

Golden Jackal in Lithuania, Arrival, Impact & Status

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Abstract. With the arrival of the first Golden Jackal *Canis aureus* individual in Lithuania in February 2015, the Ministry of the Environment moved immediately to add the species to the country's list of species that may be hunted and in May 2015 published a draft order to list the species as invasive. Evidence to justify the listing of Golden Jackal as an invasive species is lacking and the purpose of this paper is to provide a balanced argument against this position. Extensively reviewing literature from across the range of Golden Jackal in Europe, evidence is presented to support the view that Golden Jackals arrived in the Baltic States as a result of natural spread and are thus not invasive. Alongside, it is also considered that Golden Jackals are not likely to have a significant impact on the Lithuanian environment beyond a potential reduction in Red Fox *Vulpes vulpes* numbers. Furthermore, it is not valid to compare the arrival of Golden Jackals with the arrival of known-invasive species such as Raccoon Dog *Nyctereutes procyonoides* and American Mink *Neovison vison*. Finally, a summary of official and media reactions to the arrival of Golden Jackal is presented and a set of conclusions delivered that could assist in the ongoing debate in Lithuania.

Background and Historical Range.

Golden Jackal *Canis aureus* is a native Palearctic species with a historic range extending from North Africa and south-east and central Europe through to central and east Asia (Jhala & Moehlman 2008). The species is listed on Annex Five of the European Union Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, 1992), a categorisation that requires European Union countries to maintain populations at a favourable conservation status.

Extensively reviewed by Arnold et al (2012), the population and distribution of Golden Jackal within Europe has seen considerable change over recent decades, with three main phases identifiable:

- i. Period of dramatic decline (prior early 1960s): destruction of habitat and widespread persecution with poison baits led to the extinction of Golden Jackal in Hungary and Macedonia and significant reductions and local extinctions in core Balkan populations (Spassov 1989). By the 1960s, populations were fragmented into pockets, mostly in Bulgaria, Greece and Turkey (Spassov 1993, Giannatos 2004).
- ii. Period of recovery (1960s-1970s): following legal protection in 1962, populations of Golden Jackals began to recover with the species re-colonising territories in Bulgaria, thereafter establishing populations in Romania and Serbia (Spassov 1989, Kryševičius et al 1997).
- iii. Period of expansion into Central and Eastern Europe (1980s to the current day): from the 1980s onwards, the distributional range of Golden Jackals has expanded significantly across Central and Eastern Europe. From initial recolonisation of Hungary in the early 1980s, Golden Jackals have subsequently established viable populations in that country (Szabó et al 2009), with the population recently doubling to an estimated 1510 individuals between 2004 and 2007 (Tóth et al 2009). Concurrent with this, the species has also expanded considerably to the north and west with cases of breeding confirmed at localities far from the core Balkan region, including southern Ukraine, Slovenia, Austria and Italy (Arnold et al 2012). Golden Jackals have also been confirmed in Germany (Möckel 2000), the Czech Republic (Koubek & Ervenw 2007), Slovakia (Arnold et al 2012), Switzerland (Kora Carnivore Ecology and Wildlife Management 2012) northern Ukraine (GOJAGE 2013) and, of relevance to the recent reports in the Baltic States, an individual near Tomsk in western Belarus (Dzedzich NGO 2012). This record from Belarus was at a distance of 265 kilometres from the Lithuanian border.

By the end of 2012, not including the Baltic States, Golden Jackal had been recorded in 20 European countries, with confirmed breeding in 11 of these (Arnold et al 2012, Dzedzich NGO 2012, KORA 2012). In May 2015, photographs of a Golden Jackal in Biebrza National Park (north-east Poland) were released on social media (Wilk NGO, Facebook 2015). This is the first individual reported in Poland.

Golden Jackal in the Baltic States.

Estonia. In February 2013, a Golden Jackal was killed by hunters in Matsalu National Park, West Estonia. Subsequently confirmed by analysis by Peep Männil of the Estonian Environment Agency and aged and sexed as a ten-month old female, this represented the first confirmed case of a Golden Jackal in the Baltic States. However, unconfirmed records date back to 2011 with local residents reporting animal sightings and vocals in Matsalu National Park.

Subsequently, further individuals were confirmed in March 2013 by a GOJAGE team conducting survey work in Matsalu National Park. Setting up 19 calling stations to induce jackal callback and also conducting snowtrack surveys, the team heard one group of two to five jackals near Salevere, found tracks of two individuals in the area of vocalization and further tracks near Penijoe, plus obtained the first photographs of live animals via a camera trap on 28 March, five images captured of at least two individuals (GOJAGE 2013). In 2014, Golden Jackals were recorded in several other widely dispersed localities across Estonia, including in the north, north-east and south of the country. Two to three reproductions by Golden Jackal occurred in the west of the country (Matsalu area) and one in the south (Haademeeste) (Männil et al 2014). By the end of 2014, they were also recorded on Saaremaa Island (Mann 2015). As of May 2015, a total of nine individuals have been killed either by hunters or in road traffic accidents across Estonia (Peep Männil, per comms). This dispersed nature of records strongly suggests that Golden Jackals arrived some years prior to discovery and were initially undetected.

