): A record of the Danube newt, *Triturus dobrogicus*, from the Dnepr river delta (Ukraine). Russian Journal of Herpetology, 12: 69 - 72.

Macgregor, H.C., Sessions, S. K., Arntzen, J.W. (1990): An integrative analysis of phylogenetic relationships among newts of the genus *Triturus* (family Salamandridae), using comparative biochemistry, cytogenetics and reproductive interactions. J. evol. Biol., 3: 329 - 373.

Reshetnikov, A. N. (2003): The introduced fish, rotan (*Perccottus glenii*), depresses populations of aquatic animals (macroinvertebrates, amphibians, and a fish). Hydrobiologia, 510: 83 - 90.

Reshetnikov, A. (2012): Decreased *Triturus cristatus* Breeding Site Number as a Consequence of Perccottus glenii Range Expansion. FrogLog, 104: 18.

Vörös, J. & Arntzen, J.W. (2010): Weak population structuring in the Danube crested newt, *Triturus dobrogicus*, inferred from allozymes. Amphibia-Reptilia, 31: 1 - 8.

Wallace, H. (1994): The balanced lethal system of crested newts. Heredity 73: 41 – 46.

Wielstra, B. & Arntzen, J.W. (2011): Unraveling the rapid radiation of crested newts (*Triturus cristatus* superspecies) using complete mitogenomic sequences. BMC Evolutionary Biology, 11: 162.

Zavadil, V., Piálek, J., Klepsch, L. (1994): Extension of the known range of *Triturus dobrogicus*: electrophoretic and morphological evidence for presence in the Czech Republic. Amphibia-Reptilia, 15: 329 - 335.

Formular za inventarizaciju i kartiranje vodozemaca i gmazova Hrvatske

Podatci o opažačima

Broj:

Ime i prezime:

Datum opažanja:

Kontakt osoba:

Tel.

Adresa:

e-mail

Podatci o lokalitetu

Lokalitet:

Kratki opis lokaliteta:

Fotografija lokaliteta: PRILOG DATOTEKA

Porijeklo koordinate: GPS TK 100 TK 50 TK 25 Ostalo (upisati)

Vremenske prilike:

Vrijeme promatranja: OD DO

Podatci o svojtama

METODA ISTRAŽIVANJA

1 - slučajno **2** - promatranje **3** - metoda cestovnog opažanja **4** - bilježenje glasanja **5** - lov rukom **6** - lov mrežicom **7** - lov omčicom **8** - lov klopkama **9** - drugo (upisati)

drugo:

VRSTA	BROJ JEDINKI	STAROST	KOORDINATE			FOTO BR.
			X	Z	Y	

Molimo ispuniti čitko, velikim slovima, crnim ili plavim pisalom. Ispunjen formular poslati na: Državni zavod za zaštitu prirode, Trg Mažuranića 5, 10000 Zagreb, e-mail: vrste@dzzp.hr, website: www.dzzp.hr

Podatci o svojtama

VRSTA	BROJ JEDINKI	STAROST	KOORDINATE			FOTO BR.
			X	Z	Y	

NAPOMENA:

U bazi podataka: Unosilac: Datum unosa: