

**ZOOLOGIYA INSTITUTI HUZURIDAGI ILMIY DARAJALAR
BERUVCHI DSc.02/30.12.2019.V.52.01 RAQAMLI ILMIY KENGASH**

O‘ZBEKISTON MILLIY UNIVERSITETI

YANGIBOYEV ELMUROD CHORSHANBIYEVICH

**QASHQADARYO VILOYATI SUDRALIB YURUVCHILARINING
FAUNASI, EKOLOGIYASI VA AHAMIYATI**

03.00.06 – Zoologiya

**BIOLOGIYA FANLARI BO‘YICHA FALSAFA DOKTORI (PhD) DISSERTATSIYASI
AVTOREFERATI**

Toshkent – 2024

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Biologiya fanlari bo'yicha falsafa doktori (PhD) dissertatsiyasi mavzusi O'zbekiston Respublikasi Vazirlar Mahkamasi huzuridagi Oliy attestatsiya komissiyasida B2021.3.PhD/B643 raqam bilan ro'yxatga olingan.

Dissertatsiya O'zbekiston Milliy universitetida bajarilgan.

Dissertatsiya avtoreferati uch tilda (o'zbek, ingliz, rus (rezyume)) Ilmiy kengash veb-sahifasi (www.izooology.uz) hamda «ZiyoNet» Axborot-ta'lim portalida (www.ziynet.uz) joylashtirilgan.

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Dissertatsiya himoyasi Zoologiya instituti huzuridagi ilmiy darajalar beruvchi DSc.02/30.12.2019.V.52.01 raqamli Ilmiy kengashning 2024-yil "12" iyun soat 10⁰⁰ dagi majlisida bo'lib o'tadi. (Manzil: 100053, Toshkent shahri, Bog'ishamol ko'chasi, 232 b-uy. Zoologiya instituti majlislar zali. Tel.: (+99871) 289-04-65; faks: (+99871) 289-10-60; E-mail: zoology@academy.uz)

Dissertatsiya bilan Zoologiya instituti Axborot-resurs markazida tanishish mumkin (№ 1716-AR raqami bilan ro'yxatga olingan). Manzil: 100053, Toshkent shahri, Bog'ishamol ko'chasi, 232 b- uy. Tel.: (+99871) 289-04-65

Dissertatsiya avtoreferati 2024-yil "30" may kuni tarqatildi.
(2024-yil "30" maydagi № 3-raqamli ryestr bayonnomasi).



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KIRISH (falsafa doktori (PhD) dissertatsiyasi annotatsiyasi)

Dissertatsiya mavzusining dolzarbligi va zarurati. Bugungi kunda dunyo miqyosida aholi sonining jadal ortib borishi, turli xil xo‘jalik maqsadlari uchun o‘zlashtirilgan hududlar maydonining kengayishi, aholi yashash komplekslari va ishlab chiqarish obyektlarining qurilishi natijasida hududlar infrastrukturasi o‘zgarishi, neft-gaz va boshqa qazilma sanoati tarmoqlarining rivojlanishi sudralib yuruvchilar xilma-xilligiga salbiy ta’sir ko‘rsatmoqda. Ayniqsa, tabiiy landshaftlarning buzilishi sudralib yuruvchilarning yashash joylarining qisqarishi, sonining kamayishi va zaif turlarning yo‘q bo‘lib ketishi kabi salbiy oqibatlarni keltirib chiqarmoqda. Shunga ko‘ra, biologik xilma-xillikning komponenti va resursi bo‘lgan sudralib yuruvchilarni saqlab qolish maqsadida ularning populyatsiyalari holatini baholash va ularning o‘zgarish tendensiyalarini aniqlash, noyob va yo‘qolib ketish xavfi ostidagi turlarni muhofaza qilish yuzasidan chora-tadbirlar ishlab chiqish muhim ilmiy va amaliy ahamiyat kasb etadi.

Jahonda sudralib yuruvchilar xilma-xilligini o‘rganish, turli omillar ta’sirida ularning tabiiy va antropogen landshaftlarda tarqalishini aniqlash hamda kamayib va yo‘qolib ketayotgan turlar bo‘yicha ilmiy izlanishlar olib borilmoqda. Bu borada, jumladan sudralib yuruvchilar faunasini tadqiq etish, ekotizimlardagi zamonaviy tarqalish xususiyatlarini aniqlash, muhofaza qilish chora-tadbirlarini va bioresurs sifatida sudralib yuruvchilardan oqilona foydalanish yo‘llarini ishlab chiqish va saqlab qolishga alohida e’tibor qaratilmoqda.

Respublikamizda atrof-muhitni va biologik xilma-xillikni saqlash hamda ekotizim barqarorligini ta’minlashga alohida e’tibor qaratilmoqda. Bu borada, jumladan tabiiy ekotizimlar barqarorligini ta’minlash, hayvonlarning kamyob va yo‘qolib borayotgan turlarini muhofaza qilish chora-tadbirlari ishlab chiqildi. Xususan, 2019-2028-yillar davrida O‘zbekiston Respublikasida biologik xilma-xillikni saqlash strategiyasida¹ “...biologik xilma-xillikni saqlash va undan barqaror foydalanishni ta’minlash, muhofaza qilinadigan tabiiy hududlarni rivojlantirish va kengaytirish, tabiiy ekologik tizimlarning tanazzulga uchrash sur’atlarini pasaytirish, hayvonlar va o‘simliklarning kamyob va yo‘qolib borayotgan turlarini qayta tiklash” kabi vazifalari belgilangan. Ushbu vazifalardan kelib chiqqan holda, Qashqadaryo viloyati sudralib yuruvchilarining faunasi bioxilma-xilligini aniqlash, ular tarqalishiga ekologik omillarning ta’sirini baholash, sudralib yuruvchilarning yangi muhitga munosabatini, inson faoliyatining sudralib yuruvchi hayvonlarga ta’sirini aniqlash hamda kamyob, endemik va muhofazaga muhtoj turlarni saqlab qolish chora-tadbirlarini ishlab chiqish muhim ilmiy-amaliy ahamiyat kasb etadi.

O‘zbekiston Respublikasi Prezidentining 2019-yil 30-oktyabrdagi PF-5863-son “2030-yilgacha bo‘lgan davrda O‘zbekiston Respublikasining atrof muhitni muhofaza qilish konsepsiyasini tasdiqlash to‘g‘risida”gi, 2022-yil 28-yanvardagi PF-60-son “O‘zbekiston Respublikasini yanada rivojlantirish bo‘yicha harakatlar strategiyasi to‘g‘risida”gi Farmonlari, O‘zbekiston Respublikasi Vazirlar Mahkamasining 2018-

¹ O‘zbekiston Respublikasi Vazirlar Mahkamasining qarori, 11.06.2019-yildagi 484-son “2019-2028-yillar davrida O‘zbekiston Respublikasida biologik xilma-xillikni saqlash strategiyasini tasdiqlash to‘g‘risida”gi qarori

yil 7-noyabrda 914-son "Hayvonot va o'simlik dunyosi obyektlarining davlat hisobini, ulardan foydalanish hajmlari hisobini va davlat kadastrini yuritish to'g'risida"gi, 2019-yil 5-sentyabrda 737-son "O'zbekiston Respublikasida atrof tabiiy muhitning davlat monitoringi tizimini takomillashtirish to'g'risida"gi qarorlari hamda mazkur faoliyatga tegishli boshqa meyoriy-huquqiy hujjatlarda belgilangan vazifalarini amalga oshirishga ushbu tadqiqot ishi muayyan darajada xizmat qiladi.

Tadqiqotning respublika fan va texnologiyalari rivojlanishining ustuvor yo'nalishlarga mosligi. Mazkur tadqiqot respublika fan va texnologiyalar rivojlanishining V. "Qishloq xo'jaligi, biotexnologiya, ekologiya va atrof muhitni muhofazasi" ustuvor yo'nalishiga muvofiq bajarilgan.

Muammoning o'rganilganlik darajasi. Jahonda olib borilgan ilmiy izlanishlarga misol qilib I.N. Laurenti (1768), A.M. Dumeril va G. Bibron (1837-1854), A.E. Brem (1869), K.P. Shmidt (1922), R.F. Mertens (1929), Y. Hongue (2014), P. Alessandro (2014), va R. N. Jendrian (2020) ishlarini ko'rsatish mumkin.

Shulardan MDH davlatlarida ilmiy izlanishlarga P.S. Pallas (1771), A.A. Shtraux va A.M. Nikolskiy (1895-1905), P.V. Terentev va S.A. Chernov (1930-1954), I.D. Yakovleva (1964), N.N. Sherbak (1966), A.G. Bannikov (1977), S.A. Said-Aliyev (1979), Ch. Ataev (1985), T.S. Sattarov (1993), N.B. Ananeva va b. (2004), K.D. Milto (2007), A.N. Gneteva (2020) va A. A. Kidovlar (2022) tomonidan olib borilgan tadqiqotlarni keltirish mumkin.

Respublikamiz hududida sudralib yuruvchilarni o'rganish asosan o'tgan asrning 50-yillaridan boshlangan. Ilk asarlarga misol qilib taniqli zoolog olim T.Z. Zohidov (1938, 1971) va O.P. Bogdanovning (1961) ilmiy izlanishlarini va asarlarini ta'kidlab o'tish joiz, Bundan tashqari E.V. Vashetko (1970-2020), T. Yadgarov (1973), Z.Y. Kamalova (1978), D.A. Bondarenko (1994), Y.A. Chikin (2001) E.A. Peregontsev (2017) va F.Q. Jumayev (2022) kabi olimlar tomonidan qator izlanishlar olib borilgan.

Sudralib yuruvchilarni o'rganish maqsadida Qashqadaryo viloyatida o'tkazilgan tadqiqotlar asosan R.N. Meklenbursev (1948), V.P. Karpenko (1963-1965) va D.A. Bondarenko (1994) tomonidan olib borilgan.

Biroq, ushbu tadqiqot ishlari Qashqadaryo viloyati sudralib yuruvchilarining tur tarkibi, ekologik xususiyatlari haqida to'liq ma'lumot bera olmaydi. Shunga ko'ra sudralib yuruvchilarning tur tarkibini aniqlash, muhofaza qilish choralarini ishlab chiqish hamda ekologik xususiyatlarini ochib berish muhim ilmiy amaliy ahamiyat kasb etadi.

Tadqiqotning dissertatsiya bajarilgan oliy ta'lim muassasasining ilmiy-tadqiqot ishlari rejalari bilan bog'liqligi. Dissertatsiya tadqiqoti O'zbekiston Milliy universiteti Zoologiya kafedrasida ilmiy tadqiqot ishlari rejasiga muvofiq "O'zbekiston hayvonot olami bioxilma-xilligini o'rganish va muhofaza qilish" (2020-2022) mavzusidagi ilmiy-tadqiqot dasturi doirasida bajarilgan.

Tadqiqotning maqsadi. Qashqadaryo viloyatida tarqalgan sudralib yuruvchilarning tur tarkibi va ekologik xususiyatlarini aniqlash, noyob hamda kamayib borayotgan turlarning muhofaza choralarini ishlab chiqishdan iborat.

Tadqiqotning vazifalari: Yuqoridagi maqsadlardan kelib chiqqan holda quyidagi vazifalarni bajarish belgilab olindi:

Qashqadaryo viloyati hududlarida tarqalgan sudralib yuruvchilarining tur tarkibini aniqlash;

Viloyatning turli biotoplarida sudralib yuruvchilar tarqalishini o'rganish, faunasiga zamonaviy usullar orqali baho berish;

Viloyat sudralib yuruvchilarning ekologik holatini o'rganish va antropogen omillarning turlar holatiga ta'sir darajasini baholash;

Sudralib yuruvchilarning ahamiyatini o'rganish hamda noyob va kamayib borayotgan turlarning muhofazalashga qaratilgan chora-tadbirlar rejasini ishlab chiqish;

Tadqiqotning obyekti sifatida Qashqadaryo viloyatida tarqalgan sudralib yuruvchi hayvonlar olingan.

Tadqiqotning predmetini Qashqadaryo viloyatida tarqalgan sudralib yuruvchilar faunasining zamonaviy tarkibi, tarqalishi, ekologik xususiyatlari, soni, inson faoliyatining ta'siri va turlarni muhofaza qilish chora-tadbirlarini takomillashtirish tashkil etadi.

Tadqiqot usullari. Tadqiqot davomida Zoologik, gerpetologik, ekologik, biometrik, geometrik-morfologiya va statistik tahlil usullaridan foydalanilgan.

Tadqiqotning ilmiy yangiligi quyidagilardan iborat:

Qashqadaryo viloyati sudralib yuruvchilari zamonaviy holati tahlil qilinib, 2 turkum, 12 oila, 23 urug'ga mansub 35 tur aniqlangan;

sudralib yuruvchilardan - *Eremias nigrocellata* turi Qashqadaryo viloyati faunasi uchun ilk bor aniqlangan;

Qashqadaryo viloyati turli biotoplarida sudralib yuruvchilarning tarqalishiga ko'ra *Eremias velox* cho'l va adir biogeotsenozlari dominant turi, *Pseudopodus apodus* adir biogeotsenozi dominant turi hamda *Tenuidactylus fedtschenkoi* tog' biogeotsenozi dominant turi sifatida aniqlangan;

Qashqadaryo viloyatida *Eremias nigrocellata*, *Platyceps karelini*, *Echis carinatus*, *Lycodon striatus* va *Gloydius caraganus* zichligi kamayib borayotgan turlar ekanligi isbotlangan;

sudralib yuruvchilarning morfologik-geometrik belgilari asosida zamonaviy dasturlar yordamida Testudinidae, Lacertidae, Colubridae va Psammophiidae oilalariga tegishli turlarning matematik modellari (matrikslari) yaratilgan;

viloyat hududida tarqalgan noyob va kamayib borayotgan *Testudo horsfieldii*, *Varanus griseus*, *Eryx tataricus*, va *Naja oxiana* turlaridan noqonuniy foydalanilishning tur holatiga salbiy ta'siri ochib berilgan;

Qashqadaryo viloyat hududida *Testudo horsfieldii horsfieldii* va *Testudo horsfieldii bogdanovi* kenja tur vakillariga morfologik jihatdan o'xshash individlar tarqalganligi isbotlangan.

Tadqiqotning amaliy natijalari quyidagilardan iborat:

tadqiqot natijasida Qashqadaryo viloyati sudralib yuruvchilarining hozirdagi ekologik holatini aniqlashda zamonaviy dasturlardan foydalanilgan va shu orqali ulardagi o'zgarishlar aniqlanib, turlarga tashqi ta'sirlar va antropogen omillarning bevosita va bilvosita ta'sirini kamaytirishga qaratilgan chora tadbirlar rejasi ishlab chiqilgan. *Phrynocephalus mystaceus*, *Eremias grammica* va *Macrovipera lebetinus* turlarini neft va gaz qazib olish inshootlari qurilishdan oldin boshqa mos

yashash muhitiga ko‘chirish maqsadga muvofiqligi aniqlangan;

21 tur sudralib yuruvchilardan zardob olishda, xalq tabobatida, inson iste’molida va ko‘ngil ochar vosita, aksessuar va uy hayvoni sifatida foydalanilishi aniqlangan;

sudralib yuruvchilarning 11350 individlari sanoqdan o‘tkazilib, 2 turkum, 12 oilaga mansub 34 turning kadastrini ishlab chiqilgan.

Tadqiqot natijalarining ishonchliligi tadqiqotda qo‘llanilgan zoologik, gerpetologik usul va yondashuvlar asosida olingan tajriba natijalarini nazariy ma’lumotlarga mos kelishi, morfometrik ma’lumotlarni zamonaviy dasturlar asosida (Past 4.10; Microsoft Office Excel, 2010; EXLSTAT 2010, Morpho J; TPSuntil64; TPS dig264;) statistik tahlil qilingani, dissertatsiya natijalari xorijiy jurnallarda chop etilganligi hamda ishlab chiqilgan tavsiyalarning amaliyotga tatbiq etilganligi bilan izohlanadi.

Tadqiqot natijalarining ilmiy va amaliy ahamiyati. Tadqiqot natijalarining ilmiy ahamiyati Qashqadaryo viloyatining turli biotoplarida sudralib yuruvchilarning turlar tarkibi aniqlanganligi, turlar tarkibi morfologik jihatdan tahlil qilinganligi, tarqalish xususiyatlari tavsiflanganligi, hududda sodir bo‘layotgan antropogen omillarning sudralib yuruvchilar faunasiga ta’sirining o‘rganilganligi bilan izohlanadi.

Tadqiqot natijalarining amaliy ahamiyati Qashqadaryo viloyatida tarqalgan sudralib yuruvchilarning kadastrini yuritish, noyob va kamayib borayotgan turlarning tarqalish hududlarini aniqlash hamda muhofaza qilish chora-tadbirlarini ishlab chiqish, sudralib yuruvchilar faunasi tur tarkibini zamonaviy usullar orqali baholashga xizmat qiladi.

Tadqiqot natijalarining joriy qilinishi. Qashqadaryo viloyati sudralib yuruvchilarining faunasi, ekologiyasi va ahamiyati bo‘yicha olingan ilmiy natijalar asosida:

Qashqadaryo viloyatida tarqalgan sudralib yuruvchilarning 16 urug‘ga mansub 22 turdan iborat 27 nusxa namunalari respublikada yetakchi bo‘lgan “Zoologiya kolleksiyasi” noyob obyektiga kiritilgan (O‘zbekiston Respublikasi Fanlar akademiyasi 2022-yil 19-sentyabrdagi 4/1255-2292-son ma’lumotnomasi), Natijada, namunalar Qashqadaryo viloyatida uchraydigan sudralib yuruvchi hayvon turlari fondini boyitgan va ular populyatsiyalari tarqalishining zamonaviy holatini baholash hamda kadastr ma’lumotlarini tayyorlash imkonini bergan.

Qashqadaryo viloyatda sudralib yuruvchilar faunasining xilma-xilligini aniqlash va zamonaviy holatiga baho berish, kadastrini tuzish yuzasidan ishlab chiqilgan tavsiyalar O‘zbekiston Respublikasi Ekologiya va atrof-muhitni muhofaza qilish davlat qo‘mitasining Qashqadaryo viloyati boshqarmasida amaliyotga joriy etilgan. (O‘zbekiston Respublikasi Ekologiya va atrof-muhitni muhofaza qilish davlat qo‘mitasi 2022-yil 13-oktyabrdagi 03-02/7-2224-son ma’lumotnomasi). Natijada, Qashqadaryo viloyatida uchraydigan sudralib yuruvchi hayvon turlari populyatsiyalari tarqalishining zamonaviy holatini baholash, muhofaza etish choralari ishlab chiqish hamda kadastr ma’lumotlarini tayyorlash imkonini bergan.

Tadqiqot natijalarining aprobatyasi. Mazkur tadqiqot natijalari 3 ta xalqaro va 3 ta respublika ilmiy-amaliy anjumanida muhokamadan o‘tkazilgan.

Tadqiqot natijalarining e'lon qilinishi. Dissertatsiya mavzusi bo'yicha jami 11 ta ilmiy ish chop etilgan, shulardan, O'zbekiston Respublikasi Oliy ta'lim fan va innovatsiyalar vazirligi huzuridagi Oliy attestatsiya komissiyasining doktorlik dissertatsiyalari asosiy ilmiy natijalarini chop etish uchun tavsiya etilgan ilmiy nashrlarda 5 ta maqola, jumladan, 1 tasi respublika va 4 tasi xorijiy ilmiy jurnallarda nashr etilgan.

Dissertatsiyaning tuzilishi va hajmi. Dissertatsiya ishi kirish, 4 ta bob, xulosalar, amaliy tavsiyalar, foydalanilgan adabiyotlar ro'yxati va ilovalardan iborat. Dissertatsiyaning hajmi 111 betni tashkil etadi.

DISSERTATSIYANING ASOSIY MAZMUNI

Kirish qismida mavzuning dolzarbligi va zarurati asoslangan, tadqiqotning respublika fan va texnologiyalari rivojlanishining ustuvor yo'nalishlarga mosligi ko'rsatilgan, muammoning o'rganilganlik darajasi yoritilgan, tadqiqotning ilmiy yangiligi va amaliy natijalari bayon qilingan, olingan natijalarining ilmiy va amaliy ahamiyati ochib berilgan, tadqiqot natijalarining joriy qilinishi, nashr etilgan ishlar va dissertatsiya tuzilishi bo'yicha ma'lumotlar keltirilgan.

Dissertatsiyaning **“Sudralib yuruvchilarining o'rganilishi bo'yicha olib borilgan tadqiqotlarning qisqacha tarixi”** deb nomlangan birinchi bobida O'zbekistonda, jumladan Qashqadaryoda sudralib yuruvchilar turlarini o'rganish bo'yicha olib borilgan tadqiqotlarining tavsifi to'g'risida ma'lumotlar keltirilgan. Shuningdek, Qashqadaryo viloyati sudralib yuruvchilarining tur tarkibi, tarqalishi, ko'payishi, oziqlanishi va ahamiyatiga tegishli materiallar tahlil qilingan. Mavjud materiallar sudralib yuruvchilarning hozirgi holati va ekologik xususiyatlari to'g'risida xulosalar chiqarish uchun yetarli emasligi aniqlangan.

Dissertatsiya ishining **“Tadqiqot o'tkazilgan hududning tabiiy sharoitlari, tadqiqot materiallari va uslublari”** deb nomlangan ikkinchi bobida, tadqiqot davomida Qashqadaryo viloyati bo'ylab turli joylardan 11 ta tadqiqot maydoni tanlab olindi (1-jadval).

1-jadval

Qashqadaryo viloyati bo'ylab tanlab olingan hududlar joylashuvi

Tanlangan hudud kodi	O'tkazilgan marshrutlar soni	Marshrut uzunligi (km)	Koordinatasi (DD)	Dengiz sathidan balandligi (m)
Cho'l A	15/12	54.5/23.4	38,87823N 64,6523055E	260-350
Cho'l A1	6/6	42.6/18.8	39,4093125N 65,4394043E	300-350
Cho'l A2	3/5	28.4/9.7	38,7038689N 65,6629283E	350-370
Cho'l A3	3/4	23.2/10.7	38,9175431N 65,8450074E	400-460
Cho'l A4	4/4	35.1/14.3	39,0333184N 66,488481E	470-500
Adir B	3/3	20.8/8.5	38,3516947N 66,2818806E	760-830
Adir B1	18/21	44.9/18.5	38,5441079N 66,5810921E	850-1200
Adir B2	7/6	29.9/8.2	38,9022396N 67,121346E	1000-1500
Adir B3	4/4	24/9.8	39,2523159N 66,8198763E	1000-1300
Tog' C	13/9	39.5/17.1	38,4874046N 66,861257E	1800-2200
Tog' C1	7/3	28.6/8.1	38,7078356N 67,2152729E	2300-2700

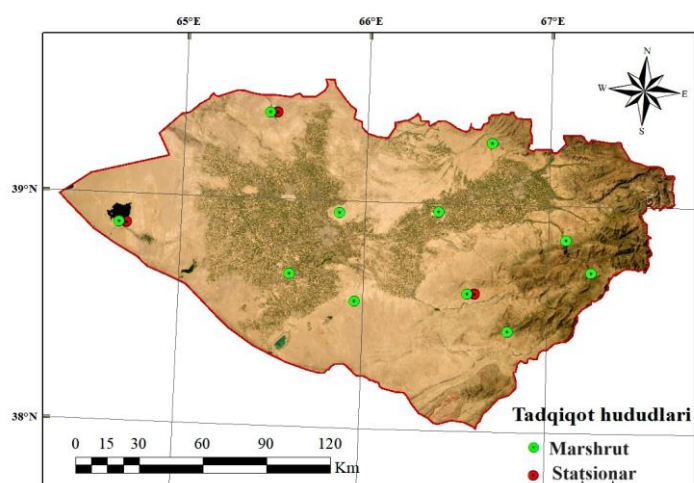
Dala tadqiqotlarida asosan marshrut va statsionar medotlardan foydalanildi. Tanlab olingan hududlarda umumiy uzunligi 516.1 km (369 km kunduzgi va 147.1 km tungi) bo'lgan 83 ta kunduzgi va 77 ta tungi marshrut o'tkazildi.

Marshrut (transekt): Marshrutlar Google Earth Pro dasturi orqali belgilandi va koordinatalar olindi. Marshrutlar ikki turda, S.T. Bukland metodiga asosan (Bukland va b., 2001) uzun transekt va qisqa transekt farqlanadi.

Marshrutlarda populyatsiya zichligini aniqlashda asosan quyidagi FMP (Formozov-Malyshev-Pereleshin) (Formozov, 1932, Malyshev, 1936, Pereleshin, 1950) formulasidan foydalanildi (1 formula)

$$D = \frac{\pi}{2} \frac{S}{dm} \text{ yoki } D = \frac{1,57S}{dm} \quad (1)$$

D-hayvonlar populyatsiyasining zichligi, S-yo'llarning kesishishi soni; m-marshrut uzunligi (km); d – hayvonlarning kunlik sayohatining o'rtacha uzunligi (km).



1-rasm. Qashqadaryo viloyati xaritasi

Sudralib yuruvchilarning yoshi va jinsini aniqlashda (Gibbons 1976). (Gibbons, 1972, Fitch va Henderson, 1977), (Blandhard va Finster, 1933, Schaefer, 1934) va zondlash (Fitch, 1987) usullaridan (ilonlarda) foydalanildi.

Sudralib yuruvchilarning tangachalari turga xos ravishda joylashish xususiyatiga ega. Ushbu tangachalarning joylashuv geometriyasidan Antigoni Kaliontzopoulou (2017) metodi orqali TPS64until va TPS264Dig dasturlarida belgilar matematik modellashirildi.

Biotoplarda sudralib yuruvchilar xilma-xilligini aniqlashda alfa (α), beta (β), gamma (γ) xilma-xillik R. H. Vittaker (1960) metodi orqali hisoblab chiqildi.

Dissertatsiyaning **“Qashqadaryo viloyati biotoplaridagi sudralib yuruvchilar faunasining turlar tarkibi va shakllanish xususiyatlari”** deb nomlangan uchinchi bobida sudralib yuruvchilar faunasining turli ko'rsatkichlari o'rganilgan.

3.1. Qashqadaryo viloyati biotoplaridagi sudralib yuruvchilar faunasining turlar tarkibi va xilma-xillik ko'rsatkichlari. Qashqadaryo viloyati bo'ylab tanlab olingan 11 hududda 35 tur sudralib yuruvchilar qayt etildi, ular 2 turkum, 12 oila, 23 urug'ga mansubligi aniqlandi (2-jadval).

Tadqiqotlarimiz davomida Qashqadaryo viloyati hududi bo'ylab umumiy soni 11350 ta sudralib yuruvchi hayvon individini sanoqdan o'tkazildi. Butun viloyat bo'ylab hisoblanganda sudralib yuruvchilar turlar mo'lligi, ya'ni gamma xilma xillik $\gamma=35$ turga tengdir.

2-jadval

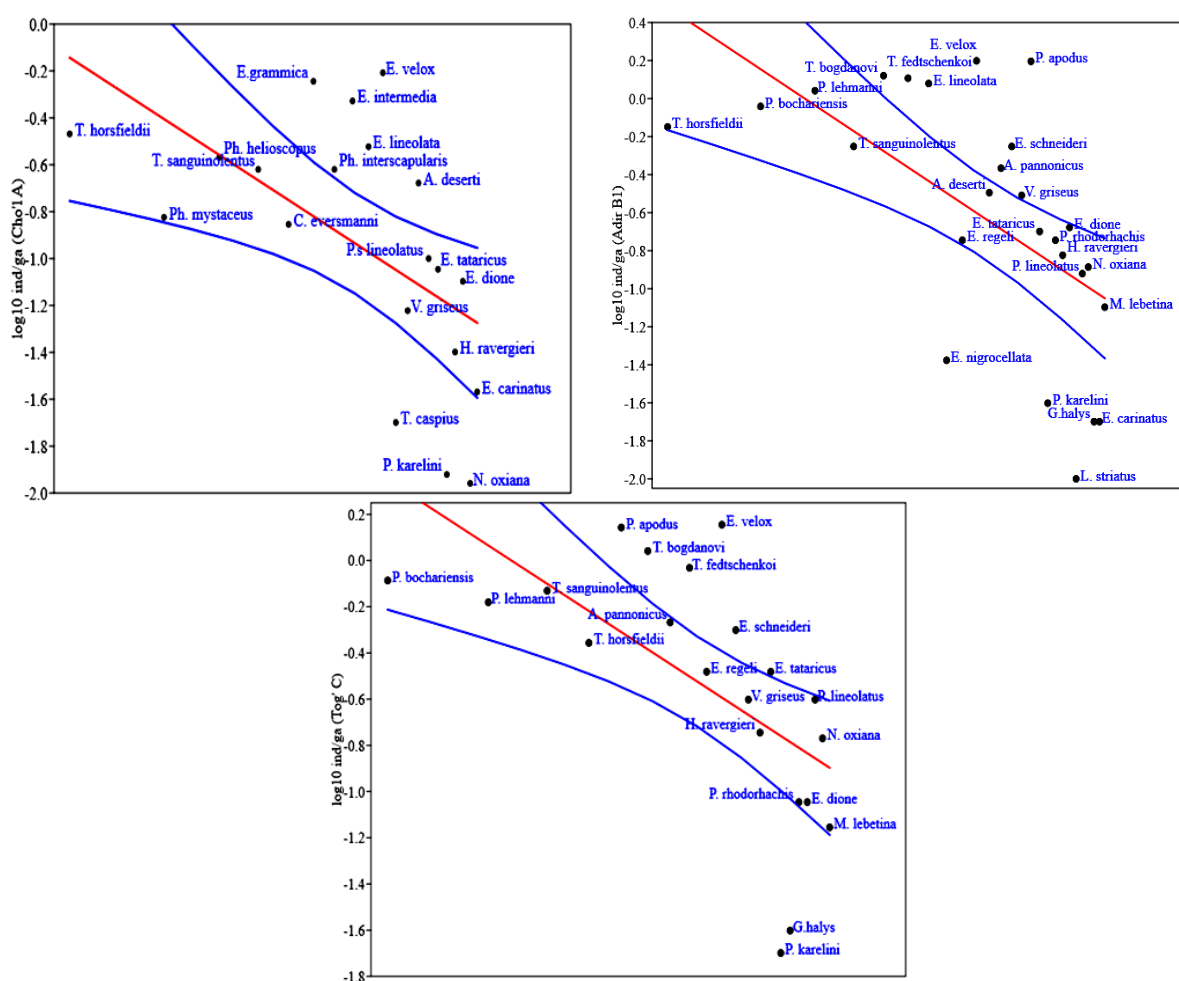
Qashqadaryo viloyati sudralib yuruvchi hayvonlarining turlar tarkibi

Oila	Urug'	Tur
Testudinidae	<i>Testudo</i>	<i>Testudo horsfieldii</i> (Gray, 1844)
Agamidae	<i>Phrynocephalus</i>	<i>Phrynocephalus helioscopus</i> (Pallas, 1771)
		<i>Phrynocephalus interscapularis</i> (Lichtenstein, 1856)
		<i>Phrynocephalus mystaceus</i> (Pallas, 1776)
	<i>Paralaudakia</i>	<i>Paralaudakia bochariensis</i> (Nikolsky, 1897)
		<i>Paralaudakia lehmanni</i> (Nikolsky, 1896)
	<i>Trapelus</i>	<i>Trapelus sanguinolentus</i> (Pallas, 1814)
Gekkonidae	<i>Crossobamon</i>	<i>Crossobamon eversmanni</i> (Wiegmann, 1834)
	<i>Tenuidactylus</i>	<i>Tenuidactylus caspius</i> (Eichwald, 1831)
		<i>Tenuidactylus fedtschenkoi</i> (Strauch, 1887)
		<i>Tenuidactylus bogdanovi</i> (Nazarov, Poyarkov, 2013)
	<i>Teratoscincus</i>	<i>Teratoscincus scincus</i> (Schlegel, 1858)
Lacertidae	<i>Eremias</i>	<i>Eremias grammica</i> (Lichtenstein, 1823)
		<i>Eremias intermedia</i> (Strauch, 1976)
		<i>Eremias lineolata</i> (Nikolsky, 1897)
		<i>Eremias nigrocellata</i> (Nikolsky, 1896)
		<i>Eremias velox</i> (Pallas, 1771)
		<i>Eremias regeli</i> (Bedriaga, 1905)
Scincidae	<i>Ablepharus</i>	<i>Ablepharus deserti</i> (Strauch, 1868)
		<i>Ablepharus pannonicus</i> (Lichtenstein, 1823)
	<i>Eumeces</i>	<i>Eumeces schneideri</i> (Daudin, 1802)
Varanidae	<i>Varanus</i>	<i>Varanus griseus</i> ssp. <i>caspius</i> (Eichwald 1831)
Anguidae	<i>Pseudopus</i>	<i>Pseudopus apodus</i> (Pallas, 1775)
Boidae	<i>Eryx</i>	<i>Eryx tataricus</i> (Lichtenstein, 1823)
Colubridae	<i>Platyceph</i>	<i>Platyceph karelini</i> (Brandt, 1838)
		<i>Platyceph rhodorhachis</i> (Jan, 1865)
	<i>Hemorrhois</i>	<i>Hemorrhois ravergeri</i> (Menetries, 1832)
	<i>Elaphe</i>	<i>Elaphe dione</i> (Pallas, 1773)
	<i>Lycodon</i>	<i>Lycodon striatus</i> ssp. <i>bicolor</i> (Nikolsky, 1903)
	<i>Natrix</i>	<i>Natrix tessellata</i> (Laurenti, 1768)
	<i>Psammophis</i>	<i>Psammophis lineolatus</i> (Brandt, 1838)
Elapidae	<i>Naja</i>	<i>Naja oxiana</i> (Eichwald, 1831)
Viperidae	<i>Echis</i>	<i>Echis carinatus</i> (Schneider, 1801)
	<i>Macrovipera</i>	<i>Macrovipera lebetinus</i> (Linnaeus, 1758)
	<i>Gloydius</i>	<i>Gloydius caraganus</i> (Eichwald, 1831)