Latvia. In December 2013, a female jackal was killed by a hunter near Jelgava in central Latvia, thought at the time to be the first record for the country (GOJAGE 2014). Subsequently however, genetic analysis revealed that hunters killed two

Golden Jackals in the same area in July 2013, believing them at the time to be young Wolves *Canis lupus* (Janis Ozolin per comms). Following these records, two more were shot in the Jelgava area and a fourth near Aizpute in the coastal province of Kurzeme. To date, a total of ten Golden Jackals have been shot or found dead in Latvia (Janis Ozolin per comms).

Lithuania. The first recorded case of Golden Jackal in Lithuania was an individual killed by a hunter in February 2015, widely reported in national media (Delfi 2015, LRT 2015, etc). Following the media news, unconfirmed reports of Golden Jackals followed in the following months from the provinces of Kaunas, Vilnius, Zarasai, Var na and Biržai (Linas Baliauskas, per comms).

Invasive Alien or Natural Expansion of Range?

To address this question, it is useful to review the terminology involved:

1. alien species. International conservation and environmental bodies generally define an 'alien species' as one that has been introduced into an area by humans, for example the International Union for Conservation of Nature (IUCN) definition states 'alien species are animals, plants or other organisms introduced by man into places out of their natural range of distribution, where they become established and disperse'. Very similar definitions highlighting the importance of introduction by humans have been adopted by leading conservation bodies such as Birdlife International, the Royal Society for the Protection of Birds (RSPB) and the WWF, as well as governments of the world, for example the United Kingdom, the United States of America and Australia (sources: Birdlife International, WWF, RSPB, United Kingdom Department for Environment, Food and Rural Affairs, United States Department of Agriculture, Australian Government Department of the Environment). Critically, the European Union in Article 3.1 of the EU Regulation 1143/2014 on Invasive Alien Species (2014) also defines alien species as those specifically originating from introductions, i.e. 'alien species' means any live specimen of a species, subspecies or lower taxon of animals, plants, fungi or micro-organisms introduced outside its natural range'.

Of leading international bodies, only the United Nation's Convention on Biological Diversity (United Nations, 1993) phrases the initial definition of alien species to potentially incorporate natural spread, i.e. 'introduction and/or spread'. In the articles of the Convention however, the term alien species is uniformly assigned for those species occurring due to human introduction.

2. invasive alien. Not all introduced species are found to be harmful to the new environments they inhabit, these are simply termed alien species. The widely accepted definition of an invasive species is a species that has been introduced to a new area and which is found to threaten biological diversity.

Article 3.2 of the EU Regulation 1143/2014 on Invasive Alien Species (2014) defines invasive aliens as species that have been introduced and have been shown to cause damage to the new environment, i.e. 'invasive alien species' means an alien species whose introduction or spread has been found to threaten or adversely impact upon biodiversity and related ecosystem services.

Of importance, explanation of Article 2.2 of the EU Regulation 1143/2014 on Invasive Alien Species explicitly states 'Some species migrate naturally in response to environmental changes. They should not be considered as alien species in their new environment and should be excluded from the scope of this Regulation. This Regulation should focus only on species introduced into the European Union as a consequence of human intervention.'

The appearance of Golden Jackals in Matsalu National Park in northern Estonia in 2011 immediately prompted questions regarding the origin of the animals – with the Estonian individuals seemingly over 1200 km north of populations of Golden Jackals known at the time, debate focussed on whether these were the result of natural undetected spread or the result of human introduction, either deliberate or accidental. To date, there is no evidence at all to suggest the animals were introduced and, quite the opposite, increasingly strong evidence points to the natural spread of Golden Jackals from populations to the south.

In support of natural range expansion:

1. As detailed in previous paragraphs, the species is known to have been expanding northwards from its core population range for over three decades. In review, Arnold et al (2012) considered that the species was very likely to continue expanding into Eastern and Central Europe.

2. Subsequent to the discovery of the individuals in Matsalu National Park, a 'land bridge' linking the seemingly isolated population in Estonia with those further south is becoming established, with confirmed cases of Golden Jackals now registered in northern Ukraine and Belarus, as well as Latvia and Lithuania. Even prior to the finding of individuals in the southern Baltic States and Belarus, GOJAGE (see GOJAGE 2014) published an article detailing a possible route of expansion into the Baltic States, considering Golden Jackals moved north via the Daugve River basin, thus arriving into Latvia first and thereafter into Estonia. The subsequent discovery of animals in Latvia and Belarus support this theory. Lithuanian individuals could be the result of spread from initial colonisation in Latvia or spread from the south-east via the Neris River basin. The photographing of an individual in north-east Poland in May 2015 continues this trend.

