

UNIVERZA V LJUBLJANI  
BIOTEHNIŠKA FAKULTETA

Aleksandra MAJIĆ SKRBINŠEK

**VLOGA STALIŠČ SPLOŠNE JAVNOSTI IN  
KLJUČNIH INTERESNIH SKUPIN PRI  
UPRAVLJANJU IN VARSTVU POPULACIJ VELIKIH  
ZVERI**

DOKTORSKA DISERTACIJA

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**THE ROLE OF GENERAL PUBLIC AND KEY INTEREST GROUPS  
ATTITUDES IN MANAGEMENT AND CONSERVATION OF LARGE  
CARNIVORE POPULATIONS**

DOCTORAL DISSERTATION

Ljubljana, 2022

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AI Varstvo velikih zveri je vpeto v širše socioekonomske, čustvene in politične kontekste. Vračanje teh vrst na območja, iz katerih so v preteklosti izginile prinaša s sabo precejšnje družbene izzive, saj temeljni konflikti, ki so v preteklosti povzročili preganjanje, niso izginili. Kot alternativo pristopom upravljanja »od zgoraj navzdol« predlagamo uporabo sodelujočih pristopov, ki pomagajo graditi zaupanje in vzpostaviti trajnostno sobivanje z velikimi zvermi. Ti pristopi so tudi inherentno bolj demokratični. Rezultati javnomnenjskih raziskav lahko pri teh pristopih predstavljajo glas »tihe večine« in upravljavcem omogočijo učinkovitejše oblikovanje rešitev. Na Hrvaškem smo pri volku v letih 1999 in 2003 dokumentirali premik stališč iz ekstremnih (pozitivnih in negativnih) proti bolj nevtralnim. Negativna stališča, ki so se razvila zlasti pri starejših kohortah ob popolni zaščiti volka proti koncu devetdesetih let prejšnjega stoletja so se do druge raziskave nekoliko umirila kljub naraščanju populacije volka. Pri rjavem medvedu smo v letih 2002 in 2008 in dokumentirali stališča javnosti in nekaterih pomembnejših interesnih skupin. Orientacije vrednot in naklonjenost ohranjanju vrste se nista spremenili, se pa je zmanjšala kapaciteta za sprejemanje rjavega medveda, verjetno zaradi rasti populacije in bolj centraliziranega upravljanja. V Albaniji in Severni Makedoniji smo raziskali odnos javnosti do vseh treh velikih zveri. Podpora varstvu volka je v obeh državah znatno nižja kot podpora varstvu rjavega medveda in evrazijskega risa. To kaže, da je potrebno vrste pri varstvu in upravljanju obravnavati ločeno, saj bi lahko skupni ukrepi za vse tri vrste povzročili, da bi se negativen odnos do volka »prelil« tudi na drugi dve vrsti.

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AI Conservation of large carnivores is entwined into wider socioeconomic, emotional and political contexts. Return of these species to the areas from which they disappeared in the past also brings considerable social challenges since the fundamental conflicts that caused persecution in the past never went away. As an alternative to top-down management, we are suggesting the use of collaborative approaches that help build trust and establish sustainable coexistence with large carnivores and are also inherently more democratic. For these approaches, results of public attitudes surveys can provide the voice of the “silent majority” and help the managers in more efficient forming of solutions. In Croatia, for wolf we documented a shift in attitudes between 1999 and 2003 from extremes (positive and negative) towards more neutral. Negative attitudes, which developed particularly in older cohorts primarily because of a top-down total protection of the wolf at the end of the 1990s, started to wind down by the second survey despite the wolf population increase. For the brown bear we documented the attitudes of the general public and key interest groups in 2002 and 2008. While value orientations and support for species conservation remained the same, there was a decrease in brown bear acceptance capacity, probably because of a population increase and more centralized management. In Albania and Northern Macedonia, we explored public attitudes towards all three large carnivores. Support for wolf conservation is in both countries much lower than support for conservation of brown bear and Eurasian lynx. This indicates that the species need to be treated separately in conservation and management since common measures for all three species could cause the negative attitudes towards wolves to transfer also to the other two species.

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# 1 PREDSTAVITEV PROBLEMATIKE IN HIPOTEZE

## 1.1 UVOD

Kot človeštvo se danes soočamo s številnimi globalnimi izzivi, med katerimi je izguba biodiverzitete gotovo en pomembnejših in bolj izpostavljenih. Biodiverziteta je temelj delovanja ekosistemov, rezultat celotne evolucije našega planeta in, nenazadnje, ključna za obstoj človeka (Soulé, 1985). Zaradi eksplozivne rasti človeške populacije in vedno večjih potreb po prostoru in naravnih virih prihaja do krčenja in spreminjanja naravnega okolja in zmanjševanja razširjenosti in številčnosti številnih živalskih in rastlinskih vrst. Glede na podatke Mednarodne zveze za varstvo narave (IUCN) je danes 38.500, oziroma 28%, vseh živalskih in rastlinskih vrst, za katere je bila delana ocena, ogroženih (IUCN Red List, 2021). Že leta 2002 so (Sanderson in sod., 2002) ugotavljali, da je vsaj 83% zemeljske površine spremenjeno zaradi človeške aktivnosti. Vpliv človeka na geologijo in ekosisteme planeta zemlje je v zadnjih stoletjih tolikšen, da je predlagana nova geološka doba, Antropocen (Lewis in Maslin, 2015), katere glavna značilnost je v temeljih spremenjen odnos med človekom in celotnim sistemom planeta Zemlja.

Kot odgovor znanosti na krizo biodiverzitete se je v osemdesetih letih dvajsetega stoletja oblikovala varstvena biologija kot interdisciplinarna, aplikativna veda, katere cilj je upočasniti, ali še bolj ustaviti, izgubo biodiverzitete in omogočiti nadaljevanje evolucijskih procesov in življenja na zemlji (Soulé, 1985). Čeprav izvira iz biologije, vključuje varstvena biologija ob številnih bioloških področjih tudi znanja in strokovnjake iz številnih drugih, tudi družbenih ved (Soulé, 1985). V zadnjem času pa se varstveno biologijo celo predlaga kot del širše varstvene znanosti (»Conservation Science«), ki vključuje tudi druge vede kot so agronomija, antropologija, ekonomija, sociologija, psihologija, komunikologija, medicina, politologija in podobno (Kareiva in Marvier, 2012). Ta kompleksnost ved, ki se ukvarjajo z reševanjem biodiverzitetne krize, je odraz izjemne kompleksnosti problematike in velikega izziva, ki ga predstavlja.

Tako kot se pojavlja biodiverziteta na različnih ravneh, od ekosistemske do ravni genov (Kryštufek, 1999), je na različnih ravneh tudi varstvo. Čeprav so vse ravni varstva ključne, je verjetno tista temeljna raven varstvo vrst, pri čemer pa ne predstavljajo vse vrste enakega varstvenega izziva. Varstvo velikih zveri zavzema v marsičem posebno mesto.

Zaradi velikih prostorskih potreb in nizkih populacijskih gostot potrebujejo velike zveri ogromna strnjena območja, da bi oblikovale viabilne populacije, kar je v sodobnem antropogeno spremenjenem svetu vse večji problem (Pelton, 2003). Obstoj teh velikih zveri se po eni strani od nekdanj križa z interesi človeka, po drugi strani pa je vedno bolj jasn velik pomen vrst na vrhu prehranskega spleta, zlasti plenilcev, pri delovanju ekosistemov (Estes, 2011). Konflikti, ki jih povzročajo z neposrednim vplivom na premoženje in eksistenco ljudi,

pa so razlog za sovraštvo do teh vrst, ki je globoko ukoreninjeno v človeški zgodovini in mnogih kulturah (Ripple in sod., 2014). Po drugi strani pa so te vrste izrazito karizmatične, pogosto prisotne v kulturni dediščini večine kultur na celotnem območju svoje zgodovinske razširjenosti, njihovo varstvo pa je močno vpeto v širše socioekonomske, čustvene in politične kontekste, kar naredi izzive njihovega varstva še bolj kompleksne (Chapron in López-Bao, 2014).

## 1.2 VELIKE ZVERI V EVROPI – IZGINJANJE IN PONOVA VRNITEV

Podobno kot sorodne vrste drugod po svetu imajo tudi evropske velike zveri dolgo zgodovino konflikta s človekom. Rjavi medved (*Ursus arctos*, v nadaljevanju medved), volk (*Canis lupus*) in evrazijski ris (*Lynx lynx*, v nadaljevanju ris) so bili zgodovinsko razširjeni po večini evropskega kontinenta, v 18. in 19. stoletju pa so te vrste zaradi neposrednega iztrebljanja s strani človeka in izgube življenjskega prostora izginile iz večjega dela svoje zgodovinske razširjenosti.

Medved je nekoč poseljeval celoten zmerni pas Holarktike. Njegovo izginjanje se je ponekod začelo že zgodaj, saj je iz delov severne in Zahodne Evrope začel izginjati že v srednjem veku. Večina ostalih populacij se je zelo zmanjšala v 19. in v začetku 20. stoletja, ko je medved izginil iz večjega dela Zahodne Evrope, kjer je ostal v zgolj nekaj majhnih reliktnih populacijah, in prišel na rob izumrtja v Skandinaviji (Breitenmoser, 1998). Večje populacije so ostale le v delu Srednje in v Vzhodni Evropi.

Tudi volk je iz velikega dela Zahodne Evrope izginil že pred začetkom 18. stoletja, v prvi polovici 20. stoletja pa je izginil iz praktično celotne Zahodne Evrope, vključno s Skandinavijo (Zimen in Boitani, 1979). Velike populacije so v prvi polovici 20. stoletja ostale samo v Vzhodni Evropi (Rusija in Karpati), ostalo pa je tudi več manjših fragmeniranih populacij v Dinaridih ter na Iberskem in Apeninskem polotoku (Promberger in Schröder, 1993; Breitenmoser, 1998).

Ris, čeprav verjetno najmanj kontroverzna izmed omenjenih vrst, je prav tako začel izginjati iz Evrope že pred 18. stoletjem, zlasti iz ravninskih območij, ki so jih bolj poseljevali ljudje, je pa bil še na začetku 19. stoletja prisoten v večini večjih gozdnatih območjih in gorskih masivov Evrope (Breitenmoser, 1998). Konec 19. in v začetku 20. stoletja je ris izginil iz Zahodne, Srednje in Južne Evrope, populacije so obstale le v borealnih gozdovih Severne Evrope, v Karpatih in majhna reliktna populacija na jugu Dinaridov v majhnem delu Grčije, Albanije in Severne Makedonije.

V preteklosti je izginjanje velikih zveri v veliki meri zrcalilo rast in širjenje človeške populacije. Kjerkoli so se naselili ljudje, so preganjali velike zveri, ki so ogrožale njihove domače živali in predstavljale tekmece za lovne vrste. Iztrebljanje teh vrst je bil kategoričen cilj vseh evropskih agrarnih družb, ki so večinoma za njihovo ubijanje izplačevale tudi nagrade (Breitenmoser, 1998). Ob neposrednem pregonu je izginjal habitat, konec 18. in v 19. stoletju pa je v večjem delu Evrope prišlo tudi do drastičnega upada populacij plenskih vrst, zlasti velikih parkljarjev (Potočnik, 2001). Izginjanje velikih zveri iz Evrope je zelo kompleksno in se med vrstami razlikuje – medtem ko je izginjanje volka in medveda sledilo podobnemu vzorcu, ko so populacije izginile s severa Evrope in ostale na jugu, je ris prav nasprotno preživel na severu Evrope in izginil na jugu. Breitenmoser (1998) razpravlja, da te razlike najverjetneje niso posledica različnih režimov preganjanja, ampak različni odzivi posamezne vrste na vplive človeka, kot so izguba habitata, padec populacij plenskih vrst, različnih živinorejskih pristopov in različnega lovnege pritiska, kar pa ima v različnih delih Evrope različna družbena in kulturna ozadja.

Tako kot je bilo izginjanje velikih zveri posledica delovanja človeka, je bila potrebna za zaustavljanje tega procesa sprememba v odnosu ljudi do narave. Izginjanje velikih zveri se je v Evropi začelo ustavljati v drugi polovici 20. stoletja, ko so se s prebujajočo se naravovarstveno zavestjo v državah, kjer so velike zveri še živele, začele ukinjati nagrade, kmalu pa so se začeli vzpostavljati tudi prvi mehanizmi zaščite (Salvatori in sod., 2007). Številne države so vzpostavile formalno varstvo velikih zveri že pred podpisom ključnih mednarodnih naravovarstvenih konvencij (kjer je treba zlasti izpostaviti in Bernsko konvencijo (Konvencija o varstvu prosto živečega evropskega rastlinstva in živalstva ter njunih naravnih življenjskih prostorov, 1979) in Konvencijo o biološki raznovrstnosti (Konvencija Združenih Narodov o biološki raznovrstnosti, 1992)), po podpisnem pristopu k tem konvencijam pa se je v večini primerov zakonska zaščita še okrepila. Države evropske skupnosti so leta 1993 naredile še dodaten pomemben korak s sprejetjem Habitatne direktive (Direktiva Sveta 92/43/EGS, 1992), ki so jo bile države članice dolžne prenesti v svojo nacionalno zakonodajo in ki nudi široko zakonsko zaščito prosto živečim živalskim in rastlinskim vrstam ter njihovim habitatom in ki je ključen dokument naravovarstva v EU.

Vzporedno z vzpostavljanjem zakonskega varstva velikih zveri je po večini evropskega kontinenta prihajalo tudi do urbanizacije in zmanjšanja intenzivne kmetijske rabe površin, ki jih je bilo težje obdelovati s stroji, kar je vodilo do širjenja habitata za številne gozdne vrste in marsikje do hitre rasti populacij plenskih vrst za velike zveri (Breitenmoser, 1998).

Posledica omenjenih sprememb je bilo vračanje velikih zveri na številna območja, iz katerih so izginile. Dinamika te rekolonizacije je najbolj izrazita pri volku, ki se je že konec sedemdesetih let prejšnjega stoletja začel širiti iz juga Apeninov proti Alpam, koloniziral Skandinavijo, v zadnjih desetletjih pa se je razširil tudi v Nemčijo in Francijo, kjer se populacije krepijo in širijo. Redno se pojavlja v Švici, Avstriji, na Poljskem in Češkem (Petra

Kaczensky in sod., 2013), prišli pa so tudi v Belgijo (van der Veken in sod., 2021) in Nizozemsko (van Liere in sod., 2021). Širitev medveda je počasnejša, kljub temu pa populacije večinoma naraščajo in se širijo, bile pa so tudi tri doselitve oziroma ponovne naselitve, in sicer iz Slovenije v Trentino v Italiji, v Pireneje v Franciji in v osrednjo Avstrijo (Kaczensky in sod., 2013). Pri tem je treba izpostaviti naselitev v Avstrijo, kjer je novo vzpostavljena populacija kljub hitri začetni dinamiki spet propadla. Naselitev v Avstrijo je ves čas spremljalo nasprotovanje večih interesnih skupin, zlasti lovcev in živinorejcev, kot ključen razlog za propad populacije pa raziskovalci navajajo krivolov (Kaczensky in sod., 2011). Najpočasnejše je okrevanje pri risu in zaenkrat poteka skoraj izključno preko ponovnih naselitev (Kaczensky in sod., 2013). Ponovne naselitve v Zahodno in Srednjo Evropo so se začele v sedemdesetih letih 20. stoletja, iz njih pa so nastale današnje populacije v severnih Dinaridih, Alpah, gorovju Jura, pogorju Harz in Bavarskem gozdu (Linnell in sod., 2009). Naštete ponovno naseljene populacije primarno izvirajo iz slovaških Karpatov, njihovo varstveno stanje pa ostaja problematično.

### 1.3 DRUŽBENI IZZIVI VRNITVE VELIKIH ZVERI

Rast populacij velikih zveri in njihovo prostorsko širjenje prinaša s sabo številne družbene in upravljalvske izzive. Četudi se naravovarstvena zavest na splošno dviguje, ima prisotnost velikih zveri velik posreden in neposreden vpliv na ljudi, ki si z njimi delijo prostor (Fritts in sod., 2003). Čeprav se človeška družba zelo hitro spreminja, se lahko velike zveri spreminjajo le v evolucijskem času in so z biološkega vidika v veliki meri enake, kot so bile pred več stoletji, ko smo jih ljudje načrtno preganjali in iztrebljali. Tudi razlogi, zaradi katerih smo jih preganjali, so v veliki meri ostali enaki.

Velike zveri v ruralnem okolju še vedno lahko povzročijo resne škode v živinoreji, če domače živali niso ustrezno varovane, v primeru medveda pa se pojavljajo tudi škode na drugem premoženju (čebelnjaki, sadno drevje, kompostniki in podobno). Ustrezno varovanje domačih živali in drugega premoženja nosi s sabo dodatno delo in stroške za kmetovalca, tako da prisotnost velikih zveri v vsakem primeru neposredno vpliva na ruralno ekonomiko (Rode in sod., 2021).

Drugo pomembno komponento pa predstavlja strah pred velikimi zvermi, tako racionalen kot iracionalen (Fritts in sod., 2003). Strah je do neke mere racionalen pri medvedu, ki je velika in močna žival in pri katerem lahko v izjemnih primerih pride do poškodb ali celo smrti ljudi. Medvedi se lahko ob velikih populacijskih gostotah in neprimernem ravnanju ljudi, zlasti ob dostopu medveda do različnih antropogenih virov hrane (npr. smeti, kompostniki, klavniški odpadki...) habituirajo na prisotnost človeka in se približujejo ljudem in naseljem. V takšnih primerih postane verjetnost neposrednega napada medveda na človeka večja, prisotnost medvedov pa lokalnim prebivalcem zelo moteča (Herrero in sod., 2005). Po drugi strani je neposreden strah pred volkom iracionalen (čeprav so v svetu

zabeleženi primeri, ko so volkovi napadli ljudi – glej - Linnell in sod., 2002), ima pa volk v kulturi in izročilu sloves »zlobnega« bitja, ki se ga ljudje bojijo. Še najmanj je strah prisoten pred risom, ki ga tudi na splošno ljudje slabše poznajo (Bath in sod., 2008; Lescureux in sod., 2011).

V ruralnem okolju pa imajo lahko ljudje od velikih zveri tudi neposredno premoženjsko korist. Lovni turizem, v populacijah, ki prenesejo tak način rabe, lahko prinese precejšen doprinos lokalni ekonomiji, prisotnost velikih zveri pa nosi s sabo tudi potencial za razvoj ekoturizma (Fritts in sod., 2003).

Po drugi strani pa se vrednote v družbi spreminjajo, velike zveri pa zlasti v urbanem okolju, kjer imajo ljudje z njimi znatno manj neposrednega stika, marsikomu pomenijo simbol neokrnjene narave in »divjine«. Okrog velikih zveri tako pogosto nastane nekakšen romantičen konstrukt, ki vodi v idealiziranje velikih zveri in močne čustvene reakcije (Fritts in sod., 2003). Družbeni diskurz okrog velikih zveri tako neredko postane izjemno glasen in čustven, tako v pozitivno kot v negativno smer. Problematika velikih zveri je pogosto močno izpostavljena in zlorabljena v medijih in politiki. Odločevalci pa se neredko znajdejo pod pritiskom različnih interesnih skupin, katerih želje, cilji in vrednote so pogosto diametralno nasprotni (Skogen in Thrane, 2007; Slagle in sod., 2018).

#### 1.4 IZZIVI VARSTVA VELIKIH ZVERI IN UPRAVLJANJA Z NJIMI

Glede na vso opisano ozadje je jasno, da je varstvo velikih zveri in upravljanje z njimi zahtevno in kompleksno področje. Čeprav se tradicionalno v ta namen uporabljajo pristopi »od zgoraj navzdol«, kjer upravljalci diktirajo upravljalne ukrepe, ki se potem izvajajo (ali pa tudi ne), je tak pristop v demokratičnih družbah vprašljiv (Björkell, 2008). Družbene spremembe v demokratičnih družbah omogočajo posredno in neposredno vključevanje interesnih skupin v procese okoljskega odločanja, kar je v zadnjih desetletjih tudi formalno deklarirano v mednarodni konvenciji (Konvencija o dostopu do informacij, udeležbi javnosti pri odločanju in dostopu do pravnega varstva v okoljskih zadevah (Aarhuška konvencija), 2005), ki so jo ratificirale vse evropske države razen Rusije. Pestrost interesov glede velikih zveri in možnost, da se ti interesi odražajo v upravljanju in varstvu, so znatno povečali kompleksnost upravljanja. Tako Brown in Decker (2001) med drugim navajata naslednje razloge, zaradi katerih je od začetka devetdesetih prišlo do povečanja kompleksnosti v upravljanju in varstvu prostoživečih populacij živali:

- število interesnih skupin se je povečalo, s tem pa so vrednote, ki jih te interesne skupine zastopajo, postale bolj raznolike.
- zakonodaja, ki ureja procese odločanja v varstvu narave in upravljanju s prostoživečimi živalmi, je natančnejša.

- zahteve javnosti po sodelovanju v odločanju naraščajo.

Pri velikih zvereh je bil dolgo glavni upravljavski pristop poseganje v populacijo z ubijanjem, v preteklosti z namenom iztrebljanja, kasneje pa tudi v obdobju varstva teh vrst kot orodje za regulacijo velikosti populacije, odstranjevanje osebkov ki povzročajo nesprejemljive škode ali so nevarni ljudem, pomiritev ljudi, v velikih populacijah pa tudi z lovom kot rabo naravnega vira (Anderson, 2021; Knott in sod. 2014; Salvatori in sod. 2002). Z vzpostavitvijo varstva pa se je znatno povečala tudi kompleksnost upravljavskih pristopov, ki so morali postati v veliki meri usmerjeni v neposredno reševanje konfliktov z velikimi zvermi in večanje podpore sobivanju, pa tudi reševanju konfliktov zaradi velikih zveri med interesnimi skupinami. Prav zaradi konfliktnosti velikih zveri je potreba po vključevanju družbenih vidikov v upravljanje oziroma varstvo teh vrst še posebej izpostavljena (Bath, 1996; 1998; Linnell in sod., 2001; Breitenmoser, 1998).

## 1.5 POMEN RAZISKAV STALIŠČ JAVNOSTI DO VELIKIH ZVERI ZA VARSTVO IN UPRAVLJANJE

Upravljanje z velikimi zvermi pogosto pomeni spreminjanje obnašanja ljudi, ki na območju velikih zveri živijo (npr. uporaba zaščitnih sredstev pri preprečevanju škod po zvereh v kmetijstvu), kar daje še poseben pomen razumevanju norm obnašanja, stališč in vrednot, saj so stališča in obnašanje tesno povezani. Razmerja med stališči in obnašanjem dobro opisuje Fishbein-Ajzenov model (Ajzen in Fishbein, 2000; Fishbein in Ajzen, 1975b), ki kljub enostavnosti predstavlja danes enega izmed najbolj razdelanih kognitivnih psiholoških modelov (Ule, 2004). Po tem modelu je obnašanje odvisno od namere obnašanja, katero sooblikujejo družbeno sprejemljive norme obnašanja, stališča do problematike, pričakovanje rezultata in vrednosti rezultata obnašanja.

Sistematične in strukturirane raziskave stališč do velikih zveri v Evropi so se začele konec sedemdesetih let prejšnjega stoletja v Skandinaviji (Andersson in sod., 1977; Vittersø in sod., 1998; Lumiaro, 1998; Bjerke in sod., 1998; Bjerke in sod., 1998; Kaltenborn in sod., 1999; Ericsson in Heberlein 2003; Kleiven in sod., 2004). Znanstveniki iz Švedske, Norveške in Finske so prvi v Evropi pokazali interes za raziskave stališč različnih interesnih in demografskih skupin (naravovarstveniki, rejci drobnice, rejci severnih jelenov, lovci, urbano in ruralno prebivalstvo) do velikih zveri. Za preostale dele Evrope predstavlja mejnik prisotnosti tovrstnih raziskav in objav leto 2000, ko so se pod pokroviteljstvom Svetovne zveze za varstvo narave - Evropske iniciative za velike zveri (IUCN - LCIE) začele pojavljati številne obsežne kvantitativne raziskave.

Na Hrvaškem so bili prvi poskusi raziskovanja stališč javnosti do zvereh rezultat zmanjševanja števila volkov in iskanja podpore javnosti za njihovo zakonsko zaščito (Morić in Huber, 1989; Gyorgy, 1984; Huber in sod., 1992; Huber in sod., 1994). Pomanjkljivosti

teh raziskav so bili majhni vzorci in nenaključno vzorčenje anketirancev. Rezultati raziskav kljub temu kažejo, da je v osemdesetih letih prejšnjega stoletja prišlo v odnosu javnosti do volkov do sprememb. Tako se je odstotek anketirancev, ki so menili, da je volk škodljiva žival, v desetletju zmanjšal iz 42% leta 1983 (Gyorgy, 1984) na 25% (Huber in sod., 1994). Podobno se je odstotek anketirancev, ki podpirajo iztrebljanje volkov, zmanjšal iz 21% leta 1983 na samo 8 % v letu 1994.

Prva raziskava, ki je sledila ustreznim metodološkim standardom v raziskovanju javnega mnenja, je bila na Hrvaškem izpeljana leta 1999. Analizirala je stališča ruralne javnosti, lovcev, gozdarjev in srednješolcev iz območja Gorskega Kotara, Like in Dalmacije do volkov. Opisno analizirani rezultati (Bath in Majić, 2001) kažejo na regionalne razlike v stališčih, saj so imeli najbolj pozitiven odnos do volka anketiranci iz Gorskega Kotara, medtem ko je bil ta odnos najmanj pozitiven pri anketirancih iz Dalmacije, kjer je bilo tudi največ škod po volkovih. Prvi korak v smeri spremljanja odnosa javnosti do volkov in ocenjevanja učinkov upravljaljskih ukrepov na Hrvaškem je ponovitev omenjene raziskave leta 2003 in leta 2005 (Majić, 2007; Majić-Skrbinšek in Bath, 2004; 2005).

Naslednja raziskava (Majić-Skrbinšek, 2003) je z anketo zajela prebivalce območja medveda na Hrvaškem, tako osrednjega območja kot tudi robnega območja, kjer se medvedi pojavljajo le občasno. Tretja ciljna skupina so bili gozdarji, ki delujejo na območju medveda.

V Sloveniji je Korenjakova (1995; 2000) v svojem diplomskem in magistrskem delu analizirala stališča obiskovalcev ljubljanskega in dunajskega živalskega vrta ter turistov, gozdarjev, lovcev in živinorejcev v Sloveniji in Avstriji do velikih zveri. Rezultati so pokazali, da so imeli najbolj pozitiven odnos do teh vrst obiskovalci živalskih vrtov. Anketirani slovenski kmetje so večinoma menili, da velike zveri vendarle sodijo v slovenske gozdove, medtem ko so jim avstrijski kmetje odrekli vsako pravico bivanja v Avstriji. Podoben rezultat je dala tudi primerjava stališč slovenskih in avstrijskih lovcev, medtem ko so bili tako avstrijski kot slovenski gozdarji velikim zverem naklonjeni.

Prva raziskava, ki je v Sloveniji raziskala odnos splošne javnosti do zveri (v tem primeru medveda), je vključevala le majhen del območja medveda v Sloveniji (Kaczensky in sod., 2004). Odnos do medveda je bil med anketiranimi lovci in prebivalci raziskovanega območja pozitiven, so pa večinoma že takrat nasprotovali širjenju medveda in višanju številčnosti populacije.

Naslednja raziskava (Prosen, 2002) je bila prav tako usmerjena v stališča ciljnih interesnih skupin do velikih zveri. Raziskovali so stališča strokovnjakov na področju rabe prostora, oškodovancev pri škodah zaradi velikih zveri, članov lovskih družin in revirnih gozdarjev. Avtor je uporabil hipotezo o oblikovanju javnega mnenja preko komunikatorjev (v tem primeru omenjenih interesnih skupin) in kanalov komuniciranja, nato pa je stališča teh

skupin poskusil generalizirati na stališča splošne javnosti v območju, iz katerega so anketiranci prihajali. Raziskava ni podala vpogleda v naravo predvidenega vpliva izbranih komunikatorjev na oblikovanje javnega mnenja, mnenje splošne javnosti pa je ostalo še naprej nedokumentirano.

Leta 2008 je bila izpeljana prva večja raziskava stališč splošne javnosti in lovcev do risa (Majić-Skrbinšek, 2008). Raziskava je pokazala, da obstaja glede ohranjanja risa v Sloveniji konsenz, večina anketirancev je podprla tudi dodatno naselitev risov iz tujine, bolj deljena pa so bila mnenja glede številčnosti risov. Leta 2010 je Slana (2010) v diplomskem delu analizirala stališča lovcev in splošne javnosti do morebitne dodatne doselitve evrazijskega risa. Anketiranci so bili potencialnemu posegu večinoma naklonjeni. Poleg tega je Mulejeva (2011) v diplomskem delu analizirala vpliv poznavanja biologije risa na stališča javnosti in lovcev na osrednjem območju razširjenosti risa v Sloveniji in ugotovila, da poznavanje biologije risa nima pomembne vloge pri napovedovanju stališča do te vrste. Pomembne napovedne spremenljivke so bile strah pred risom in splošno prepričanje o pomenu ohranjanja biotske pestrosti.