Har bir hudud turlar xilma-xilligi indeksleri C. E. Shannon (1948), L. Brillouin (1962) metodlari va turlar mo'lligi indeksi R. Margalef (1958) metodi orqali shuningdek nisbiy xilma-xillik indeksi E. C. Pielou (1966) metodi orqali hisoblab chiqildi (2-jadval).

Cho'l A hudud biologik xilma-xilligi cho'l mintaqasi bo'yicha eng yuqori bo'lib 11 oila, 17 urug', 22 tur sudralib yuruvchilarni o'z ichiga oladi. Hududda *E. velox* (populyatsiya zichligi 0.62 ± 0.008 ind/ga), *E. grammica* (populyatsiya zichligi 0.57 ± 0.016 ind/ga), *E. intermedia* (populyatsiya zichligi 0.47 ± 0.012 ind/ga) dominant turlardir.

Shuningdek *E. lineolata* va *A. deserti* turlari ekologik holati ham yuqori hisoblandi. *T. caspius*, *P. karelini* va *N. oxiana* turlari populyatsiya zichligi holati ushbu hudud bo'yicha past ko'rsatkichda ekanligi aniqlandi.



2-rasm. Turlarning holat regressiyasi bo'yicha taqsimlanishi

Adir B1 hududda 12 oila, 19 urug', 27 turga sudralib yuruvchilar qayt etildi. Dominant turlari quyidagilardir: *E. velox* (populyatsiya zichligi 1.58 ± 0.072 ind/ga), *T. bogdanovi* (populyatsiya zichligi 1.52 ± 0.12 ind/ga), *T. fedtschenkoi* (populyatsiya zichligi 1.285 ± 0.053 ind/ga), *P. apodus* (populyatsiya zichligi 1.57 ± 0.0301 ind/ga).

Hududda zichlik bo'yicha kam ko'rsatkichlar, *E. carinatus*, *E. nigrocellata*, *P. karelini* *G. caraganus* va *L. striatus* turlariga tegishlidir.

Tog' C hudud dengiz sathidan 1800-2200 metr balandlikdagi tog' mintaqasida joylashgan. Hududda 12 oila, 18 urug', 22 turga mansub sudralib yuruvchilar qayt etildi. Dominant turlari quyidagilardir: *E. velox* (populyatsiya zichligi 1.43 ± 0.045 ind/ga) va *P. apodus* (populyatsiya zichligi 1.39 ± 0.071 ind/ga).

Dominant turlardan tashqari, *T. fedtschenkoi* va *T. bogdanovi* turlari populyatsiya zichligi holati nisbatan yuqori ekanligini ko'rish mumkin. Hududda zichlik bo'yicha kam ko'rsatkichlar, *P. karelini*, va *G. caraganus* turlariga tegishlidir.

Umumiy Qashqadaryo viloyati bo'yicha *E. velox* (populyatsiya zichligi 0.84 ± 0.05 ind/ga) cho'l va adir biogeosenozlari dominant turi, *P. apodus* (populatsiya zichligi 1.39 ± 0.271 ind/ga) adir biogeosenozi dominant turi va *T. fedtschenkoi* (populyatsiya zichligi 0.732 ± 0.03 ind/ga) tog' biogeosenozi dominant turi sifatida qayt etildi. Shuningdek, ba'zi turlar populyatsiya zichligi kam bo'lsada lekin viloyat bo'ylab keng yashash muhitiga egadir. Ushbu turlar *H. ravergeri*, *T. sanguinolentus*, *N. tessellate*, *P. lineolatus*, *E. dione*, *P. rhodorhachis*, *P. lehmanni*, *T. horsfieldii* bo'lib, ular tadqiqot o'tkazilgan 11 ta biotoplarning kamida 8 tasida uchraydi.

Qashqadaryo viloyati bo'yicha umumiy holda zichlik bo'yicha kam ko'rsatkichlar, *E. nigrocellata*, *P. karelini*, *E. carinatus*, *L. striatus* va *G. caraganus* turlariga tegishlidir.

3.2. Qashqadaryo viloyati biotoplarida faunaning shakllanishi. Biotoplar kesimida xilma-xillik darajasi, turlar mo'lligi va dominant turlari aniqlangach, ushbu ma'lumotlar asosida har bir hudud faunasining o'xshashlik darajasini aniqlash va qaysi faunalar parallel yoki uzviy rivojlanib borganligini o'rganish maqsadida alfa xilma-xillik bo'yicha korrelyatsiya tahlili o'tkazildi. Tahlil natijalaridan Pearson koeffisienti (ρ) qiymati chiqarildi va shu qiymat orqali biotoplarning faunasi o'xshashlik va farqlanish holatini ko'rsatib berildi.

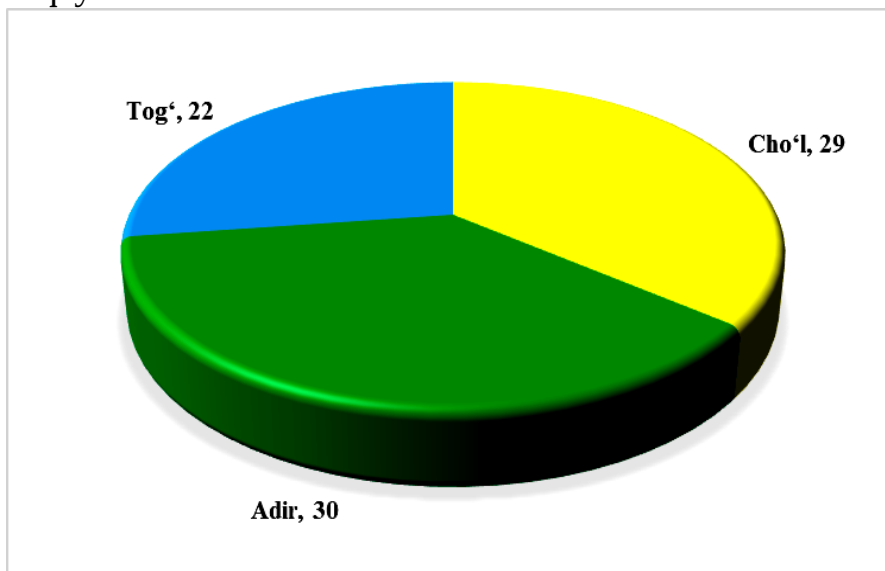
Tadqiqotlarimiz davomida viloyat biotoplari faunasining beta, zeta va qorong'i (dark) xilma-xilligi aniqlandi. M. Partel, R. Szava-Kovats, M. Zobel (2011) metodi bo'yicha qorong'i xilma-xillik tahliliga ko'ra, Afg'on litorinxi (*Lytorhynchus ridgewayi* Boulenger, 1887) Cho'l A, Cho'l A1, Adir B, Adir B1 va Tog' C hududlarda, Rang barang kaltakesak Cho'l A4 va Adir B3 hududlarda (*Eremias arguta* Pallas, 1773), deadimsimon chipor ilon (*Spalerosophis diadema* Schlegel, 1837) Cho'l A, Cho'l A1, Adir B, Adir B1, va Tog' C hududlarda va Ko'r ilon (*Xerotyphlops vermicularis* Merrem, 1820) Adir B1, Tog' C va Tog' C1 hududlarda uchrashini mumkinligi aniqlandi. Tahlilga ko'ra, Qashqadaryo viloyati reptiliyalari faunasi 35 tur emas 39 tur bo'lishi mumkin.