3. Initial genetic data from hunted individuals in Estonia show the individuals are closest to Caucasian Golden Jackals, i.e. amongst the most likely source populations to colonise the Baltic States. Whilst not conclusive, introduced animals could conceivably come from any of the Golden Jackal populations across the extensive range.

4. No Golden Jackals are known to have escaped or been released in the Baltic States or neighbouring territories. In the absence of evidence to the contrary, it is reasonable to accept that Golden Jackals have arrived in the Baltic States as a result of natural spread, i.e. the species is not alien. Regarding the term 'invasive', standard definition, along with that of the European Union, states that firstly the species must be introduced and secondly, it must

also be shown to pose a significant threat to the natural environment. There is no current evidence to support that it is an introduced species or that it poses a significant threat. On this basis, there is no scientific justification to list the species as invasive in Lithuania.

Diet of Golden Jackal. Golden Jackal is an omnivorous and opportunistic species, quite able to exploit a range of food sources and vary its diet according to season (Spassov 1989, Stoyanov 2012). Across Europe however, regardless of habitat, the species is primarily a predator of small mammals (mostly rodents and hares) and a scavenger of larger food items (Spassov 1989, Krystufek & Tvrkovic 1990, Lanszki et al 2006, Stoyanov 2012).

Despite the differing body sizes of the two species, numerous studies note that the feeding habits and diets of Golden Jackal and Red Fox are very similar or nearly identical, both dominated by small mammals and both feeding upon the same species at any given locality (Lanszki & Heltai 2010, Lanszki et al 2006, Giannatos 2004, Stoyanov 2012). In an area of recent colonisation in Hungary, studies showed that rodents seasonally accounted for 70-90% of the digested biomass of Golden Jackals and hares from zero to 10% (Lanszki et al 2006). Earlier studies by the same author found that small mammals, mainly rodents, also dominated Golden Jackal diet (55% based on biomass) in winter in Hungary, with carcasses of ungulates playing a secondary role (41% of biomass) (Heltai & Lanszki 2002). In a study in Bulgaria, rodents accounted for 59.3% of diet by biomass (Markov and Lanszki 2012). In most studies, birds were found only in very small quantities (Lanszki, Heltai & Szabó 2006, Lanszki, Giannatos, Dolev, Bino & Helta 2010, Markov & Lanszki 2012), but stomach analysis of Golden Jackals hunted across Bulgaria (Stoyanov 2012) revealed that while rodents were present in 41.7% of stomachs, birds were also present in 36%. In this case however, the authors note that the analysis was conducted during the hunting season and this percentage includes game birds that the Golden Jackals are thought to have found dead or injured. The figure also includes domestic fowl that had been scavenged on rubbish dumps. Markov (2012) reports game birds as a food source for Golden Jackals, but provides no data to support or quantify the information.

Markov (2012) also reports damage to hunting stocks of ungulates in Bulgaria and considers one of the main reasons that Golden Jackal expanded through the country was the large amount of available food provided by the intensive development of hunting in the country, with the offspring of introduced Moufflon *Ovis orientalis*, Fallow Deer *Dama dama* and Roe Deer *Capreolus capreolus* becoming a main food base for the Golden Jackals. However, this study was conducted only by analysis of data from official spring game counts and did not include any actual analysis of diet. In the listed studies of diet through scat or stomach analysis (Lanszki, Heltai & Szabó 2006, Lanszki, Giannatos, Dolev, Bino & Heltai 2010, Markov & Lanszki 2012, Stoyanov 2012), cases with cervids in the diet were rare and thought likely in most cases to be a result of Golden Jackals scavenging dead animals. In studies in Hungary, Greece and Israel for example, remains of Cervids in scats were mostly limbs and internal organs left by hunters (Lanszki et al 2006). Predation of Wild Boar *Sus scrofa* was also low in most cases, but in the Lanszki et al (2006) study, seasonal predation of Wild Boar piglets in Hungary occurred and higher wild boar consumption (15.7% of diet by biomass) was observed in Greece, especially in spring and summer periods in marshlands rich in Wild Boar. Golden Jackals will visit rubbish dumps to forage and many carrion items are recorded in the diet as a result, including domestic animals such as cats and dogs, remains of domestic pigs, plus household rubbish, sausage and potato peelings, tomato and pepper seeds, fowl feathers, skin and bones (Stoyanov 2012). In parts of the Golden Jackal range, rubbish dumps might be vital for the jackals' survival (Jaeger 2007).