Prelomnico v razumevanju odnosa javnosti do volka v Sloveniji predstavlja LIFE Narava projekt SloWolf. V okviru tega projekta je bila dvakrat izpeljana raziskava odnosa splošne javnosti in najpomembnejših interesnih skupin (rejci drobnice in lovci). V okviru prve raziskave Marinko in Majić Skrbinšek (2011) ugotavljata, da ni pomembnejših razlik med stališči raziskovanih skupin na območju stalne prisotnosti volka (teritorialni tropi) in območjih, kjer se volk pojavlja občasno (posamezni teritorialni volkovi in volkovi v disperziji). Odnos do volka je bil pozitiven s strani lovcev in splošne javnosti, rejci pa so bili volku manj naklonjeni. V okviru druge SloWolf raziskave Mulej s sodelavci (Mulej in sod., 2013) ugotavlja nespremenjeno podporo dolgoročnem ohranjanju volkov in izboljšanje sprejemanja številčnosti volkov. Leta 2015 so Majić Skrbinšek s sodelavci na območju italijanskih in slovenskih Alp izvedli obsežno raziskavo odnosa splošne javnosti in različnih interesnih skupin do volka (Majić-Skrbinšek in sod., 2015). Avtorji med drugim opozarjajo na pomen dobro načrtovanih izobraževalnih kampanj v zagotavljanju podpore javnosti ohranjanju volka.

V primerjavi z ostalimi, večinoma dobro raziskanimi evropskimi populacijami velikih zveri, so populacije velikih zveri v Severni Makedoniji, še bolj pa v Albaniji, slabo raziskane (Trajce, 2016). Pomembno prelomnico predstavlja začetek čezmejnega povezovanja makedonskih, albanskih, švicarskih in nemških organizacij pri izvedbi Programa za okrevanje balkanskega risa (angl.: Balkan Lynx Recovery Programme) leta 2006 (KORA, 2021). V okviru te iniciative so pričeli s sistematičnim čezmejnimi spremljanjem balkanske populacije risa (*Lynx lynx balcanicus*). Ob tem so začeli raziskovati tudi družbene vidike sobivanja z velikimi zvermi – škode v kmetijstvu po velikih zvereh (Keci in sod., 2007) in odnos javnosti do zveri (Lescureux in Linnell, 2010; Trajce, 2016).



## 1.6 VKLJUČEVANJE JAVNOSTI V ODLOČANJE

Rezultati zgoraj omenjenih raziskav so skoraj vsi po vrsti neposredno informirali odločevalske procese, saj si odločevalci v izogib povzročanju ali poglobljanju konfliktov prizadevajo preveriti in zagotoviti podporo javnosti načrtovanim ukrepom. Izsledki SloWolf raziskave (Marinko in Majić-Skrbinšek, 2011) so bili uporabljeni pri pripravi nacionalnega akcijskega načrta (Akcijski načrt za trajnostno upravljanje populacije volka (*Canis lupus*) v Sloveniji za obdobje 2013-2017, 2015), na Hrvaškem pa so anketne raziskave (Majić 2003; Bath in Majić, 2001) predstavljale sestavni del participativne priprave načrtov upravljanja tako za volka (Štrbenac in sod., 2005) kot tudi za medveda (Dečak in sod., 2005). Izsledki anketne raziskave o risu (Majić-Skrbinšek, 2008) pa so med drugim predstavljali podlago za načrtovanje mednarodnega projekta za reševanje risa v Dinaridih – LIFE Lynx. Odločevalci torej potrebujejo znanstvene raziskave in podatke, ki natančno opisujejo cel spekter mnenj javnosti, da bi poiskali najustreznejše poti in rešitve, ki bi omogočile doseganje upravljaljskih ciljev (Chase in sod., 2001). Tako so anketne raziskave postale dopolnilno, posredno orodje pri vključevanju javnosti v odločanje, ki da glas t.i. »tihi večini«. Javno mnenje se tradicionalno vključuje v odločitve skozi razprave, okrogle mize in delavnice, vendar obstajajo dokazi, da ti pristopi stališč javnosti ne vključujejo reprezentativno (Johnston in sod., 1993). Običajno se slišijo, in posledično upoštevajo, zgolj interesi najglasnejših, saj tako imenovana »tiha večina« praviloma pri takšnih oblikah izmenjave mnenj ni prisotna (Bath, 1996).

## 1.7 RAZISKOVALNE HIPOTEZE

Pri delu sem postavila tri delovne hipoteze:

- a) Podpora javnosti ohranjanju vseh treh vrst velikih zveri je v Dinaridih visoka, vendar obstajajo pomembne razlike med različnimi interesnimi skupinami. Razliko v odnosu do velikih zveri bolje opiše pripadnost interesni skupini kot pripadnost državi ali regiji.
- b) Stališča javnosti do velikih zveri so dinamična in se lahko lokalno pomembno spremenijo v katero koli smer v razmeroma kratkem času.
- c) Splošen trend stališč javnosti do velikih zveri teži k vedno višjemu sprejemanju njihove prisotnosti.

## 2 ZNANSTVENA DELA

### 2.1 NE POZABITE POGLEDATI NAVZDOL – KOLABORATIVNI PRISTOPI K VAROVANJU ZVERI

#### **Don't forget to look down – collaborative approaches to predator conservation.**

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Izveček: Iskanje uspešnih rešitev za varstvo velikih zveri je splošno prepoznano kot naravovarstvena prioriteta, se pa mnenja o najučinkovitejših pristopih za doseganje tega cilja razlikujejo: medtem ko nekateri dajejo prednost pristopom »ukazovanja in nadzora« od zgoraj navzdol, spet drugi zagovarjajo kolaborativne pristope. Argumenti v prid prisilnih pristopov od zgoraj navzdol so bili že predstavljeni drugje, tukaj predstavljamo argumente za sodelovanje. Marsikje v razvitem svetu je prožnost pristopov vgrajena v zakonodajo, tako da so cilji naravovarstva uravnoteženi z drugimi legitimni cilji. Nasprotno pa bi v državah v razvoju zaradi omejenih virov, revščine in neučinkovitosti upravljanja lahko imeli kolaborativni pristopi pri varstvu velikih zveri zelo velik pomen. Splošno gledano lahko politike prisile vodijo v razkroj politične legitimnosti, potencialno pa tudi do problemov nepokorščine kot je na primer nezakonito ubijanje, medtem ko lahko kolaborativni pristopi pripeljejo do psihološkega občutka lastništva, večjega zaupanja, učenja in boljših rezultatov za družbo. Trajnostni lov / lov s pastmi igra ključno vlogo pri varstvu in upravljanju številnih vrst velikih zveri. Po svetu obstajajo številni različni modeli za učinkovito varstvo velikih zveri, zdaj so potrebne raziskave, ki bi zmanjšale negotovost in preučile učinkovitost teh pristopov v različnih kontekstih.

## Don't forget to look down – collaborative approaches to predator conservation

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### ABSTRACT

Finding effective ways of conserving large carnivores is widely recognised as a priority in conservation. However, there is disagreement about the most effective way to do this, with some favouring top-down 'command and control' approaches and others favouring collaboration. Arguments for coercive top-down approaches have been presented elsewhere; here we present arguments for collaboration. In many parts of the developed world, flexibility of approach is built into the legislation, so that conservation objectives are balanced with other legitimate goals. In the developing world, limited resources, poverty and weak governance mean that collaborative approaches are likely to play a particularly important part in carnivore conservation. In general, coercive policies may lead to the deterioration of political legitimacy and potentially to non-compliance issues such as illegal killing, whereas collaborative approaches may lead to psychological ownership, enhanced trust, learning, and better social outcomes. Sustainable hunting/trapping plays a crucial part in the conservation and management of many large carnivores. There are many different models for how to conserve carnivores effectively across the world, research is now required to reduce uncertainty and examine the effectiveness of these approaches in different contexts.

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*Key words:* predator management, conservation, carnivores, conflict, collaboration, top-down, bottom-up, hunting.

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## I. INTRODUCTION

There is a fundamental disagreement about how best to conserve large predators in the Anthropocene. Some argue for coercive policies (Treves *et al.*, 2017), whereas others argue for collaborative strategies (Lundmark, Matti & Sandström, 2014). Treves *et al.* (2017) have taken a particularly strong position for a protectionist approach, whilst pointing out that the state has an obligation to conserve large predators in trust for current and future citizens. They argued that this could be accomplished for wolves *Canis lupus* in the USA by ‘... *sophisticated, careful accounting by disinterested trustees who can both understand the multidisciplinary scientific measurements of relative costs and benefits among competing uses...*’ (p. 1). They claimed that strong, top-down and protectionist control needs to be exerted over the ‘... *tyrannies of the minorities, or majorities, who may demand depletion of unpopular, native wildlife...*’ (p. 18). They rejected the idea of sustainable population management, because they believed that the science guiding sustainable management is uncertain and disputed. They argued that without stronger control, hunting, trapping and poaching would lead to the eradication of predators.

Here we consider the potential merits of collaborative approaches, counterbalancing the arguments of Treves *et al.* (2017). While we wholeheartedly share their objective to conserve predators for current and future generations, we question the sole focus on a coercive approach for six reasons: (i) large predators mostly co-occur with people in multi-functional landscapes, where collaborative approaches are more appropriate; (ii) a coercive approach raises moral issues and issues related to political legitimacy; (iii) collaborative approaches are mandated by legislation in many countries and many international legal instruments; (iv) in many parts of the world, the state does not have the capacity to impose and implement strongly enforced, top-down policies; (v) many predator populations thrive in the presence of hunting/trapping programs (hereafter just referred to as hunting) supported by local people; (vi) a

range of methods are already in use for the calculation and implementation of sustainable hunting limits.

We conclude that both top-down and bottom-up governance approaches have validity in predator conservation. Our approach as scientists should be to develop new research to reduce the uncertainties and understand the effectiveness of alternative strategies in different contexts, rather than advocating one approach to the exclusion of all others. The arguments exemplified by Treves *et al.* (2017) and this response are critical for the future viability of predator populations, the ecosystems where they live, the legitimacy of management institutions and the well-being of people who live with them.

## II. LEGISLATION FOR CARNIVORE CONSERVATION

Legislation can provide a supportive framework for changing the relationship between people and predators and for addressing the conservation conflicts associated with shared landscapes, both at local and intergovernmental levels (Trouwborst, 2015*a,b*). In international wildlife law, public trust and related concepts, such as intergenerational equity and sustainable development are distinct features of the legal landscape (Sand, 2014; Treves *et al.*, 2017). The many national and international legal instruments applicable to large carnivores allow a mixture of approaches that can help balance conservation with other interests.

In the USA, state governments hold and manage wildlife as a public trust, but the federal government can manage wildlife in special cases such as under the Endangered Species Act (ESA) when species are threatened or endangered. The ultimate goal of the ESA is for a species to achieve recovery goals so that it can be delisted and management authority returned to the states. The ESA explicitly prohibits the consideration of economic or social issues in listing decisions for protected species. However, various mechanisms are

used to reduce social conflict between rural residents and federal authorities, resulting in *de facto* consideration of economic and social factors in the process of endangered species management (Thomas & Verner, 1992).

In the European Union, conservation and other interests are balanced principally by the Habitats Directive. The Directive's primary aim is to achieve 'Favourable Conservation Status' (FCS) for such species and this is non-negotiable. However, how member states achieve FCS is largely up to them, according to the subsidiarity principle (Trouwborst, Boitani & Linnell, 2017). Member States need to 'take account of economic, social and cultural requirements and regional and local characteristics' [Article 2(3)]. In some situations, governments must enact and enforce a strict protection regime, although exemptions are allowed under certain conditions (Annex IV); in other situations, governments have flexibility to determine how they ensure FCS (Annex V). In principle, the better a predator population is faring, the more scope arises under the Directive for flexible, collaborative approaches regarding its conservation and management. This notion of broad stakeholder participation in decisions affecting wildlife also features strongly in other areas of legislation, such as the 1998 Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.

In developing countries, predator management faces very different challenges. Conservation often ranks low on the agenda because of the competing pressures of poverty and other social concerns. Governments of developing countries have often set aside extensive areas of land for wildlife, but limited resources and poor governance (especially corruption) mean they are unable to manage those areas effectively, let alone the significant wildlife populations outside protected areas (Smith *et al.*, 2003; Lindsey *et al.*, 2014, 2016). Local communities often experience high costs from these governmentally imposed wildlife areas, such as displacement, disempowerment, restricted resource use, killing of poachers and high levels of wildlife damage, and receive few or no benefits, so are not predisposed to engage positively with government wildlife agencies (Ferraro, 2002; Brockington & Igoe, 2006; Dickman, 2010). In many areas this sense of local resentment has been amplified by foreign governments being seen to impose their values on local wildlife management (Nzou, 2015). In such a landscape, a coercive approach to conservation such as currently applied may be counter-productive (Duffy *et al.*, 2015). Conversely, engaging local communities as key stakeholders in conservation has proved highly effective even in remote areas of developing countries (Hazzah *et al.*, 2014; Dickman & Hazzah, 2016). Similarly, local ownership of wildlife, such as through community conservancies, can avoid many of the problems associated with wildlife areas imposed and managed by governments (Fabricius *et al.*, 2013; Measham & Lumbasi, 2013). Collaborative approaches to carnivore conservation therefore have a crucial role to play in developing countries.

### III. DEMOCRACY AND LEGITIMACY

Democracy relates to a system of government based on a 'belief in freedom and equality between people, in which power is held either by elected representatives or directly by the people themselves' (Cambridge Dictionary online 2017). Therefore, it is beholden on democratic countries to manage public-trust assets, such as carnivores, in an appropriate manner consistent with this definition. Central to this is political legitimacy, which is 'the belief of the rightfulness of the state, in its authority to issue commands, so that those commands are obeyed not simply out of fear of sanctions or self-interest, but because they are believed in some sense to have moral authority, because subjects believe they ought to obey' (Barker, 1990). This makes legitimacy a condition where citizens surrender authority to a branch of government based on a judgement that the relationship between them and the state is proper. Thus, the political legitimacy of natural resource management policy is partly dependent on it being socially acceptable at a local level (Peterson, 2003). This acceptability is particularly likely to be rejected when local communities perceive that large, dangerous predators are imposed on them and they have to bear the risks of living with such species only to benefit distant elites (Knight, 2000; Dickman, 2010; Dickman & Hazzah, 2016). When acceptability is rejected, political legitimacy suffers (Pearce & Littlejohn, 1997), and resistance in the form of non-compliance and outright sabotage (e.g. illegal hunting) may ensue (Krange & Skogen, 2011; von Essen *et al.*, 2014).

### IV. COLLABORATIVE GOVERNANCE

Ansell & Gash (2008, p. 544) defined collaborative governance as an 'arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus oriented and deliberative and that aims to make or implement public policy or manage public programs or assets'. Such approaches to large carnivore management have been applied in various parts of the world. For example, Norway has regional large carnivore committees, with local politicians appointed by the Ministry of the Environment, Sweden has wildlife management delegations at a regional level with politicians and stakeholders, and Finland has national, regional and local wolf management organizations including public and private actors. There is a similar approach in the USA, such as the Wolf Stakeholder Working Group in California or the Wolf Advisory Group in Washington (Sandström *et al.*, 2009; Lundmark & Matti, 2015; Sjölander-Lindqvist, Johansson & Sandström, 2015). The primary tasks of such groups are often to develop and adopt management plans, determine or give advice on regional population targets, mitigate direct conflicts between wildlife and livestock and in some cases decide on quotas for large carnivore hunting. Stakeholders are often also included in monitoring and information sharing (Decker,

Riley & Siemer, 2012). These approaches seek to strengthen democracy by dealing with the problems related to a lack of both legitimacy and acceptance of centralized governance of large carnivore management (Sandström *et al.*, 2009; Torfing *et al.*, 2012; Sjölander-Lindqvist *et al.*, 2015). They also offer an arena for conflict management.

There have been few evaluations of collaborative governance in conservation, making it difficult to draw general conclusions regarding its legitimacy or outcomes. We are certainly far from being able to design the ideal collaborative process, and in fact, recent studies have highlighted some deficiencies. There are problems related to the representation of different interests (Lundmark & Matti, 2015), the lack of opportunities for deliberation (Hallgren & Westberg, 2015), the lack of mechanisms for conflict resolution (Duit & Löf, 2015) and misunderstandings of the mechanism by which decisions are made (Sandström *et al.*, 2009). Nevertheless, in spite of these problems these studies also show the potential of collaborative processes to contribute to social and organizational learning, as well as contributing to the improvement of rules and regulations of wildlife management. Indeed, research suggests that those engaged in collaborative processes develop what has been termed the 'psychological ownership' of the process, which can lead to enhanced trust between participants and an increased sense of responsibility for the governance and management of wildlife among the affected parties (Pierce, Kostova & Dirks, 2001; Pohja-Mykrä & Kurki, 2014a; Ratamäki, 2015).

Given the potential that collaborative processes have, there is an urgent need to understand what works in different contexts. We suggest that future studies should focus on four aspects: first, comparing collaborative governance approaches among countries, rather than focusing on individual case studies; second, understanding how institutional design and leadership interact with non-state actors' ideas and conceptualizations of collaborative governance; third, understanding how the social and cultural contexts of these actors inform the different governance models and their legitimate outcomes; and fourth, understanding the impact of the collaborative process on the conflict both within and outside the collaborative bodies (Sjölander-Lindqvist *et al.*, 2015).

## V. HUNTING AND CARNIVORE POPULATIONS

Rural stakeholders that share the landscape with carnivores often wish to hunt them. Such practices do not necessarily lead to carnivore population declines. Indeed, populations can increase in the presence of hunting. For example, the Swedish brown bear (*Ursus arctos*) population has been increasing since the 1930s, from around 300 to over 3000 by 2008, despite the resumption of hunting in 1943 (Swenson *et al.*, 1995; Kindberg *et al.*, 2011). Similarly, hunting areas such as Bulye Valley Conservancy in Zimbabwe, Niassa National Reserve and Namibia's communal conservancies are amongst the few places to record recent lion population

increases (Bauer *et al.*, 2016). Cougars (*Puma concolor*), have also been increasing in much of North America (Sweaner, Logan & Hornocker, 2000; Larue *et al.*, 2012) without being protected by the ESA and despite being hunted in nearly all of their range. Clearly, the ESA and the Habitats Directive are partly responsible for fostering recent increases in large carnivore populations (Fleurke & Trouwborst, 2014). However, it is hard to disentangle the effects of legislation from the concurrent changes in land use, rebounding prey populations and more positive public attitudes towards carnivores. Indeed, it is likely that these influences act synergistically (Boitani & Linnell, 2015).

Although targets for sustainable harvesting of carnivores may be difficult to estimate accurately in some cases, partly because of the uncertainties involved, methods for sustainable harvesting under uncertainty are well established, with an extensive literature (dating back at least to Walters & Hilborn, 1976). These techniques are applicable to carnivore management (e.g. Edwards *et al.*, 2014). Large carnivores in Europe and North America are among the most intensively monitored and studied large mammals in the world (Chapron *et al.*, 2014; Clark & Rutherford, 2014; Ripple *et al.*, 2014). This provides an adequate basis for harvesting, so long as caution is exercised and coupled with an adaptive adjustment of quotas. The challenge lies more with poor monitoring and enforcement of harvesting, as well as political priorities going against conservation, than with the underlying science.

## VI. ILLEGAL KILLING

One problem for the conservation of large predators is illegal killing. Central to this problem is the relationship between approaches to conservation and the likelihood of illegal activity taking place. Recently, Chapron & Treves (2016) claimed that legal hunting of wolves led to an increase in illegal killings. Other studies, however, suggest the relationship is more complex. In Sweden, for example, the illegal killing of large carnivores was significantly higher within national parks, where they are strictly protected, than outside, where they are hunted (Rauset *et al.*, 2016). In other studies, predator abundance seems to be important. Eriksson, Sandström & Ericsson (2015) showed that an increase in direct experience of bears and wolves reduced both the levels of acceptance of these animals and support for wolf conservation over time, suggesting that local attitudes towards large carnivores are likely to deteriorate as populations increase (Williams *et al.*, 2011; Dressel, Sandström & Ericsson, 2015). In Croatia, attitudes towards brown bears became less positive coincident with a shift from local management that included hunting to more top-down protectionist policy (Majić *et al.*, 2011). Pohja-Mykrä & Kurki (2014b) take this a step further and suggest that illegal killing of wolves is a direct response to the failure of policy to take rural people's concerns seriously (see also Mech, 1995). In Kenya, Maasai respondents were more negative to lions *Panthera leo*, and more inclined to kill them, if they were

denied access into protected areas to graze their livestock during droughts (Hazzah *et al.*, 2013). Such a response may be compounded by the tendency of groups to enhance their internal cohesion under stress by blaming outside actors, such as management agencies (Skogen & Krange, 2003).

It is unlikely that there would be one consistent response to a certain management intervention, such as legal hunting, that could be transferable among individuals, cultures and local contexts. Instead, an individual's behaviour towards carnivores will be a result of the complex interaction between underlying values, previous experience, norms, attitudes and trust in management authorities, set within a broader social and institutional context (Sjölander-Lindqvist *et al.*, 2015). Consequently, we must understand the interplay between individuals' appraisal of the threat from carnivores, their attitudes and the community-wide social construction of danger before we can draw general conclusions about illegal killing.

## VII. THE ROLE OF SCIENCE

Science is fundamental in helping societies navigate through the controversies that surround carnivore conflicts. We need robust science to help inform decisions. Efforts have typically focused on a linear model of natural science providing evidence to guide policy and management strategies (Burgess, Harrison & Filius, 1998; Sarewitz, 2004). Yet this approach has proved problematic for two main reasons. First, stakeholders may frame conflicts on the basis of emotion, values and worldviews, rather than evidence (Slovic, 1987). As a result science can be ignored or dismissed (Weber & Stern, 2011). Second, science is often represented as objective truth, yet researchers may use science to legitimize normative positions (Lackey, 2004), leading to scientists not being trusted and the credibility of the science being questioned (Yamamoto, 2012). Thus, it is beholden on scientists to avoid claiming that normative positions are science-based but instead to engage fully with relevant stakeholders and the decision-making process, while developing robust evidence, and being transparent about the uncertainties as well as their role and the values they hold.

## VIII. DISCUSSION

Finding ways to encourage coexistence between people and large predators in multi-functional landscapes is a major challenge for conservation worldwide (Carter & Linnell, 2016; Di Minin *et al.*, 2016). How can we encourage those with farming or other legitimate interests to share these landscapes with large predators that affect their livelihoods and lives?

There are different models for how to achieve coexistence. On the one hand, top-down, command-and-control approaches play a crucial role in carnivore conservation. Much of the increase in large carnivore populations across

parts of Europe and the USA can be attributed to legislation and its enforcement. Where carnivore populations are very low, strict protection may be appropriate and more acceptable to people living with carnivores, as their impacts on daily life are likely to be minimal and attitudes are more positive. However, as carnivore populations recover and have increasing impacts on more people, we suggest that a different approach is required. In such situations, imposing coercive approaches that may not resonate locally risks alienating local stakeholders, leading to, for example, increased carnivore killing and greater conflict (Brockington & Igoe, 2006). Instead, we suggest that more collaborative and flexible approaches are required to build trust and negotiate the challenges of living equitably and sustainably with carnivores. This approach is inherently more democratic, as well as being embedded in current legislation and in international conventions, such as the Convention on Biological Diversity (Glowka, Burhenne-Guilmin & Synge, 1994).

Evidence for the relative effectiveness of alternative approaches is not always available (Reed & Sidoli del Ceno, 2015). There are many uncertainties in developing effective strategies for predator conservation in multi-use landscapes. We are not advocating one approach over another, we rather highlight that we must better understand what works when and where. Different models are likely to be context dependent, and we must recognize that different stakeholder groups and publics have different views and desires at different scales.

The need for robust science is clear, not only to explore the effectiveness of alternative management approaches in different contexts, but also to support the sustainable management of hunting and to understand the factors that affect illegal behaviour. Treves *et al.* (2017) call for an independent, national-level, external body, informed by science, to adjudicate issues around carnivore management. Such approaches may provide useful input for top-down predator management, but they are doomed to fail unless they are balanced by more bottom-up, collaborative processes. There is increasing evidence that simply providing the results of natural science to managers is not enough. A more effective route is likely to be through developing a more integrative, trans-disciplinary approach to knowledge with the appropriate stakeholders (Bennett *et al.*, 2017).

## IX. CONCLUSIONS

(1) There is disagreement about the most effective way to conserve large carnivores, with some favouring top-down 'command and control' approaches and others favouring more collaborative approaches. Herein we examine arguments for collaboration.

(2) Flexibility is built into the legislation in the USA and Europe to balance conservation with other legitimate goals. In the developing world, collaborative approaches are likely to play a particularly important part in carnivore conservation.

(3) Coercive policies may lead to the deterioration of political legitimacy and potentially to non-compliance, including illegal carnivore killing.

(4) Collaborative approaches may lead to enhanced trust, learning and better social outcomes.

(5) Hunting can be part of the sustainable management of large carnivores.

(6) Research is required to reduce uncertainty and examine the effectiveness of alternative approaches to carnivore conservation in different contexts.

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## 2.2 SPREMEMBE V ODNOSU JAVNOSTI DO VOLKOV NA HRVAŠKEM

### **Changes in attitudes toward wolves in Croatia.**

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Izvleček: Leta 1999 smo vzporedno z razvijajočim se procesom sprememb upravljanja z volkom izpeljali osebne strukturirane intervjuje prebivalcev treh regij v območju volkov na Hrvaškem (n = 1209), potem pa študijo z enako metodologijo ponovili še leta 2003 (n = 1172). Zabeležili smo spremembe v podpori javnosti tako varstvu volkov kot tudi nadzoru številčnosti te vrste. Te spremembe so bile posledica dejanskih sprememb v odnosu in ne le rezultat sprememb v starostni strukturi vzorčene populacije. Spremembe smo opazili v obeh južnih regijah, Liki in Dalmaciji, kjer se je odnos premaknil bolj proti nevtralnemu, saj je padla tako podpora varstvu volkov kot tudi podpora nadzoru številčnosti te vrste. Zdi se, da so se različne rojstne kohorte različno odzvale na aktivnosti povezane z varstvom volkov. V letu 1999 je na mlajše kohorte verjetno imela večji vpliv kampanja zakonske zaščite volkov, medtem ko so se starejše kohorte bolj odzvale na problematiko škod na domačih živalih in so posledično gojile do volkov bolj negativen odnos. Uporaba javnomnenjskih raziskav kot ocenjevalnega orodja lahko upravljalcem omogoči večjo prilagodljivost in posledično bolj učinkovite rešitve pri upravljanju z velikimi zvermi.



Short communication

## Changes in attitudes toward wolves in Croatia

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### ABSTRACT

Against a background of an evolving wolf policy process we carried out personal structured interviews with residents of three regions within Croatian wolf range in 1999 ( $n = 1209$ ) and repeated the study, using the same methodology in 2003 ( $n = 1172$ ). We documented a change in public support for wolf conservation and support for control of wolves. The change was a result of a real change in attitudes and not of a change in the age structure of the sampled population. The changes were documented in the two southern regions, Lika and Dalmatia, with attitudes shifting towards a more neutral viewpoint, as there was a decrease in support for wolf conservation and a decrease in support to control wolves. It seems that different birth cohorts react differently to conservation activities. In 1999, the younger cohort groups may have been influenced more by the legal protection campaign. The older cohorts reacted more sympathetically to livestock concerns and thus held stronger negative attitudes toward wolves. Using human dimensions research as an evaluative tool can help large carnivore managers be more adaptive and thus effective in their management solutions.

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### 1. Introduction

Most human dimensions in wildlife management research are case studies reporting results from only one point in time. Human dimensions research on large carnivores is no exception. As an applied and still relatively recent field of study, often driven by crisis management (Bath, 1998), this is not surprising. Due to this traditional focus of human dimensions research, studies have rarely explored the subject of attitude change and rarely have been able to capture changes in attitudes over time (Williams et al., 2002). Many researchers (e.g. Manfredi et al., 1998; McComas and Scherer, 1999; Kaczynski et al., 2001) have called for the need to conduct longitudinal research and to begin attitudinal and belief monitoring.

Today in many places large carnivores are increasing in numbers and range and returning to previous areas where they were once exterminated. In those areas opportunities exist for scientists to document existing attitudes and subsequent attitude change. Changes are likely to occur as carnivore-livestock conflicts increase, policy changes occur, awareness campaigns are delivered, and carnivore-livestock damage prevention programs are implemented. For example, Zimmermann et al. (2001) found by reviewing attitude surveys in Norway that the proportion of people with negative attitudes continues to increase to its maximum with the arrival of large carnivores, and then decreases with experience of

living with large carnivores over time. Similarly, they found that the proportion of people afraid of large carnivores was relatively high before carnivore arrival but also decreased with experience. It appears that people can learn to coexist with large carnivores and change their views.