Qashqadaryo viloyati sudralib yuruvchi hayvonlarining xilma-xillik ko'rsatkichlari va indekslari

	Cho'1 A	Cho'1 A1	Cho'1 A2	Cho'1 A3	Cho'1 A4	Adir B	Adir B1	Adir B2	Adir B3	Tog' C	Tog' C1	Umumiy
Tur soni	22	20	18	12	9	12	27	18	17	22	10	35
Individlar	1434	1113	343	585	316	313	2547	1237	578	2371	513	11350
Dominantlik indeksi	0.08874	0.07794	0.1114	0.175	0.2206	0.1487	0.09544	0.1477	0.1476	0.1182	0.216	0.07679
Dominantlik quyi chegarasi	0.4114	0.3133	0.3563	0.4478	0.2294	0.2330	1.2820	0.6499	0.4605	1.2210	0.3034	0.6693
Simpson indeksi_1-D	0.9113	0.9221	0.8886	0.825	0.7794	0.8513	0.9046	0.8191	0.8524	0.8818	0.784	0.9232
Shannon–Veaver indeksi_H	2.612	2.664	2.373	2.046	1.682	2.09	2.699	2.058	2.25	2.444	1.757	2.935
Brillouin indeksi	2.567	2.612	2.265	1.987	1.62	1.997	2.666	2.022	2.175	2.416	1.704	2.924
Margalef turlar mo'illigi indeksi	2.888	2.709	2.398	1.883	1.216	1.914	3.433	2.107	2.517	2.703	1.601	3.533
Nisbiy xilma-xillik_J	0.8451	0.8894	0.8764	0.7976	0.8088	0.8412	0.8101	0.7423	0.7941	0.7907	0.7329	0.8323

Dissertatsiyaning “**Qashqadaryo viloyati sudralib yuruvchilarining ekologik tavsifi, tarqalishi va ahamiyati**” deb nomlangan to‘rtinchi bobida viloyat sudralib yuruvchilarining ekologiyasi, viloyat bo‘ylab turli muhitlarda tarqalishi, ahamiyati va hozirgi holati o‘rganilgan.

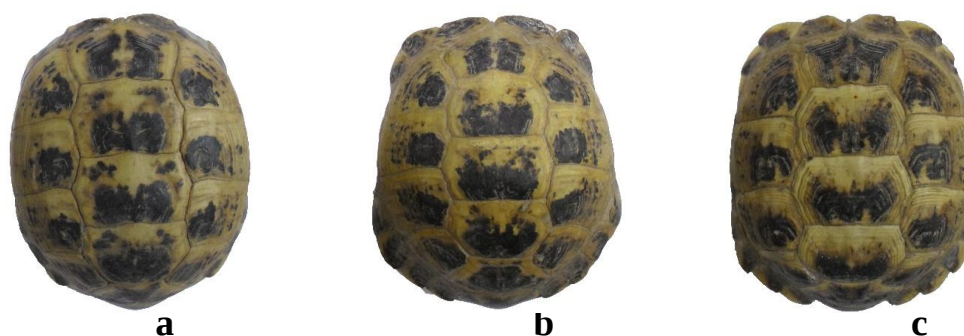
4.1. Qashqadaryo viloyati sudralib yuruvchilarining ekologik tavsifi va tarqalishi. Sudralib yuruvchilar Qashqadaryo viloyati tarkibidagi uchta yirik biogeotsenozlar, ya’ni cho‘l, adir va tog‘ zonalarining butazorlar va yarim butazorlari, ochiq qumli maydonlari, to‘qay, suv ayrilishlar, qiyaliklar, o‘rmonlar va yaylovlari kabi biosenozlarida, shuningdek, sun’iy ekotizimlar va ularning atrofida o‘ziga xos tarqalishi o‘rganildi (3-rasm). Natijalarga ko‘ra sudralib yuruvchilarning ko‘pchilik qismi asosan cho‘l biogeosenozining to‘qay, buta va yarim butazorlarda, Adir biogeosenozining butazorlar va tekislik o‘tloqlarda tarqalgan. Shuningdek 23 tur sudralib yuruvchi turli zonalarda barpo etilgan sun’iy ekotizimlarni egallaganligi qayt etildi. 5 tur sudralib yuruvchi namlikka talabchan turlar sifatida qayt etildi.



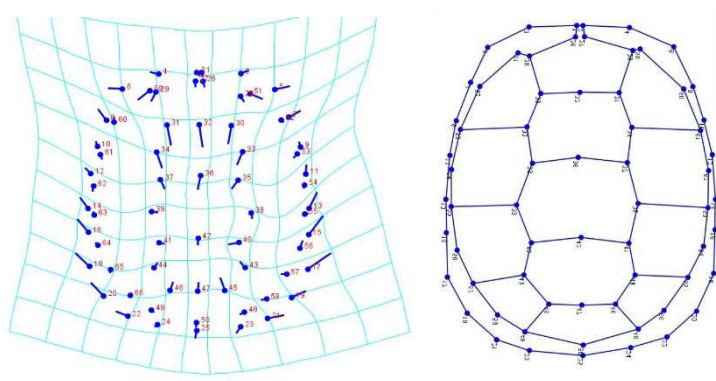
3-rasm. Sudralib yuruvchilarning turli biosenozlarda taqsimlanishi

Tadqiqotimiz davomida, populyatsiyalar ustida morfologik belgilarni geometrik modellashtirish tahlili o‘tkazildi. O‘rta Osiyo cho‘l toshbaqasining geometrik modellashtirishda, A.K. Gnetova (2020) ilimiy ishida keltirilgan kenja turlarning belgilarini kuzatish orqali toshbaqalar karapaksning marginal 3, 6, va 8 qalqonchalar orasidagi kenglik masofalari nisbati turlicha bo‘lishiga e’tibor berildi va biometrik parametrlar sifatida qalqonlar joylashuvi geometriyasida 66 ta landmark (belgi qo‘yiladigan nuqta) tanlab olindi (4,5-rasmlar).

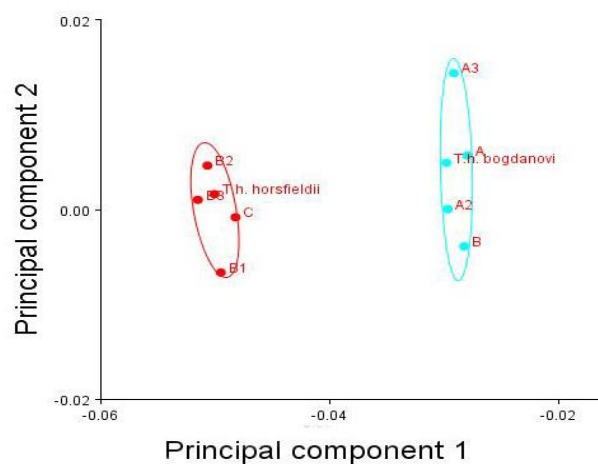
Turli biotoplardan olingan namunalar va 5 ta holotip kenja turlar matritsasi Morpho J dasturida tahlil qilindi. Tahlil jinslar bo‘yicha va kenja turlar bo‘yicha olib borildi. Jinslar bo‘yicha olingan tahlilda ajralish kuzatilmadi. Kenja turlar tahliliga ko‘ra viloyat hududida *T. h. horsfieldii* (Gray, 1844) va *T. h. bogdanovi* (Chkhikvadze, 2008) kenja tur vakillariga morfologik jihatdan o‘xshash individlar tarqalganligi aniqlandi (6-rasm).