Vegetable matter, including fruit, berries, acorns, maize and grain, also frequently forms part of the diet of Golden Jackal (up to 20-40% by biomass) and may be seasonally important (Lanszki et al 2006, Markov & Lanszki 2012, Stoyanov 2012).

Potential Environmental Impact of Golden Jackal in Lithuania. With the arrival of the first Golden Jackal in Lithuania, widespread concerns were expressed that the species will have serious negative consequences for the Lithuanian environment, in particular concerns were expressed that the Golden Jackals will have a negative impact on ground-nesting bird species, on migratory waterbirds, on species that it competes with such as Red Fox and Wolf, and on amphibians. Little evidence was given by those expressing concerns, other than to compare the arrival of Golden Jackal to the past arrivals of known alien species such as American Mink, Raccoon Dog and Raccoon *Procyon lotor*. These are not valid comparative examples – unlike the mentioned alien species, Golden Jackal most likely arrived due to natural range expansion, it is a native Palearctic species and it co-exists alongside a broadly similar range of species elsewhere in Europe. Although it is always difficult to predict exactly how a new species will settle within an environment, the logical starting point with Golden Jackal is to look at its impact on the environment elsewhere in Europe, including newly colonised areas, and how the species interacts with the range of species that it may encounter in Lithuania. In assessing the potential impact of Golden Jackal in Lithuania, the question was considered from two angles – its impact as a competitor (i.e. on other predators already in Lithuania) and as a predator (i.e. on the species that it may prey upon in Lithuania).

a. Golden Jackal as a Competitor.

i. Wolf and Red Fox. In areas of Europe where Wolf, Golden Jackal and Red Fox co-exist, studies show that Wolves consistently dominate Golden Jackals, while Golden Jackals tend to dominate Red Foxes (Macdonald 1987, Spassov 1989, Krystufek & Tvrkovic 1990, Giannatos 2004, Scheinin et al 2006). In both cases, this domination can be to the point of exclusion, i.e. Golden Jackals will not inhabit areas with high Wolf populations, and high numbers of Golden Jackals can lead to suppressed populations of Red Foxes. In Greece, the range of Golden Jackals and Wolves was found to be almost mutually exclusive (Giannatos 2004), while several studies have concluded that the presence of Wolf serves as an important limiting factor for Golden Jackal distribution across the Balkans (Spassov 1989, Krystufek & Tvrkovic 1990). Likewise in Greece, Golden Jackal population density was thought to greatly influence the presence of

Red Foxes – during a three-year period at one study location, Red Foxes occurred as permanent residents only on the fringes of Golden Jackal territories, while in the southern Peloponnese, an increase in the number of Red Foxes was observed in areas where Golden Jackals had been decimated (Giannatos 2004). Similarly, in areas where Golden Jackals and Red Foxes co-exist in Israel, Golden Jackals are known to displace foxes (Macdonald 1987, Scheinin et al 2006). This said however, even in the core Balkan population range of the Golden Jackal, Red Foxes remain the most common canid species (with Golden Jackal second), so displacement can be considered localised, not as an overall threat to the species (Stoyanov 2012).

It is reasonable to assume these relations are likely to be replicated in Lithuania, especially in winter when food might be limiting. In such circumstances, the arrival of Golden Jackal is unlikely to have any impact on the country's Wolf populations and indeed Wolves are likely to limit Golden Jackal. On the other hand, it is reasonable to assume that Red Foxes could decline in areas that Golden Jackals successfully colonise.

ii. Eurasian Lynx (*Lynx lynx*). European data on interactions between these potential competitors is scant. In areas where the two species occur, no studies have been found to indicate dynamic interactions between Golden Jackal and Eurasian Lynx. Thus, although no specific evidence has been found to assess the potential impact on Eurasian Lynx, the possibility of competition for food can not be excluded. However, Golden Jackals rarely favour the extensive forest areas preferred by Eurasian Lynx (Auagnier et al 2009), so interaction and competition for food between the two could be expected to be low. Additionally, Golden Jackals are likely to displace Red Foxes from territories inhabited by the Golden Jackals and thus any increased competition for food by Golden Jackals is likely to be mitigated by decreased food competition with Red Foxes. An assumption can be made that Golden Jackal is no significant threat to Eurasian Lynx in Lithuania. Supporting this idea, several papers highlighting threats to the endangered Eurasian Lynx Bulgaria and other Balkan States do not consider Golden Jackal as a threat (KORA 2001). It is known that Lynx populations decrease when Wolves appear in a region (eg. Boitani 2003, Bal iauskas, per comms), but there is no reason to assume this is the case with the smaller Golden Jackal.