Few human dimension research studies have been completed in Croatia. The first attempts to investigate public opinion about wolves in Croatia (Gyorgy, 1984; Morić and Huber, 1989; Huber et al., 1992; Radišić et al., 1994) came as a response to a shrinking wolf population. These studies suffered from small sample sizes and non-random sampling. This being said, the results from those few studies implied that there had been a change in public attitudes during the 1980s. The overall percentage of Croatians considering the wolf a harmful species dropped from 42% in 1983 (Gyorgy, 1984) to 25% in 1993 (Radišić et al., 1994). In addition, 21% of respondents in 1983 wanted to exterminate wolves (Gyorgy, 1984), while only 8% of the respondents expressed the same view in 1993 (Radišić et al., 1994). As the number of wolves decreased (Frković and Huber, 1992) over time, the attitude toward the species seemed to become more positive (Radišić et al., 1994). This would support the traditional view of natural resources where as a resource becomes scarce, it gains value. It was in the early 1990s, a campaign to completely protect the wolf began in Croatia, and full protection nationwide was declared for the wolf in 1995 (Parliament of the Republic of Croatia, 1995).

With a decrease in rural population and an increase in abandoned agricultural land, wolf numbers began to increase throughout the country and return to areas in Dalmatia, where they were

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exterminated after the Second World War (Frković and Huber, 1992). An increase in illegal killings was also documented during this period (Štrbenac et al., 2005) suggesting attitudes were perhaps shifting once again back to the previous negative viewpoints. A content analysis of newspaper articles seemed to support this hypothesis (Bath and Majić, 2000). As part of this study that examined newspaper articles, data was also collected in 1999 from a representative sample of residents in three regions (Gorski Kotar, Lika and Dalmatia) within wolf range in Croatia. We found that attitudes toward wolves were positive in the northern region of Gorski Kotar, largely neutral in the central region of Lika, and mainly negative in the southern region of Dalmatia (Bath and Majić, 2000). An opportunity to reassess attitudes four years later, in 2003, provided the basis for this paper and the chance to assess whether attitudes have changed. Understanding the strength and direction of attitude change toward wolves in Croatia will allow the Croatian government to more effectively implement their adaptive management approach to wolf management in the country.

By controlling for the two important socio-demographic variables of age and gender, we identify and describe the potential change in attitudes toward wolves among the general public in the wolf-inhabited regions of Croatia. We identify whether the change in attitude is due to a real change or simply a reflection of change in the structure of the population.

## 2. Methods

### 2.1. Study area, sampling and data collection

The target populations for both studies were residents of Gorski Kotar (45°20'N, 14°53'E), Lika (44°40'N, 15°23'E) and Dalmatia (43°54'N, 16°09'E). The general public within the Croatian wolf range was divided into three regions (Fig. 1) defined as management units in the Wolf Management Plan for Croatia (Štrbenac et al., 2005) and labelled Gorski Kotar, Lika and Dalmatia. In both measurements we used stratified random sampling (Kalton, 1983) at a community level in order to get the samples representative of each of the three regions. The sampling was based on the most recent national census data, which were 1991 census for the

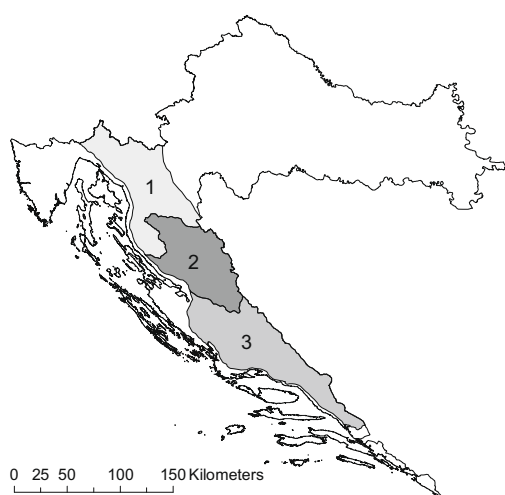


Fig. 1. Study area in both studies was divided into three regions which respond to the national management units (1 = Gorski Kotar, 2 = Lika, 3 = Dalmatia).

1999 study (Central Bureau of Statistics, 1992) and 2001 census for the 2003 study (Central Bureau of Statistics, 2001). Sampled population included all residents of the three regions older than 14 years. While typically respondents over 18 are selected for such social science research, in Croatia the census divided people into the age category 15–20 so sampling was done to be consistent with the census age class. The target sample was 400 per region ensuring a 95% confidence level and a 5% confidence interval (Sheskin, 1985). We carried out all the interviews in person at the respondent's place of residence. A team of five different interviewers conducted the interviews during each data collection period. All of them received interviewer training prior to implementing the interviews.

### 2.2. Research instrument

The questionnaire used in 1999 was designed by Bath and Majić (2000). It included items covering general attitudes toward wolves, attitudes toward different management options, knowledge and beliefs about wolves, experiences with wolves and demographic information about the respondents. The second questionnaire (Majić, 2007) was a modified version of the earlier one. All attitudinal and belief items included in the analysis were based on a 5-point Likert scale (Likert, 1932) ranging from strongly disagree to strongly agree.

### 2.3. Data analysis

We used screening of the data in order to check the accuracy. We followed the guidelines given by Tabachnick and Fidell (2001), and checked whether all values were in range and mean scores and standard deviations were reasonable. We used Mahalanobis distances in order to identify outlier cases with unusual patterns of responses and excluded them from the analysis. We also excluded cases with missing data (e.g. no age of the respondent).

We used principal components analysis (PCA) with a varimax rotation as an exploratory technique for identifying the types of attitudes measured by the questionnaire. Following several repetitions with adjusting the number of factors extracted (Tabachnick and Fidell, 2001), regression factor scores were saved as variables and used in the following analysis. To identify whether there was a change in attitudes a between the two measurements we calculated effect sizes and ran t test. To understand the differences in both samples, we calculated the effect sizes and ran MW-U test or Chi-square test, as appropriate.

Age was the most important socio-demographic variable predicting pro-wolf attitudes in the previous analysis of the data from 2003 (Majić, 2007). In order to control for age we partitioned the data into five birth cohort categories, following the guidelines given by Glenn (1977) and labelled them 1 (the youngest one) to 5 (the oldest one). The same study revealed that gender was the most important socio-demographic variable predicting fear of wolves, hence when running t test, data from both measurements (1999 and 2003) were weighted by gender. The data on gender were taken from the national census data from 2001 (Central Bureau of Statistics, 2001), as it was the census which was the closest in time to both data collection periods. Gender was weighted using simulated replication to correspond to the gender ratio from the census.

## 3. Results

### 3.1. Respondent characteristics

We obtained sample sizes of 402, 401 and 406 in 1999 and 406, 384 and 382 in 2003, for Gorski Kotar, Lika and Dalmatia, respec-

tively. Response rates were above 80% in all six samples. There were more males (58.2%) than females among the survey respondents, and this proportion remained approximately the same in both measurements (58.5% in 1999, 58.1% in 2003). Median age of the respondents was 52 (range 15–93, IQR 29) years in 1999, and 44 (range 15–93, IQR 29) years in 2003. There seemed to be a real difference in age between the two measurements (8 years difference in median age, MW–U,  $p < 0.001$ ). Most of the respondents reported seeing a wolf in captivity (Table 1), however a larger proportion saw wolves in 2003 (difference = 5.9%,  $\chi^2 = 10.58$ ,  $p = 0.001$ ). On the other hand, less people reported seeing a wolf in the wild in 2003 (difference = 5.7%,  $\chi^2 = 6.56$ ,  $p = 0.01$ ). We could confirm no differences between the two samples in number of respondents reporting they had killed a wolf (difference = 0.5%) or whether they own sheep and/or goats (difference = 0.8%) and are hunters (difference = 1.5%). Eleven cases were identified as multivariate outliers and excluded from further analysis.

### 3.2. Preparatory analysis

Principal components analysis of the attitudinal items pooled from both surveys resulted in the extraction of three factors (Table 2). The first factor explained 23.8% of the variance and was interpreted as “support to wolf conservation”. Factor 2 explained 23.4% of the variance and was interpreted as “support to control wolf numbers”. The third factor explained 11% of the variance and was interpreted as “fear”. The two items of this factor were fear of hiking in the woods and fear of attacks by wolves on humans. This factor was not used in further analysis as it was based on only these two items and had an eigenvalue that was 1.02.

### 3.3. Change in attitudes or a cohort effect?

We present the differences in the two factors (support to wolf conservation and support to control numbers) between the two measurements for each of the zones in Table 3. There was a small difference on Factor 1 (support to wolf conservation) in Lika, where the respondents in 2003 scored somewhat lower than those in 1999 indicating decrease in public support for wolf conservation. On Factor 2 (support for wolf control), measured differences in all three regions indicated a decrease in support to control wolf numbers.

The next step was to conduct a cohort analysis of the extracted factors with the purpose of controlling for age. On the “support to wolf conservation” factor (Table 4), changes were recorded in the southern regions, Lika and Dalmatia, however not across all cohorts. In Lika and Dalmatia there was a decrease in support to wolf

**Table 1**  
Characteristics of the respondents with regards to the respondents' experiences with wolves and association with an interest group (GK = Gorski Kotar, LK = Lika, DA = Dalmatia).

Measurement	Region	1999			2003		
		GK	LK	DA	GK	LK	DA
Seen wolf in captivity	N	279	233	246	253	295	296
	%	79.3	76.1	74.3	85.5	80.6	82.2
Seen wolf in wild	N	234	196	192	174	217	194
	%	66.5	63.6	58	58.6	59	53.9
Killed a wolf	N	14	11	3	8	16	10
	%	4	3.6	0.9	2.7	4.3	2.8
Hunter	N	46	25	34	26	27	39
	%	13.1	8.1	10.3	8.8	7.5	10.9
Owns sheep/goats	N	48	80	103	53	83	95
	%	13.6	26	31.1	17.8	22.6	26.4

**Table 2**

Results of the principal components analysis (PCA): Two factors were extracted and used in further analyses: Factor 1 – support to wolf conservation and Factor 2: support to control wolf numbers. Factor 3 (fear of wolves) was not used in the further analyses. Only loadings >0.30 are shown in the table.

Factor	1	2	3
Rotation sums of squared loadings – % of variance	23.8	23.4	11.4
Eigenvalues	6.66	1.7	1.02
<i>Attitudinal items</i>			
We should assure abundant populations of wolves for the future generations	0.4	–0.6	
Whether I had a chance to see a wolf or not, it is important to me that wolves exist in Croatia	0.73	–0.39	
There is no need to have wolves in Gorski Kotar/Lika/Dalmatia since they already exist in other parts of Croatia	–	0.72	
Wolves should be completely protected in Gorski Kotar/Lika/Dalmatia	0.41	–0.72	
Wolves should be allowed to be hunted year round	–0.7	0.38	
Wolves should be allowed to be killed with all possible means, including poisons and killing pups in dens	–	0.65	
Wolves keep roe deer populations in balance	0.59		
In areas where wolves live close to the communities, attacks on humans are common	–	0.31	0.71
I would be afraid to walk in woods where wolves are present	–		0.8
I would agree with increasing wolf numbers in Croatia	0.46	–0.63	
It is important to maintain wolf population in Croatia for future generations	0.79		
Wolves should be allowed to be hunted in a specific hunting season in Gorski Kotar/Lika/Dalmatia	–	0.68	
Wolves cause a lot of damage to livestock	–	0.58	0.43
If a wolf killed livestock, I would agree with killing of that problem animal	–	0.69	
We already have enough wolves in Croatia	–	0.68	
Farmers should receive compensations for the damages that wolves cause on their livestock	–	0.54	

conservation. Consistently across all regions, only in the oldest cohort (number 5) there were no changes on Factor 1.

On the “support to wolf control” factor (Table 4) we also found changes in the two southern regions and across all cohorts, except the youngest one. These results indicated a decrease in support to control of wolf numbers.

Plots of mean values across the cohorts, regions and the two measurements (Fig. 2) illustrate the effect of cohorts on attitudes toward wolves. Support to control of wolf numbers increases with age, while support to wolf conservation decreases. Visual examination of the plots allows for comparisons among the regions across the cohorts. By looking at the intersection points of the attitudinal factors' plots across the cohorts, it is possible to single out the cohort in which the presumed shift in attitudes toward wolves from negative to more positive occurred in each of the three regions. Our results suggest that this shift first took place in Gorski Kotar as the intersection point lies over the cohort group 4, followed by Lika (cohort 2 in 1999 and 3 in 2003) and lastly Dalmatia (cohort 1 in 1999 and 2 in 2003). Notable are also the extreme differences across the cohorts in Lika and Dalmatia in 1999, where the younger cohorts were strongly supporting wolf conservation and opposing wolf control, while the older cohorts expressed the almost exact opposite extreme opinions.

## 4. Discussion

Many researchers have found that socio-demographic characteristics of respondents influence the attitudes toward wolves. Elderly, less educated people, women and sheep farmers tended to have more negative attitudes toward wolves (e.g. Kellert, 1985; Bath and Buchanan, 1989; Bjerke et al., 2000; Ericsson and Heber-

**Table 3**

Comparisons of sample sizes (*N*), mean scores (possible range –1 to 1) and standard deviations (SD) for the two measurements across the three regions. We evaluated attitude change by calculating actual difference in mean scores (diff), pooled standard deviations (SDp) and by running *t* test. When running *t* test the data were weighted by gender.

Region	1999			2003			Difference 1999–2003	
	N	Mean	SD	N	Mean	SD	diff	SDp
<b>Factor 1</b>								
G. Kotar	352	0.09	0.86	295	0.18	0.90	–0.09	0.88
Lika	308	0.31	1.22	368	–0.03	0.90	0.34	1.06a
Dalmatia	331	–0.19	1.14	360	–0.32	0.90	0.13	1.02
<b>Factor 2</b>								
G. Kotar	352	–0.18	0.90	295	–0.51	0.85	0.33	0.88a
Lika	308	0.48	1.20	368	–0.25	0.84	0.73	1.02a
Dalmatia	331	0.64	0.94	360	–0.25	0.73	0.89	0.84a

a = *p* < 0.001.

**Table 4**

Comparisons of sample sizes (*N*), mean scores (possible range –1 to 1) and standard deviations (SD) for the two measurements across the three regions and across birth cohorts (1 representing the youngest birth cohort and 5 representing the oldest birth cohort). We evaluated attitude change by calculating actual difference in mean scores (diff), pooled standard deviations (SDp) and by running *t* test. When running *t* test the data were weighted by gender.

Cohort	1999			2003			Change 1999–2003	
	N	Mean	SD	N	Mean	SD	diff	SDp
<b>Gorski Kotar, Factor 1</b>								
1	56	0.24	0.82	96	0.21	0.63	0.03	0.70
2	62	0.11	0.77	53	0.37	0.80	–0.26	0.78
3	65	0.10	0.71	59	0.18	0.97	–0.08	0.84
4	88	0.10	0.90	35	–0.04	1.07	0.14	0.94
5	81	–0.11	1.06	25	–0.36	0.90	0.25	1.02
<b>Gorski Kotar, Factor 2</b>								
1	56	–0.60	1.02	96	–0.79	0.80	0.19	0.88
2	62	–0.35	0.88	53	–0.49	0.87	0.14	0.87
3	65	–0.19	0.89	59	–0.33	0.81	0.14	0.85
4	88	–0.01	0.75	35	–0.03	0.79	0.02	0.76
5	81	0.06	0.86	25	0.01	0.68	0.05	0.81
<b>Lika, Factor 1</b>								
1	48	0.61	0.96	71	0.03	0.77	0.58	0.84a
2	58	0.92	1.12	96	0.17	0.80	0.75	0.93a
3	59	0.42	1.04	64	0.20	0.75	0.22	0.89
4	58	0.29	1.31	62	–0.25	0.89	0.54	1.10b
5	80	–0.35	1.22	58	–0.52	0.96	0.17	1.11
<b>Lika, Factor 2</b>								
1	48	–0.65	1.41	71	–0.47	0.88	–0.18	1.11
2	58	0.47	1.21	96	–0.28	0.81	0.75	0.97a
3	59	0.54	1.08	64	–0.25	0.84	0.79	0.95a
4	58	0.86	1.01	62	–0.09	0.70	0.95	0.86a
5	80	0.93	0.91	58	0.04	0.81	0.89	0.86a
<b>Dalmatia, Factor 1</b>								
1	36	0.63	1.06	52	0.28	0.82	0.35	0.91
2	59	0.23	1.07	103	–0.21	0.84	0.44	0.92b
3	70	–0.02	1.01	74	–0.41	0.92	0.39	0.96c
4	70	–0.60	1.01	60	–0.74	0.87	0.14	0.94
5	90	–0.62	1.14	56	–0.20	0.85	–0.42	1.03
<b>Dalmatia, Factor 2</b>								
1	36	–0.11	1.17	52	–0.49	0.86	0.38	0.99
2	59	0.55	1.15	103	–0.21	0.65	0.76	0.86a
3	70	0.71	0.93	74	–0.15	0.81	0.86	0.86a
4	70	0.79	0.73	60	–0.10	0.56	0.89	0.65a
5	90	0.84	0.67	56	–0.20	0.66	1.04	0.66a

a = *p* < 0.001, b = *p* < 0.010, c = *p* < 0.050.

lein, 2003; Kleiven et al., 2004). Knowing this, and having in mind that the sampled populations are open systems with people immigrating, emigrating, dying and entering our sampling frame as they get older, means that any potentially detected attitude change could merely be a reflection of the change in the structure of the sampled population and not an actual attitude change. Under-

standing this difference is important for understanding the nature of the attitudes and their formation.

It is difficult to document a real change in attitudes over time because we tend to sample populations at different points in time rather than directly tracking individuals over time. By understanding the most important socio-demographic characteristics influencing the attitudes toward wolves and controlling for them, we can distinguish among attitude change due to change in population structure and real attitude change. We believe that we have documented a real change in attitudes toward wolves in Croatia, as the observed changes were independent of the most important socio-demographic parameters, age and gender.

According to Eagly and Chaiken (1993), the people that already have favourable or unfavourable thoughts predominating their attitudes about an issue will be more susceptible to cognitive structure change and thus to attitude change (i.e. those with negative attitudes will reinforce their negative attitudes). Their attitudes will be relatively enduring, resistant and predictive of that person's behaviour. Those that hold neutral attitudes might experience peripheral attitude shift when exposed to new information, and form attitudes which are relatively temporary, susceptible, and not predictive of behaviour. According to this we would expect that the residents of the Lika region, which have predominantly neutral attitudes towards wolves, might be influenced only temporarily by persuasive messages. On the other hand the Dalmatians, with predominantly negative attitudes, and the people from Gorski Kotar, with predominantly positive attitudes, should be more susceptible to change.

However, in the period between the two studies (1999–2003) the Croatian government implemented a program aimed at mitigating the effects of the damages caused by wolves on livestock. All of the activities, such as donations of electric fences and livestock guarding dogs, as well as lectures and seminars, were carried out in Lika and Dalmatia (Štrbenac et al., 2005). From that perspective, we would expect an attitude change among the respondents coming from those two regions.

Williams et al. (2002) in their quantitative meta-analysis found that public attitudes toward wolves have been stable over the last 30 years. In Utah, Bruskotter et al. (2007) similarly found that attitudes toward wolves did not change over the past decade. Our results clearly indicate that considerable changes in attitudes toward wolves can occur, even over a relatively short period of time. The changes were documented in the two southern regions, Lika and Dalmatia, with attitudes drifting towards a more neutral position, as there was both a decrease in support to wolf conservation and a decrease in support to control wolf numbers. Furthermore, the differences in attitudes among the cohort groups in Lika and Dalmatia became smaller. The hypothesis that Lika, as a neutral region, should be the most susceptible for changes in attitudes was rejected as soon as we partitioned the data into the cohort categories.

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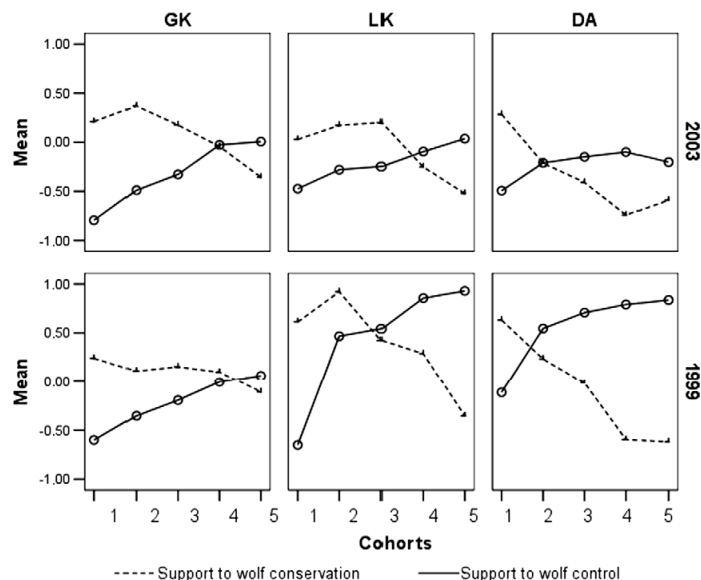


Fig. 2. Mean values of the two analysed factors (support to wolf conservation and support to wolf number control) across the regions (Gorski Kotar = GK, Lika = LK and Dalmatia = DA), the two measurements (1999 and 2003) and birth cohorts (1 representing the youngest birth cohort and 5 representing the oldest birth cohort).

Examining the cohort data for Lika in 1999 revealed that that “neutral” group was actually composed of “extreme” cohorts with the younger cohorts supporting wolf conservation and opposing wolf control more than the most positive group, the Gorski Kotar respondents. On the other hand, the older cohorts were strongly opposing conservation of wolves and strongly supporting control of the wolf population. A similar pattern across the cohorts was also found in Dalmatia, the most negative toward wolves among the three regions. In 1999, the younger cohorts may have been influenced more by the legal protection campaign than the older cohorts. At this time, the older cohorts seemed more sympathetic to livestock protection concerns and as a result held stronger negative attitudes toward wolves. Attitudes in Gorski Kotar seem to have remained stable across the two measurements. One explanation for this could be the absence of sheep farming in this region and consequent absence of wolf-livestock conflicts, resulting in less public interest in wolf management.

From the analytical perspective the change in attitudes in Lika and Dalmatia can be seen as supportive of our hypothesis that the government’s mitigating measures for conflicts caused by predator damage to livestock in these two regions would also reflect on the attitudes toward wolves, as there was a decrease in support to control wolves. However, the support for wolf conservation has also decreased considerably in these two regions, indicating that there was a decrease in overall public interest for wolf management. We can interpret this as fading of the anger-driven negative attitudes that were caused by the initial legal protection of wolves (Bath and Majić, 2000). We suggest that over time, living with wolves within this new framework of protection could lead towards more tolerance and better coexistence.

The movement from extreme viewpoints toward more neutral attitudes creates greater possibilities for compromise between all groups, and suggests that extremely positive attitudes toward wolves can be just as “problematic” as extremely negative ones in working towards effective solutions in wolf management. Traditionally, we have focused on documenting attitudes and when they

were found to be negative, the objective became one of changing them towards a more positive note. In fact, finding neutral attitudes has been seen as an opportunity to influence those views toward more positive viewpoints. The results of our research would suggest this might not be beneficial, as neutral attitudes may indicate less conflict. Attitudes should therefore be considered more as indicators of the current situation and not as objects to be directly influenced through awareness campaigns. We do need attitudinal studies to understand the nature of conflicts, but instead of focusing on changing the attitudes afterwards, we would do better to focus on a resolution of the underlying conflict. We believe that the effects the implemented management decisions have on public attitudes should be addressed more often in human dimensions research. Such research could help evaluate the effectiveness of a specific educational program or policy change, or even provide an understanding of the effect that a change in the status of a certain wildlife population might have on the attitudes. Through such attitudinal and belief monitoring the human dimensions as a research field could evolve from isolated studies driven by key management issues into an integrated component of any wildlife management decision-making process.

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## 2.3 DINAMIKA ODNOSA JAVNOSTI DO MEDVEDA IN VLOGA LOVA NA MEDVEDE NA HRVAŠKEM

### **Dynamics of public attitudes toward bears and the role of bear hunting in Croatia.**

Aleksandra Majić, Agnese Marino Taussig de Bondonia, Đuro Huber, Nils Bunnefeld

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Izvleček: Uspešno varstvo velikih zveri je odvisno od sprejemanja javnosti in odnosa le-te do njih, oboje pa se lahko v spremenjenih razmerah hitro spremeni. Javnomnenjske raziskave s časovno komponento, ki bi lahko takšne spremembe zaznale, so redke. V naši študiji smo anketirali prebivalce hrvaškega podeželja v letih 2002 in 2008 ter analizirali njihove odgovore, da bi tako zaznali, ali se je v tem času odnos do rjavega medveda (*Ursus arctos*) spremenil. Pomembni dogodki na Hrvaškem v času naše raziskave so vključevali sprejetje bolj centralizirane in jasno opredeljene strategije upravljanja z medvedom, pa tudi porast številčnosti medvedje populacije. S pomočjo statističnega modeliranja smo pri anketirancih poskusili razložiti vrednostne usmeritve, dojemanje medvedov kot grožnje in pripravljenost za sprejemanje te vrste. Rezultati kažejo, da se vrednostne usmeritve in dojemanje medvedov kot grožnje s časom niso spremenile, je pa padla pripravljenost za njihov sprejemanje. To nakazuje, da je porast medvedje populacije, morda pa tudi bolj centralizirano upravljanje z vrsto, zmanjšalo pripravljenost anketirancev, da bi številnejšo populacijo medvedov sprejeli. Sklepamo, da je stalno vključevanje javnosti v upravljanje z medvedom ključno za ohranjanje občutka nadzora nad to vrsto pri lokalnem prebivalstvu. Ob tem tudi menimo, da je lov v preučevani regiji pomembna oblika vključevanja javnosti, ki pomaga krepiti obstojno in zapuščinsko vrednost medveda in povečuje sprejemanje te vrste s strani javnosti.



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# Dynamics of public attitudes toward bears and the role of bear hunting in Croatia

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### ABSTRACT

Successful carnivore conservation depends on public attitudes and acceptance levels of carnivores, and these are likely to change as circumstances change. Attitude studies repeated in time that can demonstrate such change are rare. Our study surveyed Croatian rural inhabitants in 2002 and in 2008 and analyzed their responses to detect a change in attitudes toward brown bears (*Ursus arctos*) over time. Important developments occurring in Croatia at the time of our research included a more centralized and more clearly defined bear management strategy, and an increase in the bear population. We constructed models to explain respondent's value orientations, their level of perceived threat and their acceptance capacity for bears. Findings show that while value orientations and the overall level of perceived threat did not change over time, bear acceptance capacity was reduced. This suggests that the increase in the bear population and perhaps the more centralized bear management reduced respondents' willingness to accept a larger bear population. We conclude that continuous public involvement in bear management is essential in order to maintain a feeling of control over the bear among the local population. Furthermore we argue that hunting is an important form of public involvement in the region, serving to reinforce existence and bequest values of the bear and increase its public acceptance.

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## 1. Introduction

The key to successful carnivore conservation in human dominated landscapes lies in stakeholder acceptance (Bath and Buchanan, 1989). The Croatian context offers a good opportunity to study public attitudes toward carnivores as it has recently experienced changes in brown bear (*Ursus arctos*) management that are representative of larger scale trends. A more regulated hunting system prompted by European integration and an increase in Croatia's bear population, reflect a general tendency toward more protectionist conservation approaches and expanding carnivore populations in parts of the western world. This study investigates the effects of these changes on public attitudes and acceptance capacity for bears, by surveying Croatian rural inhabitants at two points in time. A better understanding of the changing context of carni-

vore conservation could facilitate the development of management strategies that are more receptive and adaptive to public opinion.

In Croatia, where the bear is historically a hunted species and where its population has been growing for the past few decades (Dečak et al., 2005), most of the controversy around bear management is focused on determining optimal population levels. The concept of wildlife acceptance capacity was first described by Decker and Purdy (1988, p. 53) as a dynamic measure of "the maximum wildlife population level... that is acceptable to people". Wildlife value orientations are made up of economic, esthetic, ecological and intrinsic values of wildlife, and the perceived level of threat posed by wildlife in terms of damage to property and risk to personal safety. They are seen as major influences on wildlife acceptance capacity (Decker and Purdy, 1988; Wagner and Seal, 1992; Riley and Decker, 2000; Zinn et al., 2000). Other studies have identified the effects of three more factors on both value orientations and opinions about wildlife management: socio-demographic factors (Kellert and Berry, 1987; Bath and Buchanan, 1989; Deruiter and Donnelly, 2002; Røskft et al., 2003); past experience and knowledge about wildlife (Kellert et al., 1996; Vittersø et al., 1999; Naughton-Treves et al., 2003; Røskft et al., 2003; Bisi et al., 2007; Ericsson and Heberlein, 2003); and finally contextual or situation specific factors. Context has been thoroughly studied with regards to specific opinions about manage-

Abbreviations: PCA, principal components analysis; BMP, bear management plan.