4-rasm. Qashqadaryo viloyatida tarqalgan toshbaqalarning morfologik farqlari (a- 38.626572N 66.625393E 24.04.2020, b-38.862923N 64.708734E 04.05.2021, c- 38.451082N 66.134629E 07.06.2021)



5-rasm. Toshbaqa karapaksining qalqonchalari 2D joylashuv matrissasi



6-rasm. Kenja turlar bo'yicha namunalarning morfologik taqsimlanishi

4.2. Qashqadaryo viloyati sudralib yuruvchilarining ahamiyati va hozirgi holati. Qashqadaryo viloyatida tarqalgan sudralib yuruvchilar iqtisodiy va meditsinada ahamiyatga ega 21 turi xalq tabobatida, ko'ngil ochar vosita, aksessuar va uy hayvoni sifatida va inson iste'molida foydalanilishi aniqlandi. Shuningdek aholi turar joylarida tarqalishga moslashgan gekkonlar oilasi vakillari hasharotlarni (jumladan pashshalar, chivinlar, suvaraklar v.b.) son jihatdan qisman bo'lsada cheklash orqali kasallik tashuvchi hashoarotlarga qarshi kurashda ma'lum darajada ahamiyatiga ega.

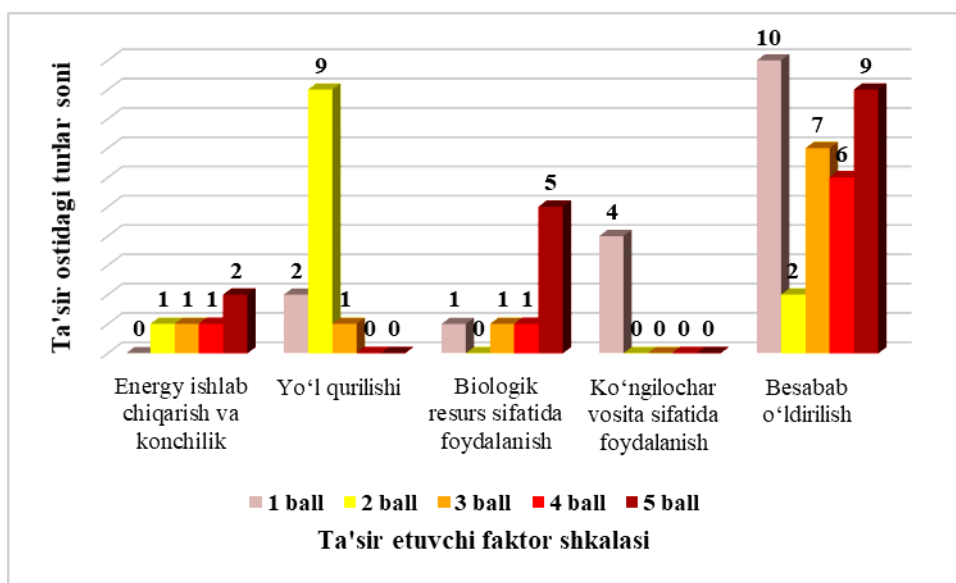
**Qashqadaryo viloyatida tarqalgan ba'zi sudralib yuruvchilarning
foydalanilishi**

No	Tur nomi	Iqtisodiy ahamiyatga ega turlar	Tibbiyotda (zadob olishda) ahamiyatga ega turlar	Tabobatda foydalaniladigan turlar	Ko'ngil ochar vosita, akssissuar va uy hayvoni sifatida foydalaniladigan turlar	Inson istemolida foydalaniladigan turlar
1	<i>T. horsfieldii</i>					
2	<i>Ph. helioscopus</i>					
3	<i>Ph. interscapularis</i>					
4	<i>Ph. mystaceus</i>					
5	<i>P. lehmanni</i>					
6	<i>T. sanguinolentus</i>					
7	<i>T. fedtschenkoi</i>					
8	<i>T. scincus</i>					
9	<i>E. grammica</i>					
10	<i>E. velox</i>					
11	<i>E. schneideri</i>					
12	<i>V. griseus</i>					
13	<i>P. apodus</i>					
14	<i>E. tataricus</i>					
15	<i>H. ravergeri</i>					
16	<i>E. dione</i>					
17	<i>N. tessellata</i>					
18	<i>N. oxiana</i>					
19	<i>E. carinatus</i>					
20	<i>M. lebetinus</i>					
21	<i>G. caraganus</i>					

(Izoh 1.: ■ -ahamiyat ega turlar, ■ -foydalanish yo'nalishi holatiga salbiy ta'sir etuvchi va + -foydalanish yo'nalishi holatiga qisman salbiy ta'sir etadigan turlar.)

Tadqiqotlar natijasida viloyat hududida tarqalgan sudralib yuruvchilarga hozirda ta'sir etayotgan antropogen omillar o'rganilib chiqildi. Natijada sudralib yuruvchilarga bevosita va bilvosita holatda aholi yashash hududining kengayishi, qishloq xo'jaligi va suv xo'jaligi hududlarining o'zlashtirilishi, energiya ishlab chiqarish va konchilik, yo'l qurilishi, biologik resurs sifatida turlardan foydalanish,

ko'ngilochar vosita sifatida turlardan foydalanish va besabab o'ldirilish omillari ta'sir etishi aniqlandi va 5 balli shkalada baholanib tahlil qilindi. Qashqadaryo viloyati sudralib yuruvchilarining ahamiyati va hozirgi holatidan kelib chiqib qo'riqlanadigan va alohida muhofazaga olingan hududlarni kengaytirish, o'zlashtirilayotgan yerlarni boshqarish, turlar sonini boshqarish va ma'lum turlarni pitomniklarda ko'paytirish usullarini ishlab chiqish, aholining sudralib yuruvchilar bilan munosabatini shakllantirish, turlardan foydalanishni qonuniy tartibga solish orqali noyob va kamayib borayotgan sudralib yuruvchilarning hozirgi holatini yaxshilanishi xulosa qilindi (7-rasm).



7-rasm. Sudralib yuruvchilarga ta'sir etayotgan antropogen omillar

XULOSALAR

“Qashqadaryo viloyati sudralib yuruvchilarining faunasi, ekologiyasi va ahamiyati” mavzusidagi biologiya fanlari bo'yicha falsafa doktori (PhD) dissertatsiyasi bo'yicha olib borilgan tadqiqotlar natijasida quyidagi xulosalar taqdim etildi:

1. Qashqadaryo viloyati sudralib yuruvchilari 2 turkum, (Testudines, Squamata) 12 oila (Testudinidae, Agamidae, Gekkonidae, Lacertidae, Scincidae, Varanidae, Anguidae, Boidae, Colubridae, Psammophiidae, Elapidae, Viperidae) va 23 urug'ga mansub 35 turdan tashkil topgan. Jumladan, Qashqadaryo viloyat faunasida *E. nigrocellata* turi ilk bor qayt etildi.

2. *E. velox* (populyatsiya zichligi 0.84 ± 0.05 ind/ga) cho'l va adir biogeotsenozlari dominant turi *P. apodus* (populyatsiya zichligi 1.39 ± 0.271 ind/ga) adir biogeotsenozi dominant turi va *T. fedtschenkoi* (populyatsiya zichligi 0.732 ± 0.03 ind/ga) tog' biogeotsenozi dominant turi sifatida qayt etildi. Shuningdek, Qashqadaryo viloyatida son jihatdan eng kam uchraydigan turlar sifatida *E. nigrocellata*, *P. karelini*, *E. carinatus*, *L. striatus* va *G. caraganus* qayt etildi.

3. Biotoplar bo'yicha fauna farqlari beta xilma-xillik asosida Cho'l A va Cho'l A1 hududlar faunasi bo'lib 7%, Adir B2 va Adir B3 hududlar 9 %, Fothill B2 va Tog' C hududlar 16%, Fothill B3 va Tog' C hududlar 23%, Cho'l A va Cho'l A2 hududlar 22% farqlarga egadir.

4. Qorong'i xilma-xillik tahliliga ko'ra Qashqadaryo viloyatida *L. ridgewayi*, Cho'l A, Cho'l A1 Adir B, Adir B1 va Tog' C hududlarda, *E. arguta* Cho'l A4 va Adir B3 hududlarda, *S. diadema* Cho'l A, Cho'l A1, Adir B, Adir B1, va Tog' C hududlarda va *X. vermicularis* Adir B1, Tog' C va Tog' C1 hududlarda uchrashi mumkinligi aniqlandi.

5. Cho'l biogeotsenozining senozlari ya'ni butazorlari va yarim butazorlarida — 25 tur, ochiq qumli maydonlarida — 7 tur, to'qaylarida — 27 tur, adir biogeotsenozining suv ayrilishlarida va qiyaliklarida — 13 tur, efemer va efemeroid o'tloqlarida — 22 tur, butazorlarida — 28 tur, tog' biogeotsenozining archazorlar — 12 tur, qiyalik(jarlik) va suv ayrilishlarida — 18 tur va yaylovlarida — 10 tur shuningdek sun'iy ekotizimlarda va ularning atrofida — 23 tur, sudralib yuruvchilar uchrashi va 5 tur sudralib yuruvchilar namlik talabchanligi aniqlandi.