iii. Other Species such as European Badger (*Meles meles*). Very little information was located to provide any assessment of the potential impact of Golden Jackal on species such as Badger, Pine Marten *Martes martes* and Stone Marten *Martes foina*, etc. A certain degree of diet overlap exists between these species and competition is possible. Exclusion of Red Foxes by Golden Jackals in occupied territories could mitigate any possible impacts. Badgers are known to co-exist with Golden Jackals without conflict, for example sharing the same hiding areas with Golden Jackals and even the same day-cover locations (Giannatos 2004).

b. Golden Jackal as a Predator.

i. small mammal populations. As detailed above, rodents generally account for the bulk of Golden Jackal diet. There is scant evidence available however as to whether Golden Jackal can reduce populations of any rodent species to critical levels or to levels that could be detrimental to other species that prey upon rodents, for example owls. However, given that dual facts that rodents dominate the diets of both Golden Jackal and Red Fox and that increased local populations of Golden Jackal suppress the populations of Red Foxes, it is quite possible that the overall impact on rodent numbers will be of little consequence.

ii. migratory waterfowl concentrations. Golden Jackal is a common species in wetlands, including along the coasts of the Black Sea and Caspian Sea and at inland sites in Hungary and Bulgaria. The species is known to predate waterfowl and take nestlings at breeding colonies, even more so to scavenge at such locations. No studies were found however to indicate any long-term significant impacts.

Red-breasted Goose *Branta ruficollis* is a widely-studied globally-threatened species with long-term action plans devised for its conservation, notably by the Wildfowl and Wetlands Trust in the United Kingdom in cooperation with the Bulgarian Society of the Protection of Birds and the Romanian Ornithological Society (Wildfowl & Wetlands Trust, 1995, 2012). The global wintering population is highly concentrated and up to 90% of birds, numbering 50,000 individuals or more, may occur at just five localities on the coastal plains of the Dobrudja region (north-eastern Bulgaria and south-eastern Romania), wintering alongside large concentrations of White-fronted Geese *Anser albifrons*. The Dobrudja region is also identified as supporting one of the highest Golden Jackal densities in Bulgaria and, by default, in Europe (Arnold et al 2012). However, despite extensive studies investigating threats and potential threats to the populations both on wintering grounds and elsewhere, Golden Jackal is not considered a threat and, indeed, the only canid predator that is thought to have any possible influence on Red-breasted Goose is Arctic Fox *Vulpes lagopus* on the breeding grounds. Given that Golden Jackals are not seen to be of threat to waterfowl concentrations on these major wintering grounds, there is little reason to suppose that will pose significant threat to migratory waterfowl concentrations in the Nemunas Delta in Lithuania or indeed at other important sites in the Baltic States, such as Matsalu National Park in Estonia.

iii. ground-nesting birds. Golden Jackal are opportunistic feeders and will take birds when available. However, diet studies in Hungary, Bulgaria, Greece and Israel showed that overall bird consumption is low. In an locality in Bulgaria with Grey Partridge *Perdix perdix*, Common Pheasant *Phasianus colchicus* and, during migration, Quail *Coturnix coturnix*, no remains of any were found in scats and overall consumption of birds was very low, accounting for just 0.4% of diet by biomass (Markov & Lanszki 2012). Similarly, autumn diet studies in agricultural and marshland areas in Greece, Hungary and Israel found bird consumption to be low in all three areas (Lanszki et al 2010). However, Stoyanov (2012) reported the presence of birds in 36% of analysed stomachs of Golden Jackals in a study in Bulgaria, but noted this included birds though likely to have been found dead (study was conducted during hunting season). Markov (2012) also reports that game birds are predated by Golden Jackals, but provides no data to support or quantify the information. In summary, Golden Jackals do predate birds given the opportunity, but there is no evidence to suggest any negative impacts on overall bird populations or indeed at a level that exceed predation by Red Fox.

iv. amphibians. Although Golden Jackal can consume amphibians in small quantities (Lanszki et al 2010), no data were found elsewhere in Europe to support the idea that the Golden Jackals have significant impacts on amphibian populations. Indeed in studies of diet in Hungary (Lanszki, Heltai, Szabó, 2006) and Bulgaria (Markov & Lanszki 2012), no amphibians were in the diet. Additionally, it should be noted that Red Foxes are also known to feed on amphibians (Vlachos 2010) and thus displacement of Red Foxes by Golden Jackals could mitigate potential predation effects of Golden Jackal on amphibians in Lithuania. As a side point, It is also interesting to compare official reaction to two new breeding species in Lithuania – with parallels in their expansion, both Golden Jackals and Great White Egrets *Ardea alba* have expanded dramatically their natural range across Europe since 1980, with the latter breeding in thirteen new European countries in that period, including all of the Baltic States (Aawicki 2014). Amphibians are an established part of Great White Egret diet, for example Nemeth & Schuster (2005) found that 17.6% of foraging Great White Egrets at a study site in Austria were found in habitats where amphibians were identified as the major food type. With Great White Egret breeding in Lithuania for the first time as recently as 2005, but already flocks of up to 400 birds being widely recorded and approximately 30 pairs breeding (Raudonikis 2012, Aawicki 2014), it is a little paradoxical that Golden Jackal is being labelled a potential threat to local amphibian populations, while the arrival of a more serious consumer of amphibians is not.