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ment, such as the acceptability of lethal control (Zinn et al., 1998; Ericsson et al., 2004; Don Carlos et al., 2009; Bruskotter et al., 2009). Few studies have investigated how value orientations or wildlife acceptance capacity change over time (but see Ericsson and Heberlein, 2003; Bruskotter et al., 2007; Majić and Bath, 2010; Zimmermann et al., 2001). The next section therefore describes the changes that have occurred in the Croatian context with regards to bear management and their relevance to public attitudes.

Croatia devised a Bear Management Plan (BMP) in 2005 out of the need to comply with the Bern and CITES conventions, in preparation for European accession in 2013. The plan brought several changes that are likely to have had varying effects on public attitudes. The Bear management regime in place at the time of the first attitude survey in 2002, was run by individual hunting ground units, responsible for setting harvesting quotas for their own grounds. Under the bear management in place at the time of the second attitude survey, in 2008, experts from the scientific community were responsible for setting quotas on a national level, and the hunting season was shortened by 45 days. This more centralized and more regulated form of bear management may have caused the perception in stakeholders that their involvement and agency in bear management diminished. However, other BMP measures were aimed at increasing public involvement in the drafting and implementation parts of the plan as well as reducing and mitigating human–bear conflicts. Guidelines and recommendations for good practice were drafted, a consultation process with various interest groups was initiated and the plan was presented throughout communities of the bear range (Dečak et al., 2005).

Brown bear populations have increased in several European countries, including Slovenia, Norway and Sweden (Swenson et al., 2000). Although population monitoring before 2005 was inconsistent in Croatia, it is possible to discern a trend of sustained population increase. Estimates show that there were about 100 bears in the 1950s, between 600 and 1000 bears in 2005 (Huber et al., 2008) and 1000 bears in 2008 (Kocijan and Huber, 2008). Questionnaires collected in Croatia in 2002 suggest that bear acceptance capacity was being approached and there is reason to believe that the growing bear population may have exacerbated conflict.

The most common form of damage caused by bears in Croatia is to crops and orchards, followed by depredation of livestock and destruction of beehives, as well as traffic accidents due to collisions with bears. Dangerous encounters with bears are instead rare, there has been one fatal encounter with a bear over the past 75 years and seven other encounters that caused injuries over the past 35 years (Dečak et al., 2005). Official estimates suggest that damage levels are low (about USD 9000 paid annually) (Sindičić, 2009), but because compensation is paid by local hunting grounds, community ties are likely to deter compensation claims. Therefore real damages are likely to be higher and to have increased along with the increase in the bear population.

In order to understand the importance of context in the formation of value orientations and acceptance capacity for bears, as well as its relevance with respect to other factors mentioned in the literature, we formulated the following hypotheses:

- Value orientations are affected by: socio-demographic variables ( $H_1$ ); experiences with bears ( $H_2$ ); changes in bear population dynamics and bear management ( $H_3$ ).
- Bear acceptance capacity is affected by: socio-demographic variables ( $H_4$ ); experiences with bears ( $H_5$ ); changes in the bear population dynamics and bear management ( $H_6$ ); and respondent's value orientations ( $H_7$ ).
- The effects of bear population dynamics and bear management will produce attitude changes at the individual level ( $H_8$ ).

## 2. Methods

### 2.1. Data collection

This study was carried out in an area of 9600 km<sup>2</sup> spreading through the Dinaric Mountains in Croatia, where bears are permanently present and hunted (Dečak et al., 2005). Low human density (about 25/km<sup>2</sup>) is present throughout the area and the primary source of income derives from small farms, livestock grazing and forestry activities (Dečak et al., 2005). We based the questionnaire on Bath and Majić's (2000) and Kaczensky's (2000) question format. It consisted of 48 multiple choice questions, mostly on a five point Likert scale regarding general attitudes toward bears, knowledge about bears, opinions about bear management, past experience with bears, and socio-demographic details of respondents (Appendix I). In 2002, questionnaires were sent to randomly sampled households from areas throughout the bear range excluding large urban areas, proportionately to the number of inhabitants. In 2008 questionnaires were mailed to the same addresses as in 2002. Each time 700 questionnaires were sent out, followed by a reminder/thank you card. The question "Have you participated in such a survey in 2002?" was included in the 2008 questionnaire to identify the respondents that were surveyed both times. Personal information was handled in accordance with the personal information protection legislation. Return rates reached 40.86% in 2002 and 53.14% in 2008, with a total of 658 responses.

### 2.2. Preparatory analysis

For the analysis we used the R version 2.11.0 (R Development Core Team, 2010). Data points with missing values and data points in which all questions relevant to our analysis had been answered were collected into a datasets of 170 and 488 data points, respectively. To compare the two datasets we used Wilcoxon's test on all of the continuous variables (as they were not normally distributed) except for age, for which we used the t-test. We used the chi-square test on all the categorical variables. Respondents who did not answer all the relevant questions were older and in several cases exhibited more negative attitudes toward bears and bear management (Appendix II). To avoid problems with missing values replacement we proceeded by eliminating all observations with missing data.

Two different datasets were used in further analyses. The main dataset consisted of 488 data points from the random sample: 231 in 2002 and 257 in 2008. The other contained the responses of people who had answered the questionnaire both in 2002 and in 2008, and consisted of 72 data points: 36 for each year. We carried out the paired and unpaired tests mentioned above on the smaller and larger datasets respectively, to detect real and overall changes in responses to each question between 2002 and 2008.

Responses from the larger dataset were then grouped to simplify analysis. We computed a knowledge score (0–7) by adding the number of correct answers to questions regarding bear population numbers and trends; bear feeding habits; their hibernation, reproduction and development behavior; and the level of legal protection they are under. We then assigned dummy variables to the categories from the Likert scale ranging from strongly disagree (1) to strongly agree (5), and used the R package "psych" to perform principal component analysis (PCA) with varimax rotation on the section on general attitudes toward bears and the section on opinions about bear management. PCA and Factor Analysis performed on dummy variables is commonly used in human dimension studies (Vaske and Donnelly, 1999; Vaske et al., 2001; Bruskotter et al., 2007, 2009; Lloyd and Miller, 2010; Majić and Bath, 2010).

PCA run on the general attitudes section gave two components with eigenvalues >1 (Tabachnick and Fidell, 1989), suggesting that

**Table 1**  
PCA loadings for the general attitudes section of the questionnaire. Only those >0.30 are shown.

Questions	"Existence, bequest and use values"	"Perceived threat"
What are your feelings toward bears?	0.68	-0.33
To have bears in Croatia is: 1. Good; 2. Do not know; 3. Bad	-0.61	
It is important to maintain the bear population for future generations	0.79	
We should assure that future generations have an abundant bear population	0.67	-0.31
Whether or not I get to see a bear, it is important to me that they exist in Croatia	0.77	
It is unnecessary to have bears in Croatia because abundant populations of bears already exist in other European countries	-0.58	
Having bears in your region increases tourism	0.64	
Bears cause abundant damage to livestock		0.82
Bears cause abundant damages to crops and orchards		0.88
In areas where bears live in close proximity to humans, bear attacks on humans are common	-0.49	0.49
I would be afraid to hike in the woods if bears were present		0.57
Eigenvalue	3.64	2.43
% of variance explained by each component	33.10	22.10
Cumulative % of variance explained	33.10	55.20

**Table 2**  
PCA loadings for the management section of the questionnaire. Only those >0.30 are shown. The first component is the only one that was interpreted and used in analysis.

Questions	"Support for limiting bear numbers"	Component 2	Component 3	Component 4
I would agree with increasing bear numbers in Croatia	-0.76			
I would agree with increasing bear numbers in my region	-0.76			
Bears should be completely protected	-0.56	-0.35		
Bears should be allowed to be hunted in a specific season		0.65		
Bears should be allowed to be hunted all year round	0.60			0.32
Bears should be killed by all means	0.54			
Hunting quotas for bears should be agreed on a national level				0.40
Hunting quotas for bears should be agreed on a county level		0.44		0.45
Hunting quotas for bears should be agreed on a hunting ground level	0.34	0.53		
If a bear repeatedly causes damages I would agree with killing this problem animal		0.31		
I would be willing to contribute money toward compensation program for losses due to bears			0.55	
We already have enough bears in Croatia	0.74			
We already have enough bears in this region	0.74			
Compensation for the damages caused by bears should not be paid if appropriate prevention was not used			0.74	
Farmers should buy insurance for protection of their crops and animals against bear damages			0.77	
Hunters that manage bears should pay for compensation for the damages caused by bears				0.55
Administration should pay for compensation for the damages caused by bears				0.49
Bear hide and skull should be removed from the list of hunting trophies		-0.66		
Hunter can keep the trophy after it has been properly registered in the national database		0.67		
Eigenvalue	3.56	2.25	2.01	1.42
% of variance explained by each component	18.70	11.80	10.60	7.50
Cumulative % of variance explained	18.70	30.60	41.20	48.70

value orientations are composed of two elements that should be analyzed separately (Table 1). The most important variables contributing to the first principal component are those expressing respondents' existence, use and bequest value orientations, the latter referring to the importance those respondents gave to conserving the bear for future generations. A series of variables are then negatively and weakly correlated to the component, relating to lack of existence values and fear of bears. This component was interpreted as "existence, bequest and use values". The variables that feature as most important in the second principal component express respondents' perception that bears cause a lot of damages to crops, orchards and livestock, and questions expressing respondent's fear of bears. This component was interpreted as "perceived threat".

PCA run on the management section of the questionnaire gave six principal components with eigenvalues >1. After considering the scree plot and the interpretability of the components (Tabachnick and Fidell, 1989), we chose to retain four components and use

the first one in the analysis (Table 2). The variables loading highest on it represent negative feelings towards increasing bear numbers, opinions that bears should be hunted more than they already are, that they should not be completely protected and that hunting quotas should be allocated on the hunting ground level. This component was interpreted as "support for limiting bear numbers".

### 2.3. Modeling

We designed three models to test our hypotheses. The response variables used in the models were the scores of the principal components mentioned above, while the explanatory variables used in the models were derived from the questionnaire. The models contained a dummy variable for "year" with two levels to represent the year in which the survey was carried out (2002 and 2008). Our data on damages and encounters with bears in the wild does not allow us to measure whether the intensity and frequency of the experience increased for the same respondents between 2002

**Table 3**

List of models and variables used in them. Explanatory variables with \* are interaction variables of “year” and variables for which we hypothesized that the effects could be year-dependent.

Response variable	Explanatory variables
1. ‘Existence, bequest and use values’	‘Gender’, ‘hunter’, ‘age’ (H <sub>1</sub> ); ‘seen in wild’, ‘damage’, ‘knowledge’ (H <sub>2</sub> ); ‘year’, ‘year * hunter’, ‘year * seen in wild’, ‘year * damage’ (H <sub>3</sub> )
2. ‘Perceived threat’	‘Gender’, ‘hunter’, ‘age’ (H <sub>1</sub> ); ‘seen in wild’, ‘damage’, ‘knowledge’ (H <sub>2</sub> ); ‘year * year * hunter’, ‘year * seen in wild’, ‘year * damage’ (H <sub>3</sub> )
3. ‘Support for limiting bear numbers’	‘Gender’, ‘age’, ‘hunter’ (H <sub>4</sub> ); ‘seen in wild’, ‘damage’, ‘knowledge’ (H <sub>5</sub> ); ‘year’, ‘year * damage’, ‘year * seen in wild’, ‘year * hunter’, ‘year * existence, bequest and use values’, ‘year * perceived threat’ (H <sub>6</sub> ); ‘existence, bequest and use values’, ‘perceived threat’ (H <sub>7</sub> )

and 2008. Therefore we included interactions between ‘year’ and other variables in the models to see whether the experience of damage, seeing a bear in the wild and being a hunter produced a change in attitudes over time (Table 3). To check for goodness of fit, we inspected the residual plots of the full models and found signs of heteroscedasticity on the first and third model. We performed Box-cox transformation on the variable “existence, bequest and use values” to stabilize its variance, and used regression diagnostics to identify and exclude 17 and 29 influential points from the first and third model, respectively.

Since the data in this study is observational (not subject to experimental manipulation) and non orthogonal (variables are autocorrelated), the significance of factors depends on the order in which they are removed from the model (Burnham and Anderson, 2002; Crawley, 2007). For this reason, multi model inference was carried out with the R package “MuMIn”, by running models for all the possible combinations of the variables. We used second order Akaike Information Criterion (AICc) to account for the small sample size and the high number of parameters. We then generated a confidence set of models by using the cut off point of 2 AICc differences (Burnham and Anderson, 2002), (Appendix V). The “MuMIn” package performed model averaging across the confidence set, to produce averaged parameter estimates, standard errors and confidence intervals. Furthermore it calculated the relative importance of each variable. This is measured across the confidence set of models by adding the weights of all the models in which each variable features, thereby ranking variables by importance according to their contribution to the entire set of likely models.

### 3. Results

#### 3.1. Descriptive analysis of variables

The socio-demographic characteristics of the respondents did not vary significantly between the samples of 2002 and 2008 (Appendix III). Age of respondents was normally distributed with a mean of 49 years. The gender composition of the population was skewed, with men making up 75.61% of the sample probably because male heads of households more often completed the questionnaire. As for the hunting proportion of the sampled population, 21.31% were hunters. There was also no significant change in the number of respondents experiencing damage and seeing a bear in the wild (Appendix III). However, our data does not account for the amount of damage or encounters experienced by each respondent, and it is possible that the same respondents that experienced damage and encounters with bears in 2002 experienced more damages and encounters in 2008. Overall, 27.05% of respondents had experienced damages from bears and 74.80% had seen a bear in the wild. Respondents’ knowledge also did not differ significantly between 2002 and 2008 (Appendix III), with a mean of three out of seven correct answers. Only 30.94% of the sample knew that the bear population is increasing, but significantly more people perceived the growth in the bear population in 2008 (Chi-square = 9.71, *df* = 3, *p* = 0.0212).

#### 3.2. Changes between 2002 and 2008

Overall, results reflect a general positive attitude toward bears (Table 4). The majority of questions pertaining to existence and bequest value orientations and perceived damages from bears did not differ significantly between the two surveys. However, the belief that attacks from bears are common was generally limited but more widespread in 2008. Tests run on the management section of the questionnaire show that overall respondents remained positive towards increasing the bear population, but significantly less so in 2008 (Table 5). In 2008 significantly less people agreed with further increasing the bear population and less people disagreed with the statement that there are enough bears in Croatia. Answers to questions about compensation issues varied considerably, but on average respondents agreed that the state and hunting grounds should pay for damages caused by bears. Although responses did not change radically between 2002 and 2008, significantly less people in 2008 agreed that compensation should be paid only when appropriate precautions are taken, and significantly less people in 2008 agreed that farmers should buy insurance against damages. Lastly, results show support for a controlled system of bear hunting. Respondents disagreed with killing bears by all means, expressed low support for year round hunting, and in 2008 significantly more people agreed with the statement that bears should be hunted in a specific season. The majority of respondents agreed with the statement that quotas should be decided on a national level but in 2008 significantly more people thought that they should be decided on a county level.

#### 3.3. Paired test results

The paired Wilcoxon and chi-square tests performed on the dataset containing only the responses of those that had answered the questionnaire both times support the main findings from the larger dataset. More people in 2008 agreed that there are already enough bears in Croatia (Wilcoxon = 40.00, *p* = 0.0045), more were aware that the bear population is growing (Chi-square = 8.44, *df* = 3, *p* = 0.0377), and more were in favor of hunting bears in a specific hunting season (Wilcoxon = 47.50, *p* = 0.0030). Furthermore, fewer respondents agreed with deciding on quotas at the national level (Wilcoxon = 279.00, *p* = 0.0294). No other significant changes were detected (Appendix IV). Still, these results show that the change in respondent’s opinions about bear management was consistent at the individual level and not simply due to different samples.

#### 3.4. Models

##### 3.4.1. Existence bequest and use values

We ran 280 models to explain “existence, bequest and use values” toward bears, and included five in the confidence set based on their AICc (Appendix V). The best model contains the variables: age, whether respondents experienced damage, whether they were hunters, and their knowledge of bears. The graphs of the model (Fig. 1) show that respondent’s “existence, bequest and use values” decreased with age and increased with knowledge. They also show

**Table 4**  
Distribution of responses (%) given in the general attitudes toward bears section of the questionnaire. Means were calculated using dummy variables assigned to the categories ranging from strongly disagree (1) to strongly agree (5) unless otherwise noted; Wilcoxon and p-values are given in bold for responses that differed significantly between 2002 and 2008.

Questions	2002					Mean	2008					Mean	Wilcoxon and p-values
	1. Strongly disagree (%)	2. Disagree (%)	3. Neutral (%)	4. Agree (%)	5. Strongly agree (%)		1. Strongly disagree (%)	2. Disagree (%)	3. Neutral (%)	4. Agree (%)	5. Strongly agree (%)		
What are your feelings toward bears?	0.43	1.73	19.91	51.52	26.41	4.02	1.56	1.17	19.46	48.64	29.18	4.03	W = 29106.00 p = 0.6867
To have bears in Croatia is: 1. Good; 2. Don't know; 3. Bad	96.97	2.60	0.43			1.03	93.77	3.89	2.33			1.09	W = 28722.00 p = 0.0924
It is important to maintain the bear population for future generations	0.87	0.43	2.60	54.55	41.56	4.35	3.50	0.39	4.67	44.75	46.69	4.31	W = 29043.50 p = 0.6442
<b>We should assure that future generations have an abundant bear population</b>	<b>0.87</b>	<b>7.36</b>	<b>6.93</b>	<b>56.28</b>	<b>28.57</b>	<b>4.04</b>	<b>3.50</b>	<b>7.39</b>	<b>13.62</b>	<b>55.25</b>	<b>20.23</b>	<b>3.81</b>	<b>W = 33717.50 p = 0.0040</b>
Whether or not I get to see a bear, it is important to me that they exist in Croatia	0.87	1.30	2.16	54.55	41.13	4.34	2.33	1.17	3.11	53.70	39.69	4.27	W = 30499.50 p = 0.5517
It is unnecessary to have bears in Croatia because abundant populations of bears already exist in other European countries	43.29	49.78	3.03	2.60	1.30	1.69	43.97	49.03	2.33	3.89	0.78	1.68	W = 29852.00 p = 0.9037
Having bears in your region increases tourism	0.00	9.52	9.96	51.95	28.57	4.00	3.11	9.73	12.45	45.53	29.18	3.88	W = 30885.00 p = 0.4048
Bears cause abundant damage to livestock	16.88	52.38	14.72	15.15	0.87	2.31	17.12	54.09	15.18	11.28	2.33	2.28	W = 30262.00 p = 0.6848
Bears cause abundant damages to crops and orchards	13.85	45.45	12.99	23.38	4.33	2.59	10.89	47.86	14.01	23.74	3.50	2.61	W = 29185.50 p = 0.7332
<b>In areas where bears live in close proximity to humans, bear attacks on humans are common</b>	<b>31.17</b>	<b>57.58</b>	<b>6.93</b>	<b>4.33</b>	<b>0.00</b>	<b>1.84</b>	<b>24.12</b>	<b>59.92</b>	<b>8.17</b>	<b>4.67</b>	<b>3.11</b>	<b>2.03</b>	<b>W = 26773.00 p = 0.0336</b>
I would be afraid to hike in the woods if bears were present	21.65	48.05	9.52	15.58	5.19	2.35	17.12	47.08	8.56	20.23	7.00	2.53	W = 27215.50 p = 0.0906

that respondents who experienced damage from bears had slightly weaker "existence bequest and use values", and respondents that were hunters had slightly stronger "existence bequest and use values". However, as shown in the figure, these variables do not explain much of the variation, and the best model is weak ( $R^2 = 0.06$ , adjusted  $R^2 = 0.05$ ). Other variables that feature in the averaged model do not reveal a clear trend based on their large confidence intervals. They are year of survey, gender, and whether respondents had seen a bear in the wild. Finally, none of the interactions between year of survey and the other variables feature as important predictors in the models (Table 6).

### 3.4.2. Perceived threat from bears

We ran 280 models to explain "perceived threat" from bears, and we included four models in the confidence set (Appendix V). The best model contained the variables: gender, whether respondents experienced damage, whether they had seen a bear in the wild and their knowledge of bears. Fig. 1 shows that perceived threat decreased with knowledge and was slightly higher in women. Respondents that had experienced damage felt more threatened, while respondents who had seen a bear in the wild felt less threatened. However the effects of these variables are not strong and the explanatory power of the model is weak ( $R^2 = 0.08$ , adjusted  $R^2 = 0.07$ ). The effect sizes of the following

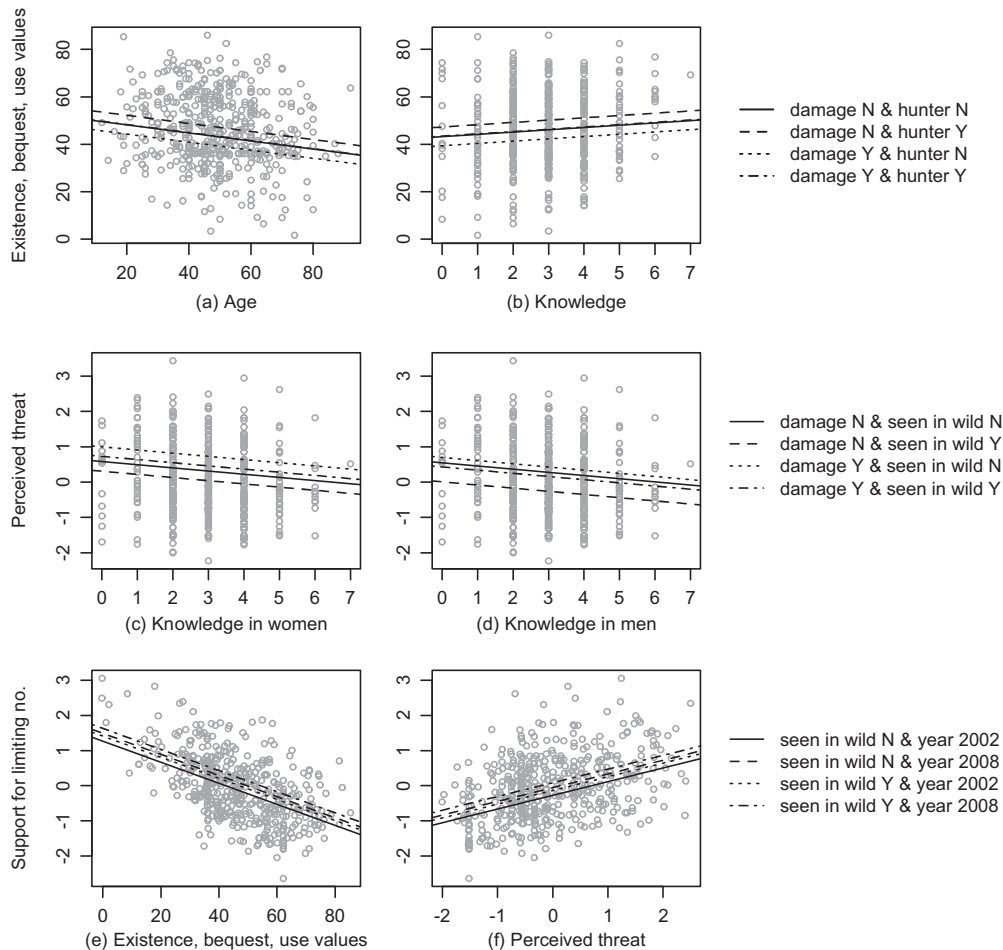
variables in the averaged model are small, their standard errors large, and their relative importance low: age, being a hunter and year. None of the interactions between year of survey and other variables feature as important predictors (Table 6).

### 3.4.3. Support for limiting bear numbers

We ran 3128 models to explain respondents' "support for limiting bear numbers" and included thirteen in the confidence set (Appendix V). The best model contained the variables: "existence, bequest and use values"; "perceived threat from bears"; year of survey; and whether respondents had seen a bear in the wild. Fig. 1 shows that stronger "existence bequest and use values" decreased respondents' "support for limiting bear numbers", while stronger "perceived threat" increased it. Moreover, respondents in 2008 were slightly more in favor of limiting the bear population than respondents in 2002, and respondents that had seen a bear in the wild were slightly more in favor of limiting bear numbers. The figure representation and the  $R^2$  values of the model ( $R^2 = 0.47$ , adjusted  $R^2 = 0.47$ ) show that its explanatory power is higher than the previous two models. Several other variables included in the averaged model have low relative importance, small effect sizes and large standard errors, these are: experience of damage, age, knowledge, gender, being a hunter and the interactions between year of survey and other variables (Table 6).

**Table 5**  
Distribution of responses (%) given in the management section of the questionnaire. Means were calculated using dummy variables assigned to the categories ranging from strongly disagree (1) to strongly agree (5) unless otherwise noted. Wilcoxon and p-values are given in bold for responses that differed significantly between 2002 and 2008.

Questions	2002					2008					Mean	Wilcoxon and p-values
	1. Strongly disagree (%)	2. Disagree (%)	3. Neutral (%)	4. Agree (%)	5. Strongly agree (%)	1. Strongly disagree (%)	2. Disagree (%)	3. Neutral (%)	4. Agree (%)	5. Strongly agree (%)		
<b>I would agree with increasing bear numbers in Croatia</b>	<b>2.16</b>	<b>7.36</b>	<b>12.99</b>	<b>54.98</b>	<b>22.51</b>	<b>3.86</b>	<b>3.89</b>	<b>10.12</b>	<b>49.03</b>	<b>18.68</b>	<b>3.60</b>	<b>W = 32859.00</b> <b>p = 0.0266</b>
<b>I would agree with increasing bear numbers in my region</b>	<b>1.73</b>	<b>12.12</b>	<b>12.12</b>	<b>55.84</b>	<b>18.18</b>	<b>3.76</b>	<b>3.11</b>	<b>13.23</b>	<b>48.64</b>	<b>14.01</b>	<b>3.54</b>	<b>W = 33132.50</b> <b>p = 0.0161</b>
<b>Bears should be completely protected</b>	<b>3.90</b>	<b>13.42</b>	<b>8.23</b>	<b>47.19</b>	<b>27.27</b>	<b>3.83</b>	<b>4.67</b>	<b>20.62</b>	<b>40.47</b>	<b>21.79</b>	<b>3.48</b>	<b>W = 33454.50</b> <b>p = 0.0104</b>
<b>Bears should be allowed to be hunted in a specific season</b>	<b>13.42</b>	<b>28.14</b>	<b>11.26</b>	<b>40.69</b>	<b>6.49</b>	<b>3.00</b>	<b>4.28</b>	<b>11.28</b>	<b>54.86</b>	<b>22.18</b>	<b>3.81</b>	<b>W = 18715.50</b> <b>p = 5.0E-14</b>
Bears should be allowed to be hunted all year round	39.39	51.08	4.76	2.60	2.16	1.80	32.30	55.64	3.50	1.95	1.98	W = 27344.50 p = 0.0931
Bears should be killed by all means	64.07	31.60	1.73	0.00	2.60	1.49	61.48	33.85	3.11	0.78	1.53	W = 28933.50 p = 0.5696
Hunting quotas for bears should be agreed on a national level	8.66	16.02	4.33	43.72	27.27	3.64	9.73	15.56	44.36	23.74	3.61	W = 30958.50 p = 0.3859
<b>Hunting quotas for bears should be agreed on a county level</b>	<b>9.52</b>	<b>32.03</b>	<b>10.82</b>	<b>39.83</b>	<b>7.79</b>	<b>3.09</b>	<b>7.00</b>	<b>27.24</b>	<b>42.41</b>	<b>12.45</b>	<b>3.37</b>	<b>W = 26694.00</b> <b>p = 0.0430</b>
Hunting quotas for bears should be agreed on a hunting ground level	18.18	27.27	7.36	37.66	9.52	2.96	15.56	25.29	37.74	12.06	3.05	W = 28152.00 p = 0.3052
If a bear repeatedly causes damages I would agree with killing this problem animal	4.33	13.85	9.96	60.17	11.69	3.61	6.23	14.79	49.42	14.01	3.56	W = 31247.50 p = 0.2701
I would be willing to contribute money toward compensation program for losses due to bears	3.03	28.57	33.33	31.60	3.46	3.01	8.56	27.63	28.02	3.11	2.85	W = 31840.00 p = 0.1474
<b>We already have enough bears in Croatia</b>	<b>10.39</b>	<b>46.32</b>	<b>19.48</b>	<b>21.21</b>	<b>2.60</b>	<b>2.66</b>	<b>4.67</b>	<b>37.35</b>	<b>29.96</b>	<b>4.67</b>	<b>2.97</b>	<b>W = 24398.50</b> <b>p = 0.0003</b>
<b>We already have enough bears in this region</b>	<b>10.82</b>	<b>38.10</b>	<b>16.88</b>	<b>29.44</b>	<b>4.76</b>	<b>2.80</b>	<b>4.67</b>	<b>33.85</b>	<b>30.35</b>	<b>7.39</b>	<b>3.06</b>	<b>W = 26339.00</b> <b>p = 0.0248</b>
<b>Compensation for the damages caused by bears should not be paid if appropriate prevention was not used</b>	<b>7.79</b>	<b>32.03</b>	<b>10.82</b>	<b>42.42</b>	<b>6.93</b>	<b>3.06</b>	<b>10.51</b>	<b>45.91</b>	<b>26.07</b>	<b>6.61</b>	<b>2.68</b>	<b>W = 34795.00</b> <b>p = 0.0005</b>
<b>Farmers should buy insurance for protection of their crops and animals against bear damages</b>	<b>8.23</b>	<b>24.68</b>	<b>12.99</b>	<b>41.56</b>	<b>12.55</b>	<b>3.28</b>	<b>9.34</b>	<b>31.91</b>	<b>42.41</b>	<b>4.67</b>	<b>3.04</b>	<b>W = 33130.00</b> <b>p = 0.0195</b>
Hunters that manage bears should pay for compensation for the damages caused by bears	3.46	12.55	12.12	51.52	20.35	3.75	3.08	13.66	50.22	21.59	3.78	W = 29220.00 p = 0.7443
Administration should pay for compensation for the damages caused by bears	4.33	10.39	11.26	51.95	22.08	3.76	2.72	10.12	52.53	22.18	3.93	W = 29342.50 p = 0.8116
Bear hide and skull should be removed from the list of hunting trophies	10.82	30.74	19.91	23.38	15.15	3.03	7.39	29.18	25.68	18.68	3.20	W = 27359.00 p = 0.1243
Hunter can keep the trophy after it has been properly registered in the national database	7.36	3.03	14.72	61.04	13.85	3.73	5.45	8.56	56.03	11.28	3.61	W = 32090.00 p = 0.0825



**Fig. 1.** Multivariate plots of the best model explaining existence bequest and use values, perceived threat and support for limiting bear numbers. The gray points are raw data and the trend lines represent the effects of the categorical variables taken from the model outputs. The graphs show: the effect of (a) age and (b) knowledge on the transformed variable representing existence bequest and use values for respondents who never experienced damage and were not hunters, who never experienced damage and were hunters, who experienced damage and were not hunters, who experienced damage and were hunters; the effect of knowledge in (c) women and in (d) men on level of perceived threat for respondents who never experienced damage and had never seen a bear in the wild, had never experienced damage and had seen a bear in the wild, had experienced damage and had never seen a bear in the wild, had experienced damage and had seen a bear in the wild; the effect of the transformed variable representing respondent's (e) existence bequest and use values and their (f) perceived threat on their level of support for limiting bear numbers, for respondents who in 2002 had never seen a bear in the wild, who in 2008 had never seen a bear in the wild, who in 2002 had seen a bear in the wild, who in 2008 had seen a bear in the wild.

#### 4. Discussion

The results of this study show that respondents' existence bequest and use value orientations and their overall level of perceived threat did not change significantly over time, while instead acceptance capacity for bears was reduced. We hypothesize that this reduction might be due to changes in bear population and management. We also discuss the formation of value orientations and the socio-demographic and experience factors that influence them. Our findings offer insights into the general structure of attitudes and the direction of attitude change over time. Overall attitudes toward bear management have remained largely intact and the majority of respondents are still in favor of increasing the bear population.

##### 4.1. Wildlife value orientations

Some literature suggests that wildlife value orientations are created early in life, as individuals are socialized into different professional cultures and lifestyles that shape their relationship with nature (Bjerke and Kaltenborn, 1999; Røskaft et al., 2003). Our model supports this and validates the hypothesis that socio-demographic variables affect value orientations ( $H_1$ ). Women were more threatened by bears than men and younger respondents showed more positive attitudes than older respondents, in agreement with literature that discusses the growth of environmental concerns in younger generations (Deruiter and Donnelly, 2002).

Furthermore, our models show that experiences with bears influence value orientations ( $H_2$ ). A large part of the sample



**Table 6**  
The averaged models explaining “existence bequest and use values”, “perceived threat”, and “support for limiting bear numbers”.

		Coefficient	Standard error	Lower CI	Upper CI	Relative importance
1. “Existence bequest and use values”	(Intercept)	52.1245	3.1246	45.9868	58.2623	
	Age	-0.1680	0.0481	-0.2625	-0.0735	1.0000
	Damage (y)	-3.8997	1.5852	-7.0147	-0.7848	1.0000
	Hunter (y)	4.1270	1.7871	0.6156	7.6384	1.0000
	Knowledge	0.7777	0.6239	-0.4474	2.0028	0.8050
	Year (2008)	-0.2179	0.4812	-1.1619	0.7262	0.1772
	Gender (m)	0.2411	0.5507	-0.8395	1.3218	0.1685
	Seen in wild (y)	0.0899	0.3074	-0.5135	0.6933	0.1288
2. “Perceived threat”	(Intercept)	0.5612	0.1545	0.2576	0.8648	
	Gender (m)	-0.2998	0.1061	-0.5083	-0.0913	1.0000
	Damage (y)	0.4219	0.1009	0.2236	0.6201	1.0000
	Knowledge	-0.0882	0.0352	-0.1575	-0.0190	1.0000
	Seen in wild (y)	-0.2734	0.1059	-0.4815	-0.0653	1.0000
	Hunter (y)	-0.0226	0.0488	-0.1184	0.0731	0.225
	Age	0.0004	0.0010	-0.0016	0.0024	0.1919
	Year (2008)	0.0012	0.0146	-0.0274	0.0299	0.1538
3. “Support for limiting bear numbers”	(Intercept)	1.3058	0.1459	1.0192	1.5925	
	Existence (transformed)	-0.0335	0.0022	-0.0378	-0.0292	1.0000
	Perceived threat	0.3870	0.0351	0.3181	0.4559	1.0000
	Year (2008)	0.2243	0.0751	0.0768	0.3718	1.0000
	Seen in wild (y)	0.1201	0.0860	-0.0487	0.2890	0.8552
	Damage (y)	0.0231	0.0428	-0.0609	0.1071	0.2507
	Age	-0.0006	0.0012	-0.0029	0.0017	0.2304
	Gender (m)	0.0065	0.0166	-0.0260	0.0390	0.1186
	Knowledge	0.0013	0.0034	-0.0054	0.0080	0.0706
	Hunter (y)	-0.0032	0.0091	-0.0211	0.01467	0.0656
	Perceived threat * year (2008)	0.0019	0.0063	-0.0104	0.01423	0.0610
	Existence (transformed) * year (2008)	0.0001	0.0003	-0.0005	0.0006	0.0558
	Seen in wild (y) * year (2008)	-0.0005	0.0084	-0.0170	0.01611	0.05447

reported having seen a bear in the wild, and many respondents were hunters. Respondents that had had these kinds of experiences with bears, along with respondents that were more knowledgeable of bears, felt less threatened by them. In contrast, the experience of damage had a negative effect on both respondents' existence bequest and use values, and their level of perceived threat. Experience with wildlife can be linked to social group membership, as it may be more common among respondents who live closer to forests, cultivate crops or rear livestock. These individuals would be expected to have predetermined, usually more negative attitudes toward carnivores characteristic to rural inhabitants, as was found in rural areas near Yellowstone National Park (Bath, 1989) and among sheep farmers in Norway (Bjerke and Kaltenborn, 1999).

Our results show that those respondents who lived in close contact with bears and incurred the costs of bear conservation had more negative attitudes. The detected effect of real threats on perceived threats has important management implications. In places like Croatia, where there is a history of coexistence with carnivores and where significant percentages of the population have experienced bear presence, an awareness raising campaign aimed at swaying attitudes without acknowledging that threats are real is likely to fall short of its objectives. Instead, our results indicate that when dealing with negative attitudes, the most effective management approaches are those aimed at conflict resolution.

Our best models do not support the hypothesis that value orientations are affected by changes in the bear population and management ( $H_3$ ), but they do show that they depend on factors that have the potential to produce change. The fact that younger respondents held stronger existence, bequest and use values suggests that a generational change may soon be replacing more negative wildlife values. Moreover, a more centralized and regulated bear management and an increase in the bear population could theoretically affect the frequency, intensity or the experience of damage from bears and encounters in the wild. Vittersø et al. (1999) show that farmers experiencing higher levels of predation from large

carnivores had more negative attitudes. Furthermore, Bjerke et al. (2000) show that higher levels of marginalization of the rural community from decision making are positively associated with fear. In our study the impact of changes in bear management and bear population was not strong enough to produce changes in the principal components that were used to summarize value orientations, since neither year nor the interaction between year and other variables was significant. However, background changes do seem to have led to an increase in respondents' fear of bear attacks between 2002 and 2008, as shown by the unpaired tests.

Although there are signs that value orientations might be influenced by contextual changes, our results show that overall they remain consistent. This is supported by the fact that paired tests did not detect any changes at the individual level ( $H_8$ ). Our results show that value orientations are also difficult to model, and even though the variables discussed above were significant they had low explanatory power. This is consistent with findings by Ericsson and Heberlein (2003), who present four models explaining attitudes towards wolves with adjusted  $R^2$  ranging from 0.17 to 0.08.

#### 4.2. Bear acceptance capacity

Hypotheses regarding the effects of socio-demographic variables ( $H_4$ ) and experience ( $H_5$ ) on bear acceptance capacity were in part refuted by the model explaining “support for limiting bear numbers”. The experience of encountering a bear in the wild is an important predictor but the experience of damage is a less important predictor. However, our data does not allow to measure the likely increase in the frequency of damages incurred in 2008 by the same respondents that experienced damage in 2002. This could have led to a failure in detecting an existing trend in the data. Studies have shown that wildlife densities increase around human-related food sources, such as supplementary feeding sites (Ghoddousi, 2010; Sahlsten et al., 2010) and agriculture (Bunnfeld et al., 2006). Currently, we have limited knowledge on bear use

space and the relationship between bear population size, bear distribution, and the damages it causes. Further studies combining data from these areas would therefore enhance our understanding of the issue.

Our models instead support the hypotheses that value orientations ( $H_7$ ) and changes in bear management and bear population size ( $H_6$ ) affect bear acceptance capacity. The model shows that bear acceptance capacity was reduced over time, and this is confirmed by both the unpaired and the paired tests. The latter indicate that opinions about acceptable levels of the bear population changed even at the individual level ( $H_8$ ). Furthermore, in 2008 fewer respondents believed that the costs of damages should be borne by individuals, as fewer supported buying insurance and more were in favor of compensation being paid irrespectively of the preventive measures taken. Therefore, results indicate that attitudes regarding bear management and increasing bear population levels have become slightly more negative over time.

Although the BMP takes important steps to mitigate both human–bear encounters and the damages caused by bears, it is possible that the positive results of these actions have not yet been felt by the local population. This might be because they have not been properly implemented, or because the people do not know of them. Instead, the more immediate effects of the BMP, such as the more regulated hunting system and management being taken away from local administrations, may have spurred more public discussion, inducing the perception that bears have become more protected and that local stakeholders have been denied their rights to self-determination. It is possible that respondents were not aware that the hunting quotas more than doubled since implementation of BMP and that actually quotas are not being fulfilled (Biščan et al., 2010). On the other hand, it may take longer for the positive impacts of the BMP to trickle down into public consciousness. This could be facilitated by reinforcing BMP efforts that encourage stakeholders to participate in bear management and raise awareness about the BMP's guidelines to reduce human–bear conflict. In line with most human dimension studies (Bath, 1989; Bisi et al., 2007; Bjerke et al., 2000) our results highlight the importance of public involvement in wildlife management.

#### 4.3. The role of hunting as a conservation tool

Despite the changes mentioned above, attitudes towards bears in Croatia were overall positive and the majority of the public is still willing to accept an increase in the bear population. Some literature divides value orientations into “use” and “non-use” values, placing them on opposite sides of the same scale (Bjerke and Kaltenborn, 1999; Vaske and Donnelly, 1999). Findings in this study do not support that division, and show that use values correlate with existence and bequest values in the first principal component. Hunters made up a large part of the sampled population and scored higher on the scale of “existence, bequest and use values” of bears. It is likely that their utilitarian values contributed to strengthen the existence and bequest values of non hunting members in the community. Since bear hunting is a historically established tradition in Croatia, the bear may have come to symbolize an aspect of rural and national cultural heritage. Moreover, because compensation for damage is paid by local hunting grounds, trophy hunting provides the financial means to cover some of the costs of bear conservation as well as profit for the hunting grounds and the local tourism industry.

Changes in attitudes and acceptance levels of the bear over the past decade provide insight regarding the role of hunting as a tool to maintain local rights over land use and livelihoods. Results suggest that when faced with a growing bear population and a more centralized bear management some respondents asserted their hunting rights with more intensity. More people in 2008 were in

favor of hunting the bear and less wanted it to be protected. Treves (2009) argues that hunting can increase support for conservation by contributing a sense of ownership and control over carnivore populations. Our results support this view, and suggest the need for management strategies that further public participation in bear management and decision making. In Croatia hunting forms an important aspect of public involvement, and given the appropriate institutional and ecological mechanisms to ensure its sustainability it can constitute an effective conservation instrument.

The general trend of increasing bear populations in several European countries (Swenson et al., 2000), and the future extension of the European Union will affect management of bears and other large carnivores in more countries. These changes suggest the need for continued monitoring of wildlife populations and attitudes of stakeholders toward wildlife. They also highlight the importance of context specific management strategies that help build local support for wildlife conservation.

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#### Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.biocon.2011.09.005.

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## 2.4 ZVERI SI NISO ENAKE V OČEH PREBIVALCEV PODEŽELJA. BI MORALI OB KONFLIKTNIH RAZVIJATI VARSTVENE NAČRTE ZA FUNKCIONALNE CEHE, ALI ZA POSAMEZNE VRSTE?

### **All carnivores are not equal in the rural people's view. Should we develop conservation plans for functional guilds or individual species in the face of conflicts?**

Aleksandër Trajçe, Gjorge Ivanov, Erjola Keçi, Aleksandra Majić, Dime Melovski, Kujtim Mersini, Sabit Mustafa, Tomaž Skrbinšek, Aleksandar Stojanov, Aleksandra Todorovska, Manuela von Arx, John D.C. Linnell

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Izvleček: S podatki zbranimi v anketni raziskavi ( $n = 759$ ) smo ocenjevali razlike v odnosu ruralne javnosti do medvedov, volkov in risov v Albaniji in Makedoniji. Volk je bil vrsta, ki ji je bila javnost na podeželju najmanj naklonjena in za katero je bila v primerjavi z medvedom in risom podpora varstvu najmanjša. Ob tem so volkove tudi dojemali kot bolj konfliktno kot drugi dve vrsti. Menimo, da bi glede na vrstno specifične razlike v odnosu javnosti morali volka obravnavati ločeno od medveda in risa, saj lahko nižja podpora javnosti do volkov ogrozi tudi varstvo ostalih dveh vrst velikih zveri. Glede na podobno raven podpore javnosti njihovem varstvu, bi lahko medvede in rise v varstvenih iniciativah potencialno obravnavali skupaj, je pa potrebno z vidika reševanja konfliktov vsako izmed treh vrst obravnavati ločeno.



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### Original Research Article

# All carnivores are not equal in the rural people's view. Should we develop conservation plans for functional guilds or individual species in the face of conflicts?



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### ABSTRACT

We tested differences in attitudes towards bears, wolves and lynx among the rural public in Albania and Macedonia through information collected from a questionnaire survey (n = 759). Wolves were the species with the least positive attitudes among the rural public and had the lowest support for conservation compared with bears and lynx. In addition, conflict perception of wolves was higher than for bears and lynx. We argue that, based on species specific differences in public attitudes, conservation initiatives and management plans for large carnivores should deal with wolves separately from bears and lynx, as lower public support for wolves might jeopardise the conservation of the two other large carnivores. Bears and lynx can be potentially treated together in conservation initiatives based on the similar levels of public support for conservation, however, from a conflict-management point of view, all three species need to be addressed separately.

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## 1. Introduction

Large carnivore conservation remains a challenging endeavour worldwide. Their large spatial requirements and conflicts with humans are the main challenges when it comes to conservation (Gittleman et al., 2001; Woodroffe and Ginsberg, 1998).

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From an ecological perspective, carnivore conservation objectives should be set to ensure the viability of large populations and thus require large areas to fulfil the species' ecological requirements. However, as humans have influenced and fragmented the majority of natural landscapes worldwide, setting aside wilderness conservation areas large enough to sustain viable large carnivore populations is almost impossible, particularly in a European context (Linnell et al., 2005; Woodroffe and Ginsberg, 1998). Conservation must therefore occur in multi-use human-dominated landscapes and as a result conservation ambitions for large carnivores in Europe are constrained by both the fact that humans have modified the natural landscape for millennia, and by the degree of acceptance that local human populations have for their presence (Linnell et al., 2001). Large carnivores cause considerable economic damage throughout Europe, mainly due to livestock depredation (Kaczensky, 1999), and they also sometimes represent a risk for human safety (Löe and Röskaft, 2004). Conserving large carnivores in such human dominated landscapes requires complementing classic conservation biology approaches (Carroll et al., 2001; Noss et al., 1996) with social science research which examines human attitudes toward these species (Bath, 1998; Decker et al., 2001; Manfredo et al., 1996), and the integration of the latter into conservation strategies and programmes.

Within conservation biology there has been a trend for moving away from single-species conservation to more holistic, ecosystem approaches (Groom et al., 2006). The historical developments include ideas such as 'ecosystem management' (Christensen et al., 1996; Grumbine, 1994), and the 'ecosystem approach' (COP, 1998). The motivation is to rationalise the use of limited resources for conservation by focusing on entire ecosystems rather than single species (Christensen et al., 1996). This is further supported by the fact that many ecosystem elements either depend on, or interact with, one another and moreover, they provide a more practical approach for conservation. One way to rationalise this approach is to focus efforts on functional groups of animals or 'guilds' that, given their ecological characteristics and functions, will theoretically ensure the protection of ecosystems at large (Lambeck, 1997; Roberge and Angelstam, 2004; Simberloff, 1998). Large carnivores are a potential target of this 'guild' approach (Carroll et al., 2001; Noss et al., 1996). Across the European continent there is a strong movement for the conservation of large carnivores as a group; grey wolves (*Canis lupus*), brown bears (*Ursus arctos*), Eurasian lynx (*Lynx lynx*) and wolverines (*Gulo gulo*) are often packaged together in conservation efforts and initiatives. Many environmental organisations in Europe base their awareness and fundraising activities on this large carnivore 'guild', and often implement programmes aiming at the simultaneous conservation of all large carnivores (EAZA, 2010; Kirby, 1999; Salvatori, 2013).

Species-specific differences in public attitudes could potentially represent a problem for the 'guild' approach if different species inspire different feelings among the public. Negative attitudes toward a particular species might negatively influence the public's view of the entire guild, including species that the public might not be particularly against or which may even be favoured for conservation (Farhadinia et al., 2017). Attitudes about large carnivores can vary according to a number of factors and variables, often linked to cultural, economic and social circumstances (Kleiven et al., 2004; Roskaft et al., 2007). These differentiations are widely noted even in historical literature and folklore. While wolves have been traditionally depicted as merciless beasts of destruction, evil creatures and are ever-present in legends and stories across the European continent (Dingwall 2001; Marvin, 2012), lynx are hardly talked about in a historical or cultural context and remain a poorly known species for most people (Breitenmoser and Breitenmoser-Würsten, 2008). In addition, wolves and bears have a history of attacking and even killing people and have been feared for this reason, but there is hardly any evidence of lynx or wolverines attacking humans (Breitenmoser and Breitenmoser-Würsten, 2008; Kruuk, 2002; Linnell et al., 2002). Moreover, carnivores are not equal in the level of damage they can inflict on economic activities, with wolves being responsible for most losses of livestock and bears causing more damage on crops and fruit trees (Andersen et al., 2003; Kaczensky, 1999; Swenson and Andren, 2005). Lescureux and Linnell (2010) further argue that people have different perceptions of carnivore species and their characteristics, depending on the species' cultural history, ecology, the level of damage they cause, and their level of interactions with humans.

This study seeks to explore the relative ranking of attitudes toward three species of large carnivores, namely wolves, bears and lynx, within a sample of the rural public in Albania and Macedonia who share their immediate environments with these species. We conducted a quantitative study based on the administration of a questionnaire survey, aiming to collect information on people's perceptions of, and attitudes towards, the three species. This study is the first of its kind in the region and represents a new possibility for modernising wildlife management policies and decision-making processes in these two countries. In addition, it is an exploration of the relative opinions of different species given by the same people within the same sample of the population. As such, it brings new insights in human dimensions research as it is one of few studies in Europe that simultaneously looks at public attitudes towards several species of large carnivores. The specific hypothesis was to test whether public support and attitudes toward large carnivores differ considerably between the three species and the two countries. Based on the results, implications that might arise for current and future conservation and management approaches are discussed. Furthermore, the results are also interpreted in light of similar attitudinal studies that have been conducted in other parts of Europe, especially when it came to exploring the extent to which various individual characteristics (such as age, gender, education) influence variation in general attitudes.

## 2. Materials and methods

### 2.1. Study area

The study area is in the regions of eastern Albania and western Macedonia covering a total area of 13,407.2 km<sup>2</sup> (S1). This area was selected because it is the only area in the region with a documented presence of all three large carnivores (Chapron

et al., 2014; Ivanov et al., 2008; Kaczensky et al., 2013), therefore providing higher chances for respondents to give opinions on all three species. While the brown bear and wolf are considered to have larger and stable populations in both countries, the lynx is evaluated as critically endangered with very few individuals remaining (S2). The lynx in Albania and Macedonia are part of the remaining Balkan lynx population, estimated to be the most threatened indigenous population of Eurasian lynx in Europe, with no more than 40 mature individuals remaining (Melovski et al., 2015).

The survey was conducted in 32 municipalities in Albania and 29 in Macedonia with a cumulative area of 3227.2 km<sup>2</sup> and 10,180 km<sup>2</sup> respectively. The cumulative population of the study area municipalities in Albania was 163,500 inhabitants (Institute of Statistics, 2003) with a population density of 50.7 people/km<sup>2</sup>. The study area in Macedonia had 358,600 inhabitants (State Statistical Office, 2007) with a population density of 35.2 people/km<sup>2</sup>. These areas are predominantly rural, characterised by small villages scattered over a largely mountainous and forested landscape. The main human activities are farming, livestock breeding, forestry, collection of medicinal and aromatic plants and other forest products, and hunting. The most commonly kept livestock species are sheep and to a lesser extent cattle, goats, donkeys and horses. In recent decades, these areas of Albania and Macedonia have been facing rural depopulation, with locals migrating out of the area towards big cities in the respective countries or even abroad. However, this abandonment occurred in different periods in the two countries; in Macedonia having its peak in the 1950s and 1960s (Thomas, 1982) and in Albania occurring almost entirely after the collapse of the communist regime in 1990s (King and Vullnetari, 2003). The physical landscape is characterised by agriculture fields in valley bottoms and around villages, forests on mountain slopes, and alpine pastures and meadows at higher elevations. Agriculture and livestock breeding remain rather traditional and occur at a near subsistence level, particularly in Albania (Keçi et al., 2008; Kume et al., 2004).

## 2.2. Sampling frame and data collection

Only residents 18 years and older were eligible to take part in the survey. Stratified random sampling was used to ensure a proportional representation of the population. A target sample of 400 questionnaires per country was chosen so as to ensure a 95% confidence level and 5% confidence interval (Sheskin, 1985). In total ten interviewers (five in each country) helped in the data collection process, all of whom had received prior training for the survey. All interviews were conducted face-to-face and people were selected on a random approach after entering a given village – e.g. every third person encountered in the street. The field survey extended from April 2007 to January 2009.

## 2.3. Questionnaire structure

The survey instrument (S3) was a questionnaire developed out of similar research studies in other European countries (Bath et al., 2008; Bath and Majic, 2001; Kaczensky et al., 2004). The questionnaire was adapted according to Albanian and Macedonian contexts and was focused on the three species of large carnivores present in these countries. Questions were organised around general topics such as attitudes, beliefs, knowledge of species, management, personal experiences, and socio-demographic information. There were 46 questions in total, of which 24 were asked for all three large carnivore species, six were questions intended to measure general environmental attitudes of participants, two were management-specific questions concerning respectively lynx and wolves, three questions focussed on related attitudes toward general societal issues, and 11 were questions concerning background socio-demographic information and interviewee profile. Attitudinal items were based on a 5-point Likert scale and scored from 1 (strongly disagree/dislike) to 5 (strongly agree/like).

## 2.4. Data analysis

All statistical analyses were done in the R statistical environment (Version 3.1.2, R Development Core Team, 2014). Initially we reduced data among the attitudinal questions by performing a principal component analysis (PCA) with Varimax rotation to summarise the types of attitudes measured by the questionnaire items. We used the functions in the R package *Psych* (Revelle, 2014) for the PCA, and did the analysis for all three species together to enable comparisons. Based on a scree plot analysis, we extracted two factors that included the majority of variance in the data (fit = 0.94). We based the interpretation of these two factors on loadings of different variables (responses to specific questions) in each factor. Grouped in the first extracted factor were the responses to questions about support for conservation (SC) of species. The second factor was interpreted as conflict perception (CP) of species, as it included the responses to questions about perception of large carnivores as dangerous and a threat to human livelihoods (Table 1). We used these two factors (SC and CP) as response variables in the downstream analysis. To ease interpretation, we centred and scaled both factors on a scale –2 to 2, where 0 is “neutral” (all answers on the Likert scale).

We used linear mixed effects models with R package *nlme* (Pinheiro et al., 2014) to model the effects of independent variables on SC and CP scores. A set of models was fitted for each of these two factors as the response variables, with explanatory variables selected *a priori* based on the existing knowledge and reasoning about their effects on the response variable (Burnham and Anderson, 2002). Besides existing explanatory variables in the questionnaire, we created a knowledge score (0–15) for large carnivores as a new variable, by summing correct answers given by each respondent in regard to questions on ecology (weight, way of living, diet) and legal status (protection status, payment for compensation) of the three species in each country. Since there was no reason to expect a particular distribution for the response variables (and hence use

**Table 1**

PCA loadings of each attitudinal question for the two extracted factors. Only values > 0.30 are shown.

Question	Support for Conservation	Conflict Perception
How do you feel about [bears, wolves, lynx]	0.72	-0.30
It is important to save [bears, wolves, lynx] for future generations	0.76	
[Bears, wolves, lynx] attract tourists	0.68	
[Bears, wolves, lynx] cause big damage on livestock	-0.35	0.64
I'm afraid the presence of [bears, wolves, lynx] might cause financial loss		0.69
[Bears, wolves, lynx] that kill livestock should be killed	-0.36	0.57
It is known that [bears, wolves, lynx] kill people		0.57
[Bears, wolves, lynx] reduce prey populations significantly and make hunting impossible		0.65
[Bears, wolves, lynx] should be entirely protected by law	0.69	
I would agree for [bears, wolves, lynx] numbers to increase in [AL, MK]	0.67	-0.31
I think we already have enough of [bears, wolves, lynx] in [AL, MK]	-0.31	0.48
There should be authorised hunting of [bears, wolves, lynx] in [AL, MK]		0.61
% of variance explained by each factor	24	24
Cumulative % of variance explained	24	48

an appropriate link function in a generalized linear model) we used the identity link (Gaussian errors) and transformed the response variable as required. While the CP score had a unimodal symmetrical distribution, and didn't require a transformation, we inverted the data and used the lognormal transform for the SC score, and back-transformed the results for interpretation. Since the explanatory variables were selected *a priori* based on our understanding of the questions, we fitted the full model set for these variables without interactions up to the number of parameters supported by the data. We used 40 data points per parameter as the criteria, where we considered each respondent as a data point. Since each respondent generated three records (one for a set of questions for each species) and these records were not independent, we included the respondent as a random effect variable fitted into the intercept. We used diagnostic plots for the global model in R to check for heterogeneity, non-normality and model outliers. Clear model outliers were removed from the data and were not further explored since there were few. We checked for multicollinearity using Variance Inflation Factors. We checked for heterogeneity in the data by plotting residuals against fixed-effects variables, and included error structure in the model (Zuur et al., 2009). Since the variance for different species and genders varied, we included the correction in the model error structure using varIdent weights (Zuur et al., 2009). The models were ranked using the Second-order Information Criterion (AICc), and we used Akaike's weights to estimate the relative importance of each variable (Burnham and Anderson, 2002). Among the models with the lowest that were within  $\Delta AICc \leq 2$ , we considered the models with the least parameters as the most parsimonious. These final models (Table 2) for both response variables were checked again for fit and used for inference. Fitting of the full model set, estimation of variable importance and model averaging were done using the R package *MuMIn* (Bartoń, 2014). The process of factors extraction and subsequent model selection are summarised in Appendix S4.