Summary of environmental impact:

Whilst it can be debated how accurately we can assess the overall environmental impact of Golden Jackals in the Baltic States through comparison with the impact in southern areas, the evidence available suggests the overall impact will be minimal. There is a likelihood of reductions in Red Fox populations and the possibility of limited predation of young deer and Wild Boar. With Golden Jackal and Red Fox having almost identical diets, any potential effects of predation by Golden Jackals are also likely to be mitigated by displacement of Red Foxes in areas settled by Golden Jackals. It should also be noted that if Golden Jackal is accepted as a species occurring as a result of natural range expansion, i.e. not human introduction, then the question of impact on the environment is secondary. All environments are in a state of flux, some species decreasing in numbers and range and some expanding. Lithuania is no exception – over recent decades, a number of species have declined or become extinct, including European Roller *Coracias garrulus* and Garden Dormouse *Eliomys quercinus*, other have successfully colonised, Great White Egret most prominently. To reiterate, as article 2.2 of the EU Regulation 1143/2014 on Invasive Alien Species states, species colonising a country by natural expansion, whether due to environmental changes or not, should not be termed invasive. Official and Media Reaction to the Arrival of Golden Jackal in Lithuania. In short, overwhelmingly negative. Following the first confirmed case of Golden Jackal in Lithuania, an individual shot near Šakių, the Lithuanian Ministry of the Environment moved to add Golden Jackal to the list of species that may be hunted, permitting unlimited hunting (from 1 May 2015 onwards) without quota or season (Lietuvos Respublikos Aplinkos Ministerija, April 2015). On 21 May 2015, the Ministry of the Environment published a Draft Order to amend the list of invasive species in Lithuania to include Golden Jackal (Lietuvos Respublikos Aplinkos Ministerija, May 2015).

Simultaneously, national media outlets ran stories on the occurrence of the first Golden Jackal in Lithuania, generally referring to the species as invasive and pointing to ecological disasters to come, a notable headline by Delfi, one of the country's leading media outlets, being 'First Jackal hunted in Lithuania, Prophecy of Big Trouble Ahead' (Lietuvoje sumedžiotas pirmasis akalas – didžiulis bėdos pranašas). (Grynas Delfi 2015). In similar manner, Laimutis Budrys, a Senior Specialist in the Wildlife Protection Department of the Ministry of the Environment repeatedly referred to Golden Jackal as an invasive species on national LRT radio on 25 April 2015, drawing parallels with Raccoon Dog and recent records of Raccoon in Kuršiai Marios (LRT 2015). He failed to mention that, unlike Golden Jackal, both of these species were clearly introduced by humans, neither are native to the Europe and neither have historically co-existed with species they encounter in their current range.

Thus, even prior to an official decision (as of May 2015) being taken by the Ministry of the Environment to formally list Golden Jackal as an invasive alien species, clearly the message being given to the public is to the detriment of the species, as is the listing of it as a species that can be hunted without limit.

Official Positions elsewhere in the Baltic States.

Estonia. Golden Jackal is currently regarded as an alien species (not an invasive species), but the debate as to whether they arrived due to introduction or natural spread is moving towards the view that natural expansion is the most probable cause of appearance in Estonia and the species should thus be termed a "new" species, not an alien species. With this in mind, a review of the official status could be expected, bearing that there is now enough evidence that they occur in all countries between Estonia and established parts of the Golden Jackal range. However, on national media as recently as May 2013, the Estonian Ministry of the Environment was still talking of plans to eradicate the species from Estonia during the following hunting season (Estonian Public Broadcasting 2013). Over the last two years, hunting was permitted in Estonia from 1 October through to 31 March (Peep Männil, per comms).

Latvia. Golden Jackal has not been legally declared an invasive species in Latvia (Janis Ozolin per comms). Hunting is permitted, but the hunting season has been set to coincide with that of Wolf, i.e. 15 July through to 31 March. This is largely to prevent illegal hunting of Wolf, as stated by Valters Lūsis of the State Forestry Service "Hunters can mix the jackals up with wolves, and some might do so deliberately if we set different dates, so we made sure that their seasons are exactly the same" (Latvian Public Broadcasting 2014). Opinion amongst officials in Latvia is not universally negative, for example Janis Ozolins, senior research scientist at the Latvian State Forestry organisation considers the process of species migration as natural, recommends against any mass culling and discounts the idea that Golden Jackal could proliferate as a problem in Latvia (Latvian Public Broadcasting 2014). Discussion.