### 3. Results

#### 3.1. Respondents' characteristics and interactions with large carnivores

In total, 759 people were interviewed during the survey, 397 in Albania and 362 in Macedonia. A detailed descriptive profiling of respondents can be found in Appendix S2. The original sampling design aimed to interview an equal number of men and women. However, because of the conservative and patriarchal nature of societies in the region, it was not always possible to interview enough women, despite having female interviewers in each team. This resulted in a male bias among the respondents (76.9% men and 23.1% women). The bias was higher in Macedonia where only 15% of the respondents were women. The average age of respondents was 43.3 years (range 18–83) and among these the Macedonian sampled population was on average younger (40.5 years) than the Albanian one (45.8 years) [ $t(757) = 5.136; p < 0.05$ ]. In respect to residence, the vast majority of respondents (94.6%) in both countries described themselves as being permanent inhabitants in their respective rural municipalities. In Albania, livestock and beehive ownership was higher than in Macedonia, with the majority

**Table 2**

Support for conservation (SC) and conflict perception (CP) models and the explanatory variables used in them. Explanatory variables with \* are a-priori hypothesised interaction variables, which improve the model.

Response variable	Explanatory variables
Support for conservation (SC)	'species', 'interest in hunting', 'gender', 'had damage', 'knowledge species', 'interest in hiking', 'seen captive', 'country', 'education', 'practice hunting', 'species*gender', 'gender*education', 'hunt*education', 'species*knowledge species', 'species*country'
Conflict perception (CP)	'country', 'species', 'education', 'knowledge species', 'gender', 'had damage', 'interest in hiking', 'seen captive', 'interest in hunting', 'has livestock', 'species*has livestock', 'species*gender', 'species*knowledge species', 'country*hunt', 'country*species'



of the respondents claiming to own at least one head of livestock, whereas in Macedonia livestock ownership was rather limited to fewer people (in AL: 48.5% were owners of small livestock, 77.3% owners of big livestock and 6.5% owners of beehives; in MK: 8.3% were owners of small livestock, 29.6% owners of big livestock and 2.8% owners of beehives). Hunting was practiced by more respondents in Albania than in Macedonia (24.1% of respondents in AL, 16.3% in MK).

People in Albania seemed to have more interactions with wolves and bears in the wild when compared to Macedonia as higher incidences of observations, shooting of, and damages from these two large carnivores were reported. The picture was inverted for lynx, with people in Macedonia having reportedly more interactions with the species. Overall, wolves and bears were the species with which people had most interactions, and lynx were the least interacted with. Respondents in Macedonia had more observation experiences of large carnivores in captivity than Albanian respondents. Wolves were reported as the most damage-causing animal in both countries, followed by bears, whereas there were very few reports of lynx causing damage in Macedonia and none in Albania. There seems to be a general lack of knowledge of lynx as a species in Albania. Despite showing a lynx photograph during the interviews, only about one third (33.5%) of respondents in Albania reported knowing the species and were thus able to give answers to the lynx-related items in the questionnaire. Descriptive analysis of interactions with large carnivores are presented in Appendix S2.

### 3.2. Attitude differences between species and countries

Through the constructed models we explored the effects of single explanatory variables, and their selected interactions, have on the response variables (SC and CP), while controlling for the effect of other variables. The most obvious effect is that of species in SC ( $i = 1.00$ ; “ $i$ ” is the importance of predictor variables expressed in terms of proportion of models that use the variable weighted by each model's Akaike's weight). Bears and lynx enjoy a high support for conservation as they rank the highest in the SC score. Wolves, on the other hand, ranked the lowest among the three large carnivores, being the least favoured species for conservation, among members of the rural public in both Albania and Macedonia (Fig. 1). However, the SC score of wolves is still positive (above zero), indicating that, for the most part, the rural population in Albania and Macedonia is supportive of their conservation. Therefore, it can be argued that all three species enjoy a positive support for conservation in Albania and Macedonia, however, wolves are supported less than bears and lynx.

The support for conservation results are mirrored by the effect of species in conflict perception ( $i = 1.00$ ). Wolves are considered by far the species that evoke a greater conflict perception among a majority of people, bears rank second and lynx rank third and almost neutral in their CP (Fig. 1). While the SC model suggests that bears and lynx enjoy a largely similar support for conservation and wolves are the species that stands out with the lowest support, the CP model separates all three species from each other.

Country differences and their effect on SC and CP, were evident in both constructed models. Support for conservation seemed higher in Albania than Macedonia (when controlling for knowledge, education and gender). The Albanian public had more supportive attitudes for the conservation of all three species, and this difference was higher for lynx and lower for bears (Fig. 1). In addition, in Albania, SC for lynx was the highest among all three carnivores, whereas in Macedonia, bears ranked first in SC, slightly above lynx. Wolves had the lowest SC in both countries.

Interestingly, support for conservation does not seem to be driven by conflict perception, as this was higher in Albania as well. In general, the rural Albanian public perceived wolves and bears as species causing more conflict than their counterparts in Macedonia did. The picture was less pronounced for lynx, the CP of which was close to neutral in Albania and slightly negative in Macedonia (meaning that the majority of the public did not perceive the lynx as a conflict species). In both countries, wolves were perceived as the species causing most conflict (Fig. 1).

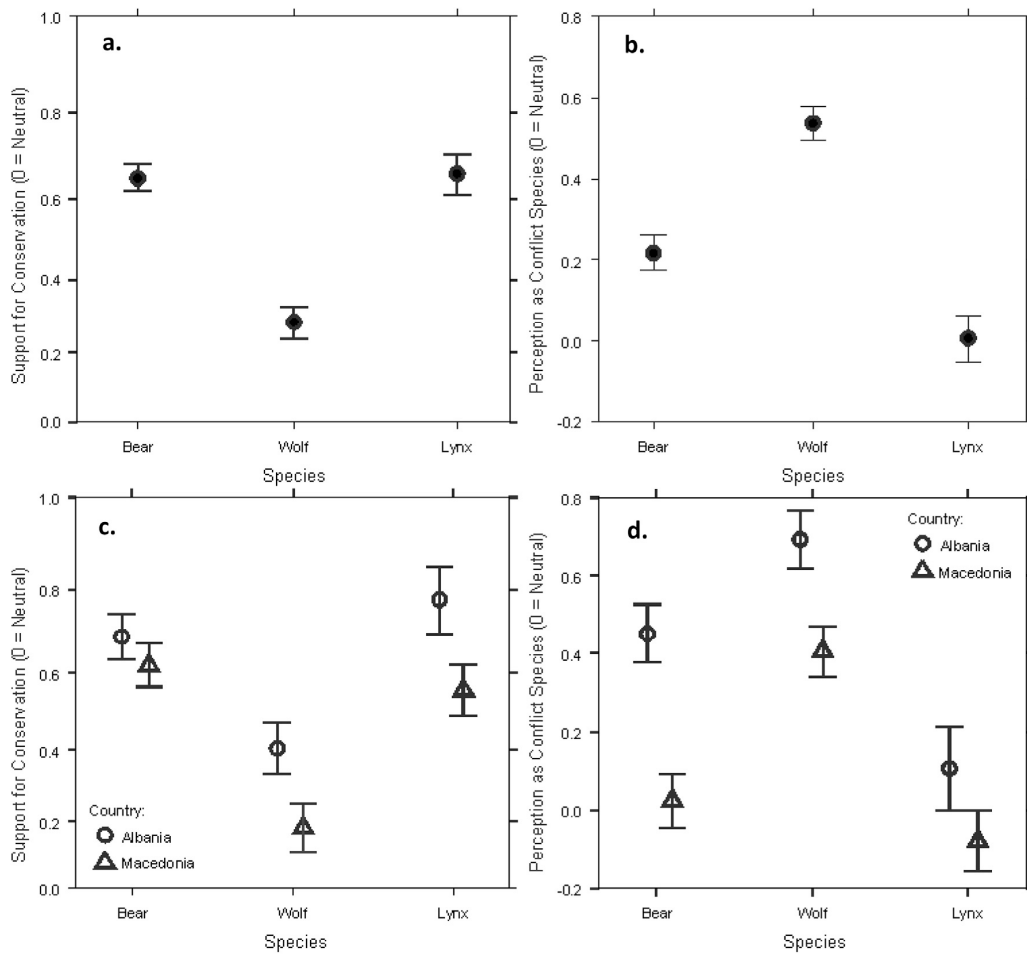
### 3.3. Exploring effects of respondents' characteristics on attitudes

#### 3.3.1. Knowledge about large carnivores

The effect of knowledge was prominent in both models (SC:  $i = 0.94$ ; CP:  $i = 1.00$ ). People with greater knowledge about large carnivores were more supportive of their conservation and perceived fewer conflicts with them than people who knew less about large carnivores (Fig. 2). However, there were differences between species concerning the degree of the effect of knowledge on both models. Knowledge had the most impact on SC for lynx and the least impact for wolf (Fig. 2). In regard to CP, while increases in knowledge had a very strong impact in reducing conflict perception of lynx and bear, it seems to have a very marginal, to almost no, impact in reducing conflict perception of wolves (Fig. 2).

#### 3.3.2. Gender

The gender of respondents was an important predictor in terms of attitudes towards large carnivores, for both SC ( $i = 1.00$ ) and CP ( $i = 0.91$ ). Women were, in general, less supportive of large carnivore conservation and considered them more a cause of conflict than men. The difference in SC metric was the largest for bears, and the least pronounced for lynx. On the other hand, both men and women perceived wolves to be the species causing most conflict and came quite close in that attitude. The difference in the CP metric was, again, largest for bears. With regard to lynx, the majority of men do not consider them as conflict species as their CP is below zero (Fig. 3).



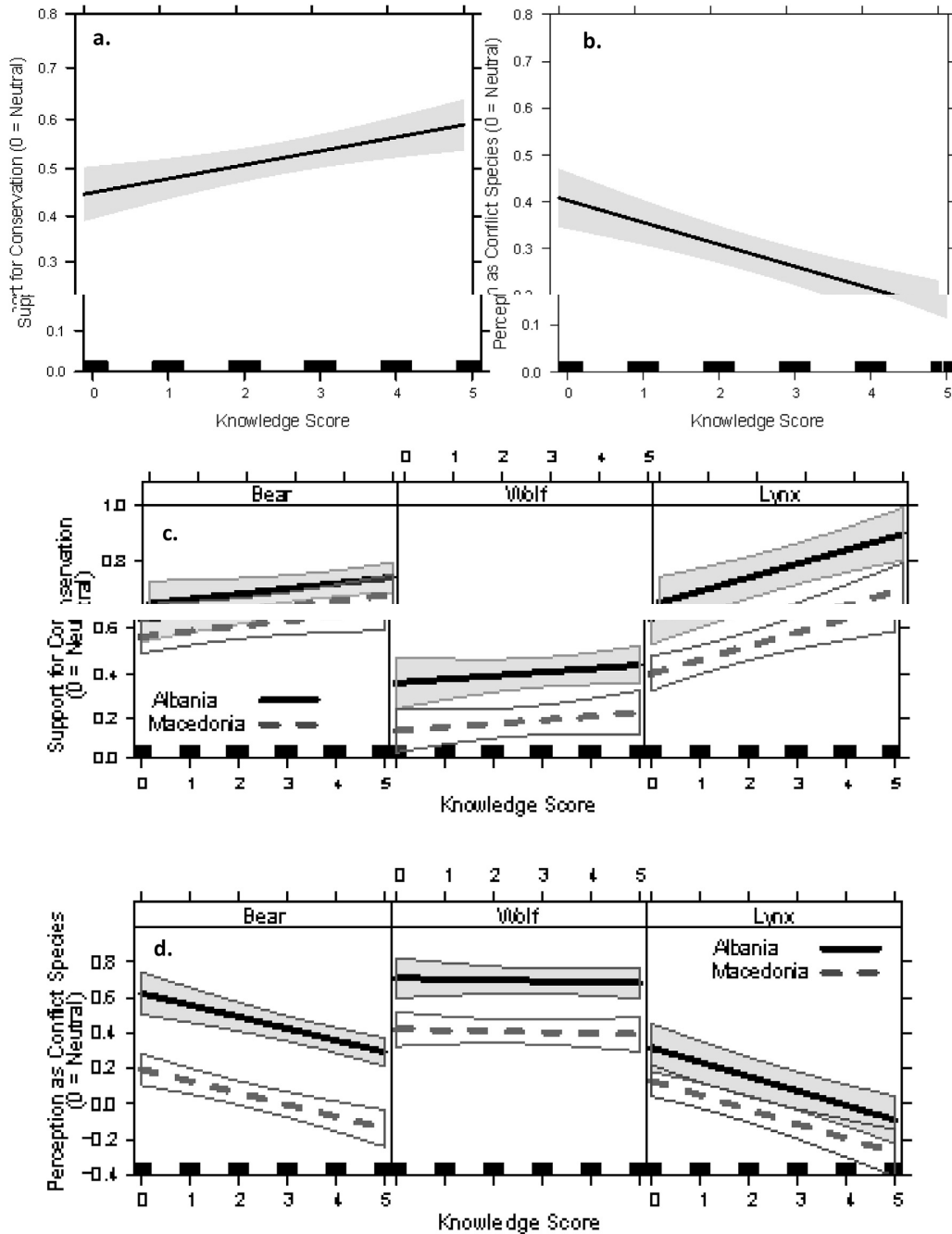
**Fig. 1.** Effect of species in SC (a.) and CP (b.) and of species by country in SC (c.) and CP (d.). For SC -2 = most negative, 0 = neutral, +2 = most positive and for CP -2 = no conflict, 0 = neutral, +2 = most conflict. Bears and lynx seem to enjoy a high support for conservation, whereas wolves have by far the lowest support (albeit still positive). Wolves are considered the most conflict causing species, followed by bears, while lynx rank almost neutral in people's conflict perception. All three species are supported more in Albania than in Macedonia, with the difference being largest for lynx and smallest for bear. Simultaneously, all three species are perceived more conflict causing in Albania than in Macedonia.

### 3.3.3. Education

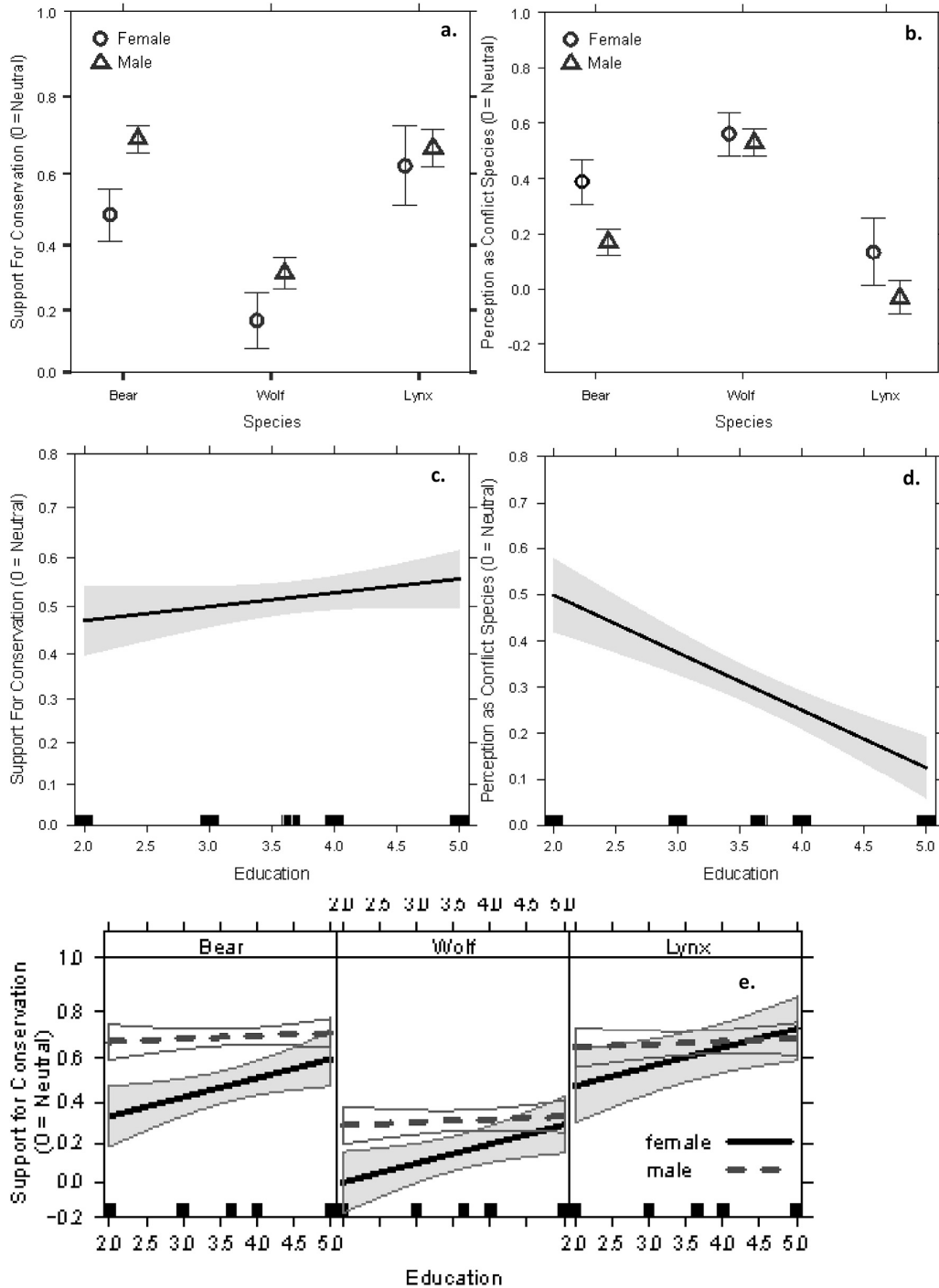
Our study revealed a strong effect of education on both SC ( $i = 0.71$ ) and CP ( $i = 1.00$ ) models. It seems that higher education levels are associated with an increase in SC and decrease in CP. The effect of education was much stronger for CP than for SC (Fig. 3).

Whilst for the CP model the education variable does not seem to interact with any other variable for improving the model, for SC it interacts with gender and 'interest in hunting'. There seems to be a difference in how men and women, in terms of how their levels of education affects support for large carnivore conservation. Education has a much greater effect on women than it does on men. Increased education in men doesn't seem to have a significant effect on SC, whereas the effect is much stronger for women, for whom, increase in education leads to higher support for conservation. Exploring these effects on a species by species approach, we noticed that the difference in the SC metric between men and women decreased significantly with an increase in education of women. In the case of support for lynx conservation, women with higher education are even more supportive than men with the same level of education, and they come quite close to men in the wolves' case (Fig. 3).

Since our population sample was highly biased towards men (particularly in Macedonia), careful considerations are needed when interpreting the interplays between gender and education. In addition, exploring education levels between genders and countries showed that in general the Macedonian women's sub-sample had a higher level of education than the Albanian one. Most of the women who agreed to partake in the questionnaire survey in Macedonia had tertiary (university)



**Fig. 2.** Effect of knowledge on SC (a.) and CP (b.). Effect of knowledge by species and country on SC (c.) and CP (d.). Higher knowledge about large carnivores leads to higher support for conservation and lower conflict perception. The effect in SC is stronger for lynx and least pronounced for wolf, whereas in CP effect of knowledge is almost negligible for wolf and very strong for lynx and bear.



**Fig. 3.** Effect of gender and education on attitudes towards large carnivores. Effect of gender on SC (a.) and on CP (b.). Effect of education on SC (c.) and CP (d.). Effect of education by gender and species on SC (e.). Men are more supportive of LCs and perceive them less conflict species than women do. Higher education leads to higher support for conservation and lower conflict perception. The effect in SC is stronger for women; higher education in women leads to higher SC than among men.

education, considerably higher than the median education of women in Albania (primary education). The Macedonian sub-sample seems to be highly biased towards more educated women (for results on descriptive statistics of our sampled population refer to Appendix S2).

#### 3.3.4. *Livestock ownership and damages from large carnivores*

While 'owning livestock' did not come up as an important predictor in the SC model (importance = 0.29), it seems to have an effect in the CP model, when it interacts with the 'species' variable (Fig. 4). Interestingly, while people who owned livestock perceived wolves and lynx as slightly more conflictful species than people who did not own livestock, the effect for bears was the opposite i.e. owners of livestock had lower perception of conflict than people who did not own livestock.

Experiencing damages from large carnivores came up as an important predictor in both models (SC:  $i = 0.99$ ; CP:  $i = 1.00$ ). As expected, people who had experienced damages from large carnivores were less supportive of their conservation and had higher conflict perceptions than people who had not experienced damages, however these differences in the metrics of both models were low (Fig. 4).

#### 3.3.5. *Interest in hunting*

The modelling results indicate that 'interest in hunting' has an effect on both SC ( $i = 1.00$ ) and CP ( $i = 0.59$ ) models. Interestingly, the parameter "has interest in hunting" seems to be a much stronger predictor of an effect of hunting than the yes/no parameter of whether a person actually practices hunting, which only came up in the SC model ( $i = 0.64$ ).

It seems that a greater interest in hunting is associated with more support for conservation of large carnivores (Fig. 5). For CP, the 'interest in hunting' variable interacts with the 'country' variable. It seems that an increase of interest in hunting has quite opposite effects on CP with regard to the country concerned. While in Macedonia an increase in interest in hunting is associated with increased conflict perception, in Albania it led to a decrease in conflict perception (Fig. 5).

#### 3.3.6. *Interest in hiking*

A person's 'interest in hiking' was a very important predictor for both SC ( $i = 0.91$ ) and CP ( $i = 0.98$ ) models. There is a slight increase in SC with increase of interest in hiking. However, there is also a considerable increase in CP with increase in interest in hiking (Fig. 5).

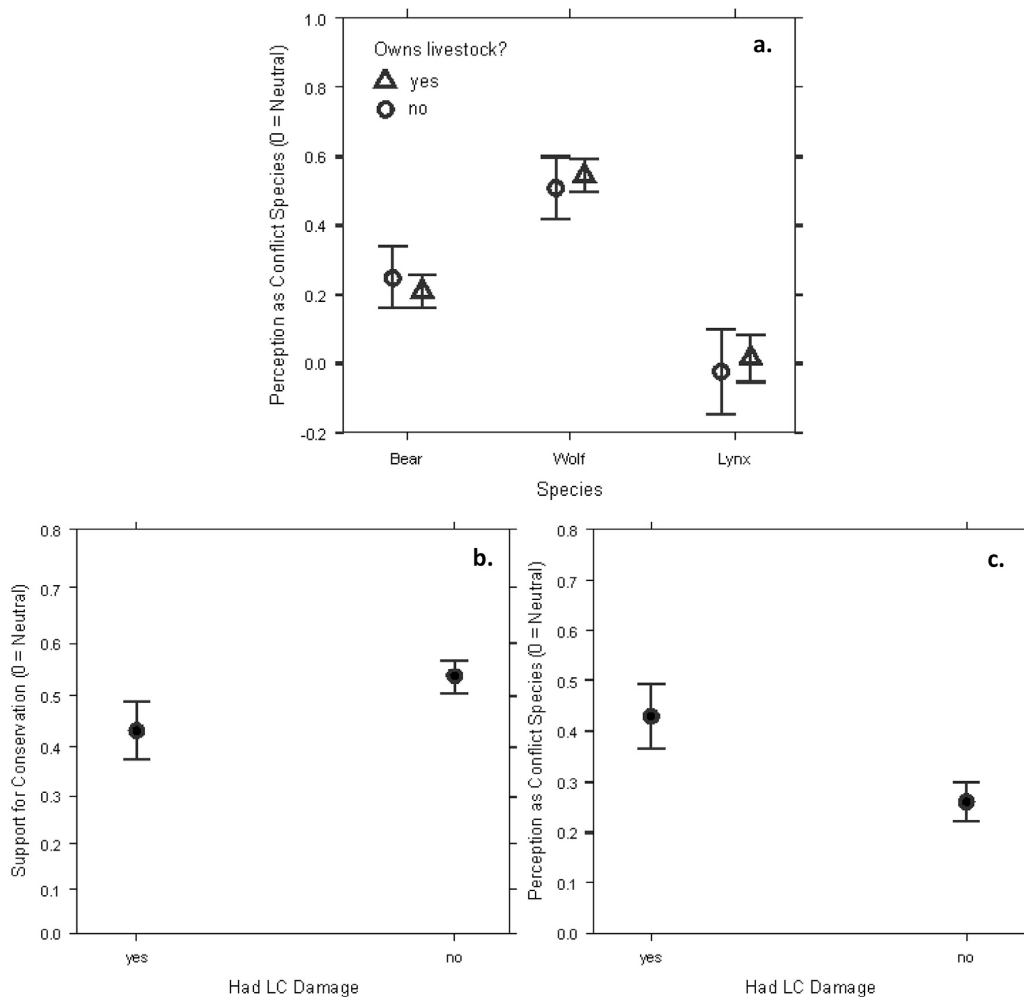
## 4. Discussion

### 4.1. *The large carnivore 'guild' and implications for conservation*

This study demonstrates that there are substantial differences in attitudes towards the different species of large carnivores among the rural public in Albania and Macedonia, with wolves receiving less support for conservation and being more associated with conflicts. Albanians perceived all species as being more conflictful than Macedonians, but also expressed greater support for their conservation.

This research represents the first quantitative study on public attitudes towards wildlife conducted so far in Albania and Macedonia on a representative sample of the rural population, as well as the first to look at attitude differences between countries by using the same standardised research framework. In addition, it is one of few studies in Europe that simultaneously looks at public attitudes towards multiple sympatric large carnivores. Human dimensions studies tends to be focused on single species, with wolves often getting the greatest share of attention (Bath, 2009, 2000; Ericsson and Heberlein, 2003; Majić and Bath, 2010; Nilsen et al., 2007; Williams et al., 2002). There have been a few studies that attempt to look at public attitudes towards several large carnivore species at a time (Andersone and Ozoliņš, 2004; Hunziker et al., 2001; Kleiven et al., 2004; Roskaft et al., 2007; Wechselberger et al., 2005; Wechselberger and Leizinger, 2005), however, most of them remain either descriptive in nature or just focus on the factors that influence individual variability in attitudes. In this regard, the present study is one of the first to make an explicit comparative analysis of the attitudes of the same sample of the public towards different carnivore species.

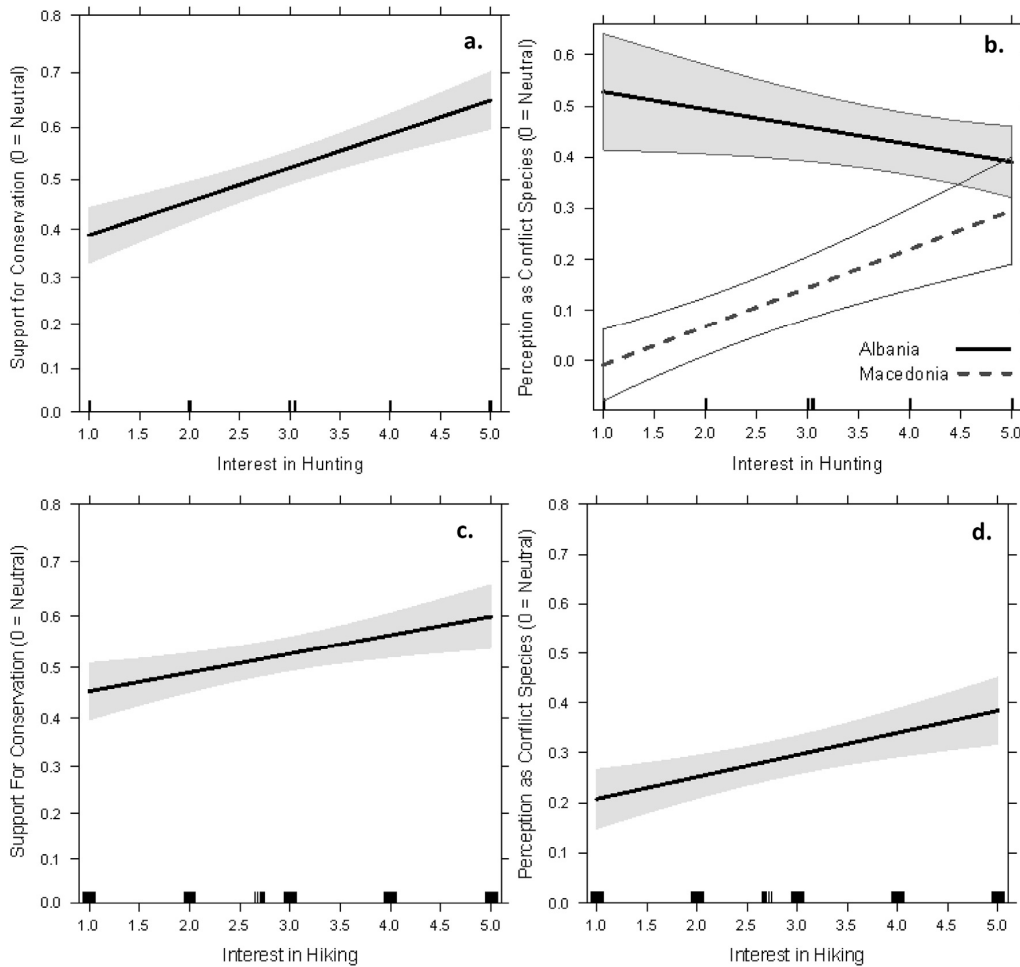
Large carnivores are frequently treated as a 'guild' in European conservation initiatives based on their similar ecological needs and the similar potential to cause conflict with humans. Human dimensions' research on large carnivores has produced results that call into question the wisdom of this guild approach in conservation and management, primarily because different species of carnivores generate different feelings among members of the public. Kleiven et al. (2004) and Roskaft et al. (2007) conclude that public attitudes of the Norwegian population are quite species-dependent. Norwegians seems to be much more negative towards the larger carnivores, bears and wolves, and more accepting of the smaller ones, lynx and wolverines. More positive attitudes towards lynx are prevalent, even though lynx are documented to cause significantly more damage than wolves and bears in Norway – this is also explained by their higher abundance and wider distribution (Kleiven et al., 2004; Roskaft et al., 2007, 2003). In the Albanian and Macedonian contexts, wolves stand out by having lower support for conservation and higher conflict perception than bears and lynx. The more negative status that wolves have in people's perceptions is probably a reflection of the wolves' greater involvement in conflicts with people, mainly by depredating on livestock (Keçi et al., 2008). Lescureux and Linnell (2010) argue that people's attitudes towards carnivore species are based on their ecological characteristics, the reciprocal interactions between the two, and the infringement that carnivores cause to what is considered 'human space'. As such, wolves are considered as a large 'homogenous' population that is often hard to



**Fig. 4.** Effect of owning livestock on CP (a.) and effect of having experienced damage from large carnivores on SC (b.) and CP (c.). Owners of livestock have higher CP for lynx and wolf and lower CP for bear than people who do not own livestock. People who have experienced damage from LCs have lower SC and higher CP than people who have not experienced damage.

control on a local level (Lescureux and Linnell, 2013), as opposed to bears that are often viewed as individuals, and where people feel that they can control the few that adopt undesired behaviours (Lescureux et al., 2011a). Lynx on the other hand are more ambiguous, and even though most studies reveal that they are generally favoured by the local population, they often receive a negative share of opinions due to their cryptic nature, which occasionally gives rise to inaccurate myths of behaviour that make them feared by the local population (Lescureux et al., 2011b).

Between-country differences between Albania and Macedonia validate a further point for the need of local considerations in the conservation and management of large carnivores. As mentioned, the Albanian rural population seems to be simultaneously more supportive of the conservation of large carnivores and perceiving them as more conflictual species than the Macedonian rural population. While at first glance such a situation might appear contradictory, it has explanatory grounds in considering existing differences in rural livelihoods between the two countries and subsequent interrelationships with large carnivores. In Albania, rural communities have largely preserved traditional lifestyles centred on family-based subsistence farming and livestock husbandry (Doempke S., 2010). Almost every village family owns some livestock (Keçi et al., 2008; Kume et al., 2004). Livestock are always looked after and guarded by at least one member of the family when grazing in forests and meadows. In Macedonia, the picture seems to be inverted as livestock ownership is concentrated in the hands of fewer individuals, who specialise in such an activity and make a profit from it by owning larger flocks of livestock (Keçi et al., 2008). The majority of the Macedonian rural population does not own or care for livestock and this could potentially explain the



**Fig. 5.** Effect of interest in hunting and interest in hiking on SC (a, c.) and effect of interest in hunting by country on CP (b.) and interest in hiking on CP (d.). Higher interest in hunting leads to higher SC, whereas it leads to lower CP in Albania and higher CP in Macedonia. Higher interest in hiking leads to higher SC and CP.

overall perception of large carnivores as less of a conflict species than in Albania. Similarly, these very differences in rural livelihoods between Albania and Macedonia can potentially justify the higher support for conservation in the former. The prevalent subsistence farming and stock-breeding observed in Albania ensures a more frequent and close relationship with large carnivores than in Macedonia. Several studies suggest that farmers and livestock owners in societies with more traditional rural livelihoods and subsistence economies tend to show greater tolerance towards large carnivores and have a more positive image of them, than their counterparts in countries with more developed economies and intensive production (Athreya et al., 2013; Boitani, 1995; Dorresteijn et al., 2014; Kellert et al., 1996). These country-specific differences were mirrored also in the number of interactions reported with the large carnivores in the wild. The Albanian rural population has a higher level of interactions with wolves and bears in the wild compared with the Macedonians (S2). The majority of respondents in Albania confirmed having seen bears and wolves in the wild at least once in their lifetime. Higher interactions with large carnivores in Albania are an indicator of rural livelihood differences between Albania and Macedonia and could explain the higher support for conservation shown in Albania.

Lynx, on the other hand, stand out from wolves and bears in that they were rarely seen or interacted with in the wild in both countries. The fewer interactions with lynx in general seem to be consistent with the fact that they are much rarer than wolves and bears in the region (Breitenmoser-Würsten and Breitenmoser, 2001; Kaczensky et al., 2013; Melovski et al., 2015) and their behaviour make them much less visible to humans (Breitenmoser and Breitenmoser-Würsten, 2008). Our survey indicated that lynx were largely unknown animals among the rural public in Albania. About two thirds of respondents in Albania did not even know of the existence of such a species at the time of the survey. On the other hand, lynx was widely

known among the rural Macedonian public. This clear difference in knowledge between the two countries is potentially attributable to the prominent symbolic status that lynx hold in Macedonia and their representation in daily life and culture (e.g. the image of a lynx is portrayed on the 5 Denar coin, the currency of Macedonia).

#### 4.2. Factors influencing attitudes towards large carnivores

In regard to effects of different factors on attitudes, this study largely confirmed what other human dimension research in Europe has generally revealed (Bath et al., 2008; Bjerke et al., 2002; Bjerke and Kaltenborn, 1999; Ericsson and Heberlein, 2003; Kaczensky et al., 2004; Kleiven et al., 2004; Majić et al., 2011; Majić and Bath, 2010; Roskaft et al., 2003). Gender, education, knowledge, and damages to livestock were all strong predictors of attitudes towards all three species. A multitude of human dimension studies across Europe have shown that older generations tend to have more negative views towards large predators and are usually less supportive of their conservation than younger people (Andersone and Ozolinš, 2002; Bath et al., 2008; Bjerke et al., 2002; Ericsson and Heberlein, 2003; Kaczensky et al., 2004; Kleiven et al., 2004; Majić et al., 2011; Majić and Bath, 2010; Roskaft et al., 2007; Wechselberger et al., 2005). However, this did not seem to be the case for Albania and Macedonia. A potential explanation could lie in the familial and societal structure of rural mountainous villages of Albania and Macedonia, characterised by a strong age-based patriarchal system of governance where the elderly men within families and villages have a leadership role and exert great influence on the younger members of the community (Danaj, 2014; Kaser, 1996). Moreover, the persistence of traditional customary laws and practices, particularly in highland Albania (de Waal, 2005), ensures the continuity of such systems over time and limits generational changes in attitudes.

Interest in hunting seemed to have an effect on the support for conservation of large carnivores and was a much stronger predictor of attitudes than whether a person actually hunted or not. This result might have important implications for using hunting as a management approach in the conservation of large carnivores – and in particular about wolves, due to their lower public support when compared to bears and lynx. Nonetheless, any eventual lethal control management options for wolves need to be exerted cautiously and sustainably, in order to ensure the long-term survival of the population. Various authors have suggested that carefully regulated hunting, conducted and managed by local hunters, is among the most accepted methods for the management of carnivores and can contribute to the reduction of conflicts with locals, increase public acceptance of large predators and even potentially generate income for the local people (Bruskotter et al., 2007; Ericsson et al., 2004; Kaltenborn and Brainerd, 2016; Majić et al., 2011; Treves, 2009). However, careful country-specific considerations should be made when advocating and using hunting as a conflict-mitigation tool, as the effect of hunting interest was opposite in the two countries. While in Albania an increase of interest in hunting was associated with lower conflict perception of large carnivores, in Macedonia this increase seems to lead to higher conflict perception. Such opposite effects may have explanatory grounds concerning differences in hunting traditions between the two countries. In Macedonia there is a longer tradition of recreational hunting, which was particularly well organised during the Yugoslav regime and was conducted in designated and managed hunting grounds (Petkovski et al., 2003). The hunters' community in Macedonia has been organised in associations and clubs for decades. By contrast, in Albania, recreational hunting is a relatively new activity, being fully opened to the broader public only after the collapse of the communist regime in the 1990s and lacking proper forms and norms of control and management. Prior to 1990 recreational hunting was restricted to elite members of the totalitarian government and other trusted members of the community. The longer tradition of recreational hunting in Macedonia and existence of hunting grounds managed by hunting associations, indicate a higher sense of responsibility and ownership towards prey species among hunters and thus large carnivores could be viewed as competitors and a threat to their activity. In Albania, such forms of organisations in hunting are still nascent and not yet consolidated, thus prey species have not yet been 'commodified' as in Macedonia. Hunting interest in Albania seems to be more of an indicator for nature and wildlife appreciation in general, rather than a representation of hunting interests *per se* and perceptions of game ownership among hunters.

Our models indicated that increased interest in hiking in Albania and Macedonia is associated with higher support for conservation. This seems consistent with public attitude findings in other parts of the continent, where studies have shown that people who engage more in outdoor activities tend to have more positive attitudes towards large carnivores than people who do not (Bath, 2000; Roskaft et al., 2003; Wechselberger et al., 2005). At the same time, interest in hiking was associated with higher conflict perception of large carnivores. Among rural inhabitants walking in the forests is a necessary, utilitarian, activity for collecting plants, forest fruits or mushrooms. Given that the presence of large carnivores could be viewed as a physical threat may explain higher conflict perceptions among people with higher interest in hiking.

#### 4.3. Conclusion

The results of this study are interesting in two ways. Firstly, they have clear consequences for the future management of large carnivores in Albania and Macedonia. Because of the lower support shown towards wolves, conservation initiatives that place the bear and lynx into the same category as the wolf would not be advised for the region. Giving wolves a full protection without any management options could lead to an escalation of conflict, much like experiences in nearby Croatia has shown (Bath and Majić, 2001). Conflict escalation with wolves, could spill-over to lynx and bears and be detrimental to the more positive image of the latter. Addressing conflicts with these three species also requires a species-specific approach given the differences in conflict perceptions they evoke among the rural public. Secondly, this is one of very few human-dimension



studies conducted in south-eastern Europe. Based on this experience it is possible to conclude that the method worked well in the Albanian and Macedonian social context (although access to women was difficult and posed sampling limitations) and produced meaningful results. The general factors explaining attitudes towards large carnivores were broadly similar to studies conducted elsewhere in western, central and northern Europe, indicating the broad generality of these patterns.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gecco.2019.e00677>.

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## 2.5 OKREVANJE POPULACIJ VELIKIH ZVERI V SODOBNI KRAJINI EVROPE, V KATERI PREVLAĐUJE ČLOVEK

### **Recovery of large carnivores in Europe's modern human-dominated landscapes.**

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Izvleček: Varstvo velikih zveri predstavlja resen izziv pri varstvu biodiverzitete. S pomočjo podatkov o preteklem in sedanjem stanju populacij rjavega medveda (*Ursus arctos*), evrazijskega risa (*Lynx lynx*), volka (*Canis lupus*) in rosomaha (*Gulo gulo*) v državah Evrope smo pokazali, da približno tretjino celinske Evrope poseljuje najmanj ena vrsta velikih zveri, pri podatkih iz 21. stoletja v večini primerov s stabilno ali naraščajočo številčnostjo. Razlogi za ta splošen naravovarstven uspeh so v varstveni zakonodaji, naklonjenem javnem mnenju in številnih pristopih, ki omogočajo sobivanje med velikimi zvermi in ljudmi. Primer Evrope ponazarja, da velike zveri in ljudje lahko sobivajo v isti krajini.

U.S. National Climate Data Center (<http://www.ncdc.noaa.gov/paleo/study/17455>) and Pangaea (<http://doi.pangaea.de/10.1594/PANGAEA.839454>) and can be accessed in tables S3 and S4. Financial support was provided by the Corner Science and Education Foundation (CTH/RFA), the W.O. Crosby Fellowship (C.T.H.), Swiss National Science Foundation grants

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SUPPLEMENTARY MATERIALS

[www.sciencemag.org/content/346/6216/1514/suppl/DC1](http://www.sciencemag.org/content/346/6216/1514/suppl/DC1)  
Materials and Methods

Figs. S1 and S2  
Tables S1 to S4  
References (35–51)

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CONSERVATION

# Recovery of large carnivores in Europe's modern human-dominated landscapes

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The conservation of large carnivores is a formidable challenge for biodiversity conservation. Using a data set on the past and current status of brown bears (*Ursus arctos*), Eurasian lynx (*Lynx lynx*), gray wolves (*Canis lupus*), and wolverines (*Gulo gulo*) in European countries, we show that roughly one-third of mainland Europe hosts at least one large carnivore species, with stable or increasing abundance in most cases in 21st-century records. The reasons for this overall conservation success include protective legislation, supportive public opinion, and a variety of practices making coexistence between large carnivores and people possible. The European situation reveals that large carnivores and people can share the same landscape.

Large carnivores are among the most controversial and challenging group of species to conserve in our modern and crowded world. There is a deeply rooted hostility to these species in human history and culture, because of perceptions of their negative impacts on human livelihoods (1). Large carnivore abundance and distribution have historically been reduced (2), and their present conservation has become intertwined with broader emotional, political, and socioeconomic issues that further complicate this challenge (3). In addition, large carnivores live at low densities and have large spatial requirements (4). Accordingly, the conservation of viable large carnivore populations needs to be planned and coordinated on very wide scales, often spanning many intra- and international borders [i.e., requiring transboundary management (5)].

The main debate around large carnivore conservation is whether there is enough suitable space

left for viable and ecologically functional populations (6). As the two main drivers of the current biodiversity crisis—human overpopulation and overconsumption—show no sign of reducing, an intuitive forecast could be that large carnivores will persist only in highly managed protected areas (with regular translocations being made to achieve artificial connectivity) or in some remote and uninhabited wilderness areas. This approach derives conceptually from the North American wilderness model that separates people and nature and that has further been adopted in many Asian, African, and neotropical countries (6) (“keeping people and predators apart,” the separation model). The ultimate expression of this approach lies in the southern African propensity to fence protected areas (6). The alternative model, “allowing people and predators together” (coexistence model), following a landscape-scale conservation approach, has rarely been given proper consideration, probably because

it has been deemed a priori to fail because of the existing conflicts between large carnivores and humans. This dichotomy of large carnivore conservation models is analogous to the land-sharing versus land-sparing debate, which is ongoing in a wider biodiversity conservation context (7).

We compiled data about the status (i.e., current and past occurrence and abundance) of large carnivores [brown bears (*Ursus arctos*), Eurasian lynx (*Lynx lynx*), gray wolves (*Canis lupus*), and wolverines (*Gulo gulo*)] in Europe (8). We show that the European continent (considering all continental European countries excluding Belarus, Ukraine, and Russia) is succeeding in maintaining, and to some extent restoring, viable large carnivore populations on a continental scale (Fig. 1 and fig. S1). All mainland European countries except for Belgium, Denmark, the Netherlands, and Luxembourg have a permanent and reproducing occurrence of at least one species of large carnivore (Fig. 1). The total area with a permanent presence of at least one large carnivore species in Europe covers 1,529,800 km<sup>2</sup> (roughly one-third of mainland Europe), and the area of occasional presence is expanding, as the presence of solitary dispersing wolves has been confirmed in both Denmark and Belgium in recent times.

Brown bears presently occur permanently in 22 countries (485,400 km<sup>2</sup>) and can be clustered into 10 populations, most of which are native populations (tables S1 to S3). Eurasian lynx presently occur permanently in 23 countries (813,400 km<sup>2</sup>) and can be clustered into 11 populations, five of them being native populations (tables S5 to S7). Wolves currently occur permanently in 28 countries (798,300 km<sup>2</sup>) and can be clustered into 10 populations, which are all native (tables S9 to S11). Wolverines, however, are only found in the three Fennoscandian countries, and they permanently occur over a total of 247,900 km<sup>2</sup> in two populations (tables S13 to S15). Because of the limited biogeographic distribution of wolverines, Fennoscandia is the only region containing all four large carnivore species in Europe (171,500 km<sup>2</sup>), and could be considered as a large-carnivore hot spot together with southeastern Europe (Dinaric, Carpathian, and Balkan regions) and the Baltics (fig. S2). Three large carnivore species overlap over 593,800 km<sup>2</sup> in Europe (fig. S2).

Overall, Europe hosts several large and stable populations on the order of thousands of individuals, many medium-sized and increasing populations that number in the hundreds of individuals, and a few small and declining populations with a few tens of individuals. Interestingly, none of the medium or large populations are declining. Brown bears are the most abundant large carnivore in Europe, with an estimated total number around 17,000 individuals, and all population ranges have

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been relatively stable or slightly expanding (table S2). Wolves are the second most abundant species, with an estimated total number larger than 12,000 individuals (table S10). Most populations have been increasing or stable during recent years, although the Sierra Morena population (Spain) is on the brink of extinction, with only one pack detected in 2010 (9). In recent years, the larger Iberian population has an uncertain trend, although it seems stable, and the Karelian population has declined (9). The estimated total number of Eurasian lynx is around 9000 individuals (table S6), and most populations have generally been stable in the past decade, although most of the reintroduced populations appear to have stagnated at relatively small sizes, and the Vosges-Palatinian and Balkan lynx populations have declined (9). Finally, the estimated total number of wolverines is 1250 individuals, and both populations are increasing (table S14). Details on large carnivore monitoring methods are given in tables S4, S8, S12, and S16 and (9).

All four large carnivore species are persisting in human-dominated landscapes (fig. S3) and largely outside protected areas. The mean  $\pm$  SD human density in areas of permanent large carnivore presence is  $19.0 \pm 69.9$  inhabitants/km<sup>2</sup> (range: 0 to 1651) for brown bears;  $21.8 \pm 73.8$  inhabitants/km<sup>2</sup> (range: 0 to 2603) for lynx;  $36.7 \pm 95.5$  inhabitants/km<sup>2</sup> (range: 0 to 3050) for wolves; and  $1.4 \pm 5.7$  inhabitants/km<sup>2</sup> (range: 0 to 115) for wolverines (fig. S3). These figures suggest species-specific sensitivities of large carnivores to humans, with wolves being most successful in adapting to human-dominated landscapes (fig. S3). Wolverines are somewhat special, because their distribution is constrained by climatic conditions, which restricts them to northern and high-altitude areas, which have low human population densities (10).

These figures permit cautious optimism for the occurrence, abundance, and trends for large carni-

vores in Europe. The general picture emerging from the current status of large carnivores in Europe is that these species have shown the capacity to survive in human-dominated landscapes, representing an often underappreciated conservation success story. Having high numbers of large carnivores in such landscapes is not exclusive to Europe [the United States has abundant populations of black bears (*Ursus americanus*) and mountain lions (*Puma concolor*)]; however, the largest species, brown bears and wolves, occur in Europe with much higher human densities. For example, Europe hosts twice as many wolves (>11,000) as the contiguous United States [ $\sim$ 5500 wolves (11)], despite being half the size (4.3 million km<sup>2</sup> versus 8 million km<sup>2</sup>) and more than twice as densely populated (97 inhabitants/km<sup>2</sup> versus 40 inhabitants/km<sup>2</sup>).

We believe that the alternative view to the coexistence model (i.e., the separation model), which argues that the largest predators can only survive in protected areas or wilderness, is a consequence of former policy goals to exterminate these species (12). However, our results underline that if the separation model had been applied in Europe, there would hardly be any large carnivore populations at all, because most European protected areas are too small to host even a few large carnivore reproductive units (13).

Whereas large carnivores do not permanently occur in the areas of highest human density in Europe, they have shown an ability to recolonize areas with moderate human densities if they are allowed, and to persist in highly human-dominated landscapes and in the proximity of urban areas (14, 15) in highly fragmented landscapes consisting of forest-farmland mosaics or even agroecosystems. Our results are not the first to reveal that large carnivores can coexist with people (16–18), but they show that the land-sharing model for large carnivores (coexistence model) can be successful on a continental scale.

The reasons for the success of large carnivores in Europe range from coordinated legislation shared by many European countries (19, 20) to context-specific management practices and institutional arrangements. Since the end of World War II, Europe has benefited from stable political institutions ensuring proper law enforcement. The post-communist transition in Eastern European countries was not generally associated with institutional collapse, with the exception of some Balkan countries. This stability created the conditions for securing land tenure and associated rights for activities such as forestry and hunting, which are preconditions for the development of sustainable practices. The rise of environmental movements in the 1970s provided the motivation for various pan-European legislative agreements to emerge that served to promote biodiversity conservation. For example, the Bern Convention, administered by the Council of Europe, covers all countries included in this report, and the Habitats Directive covers all 20 European Union member states with a permanent occurrence of large carnivores. Consequently, the four large carnivore species examined here enjoy some degree of legal protection in all European countries. Large carnivores have also benefited from the socioeconomic changes over the past four decades that led to an improvement in habitat quality. For example, Europe again hosts large populations of wild ungulates (21), which can sustain large carnivore populations. The impact of human land-use activities has also been declining in many areas because of a widespread exodus from rural areas and the associated abandonment of agricultural land (22). These broad patterns are further accompanied by a variety of local, cultural, or regulatory practices making coexistence between large carnivores and people possible (15, 23). One important prerequisite has been to maintain and revive traditional livestock protection measures

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(livestock-guarding dogs, night corrals, and shepherds), as well as to invest in new techniques (electric fences) as an important nonlethal tool to minimize large carnivore depredation on livestock (24).

The most severe challenges for large carnivore conservation are in countries where large carnivores have previously been extirpated, where the adaptations for coexistence have been lost, or where husbandry practices have evolved toward new production schemes. In such contexts, the return of large carnivores can trigger social conflicts. For example, poaching enjoys social acceptance in rural areas of Norway (25), limits the recovery of wolves in Scandinavia (26), and eradicated a reintroduced bear population in Austria (27). In these areas, the practical challenges and economic impacts of carnivore conservation have escalated into social conflicts, where the carnivores have become symbols of wider political divisions between rural and urban populations and between individuals and groups with fundamentally different value orientations and interests.

At present, there is a conjuncture between many policy areas combined with a generally supportive public opinion, so that the positive forces have been prevailing. However, the underlying negative forces are still present and could reemerge as a result of ecological, social, political, or economic changes. There is a need to monitor both the ecological situation and sociopolitical climate to ensure that the current trends are maintained.

The European experience offers hope for wildlife conservation in human-dominated landscapes and is relevant to other areas of the world. Although developing countries may lack many of the institutions and capacities that have enabled large carnivore recovery in Europe, there are other examples of large carnivores persisting and recovering in human-dominated landscapes and even in cities (17, 28, 29). Clearly, the presence of large carnivores in human-dominated ecosystems is associated with modified ecological conditions that deviate from conditions in areas with little human activity. However, the fact that such species

can persist in these novel ecosystems encourages optimism for the conservation of larger and more connected large carnivore populations.

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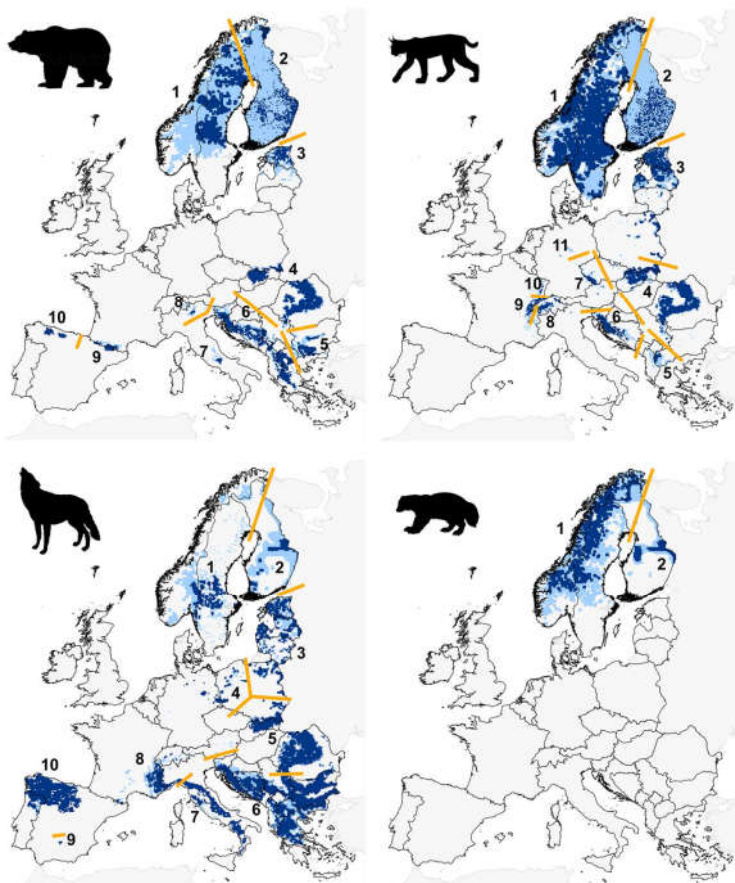
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SUPPLEMENTARY MATERIALS

[www.sciencemag.org/content/346/6216/1517/suppl/DC1](http://www.sciencemag.org/content/346/6216/1517/suppl/DC1)  
Materials and Methods  
Figs. S1 to S3  
Tables S1 to S16  
References (30–258)

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**Fig. 1. Distribution of large carnivores in Europe in 2011.** Brown bears (top left), Eurasian lynx (top right), gray wolves (bottom left), and wolverines (bottom right). Dark blue cells indicate areas of permanent occurrence, and light blue cells indicate areas of sporadic occurrence. Numbers refers to population identifications in tables S1 to S16. Orange lines indicate boundaries between populations.

### 3 RAZPRAVA IN SKLEPI

#### 3.1 RAZPRAVA

Iskanje rešitev za sobivanje med ljudmi in velikimi zvermi v antropogeno spremenjeni, multifunkcionalni krajini je resen globalni izziv (Carter in Linnell, 2016; Di Minin in sod., 2016), saj pravzaprav zahtevamo od ljudi, da si delijo prostor z živalmi, ki lahko neposredno ogrožajo njihove vire za preživetje, obenem pa utegnejo biti neposredno nevarne tudi njim.

Varstva velikih zveri in sobivanja z njimi se lahko z upravljaljskega vidika lotimo z dvema temeljnima pristopoma, ki pa se med seboj precej razlikujeta. Pri prvem, tradicionalnem, upravljavci »od zgoraj navzdol« predpišejo ukrepe, ki naj bi se jih ostali držali. Pri drugem, kolaborativnem pristopu, se rešitve za varstvo in sobivanje iščejo v sodelovanju z drugimi legitimnimi interesi v prostoru. Tega se s soavtorji lotevamo v prvem članku disertacije (Redpath in sod., 2017).

»Prisilna« politika pristopa od zgoraj navzdol lahko povzroči razkroj legitimnosti in proženje odpora, kar lahko pripelje tudi do nezakonitega ubijanja velikih zveri, te probleme in negativne posledice ukrepov pa lahko zaznamo s spremljanjem stališč javnosti. Po drugi strani pa kolaborativni pristop zahteva temeljito razumevanje stališč javnosti do velikih zveri, pa tudi odnosov med prepričanji, stališči, nameni obnašanja in dejanskim vedenjem, kar je bil predmet večine mojih raziskav. Takšne raziskave omogočajo lažje in ustrežnejše vključevanje javnosti v odločanje, kot to zahtevajo številni predpisi (npr. Bernska konvencija, 1979; Aarhuška konvencija, 2005). Ker je upravljanje z velikimi zvermi pogosto bolj sociološke kot biološke narave (Bath, 1996), omogočajo rezultati takšnih raziskav tudi boljše in učinkovitejše odločitve v upravljanju in varstvu teh vrst. Raziskave longitudinalnega spreminjanja stališč do volka in medveda v času predstavljam v naslednjih dveh člankih, vključenih v disertacijo (Majić in Bath, 2010; Majić in sod., 2011). Na raziskovanju stališč se nanaša tudi četrti članek (Trajce in sod., 2019), v katerem s soavtorji ugotavljamo, da se lahko odnosi do različnih vrst velikih zveri zelo razlikujejo, kar kaže, da bi morali ustrezno prilagajati tudi upravljanje.

V Evropi so se oblikovale nove smernice za varstvo velikih zveri po katerih se težišče varstva in upravljanja z nacionalne ravni preusmerja na raven populacije (Linnell in sod., 2008), kar smo začeli upoštevati pri raziskavah in na primer v raziskavo, opisano v četrtem članku, vključili čezmejno območje Severne Makedonije in Albanije, kar pokriva večji del razširjenosti balkanskega risa in ne zgolj območje znotraj posamezne države. Čezmejni pristopi pomenijo pomemben preskok, saj velika večina evropskih držav zaradi omejene velikosti in številnih območij ohranjene narave ob državnih mejah ne more imeti populacij velikih zveri v varstveno ugodnem stanju. V praksi to pomeni, da je za učinkovito varstvo populacij velikih zveri nujno potrebno tesno sodelovanje med dvema ali več sosednjimi



državami. In varstvo velikih zveri nam v Evropi, kot je razvidno iz zadnjega izmed člankov v disertaciji (Chapron in sod. 2014), uspeva.