Origin and Status in Lithuania. Given the steady spread of the species northwards over recent decades, Golden Jackal is

clearly a species in the process of range expansion and, supported by recent records in northern Ukraine and Belarus, there is little reason to suppose the appearance of Golden Jackals in the Baltic States is anything other than an continuation of this process. Either originating from the core Balkan populations or, suggested by genetic analysis of Estonian individuals, Caucasian populations, the movements of animals seem very likely to have occurred via Ukraine and Belarus, thereafter moving into the Baltic States through the watersheds of the River Daugava and possibly River Neris.

Though the initial recovery and expansion of Golden Jackal populations in the 1970s and 1980s was likely linked to reduced persecution following legal protection, the continued expansion beyond the historic range is clearly a new phenomenon. It is likely that expansion as far north as the Baltic States has been facilitated by a number of factors, the increased core populations being only one. The absence of physical landscape barriers such as high mountain ranges is clearly advantageous to the spread of Golden Jackals, as has been suggested less snowy winters, a reduction in Wolf populations along the route and a continuum of landscapes from Ukraine to the Baltic States that offer both suitable feeding terrain and safe daytime refuges in small woodlands (Arnold et al 2012).

Without any evidence to the contrary, it is reasonable to accept that Golden Jackals arrived in the Baltic States not as a result of human introductions, but as a result of natural spread, possibly aided by milder winter conditions and reduced populations of Wolves. With this in mind, Golden Jackal should be termed a new species, not an alien or invasive species. Article 2.2 of the EU Regulation 1143/2014 on Invasive Alien Species explicitly states that species expanding naturally in response to environmental changes should not be classified as alien species in their new environment. In the opinion of the author, the classification of Golden Jackal as an invasive alien in Lithuania has no scientific justification.

Invalid Comparisons. An almost uniform reaction to the arrival of Golden Jackal in Lithuania has been to draw comparisons with the situations of invasive species such as Raccoon, Raccoon Dog and American Mink. All of these species are widely-documented to have been introduced by humans and none are native to the Western Palearctic and thus have historically never interacted with the native species of Europe. By contrast, not only has Golden Jackal almost certainly arrived as a result of natural spread, but it is also a species native to the Western Palearctic (of which the Baltic States are part). As a native Palearctic species, the Golden Jackal co-exists elsewhere in its range with a broadly similar mix of species to those in the Baltic States, even allowing for differences in the exact structure and species compositions of the areas. There is little scientific value in comparing past experiences with truly invasive species such as American Mink with a native Palearctic species undergoing range expansion.

Consistent Approach. Over the last fifteen years, quite a number of other species from the south/south-east have also expanded their range across the Baltic States and begun to breed in Lithuania and Latvia – amongst them, birds such as Great White Egret (Aawicki 2014), Black-winged Stilt *Himantopus himantopus* (Gražulevičius 2012), Mediterranean Gull *Larus melanocephalus* (Lietuvos Ornitofaunistinis Komisijos 2008) and European Bee-eater *Merops apiaster* (Jusys et al 2010), and mammals such Mediterranean Water Shrew *Neomys anomalus* (Balčiauskas & Balčiauskienė 2014) and Root Vole *Microtus oeconomus* (Balčiauskas 2014). Amongst these, Great White Egret in particular has seen rapid recent colonisation of Lithuania – first recorded in the country in 1959, the species remained a rare non-annual vagrant until 1995. From that time onwards however, Great White Egrets expanded their range into the country at an unprecedented rate, individual flocks of close to 400 birds being recorded within ten years and breeding beginning from 2005. The species continues to expand and currently up to 30 pairs breed at localities across the country (Raudonikis 2012). To the knowledge of the author, little debate followed the arrival of any of these species, they have not been designated as invasive species and certainly not subject to culling. As with Golden Jackal, all have spread from more southerly parts of Europe and, whilst not native to Lithuania, are native to the Western Palearctic.

Official bodies and scientific institutes should take a consistent approach to classification of newly arrived breeding species in Lithuania. Without evidence to support such actions, there is no scientific justification to label Golden Jackal as an invasive alien, yet overlook other species arriving from broadly the same direction.

Hunting. If permitted, hunting of Golden Jackal should be regulated in a responsible sustainable manner. Accepting that Golden Jackal is not an alien invasive species, then provisions of Annex 5 of the Habitats Directive of the European Union should apply. Article 14 of this directive, the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (1992), explicitly states 'Member States shall take measures to ensure that the taking in the wild of specimens of species listed in Annex V is compatible with their being maintained at a favourable conservation status'. Currently Lithuania allows unlimited hunting of Golden Jackal without quota or season. In the view of the author, this is not responsible – not only is it clearly against maintaining a favourable conservation status, but it is likely to lead to increased illegal killing of Wolf. At the very least, Lithuania needs to set a hunting season to coincide with that of Wolf.