### **3.1.1 Kolaborativni pristopi k varstvu velikih zveri in kontrast s pristopi od zgoraj navzdol**

V prvem članku, predstavljenem v disertaciji (Redpath in sod., 2017), s soavtorji kolaborativne pristope sodelovanja z interesnimi skupinami primerjamo s klasičnim pristopom »od zgoraj navzdol«, ko ukrepe diktira upravljalec. V Evropi in ZDA je izvajanje varstvene zakonodaje, ki je bila postavljena po tem principu, ključno prispevalo k izboljšanju varstvenega stanja velikih zveri. Če so populacijske gostote velikih zveri zelo nizke, je njihov vpliv na ljudi razmeroma majhen, odnos bolj pozitiven in je lahko tudi stroga zaščita popolnoma sprejemljiva. Do težave pride, ko začnejo populacije naraščati in imeti vse večji vpliv na vedno več ljudi in s soavtorji menimo, da se je potrebno v takšnih primerih problema lotiti drugače. Prisilne pristope od zgoraj navzdol lahko lokalno prebivalstvo slabo sprejme in se lahko ukrepom upre, kar lahko vodi do povečanja ilegalnega ubijanja velikih zveri in še poglobljenih konfliktov (Brockington in Igoe, 2006). Kot alternativo predlagamo uporabo bolj kolaborativnih in fleksibilnih pristopov, ki pomagajo graditi zaupanje in vzpostaviti trajnostno sobivanje z velikimi zvermi. Ti pristopi so tudi inherentno bolj demokratični in nenazadnje zahtevani v nacionalnih zakonodajah in mednarodnih konvencijah.

Opisana problematika je zelo aktualno in se z njo v Evropski skupnosti intenzivno soočamo. Z rastjo populacij velikih zveri (zadnji članek disertacije, Chapron s sod. 2014) naraščajo tudi konflikti. Interesne skupine, ki nasprotujejo velikim zverem, postajajo vse glasnejše, vse močnejši pa je tudi konflikt med njimi in interesnimi skupinami, ki varstvo velikih zveri zagovarjajo (Hovardas in sod., 2021). Dejansko varstvo in upravljanje se mora prilagajati kontekstu in lokalnim razmeram, pri tem pa potrebuje podporo znanosti. Ob tem pa je vedno več dokazov, da klasični pristop, v katerem naravoslovne znanosti pridobijo empirične dokaze, s pomočjo katerih se vodijo politike in upravljavske strategije (Sarewitz, 2004; Burgess in sod., 2016), ni dovolj. Kot učinkovitejši pristop se zdi bolj vključujoče, transdisciplinarno pridobivanje znanja z neposrednim sodelovanjem vseh ustreznih deležnikov (Bennett in sod., 2017).

### **3.1.2 Spremembe v stališčih javnosti do velikih zveri skozi čas**

Javno mnenje se tradicionalno vključuje v odločitve skozi razprave, okrogle mize in delavnice, vendar obstajajo dokazi, da ti pristopi stališč javnosti ne vključujejo reprezentativno (Johnston in sod., 1993). Običajno se slišijo, in posledično upoštevajo, zgolj interesi najglasnejših, saj tako imenovana »tiha večina« praviloma pri takšnih oblikah izmenjave mnenj ni prisotna (Bath, 1996). Čeprav velike zveri in upravljanje z njimi pogosto sprožajo razvoj ekstremnih stališč tako v pozitivnem kot v negativnem smislu (Kellert, 1985;

Bath, 1996; Scarce, 1998), nam novejšje raziskave kažejo tudi na visok delež nevtralnih stališč javnosti do te problematike (Bath in Majić, 2001; Williams in sod., 2002; Ericsson in Heberlein, 2003). To pomeni, da ima tudi glede upravljanja z velikimi zvermi javnost svojo »tiho večino«, katere stališča moramo aktivno iskati. Med raziskovalci je sicer konsenz, da so stališča ljudi, ki živijo na območju velikih zveri, za upravljanje s temi vrstami najpomembnejša (Ericsson in Heberlein 2003; Naughton-Treves in sod., 2003), vseeno pa ostaja varovanje populacij velikih zveri kot naravne dediščine tudi nacionalno vprašanje. Zato v raziskovane vzorce pogosto vključujemo tudi prebivalce urbanih središč oziroma drugih območij, kjer velikih zveri ni, njihova stališča pa je potrebno vseeno razumeti in primerno upoštevati.

Običajno se raziskave stališč javnosti do zveri izvajajo ob posameznih izjemnih dogodkih (Bath, 1998) in so običajno rezultat krize ali načrtovanja kontroverznih varstvenih ukrepov kot je npr. ponovna naselitev vrste in kot takšne ne morejo dokumentirati sprememb skozi čas (Williams in sod., 2002). Obenem pa številni znanstveniki opozarjajo prav na potrebo po takšnih longitudinalnih študijah (Enck in Bath 2001; Kaczensky in sod., 2001), saj se okoliščine upravljanja nenehno spreminjajo in zahtevajo fleksibilnejše upravljalvske pristope.

V drugem in tretjem članku disertacije (Majić in Bath, 2010 (str. 17); Majić in sod., 2011 (str. 25)) smo s soavtorji raziskali stališča javnosti do volka in medveda na Hrvaškem, z longitudinalno študijo pa smo pokazali tudi kako so se ta stališča v času spreminjala. Pri volku smo v letih 1999 in 2003 dokumentirali premik stališč iz ekstremnih (pozitivnih in negativnih) proti bolj nevtralnim, kar izboljšuje možnosti za kompromise. Negativna stališča, ki so se razvila zlasti pri starejših kohortah ob »od zgoraj navzdol« popolni zaščiti volka proti koncu devetdesetih let prejšnjega stoletja (Bath in Majić, 2001) so se do druge raziskave nekoliko umirila. Na premik stališč proti bolj nevtralnim pa je verjetno vplivala tudi kampanja ozaveščanja in reševanja konfliktov, zlasti preko podpore izboljšanju zaščite domačih živali, ki se je izvajala v času med obema raziskavama stališč (Štrbenac in sod., 2005).

Pri medvedu smo razmeroma veliko anketno raziskavo prav tako izvedli dvakrat, v letih 2002 in 2008 in dokumentirali stališča javnosti in nekaterih najpomembnejših interesnih skupin. Opazili smo, da se orientacije vrednot in splošno razumevanje medveda kot grožnje niso spremenile, se pa je zmanjšala kapaciteta za sprejemanje (še več) medvedov. V času med raziskavama je populacija medvedov na Hrvaškem znatno narastla, ob tem pa je Hrvaška sprejela tudi strategijo za upravljanje z medvedom. Rast populacije in bolj centralizirano in dorečeno upravljanje sta najverjetneje pripeljala do upada kapacitete za sprejemanje medveda, vendar so stališča kljub temu ostala pretežno medvedu naklonjena.

Rezultati obeh raziskav, zlasti pa raziskave stališč do volka, so nas opozorili na nekatere negativne posledice upravljanja od zgoraj navzdol, pa tudi na pozitivne učinke sodelovanja z ljudmi in reševanja problemov, saj se je oboje odrazilo na stališčih. Te izkušnje sem prenesla tudi v širši kontekst v prvem članku disertacije (Redpath in sod. 2017). Prav tako so nas rezultati opozorili na občutljivost stališč na dogodke v družbi in posledično na nujnost longitudinalnih javnomnenjskih raziskav. Prav longitudinalnost raziskav je izjemnega pomena, saj se pri upravljanju s populacijami prosto živečih živali vse pogosteje ugotavlja potreba po rednem spremljanju stališč in drugih družbenih kazalnikov (Treves in sod., 2013). Le tako lahko stališča korektno upoštevamo pri upravljaljskih odločitvah in gradimo upravljanje, ki omogoča in podpira sobivanje ljudi in velikih zveri.

### **3.1.3 V očeh javnosti niso vse velike zveri enake**

Četrty članek disertacije predstavlja zanimiv primer raziskovanja stališč javnosti in ključnih interesnih skupin do vseh treh velikih zveri v Albaniji in Severni Makedoniji. Obe državi si populacije delita, tako da smo raziskavo, eno prvih v jugovzhodni Evropi, izvedli na obeh straneh meje.

Ob nekaterih razlikah med državama in razlikah med skupinami glede na demografske karakteristike (ki so se izkazale za podobne kot v raziskavah, izvedenih v Zahodni in Srednji Evropi), je bila zanimiva ugotovitev, da je v obeh državah podpora varstvu volka znatno nižja kot podpora varstvu medveda in risa. To kaže, da je potrebno vrste pri varstvu in upravljanju obravnavati ločeno, saj bi lahko skupni ukrepi za vse tri vrste povzročili, da bi se negativen odnos do volka »prelik« tudi na drugi dve vrsti, kar bi lahko zlasti v primeru izjemno občutljive populacije ogrožene podvrste balkanskega risa, ki živi še samo na tistem območju, prineslo resne varstvene probleme.

### **3.1.4 Evropsko varstvo velikih zveri kot zgodba o uspehu ter kontrast med rezervatnim varstvom in sobivanjem**

V zadnjem, petem članku, ki sem ga vključila v disertacijo, smo v širokem konzorciju evropskih strokovnjakov za velike zveri zbrali podatke o varstvenem stanju velikih zveri v Evropi in naredili sintezo. Rezultat je bil marsikomu presenetljiv, saj je prikazal izrazito optimistično sliko prostorske in številčne rasti velike večine populacij in rekolonizacijo območij, kjer so bile velike zveri v preteklosti iztrebljene.

Zlasti zanimiv vidik je primerjava modela sobivanja, ki ga uporabljamo v Evropi, z modelom ločevanja ljudi in velikih zveri z rezervatnim varstvom, ki je v uporabi v Severni Ameriki in ki se je v najbolj ekstremni obliki z ograjevanjem zavarovanih območij z ograjami usidral na jugu Afrike. Glede na majhnost in razdrobljenost zavarovanih območij bi uporaba tega modela v Evropi vodila v izumiranje velikih zveri.

Članek je izzval precej pozornosti v strokovni javnosti zlasti zato, ker je razbijal ustaljeno dogmo, da je sobivanje z velikimi zvermi zaradi konfliktnosti a-priori nemogoče in da je rezervatno varstvo edina rešitev. V članku smo s soavtorji pokazali, da je obstoj velikih zveri mogoč tudi v močno spremenjenih ekosistemih antropocena, če le to možnost dopustimo in vlagamo v sobivanje.

### **3.1.5 Vloga znanosti**

Vloga znanosti, ki je ne glede na temeljni pristop ključna in ki je nujno potrebna za upravljanje, pa ni vedno preprosta. Tradicionalno se uporablja linearni model, v katerem naravoslovne znanosti pridobijo empirične dokaze, s pomočjo katerih se vodijo politike in upravljalne strategije (Burgess in sod., 2016; Sarewitz, 2004). Ta pristop se je pokazal kot problematičen zaradi dveh temeljnih razlogov. Kot prvo lahko interesne skupine formirajo konflikte na osnovi emocij, vrednot in svetovnega nazora, ne pa na osnovi dokazov (Slovic, 1987) in lahko preprosto ignorirajo znanost (Weber in Stern, 2011). Kot drugo se znanost pogosto predstavlja kot objektivna resnica, kljub temu pa jo lahko raziskovalci uporabijo kot argument za legitimizacijo in branjenje normativnih pozicij (Lackey, 2004). Na ta način lahko pride do izgube zaupanja in kredibilnosti, znanstveniki pa postanejo samo še ena interesna skupina.

## 4 SKLEPI

Varstvo velikih zveri je evropska zgodba o uspehu. V antropocenu, ko je postala hitra izguba biodiverzitete stalnica in ko že začenjamo preko podnebnih sprememb boleče in neposredno čutiti človekov vpliv na planet, so takšne zgodbe na žalost redke, jih pa je prav zato vredno razumeti in se iz njih učiti.

Okrevanje populacij velikih zveri je posledica sprememb odnosa do narave in družbenih sprememb, pa tudi spremenjene človekove rabe okolja. Vendar pa je Evropa 21. stoletja, kljub demokratičnim vrednotam in na splošno pozitivnemu odnosu do narave, dom 750 milijonom ljudi – neokrnjene narave je malo, zveri pa brez sobivanja z ljudmi v tej Evropi ne bi mogle preživeti. Sobivanje je ključ in bi moralo biti cilj, a doseganje tega cilja ostaja vse prej kot preprosto.

Rast populacij velikih zveri in njihovo prostorsko širjenje tudi ni enoznačno – ta zgodba o uspehu se zdi marsikateremu lokalnemu prebivalcu, ki mora svoje vedenje in delo prilagajati novi realnosti prisotnosti velikih zveri, vse prej kot »zgodba o uspehu«, glasovi proti velikim zverem pa postajajo vse glasnejši. Trenutno okrevanje populacij teh vrst je v veliki meri rezultat pristopa od zgoraj navzdol, tako preko nacionalnih zakonodaj kot preko zakonodajnih instrumentov Evropske skupnosti. Nagla rast populacij in širitev velikih zveri, z vsemi problemi in konflikti ki jo spremljajo, pa daje misliti, da tak pristop v prihodnosti ne bo vzdržen in da bo trajnost sobivanja med ljudmi in velikimi zvermi treba zagotoviti drugače. Pri tem se moramo zavedati, da se velike zveri v očeh javnosti razlikujejo in da moramo biti previdni, da jih ne obravnavamo »paketno«, ampak da ukrepe prilagodimo vsaki vrsti posebej.

Najbolj obetaven, pa tudi najbolj demokratičen pristop je vzpostavljanje varstva in upravljanja v sodelovanju z interesi v nekem prostoru. So pa takšni kolaborativni pristopi zahtevni – po eni strani potrebujejo ogromno znanja, po drugi strani pa precejšen angažma s strani upravljalcev. Ne enega ne drugega ni vedno preprosto zagotoviti. Vloga socioloških študij, zlasti javnomnenjskih raziskav, je pri kolaborativnem pristopu ključna, saj je le na ta način mogoče vzpostaviti dovolj prožno upravljanje, ki bo omogočilo varstvo zveri ob upoštevanju interesov ljudi, ki morajo z njimi živeti. Enkratni posnetki stanja, ki se običajno izvajajo, pa pri tem niso dovolj – potrebne so longitudinalne študije, ki bodo zabeležile ne samo stališča, ampak tudi njihove spremembe skozi čas in jih povezale s kritičnimi dogodki v družbi. Tako dobijo upravljalci povratno informacijo o učinkih ukrepov in dogodkov v preteklosti, pa tudi smernice za ukrepanje v prihodnje.

Vloga znanosti, tako naravoslovnih kot družboslovnih, je v takšnih procesih ključna, moramo pa biti pri tem znanstveniki izjemno previdni. Znanstveniki kot ljudje imamo, enako kot drugi, svoje osebne vrednote in zagovarjamo svoja stališča. Meja med objektivno

znanostjo in nečim kar to ni, lahko postane ob interpretaciji raziskav pri tematikah, v katerih smo tudi osebno angažirani (kar je pri naravovarstvenih temah pogosto), zelo tanka in je potrebno veliko previdnosti, da je (tudi nezavedno) ne prestopimo. Družba od znanstvenikov potrebuje objektivno resnico, znanstveniki pa od družbe zaupanje, da so to objektivno resnico sposobni in pripravljeni posredovati – brez tega je delo znanstvenika brez smisla. Zato je potrebno jasno in odkrito komunicirati kaj so naša stališča, kaj pa objektivna resnica (vključno z našo negotovostjo pri njenem zaznavanju) in jasno poudariti razliko med enim in drugim. V nasprotnem primeru izgubimo verodostojnost in postanemo zgolj še ena interesna skupina, ki bolj prispeva k problemu kot k njegovemu reševanju.

## 5 POVZETEK

Varstvo velikih zveri zavzema v okviru naravovarstva posebno mesto zaradi svoje kompleksnosti in zahtevnosti. Zaradi velikih prostorskih potreb in nizkih populacijskih gostot potrebujejo velike zveri ogromna strnjena območja, kar je v sodobnem antropogeno spremenjenem svetu vse večji problem. Obstoj velikih zveri se po eni strani od nekdanj križa z interesi človeka, konflikti, ki jih povzročajo z neposrednim vplivom na premoženje in eksistenco ljudi, pa so razlog za sovražstvo do teh vrst, ki je globoko ukoreninjeno v človeški zgodovini in kulturi (Ripple in sod., 2014). Po drugi strani pa so te vrste izrazito karizmatične, pogosto prisotne v kulturni dediščini večine kultur na celotnem območju svoje zgodovinske razširjenosti, njihovo varstvo pa je močno vpeto v širše socioekonomske, čustvene in politične kontekste, kar naredi izzive njihovega varstva še bolj kompleksne (Chapron in López-Bao, 2014).

Intenzivno preganjanje, sistematično iztrebljanje, izginjanje habitata in izginjanje plena so povzročili izginjanje velikih zveri iz velikega dela območja, ki so ga zgodovinsko poseljevale, pa tudi populacije, ki so ostale, so bile v veliko primerih zelo majhne in razdrobljene (Breitenmoser, 1998). Izginjanje teh vrst se je v Evropi začelo ustavljati v drugi polovici 20. stoletja, ko so se s prebujajočo se naravovarstveno zavestjo začeli vzpostavljati tudi prvi mehanizmi zaščite (Salvatori in sod., 2007). Z urbanizacijo se je spremenila raba prostora, marsikje pa je prišlo do hitre rasti populacij plenskih vrst (Breitenmoser, 1998). Posledica je bilo vračanje velikih zveri na mnoga območja, iz katerih so v preteklosti izginile, proces ki traja še danes (Kaczensky in sod., 2013). Vračanje velikih zveri pa prinaša s sabo precejšnje družbene izzive, saj temeljni konflikti, ki so v preteklosti povzročili preganjanje, niso izginili.

Število interesnih skupin se povečuje, vrednote postajajo vedno bolj raznolike in zahteve javnosti po sodelovanju v odločanju naraščajo, kar dela varstvo teh vrst in upravljanje z njimi vedno bolj kompleksno (Brown in Decker, 2001). Tradicionalni pristopi reševanja problemov s poseganjem v populacijo s smrtnostjo ne zadostujejo več, upravljanje pa se je moralo usmeriti v reševanje konfliktov in podporo sobivanju.

V prvem članku, predstavljenem v disertaciji (Redpath in sod., 2017 str. 10), s soavtorji kolaborativne pristope sodelovanja z interesnimi skupinami primerjamo s klasičnim pristopom »od zgoraj navzdol«, ko ukrepe diktira upravljalec. Pristopi od zgoraj navzdol so lahko ključni, ko so populacije velikih zveri majhne, ko pa populacije začnejo naraščati, pa lahko povzročijo odpor in vodijo v še večje konflikte (Brockington in Igoe, 2006), kar je v Evropi zelo aktualna tematika. Kot alternativo predlagamo uporabo bolj kolaborativnih in fleksibilnih pristopov, ki pomagajo graditi zaupanje in vzpostaviti trajnostno sobivanje z velikimi zvermi. Ti pristopi so tudi inherentno bolj demokratični in nenazadnje zahtevani v nacionalnih zakonodajah in mednarodnih konvencijah.

Tradicionalno se raziskave stališč javnosti do zveri izvajajo ob posameznih izjemnih dogodkih (Bath, 1998) in so običajno rezultat krize ali načrtovanja kontroverznih varstvenih ukrepov kot je npr. ponovna naselitev vrste in kot takšne ne morejo dokumentirati sprememb skozi čas (Williams in sod., 2002). Obenem pa številni znanstveniki opozarjajo prav na potrebo po takšnih longitudinalnih študijah (Enck in Bath, 2001; Kaczensky in sod., 2001), saj se okoliščine upravljanja nenehno spreminjajo in zahtevajo fleksibilnejše upravljske pristope. V drugem in tretjem članku disertacije smo s soavtorji raziskali stališča javnosti do volka in medveda na Hrvaškem, z longitudinalno študijo pa smo pokazali tudi kako so se ta stališča v času spreminjala.

Pri volku (Majić in Bath, 2010) smo v letih 1999 in 2003 dokumentirali premik stališč iz ekstremnih (pozitivnih in negativnih) proti bolj nevtralnim. Negativna stališča, ki so se razvila zlasti pri starejših kohortah ob »od zgoraj navzdol« popolni zaščiti volka proti koncu devetdesetih let prejšnjega stoletja (Bath in Majić, 2001) so se do druge raziskave nekoliko umirila. Na premik stališč proti bolj nevtralnim pa je verjetno vplivala tudi kampanja ozaveščanja in reševanja konfliktov (Štrbenac in sod., 2005).

Pri medvedu (Majić in sod., 2011) smo raziskavo prav tako izvedli dvakrat, v letih 2002 in 2008 in dokumentirali stališča javnosti in nekaterih najpomembnejših interesnih skupin. Opazili smo, da se orientacije vrednot in splošno razumevanje medveda kot grožnje niso spremenile, se pa je zmanjšala kapaciteta za sprejemanje medveda. Rast populacije in bolj centralizirano in dorečeno upravljanje sta najverjetneje pripeljala do padca kapacitete za sprejemanje medveda, vendar je odnos kljub temu ostal pretežno medvedu naklonjen.

V četrtem članku (Trajce in sod., 2019) opisujemo raziskavo odnosa javnosti in ključnih interesnih skupin do vseh treh velikih zveri v Albaniji in Severni Makedoniji. Ob nekaterih razlikah med državama in razlikah med skupinami glede na demografske karakteristike je bila zanimiva ugotovitev, da je v obeh državah podpora varstvu volka znatno nižja kot podpora varstvu medveda in risa. To kaže, da je potrebno vrste pri varstvu in upravljanju obravnavati ločeno, saj bi lahko skupni ukrepi za vse tri vrste povzročili, da bi se negativen odnos do volka »prelil« tudi na drugi dve vrsti, kar bi lahko zlasti v primeru izjemno občutljive populacije ogrožene podvrste balkanskega risa, ki živi še samo na tistem območju, prineslo resne varstvene probleme.

V petem članku (Chapron in sod., 2014) smo v širokem konzorciju evropskih strokovnjakov za velike zveri zbrali podatke o varstvenem stanju velikih zveri v Evropi in naredili sintezo. Rezultat je bil marsikomu presenetljiv, saj je prikazal izrazito optimistično sliko prostorske in številčne rasti velike večine populacij in rekolonizacijo območij, kjer so bile velike zveri v preteklosti iztrebljene. Prav tako smo pokazali pomen sobivanja, saj bi glede na majhnost in razdrobljenost zavarovanih območij rezervatno varstvo v Evropi vodilo v izumiranje velikih zveri.



Zaradi konfliktnosti velikih zveri je potreba po vključevanju družbenih vidikov v upravljanje oziroma varstvo teh vrst še posebej izpostavljena (Bath, 1996; 1998; Linnell in sod., 2001; Breitenmoser, 1998). Odločevalci potrebujejo znanstvene raziskave in podatke, ki natančno opisujejo cel spekter mnenj javnosti, da bi poiskali najustreznejše poti in rešitve, ki bi omogočile doseganje upravljaljskih ciljev (Chase in sod., 2001). Pri tem pa moramo biti raziskovalci izjemno previdni, saj smo v naravovarstvenih tematikah pogosto osebno angažirani in imamo jasno opredeljene osebne vrednote in stališča. Pri podajanju rezultatov moramo odkrito komunicirati kaj so naša stališča, kaj pa objektivna resnica (vključno z našo negotovostjo pri njenem zaznavanju) in jasno poudariti razliko med enim in drugim. V nasprotnem primeru izgubimo verodostojnost in postanemo zgolj še ena interesna skupina, ki bolj prispeva k problemu kot k njegovemu reševanju.

## 6 SUMMARY

Conservation of large carnivores holds a special place in nature conservation because of its complexity and challenges. Because of large spatial demands and low population densities, large carnivores require large areas of continuous habitat, which is increasingly becoming a problem in the modern, human-dominated world. Presence of large carnivores has always clashed with the interests of humans, and there is hostility towards these species that's deeply rooted in human history and culture because of their direct effect on people's property and livelihood (Ripple et al., 2014). On the other hand, these species are deeply charismatic, often present in the culturally heritage in most cultures across their historic range while their conservation is strongly entangled in wider socioeconomic, emotional, and political contexts, which makes the challenges of their conservation even more complex (Chapron and López-Bao, 2014).

Intense persecution, systematic eradication, habitat loss and dwindling of prey caused disappearance of large carnivores from a large part of their historic range, and the populations that remained were in many cases very small and fragmented (Breitenmoser, 1998). The decline of these species in Europe started slowing down in the second half of the 20<sup>th</sup> century when increasing conservation awareness gave rise to the first protection mechanisms (Salvatori et al., 2007). Urbanization changed the way humans use the landscape, and many places saw a rapid increase in abundance of prey species (Breitenmoser, 1998). This resulted in the return of large carnivores to many areas where they previously disappeared, and the process is continuing to this day (Kaczensky et al., 2013). However, this return also brings considerable social challenges since the fundamental conflicts that have caused the persecution in the past never went away.

The number of interest groups is rising, values are diversifying and the demands of public to participate in the decision making are getting stronger, which makes conservation of large carnivores and their management increasingly complex (Brown and Decker, 2001). The traditional approaches of solving problems by lethal interventions don't suffice anymore, and management had to shift its focus into resolution of conflicts and support for coexistence.

In the first article of the dissertation (Redpath et al., 2017) we contrast the collaborative approaches of cooperation with interest groups with the classic top-down approaches where managers dictate management measures. The top-down approaches may be essential when the carnivore populations are small but can cause antagonism and lead to even greater conflicts when these populations start to grow (Brockington and Igoe, 2006), which is a very relevant topic in Europe. As an alternative we suggest the use of more collaborative and flexible approaches that help build trust and facilitate sustainable coexistence with large

carnivores. These approaches are also inherently more democratic, and required in national legislations and international conventions.

Surveys of public attitudes towards large carnivores have traditionally been conducted in face of some extraordinary event (Bath, 1998) and are usually the result of a crisis or planning of a controversial conservation action, for example a species reintroduction, and as such can't document changes of attitudes through time (Williams et al., 2002). At the same time many scientists are pointing out the need for longitudinal studies (Enck and Bath, 2001; Kaczensky et al., 2001) since rapid changes of management circumstances demand more flexible management approaches. In the second and third article of the dissertation we explored the public attitudes towards wolf and bear in Croatia and showed through longitudinal studies how these attitudes changed through time.

For the wolf (Majić and Bath, 2010) we documented a shift of attitudes between 1999 and 2003 from extreme (positive and negative) towards more neutral. Negative attitudes, which developed particularly in the older cohorts as a result of "top-down" total protection of the wolf at the end of the 1990s (Bath and Majić, 2001) started to wind down by the second survey. A part of this shift towards more neutral attitudes can probably also be attributed to an awareness raising and conflict-solving campaign that took place at the same time (Štrbenac et al., 2005).

For the brown bear (Majić et al., 2011) we also conducted the survey twice, in 2002 and 2008, and documented the attitudes of the general public and the key interest groups. We observed that the orientation of values and the general perception of bear as a threat didn't change, but there was a decrease in acceptance capacity for bears. Growth of the bear population and increasingly centralised management probably caused this drop in acceptance capacity, however the attitudes towards bears remained generally positive.

In the fourth article (Trajce et al., 2019) we describe a survey of the attitudes of the general public and the key interest groups towards all three large carnivores in Albania and Northern Macedonia. Besides some differences between both countries and the differences between groups based on the demographic characteristics, an interesting finding was that the support for conservation of wolves was in both countries considerably lower than support for conservation of bear and lynx. This indicates that for conservation and management purposes these species should be treated separately since joined measures for all three species could cause the negative attitudes towards wolves to also transfer to the other two species. This could cause serious problems particularly for the vulnerable population of the threatened Balkan lynx subspecies that lives in the area.

In the fifth article (Chapron et al., 2014) we formed a large consortium of European large carnivore experts, collected the data on conservation status of large carnivores in Europe,

and made a synthesis. The result was surprising for many since it showed a very optimistic picture of spatial and numeric growth of most populations and recolonization of areas from which large carnivores were extinct in the past. We also demonstrated the importance of coexistence since considering the small size and fragmentation of protected areas, an attempt of separation and conservation in protected areas would result in extinction of large carnivores in Europe.

The high conflict potential of large carnivores makes the need for inclusion of human dimensions in management and conservation of these species particularly important (Bath, 1996; 1998; Linnell et al. 2001; Breitenmoser, 1998). Decision makers need scientific research and data that precisely describe the entire spectrum of public attitudes to find the best solutions and paths towards reaching the management goals (Chase et al., 2001). Researchers must be particularly cautious when providing this since we are often personally invested in conservation topics and have clearly defined personal attitudes and values. In presenting the results we must clearly communicate the difference between our attitudes and the objective truth (including our uncertainty in its detection). Failing that, we lose credibility and become just another interest group, contributing more to the problem than towards its resolution.

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## **PRILOGE**

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