Conclusions. Decisions made by respected bodies such as the Ministry of the Environment and scientific institutes should be based on facts and supported by evidence. If comments and actions taken regarding Golden Jackal in Lithuania are not based on consistent scientific criteria, the credibility of the relevant bodies is undermined.

1. Golden Jackal should not be termed an alien or invasive species. There is no evidence pointing to the introduction of this species by human action, either deliberate or accidental. With the species now recorded in all territories between the historic range and the newly discovered animals in the Baltic States, natural expansion is by far the most likely explanation for occurrence. To reiterate, Article 3.1 of the EU Regulation 1143/2014 on Invasive Alien Species (2014) defines alien species as those specifically originating from introductions. Article 2.2 of the same regulation also states that species migrating in response to environmental changes should not be designated as invasive species.

2. Comparisons with known invasive aliens such as American Mink, Raccoon Dog and Raccoon are not valid. Not only is the origin of Golden Jackal probably the result of natural spread, but it is also native to the Western Palearctic species (of which the Baltic States are part). The above mentioned invasive species are widely-documented to have been introduced

by humans, they are not native to the Western Palearctic and thus have historically never interacted with the native species of Europe. Golden Jackal is native to the Western Palearctic and it co-exists elsewhere in its range with a broadly similar mix of species to those in the Baltic States.

3. Evidence from studies of Golden Jackals elsewhere in Europe suggests that Golden Jackals will have no significant overall impact on the species that they are likely to encounter in Lithuania. The only exception to this is Red Fox that might be expected to show local declines in population. With almost identical diets found in comparative studies of Golden Jackals and Red Foxes from a wide range of localities, any potential impact of predation by Golden Jackals on the Lithuanian environment is likely to be compensated by an associated reduction in Red Fox predation. Assessments regarding the potential impact of Golden Jackals on the environment should be evidence-based. Golden Jackal is a native Palearctic species and is primarily a predator of small mammal species (rodents and hares) and a scavenger. There is no evidence that its presence in other European countries has an overall detrimental impact on the environment, including in other countries of recent colonisation, such as Slovenia.

4. Information provided to the public should be accurate and based on fact. In national media outlets, prior to any official decisions, spokespersons from scientific institutes and the country's Ministry of the Environment repeatedly described Golden Jackal as invasive and undesirable, comparing the species with clearly non-native species such as Raccoon Dog. With evidence pointing to natural expansion as the likely path of Baltic colonisation, this could be considered misinformation. Pre-empting official decisions and declaring the species as invasive in national media is likely to lead to long-term negative attitudes amongst the public, regardless of actual decisions taken on the status of the species at a later date.

5. Official bodies and scientific institutes should take a consistent approach to classification of newly arrived breeding species in Lithuania. Over the last decade, quite a number of other species from the south/south-east have begun to breed in Lithuania and Latvia, including both birds and mammals. No evidence exists to suggest anything other than natural spread in any of these species, yet only Golden Jackal is variously being described as alien and invasive. There is no scientific basis to treat Golden Jackal in a different manner. If official bodies and scientific institutes wish to have any credibility, a logical consistent scientific basis should underpin their actions.

6. Golden Jackal is listed on Annex 5 of the Habitats Directive of the European Union. If Golden Jackal is accepted as occurring naturally, i.e. not as an alien invasive, European legislation confers protection on the species. While permitting hunting, this dictates that populations should be maintained at a favourable conservation status. Though obliged to heed European legislation unless it has an exemption, Lithuania currently has no safeguards in place to ensure the newly established population is maintained at such a favourable status. Indeed, by adding Golden Jackal to the list of species that may be hunted throughout the year without restriction, there is anything but a favourable conservation status.

7. Notwithstanding point 6, at the very least, the hunting season should be restricted to coincide with that of the Wolf – as the State Forestry Service of Latvia has concluded, hunters can mistake Golden Jackals and Wolves and thus seasons should be coordinated to avoid illegal killing of Wolves. Currently, Lithuania permits the unlimited hunting of Golden Jackal without quota or season. It is reasonable to foresee this leading to illegal hunting of Wolf, either accidental or deliberate. Acknowledgements.

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FOOTNOTE: Following a series of meetings and presentation of these arguments to the Ministry of the Environment in Lithuania, the proposal to list Golden Jackal as invasive species was dropped. This decision was formally adopted at a meeting of the Invasive Species Council in summer 2015, thereby the argument was accepted, the presence of Golden Jackal in the Baltic States is, in all likelihood, a result of natural spread. Proposals were also forwarded at the same meeting to remove the species from the list of species that may be hunted all year without limit and to align the hunting season to coincide with that of Wolf.