6. Qashqadaryo viloyat hududida *T. h. horsfieldii* va *T. h. bogdanovi* kenja tur vakillariga morfologik jihatdan o'xshash individlar tarqalgan bo'lib ular 5 ta arealda taqsimlanganligi aniqlandi.

7. Qashqadaryo viloyatda tarqalgan sudralib yuruvchilarining 21 turlaridan zardob olishda, xalq tabobatda, inson iste'molida va ko'ngil ochar vosita, aksessuar va uy hayvoni sifatida foydalanilishi aniqlandi.

8. Qashqadaryo viloyati hududidagi o'zlashtirilayotgan yerlarni maqsadli va yo'naltirilgan holda, ekologik ta'sir doirasi asosida boshqarish — 30 turning, turlar sonini boshqarish orqali ma'lum turlarni pitomniklarda ko'paytirish va tabiiy muhitga yillik reja tartibida qo'yib yuborish usullarini ishlab chiqish — 6 turlarning holatiga ijobiy ta'sir qilishi aniqlandi.

AMALIY TAVSIYALAR

Qashqadaryo viloyati sudralib yuruvchilarni muhofaza etishda ularni limitlash omillar va ushbu omillarni to'xtatishga e'tibor qaratish maqsadga muvofiqdir. Antropogen omillarni kelib chiqqan holda Qashqadaryo viloyati sudralib yuruvchilarini muhofaza qilishda quyidagi chora-tadbirlarni tavsiya etildi.

-viloyat tabiiy landshaftlarida aholi turar joylari barpo etish, qishloq va suv xo'jaligi maydonlari va inshootlari barpo etishda obyektlarning turlarga ta'sir darajasini belgilovchi ekspert xulosasini olishni qonuniylashtirish nizomlarini qayta shakllantirish.

-neft va gaz qazib olish inshootlari qurilishdan oldin hududda mavjud *Ph. mystaceus*, *E. grammica* va *M. lebetinus* turlar vakillarini imkon darajasida boshqa mos yashash muhitiga ko'chirish.

-biologik resurs sifatida foydalaniladigan hozirda brakonyerlik tazyiqida bo'lgan 8 tur sudralib yuruvchilar noqonuniy ovlanishini nazoratga olish.

-mahalliy aholi ongida sudralib yuruvchilarga bo'lgan dunyo qarashni o'zgartirish va bunda ommaviy axborot vositalaridan foydalanish hamda hududiy

tushuntirish ishlari olib borish.

-mas'ul tashkilotlar tomonidan monitoring o'tkazish va 5 yillik monitoring natijasida limitlash omillari dinamikasini statistik tahlil natijasini e'lon qilib borish.

-qonuniy tartibda pitomniklar tashkil etishni rag'batlantirish va yillik reja asosida tabiatga noyob tur vakillarini ko'paytirib qo'yib yuborish holatini nazorat qilish.

-sudralib yuruvchilarning turlarini pitomniklarda ko'paytirish va olingan nasllarni tabiatga qo'yib yuborishga qaratilgan volontyorlar asosidagi jamoa tashkilotlarini tuzish.

**SCIENTIFIC COUNCIL DSc.02/30.12.2019.V.52.01 ON AWARD OF
SCIENTIFIC DEGREES AT THE INSTITUTE OF ZOOLOGY**

NATIONAL UNIVERSITY OF UZBEKISTAN

YANGIBOYEV ELMUROD CHOESHANBIYEVICH

**FAUNA, ECOLOGY AND IMPORTANCE OF REPTILES OF THE
KASHKADARYA REGION**

03.00.06 – Zoology

**DISSERTATION ABSTRACT FOR THE DOCTOR OF PHILOSOPHY (PhD)
ON BIOLOGICAL SCIENCES**

Tashkent – 2024

The title of the doctoral dissertation (PhD) has been registered by the Supreme Attestation Commission at the Cabinet of Ministers of the Republic of Uzbekistan with registration numbers of B2021.3.PhD/B643

The dissertation has been carried out at the National university of Uzbekistan.

The abstract of the dissertation is posted in three languages (Uzbek, English, Russian (resume)) on the webpage of the Scientific Council (www.izooology.uz) and on the website of “ZiyoNET” information educational portal (www.ziyo.net).

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The defense of the dissertation will take place on «12» june 2024 at 10⁰⁰ at the meeting of the Scientific council DSc.02/30.12.2019.V.52.01 in the Institute of zoology (Address: 232b Bogishamol Str., Tashkent, 100053, Uzbekiston, Conference hall of the Institute of Zoology. Tel: (+99871) 289-04-65; fax: (+99871) 289-10-60; E-mail: zoology@academy.uz).

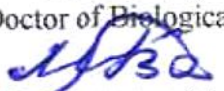
The dissertation can be looked through in the Information Resource Center of the Institute of zoology (registration under №1716-AR). Address: 232b, Bogishamol str. Tashkent. Tel.: (+99871) 289-04-65. fax: (+99871) 289-10-60.

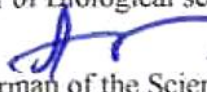
Abstract of the dissertation sent out on «30» may 2024.

(Protocol at the register №3 dated «30» may 2024).




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INTRODUCTION(abstract to the dissertation of Doctor of Philosophy (PhD))

Relevance and necessity of the dissertation topic. Today, due to the rapid increase in the number of people worldwide, the expansion of the area of the territories used for various economic purposes, the changes in the infrastructure of the places as a result of the construction of residential complexes and production facilities, the development of the oil and gas and other fossil industries hurts the diversity of reptiles. In particular, the destruction of natural landscapes has negative consequences, such as the reduction of habitats of reptiles, the reduction of their numbers, and the extinction of vulnerable species. In order to preserve reptiles, to assess the state of their populations, and to determine their trends of change, to develop measures for the protection of rare and endangered species is of great scientific and practical importance.

In the world, research are being conducted on scientific studying the diversity of reptiles, determining their distribution in natural and anthropogenic landscapes under the influence of various factors, and on vulnerable and endangered species. In this regard, special attention is paid to studying reptile fauna, identifying the modern distribution features in ecosystems, and developing and preserving conservation measures, and ways of rational use of reptiles as bioresources.

In our republic, special attention is paid to the preservation of the environment and biological diversity, as well as to ensuring the stability of the ecosystem. In this regard, measures were developed, including ensuring the stability of natural ecosystems and conservation of rare and endangered species. In particular, in the strategy¹ for the preservation of biological diversity in the Republic of Uzbekistan for the period of 2019-2028, "...to ensure the preservation and sustainable use of biological diversity, the development and expansion of protected natural areas, the reduction of the rate of degradation of natural ecological systems, the restoration of rare and endangered species of animals and plants" tasks are defined. Based on these tasks, determine the biodiversity of the fauna of reptiles of the Kashkadarya region, assess the influence of environmental factors on their distribution, determine the reaction of reptiles to a new environment, the impact of human activities on reptiles, and develop measures to preserve rare, endemic and needs conservation species, holds scientific and practical significance.

This research work serves to a certain extent in the implementation of the tasks defined in the Decrees of the President of the Republic of Uzbekistan dated October 30, 2019, No. PF-5863 "On Approval of the Concept of Environmental Protection of the Republic of Uzbekistan until 2030", dated January 28, 2022, No. PF-60 "on the Development Strategy of New Uzbekistan for the period of 2022-2026", Resolutions of the Cabinet of Ministers of the Republic of Uzbekistan dated November 7, 2018 No. 914 "on Maintenance of State recording, accounting of volume of use and State Cadastre of objects of Fauna and Flora", dated September

¹ Resolution of the Cabinet of Ministers of the Republic of Uzbekistan, No. 484 dated 11.06.2019 "On approval of the strategy for the preservation of biological diversity in the Republic of Uzbekistan for the period of 2019-2028"

5, 2019 No. 737 "on Improving the Environmental Monitoring System in the Republic of Uzbekistan", and in other regulatory-legal documents related to this activity.

Compliance of the research with the priority directions of the development of science and technology of the republic. This research was carried out in compliance with V the priority directions of the development of science and technology of the republic "Agriculture, biotechnology, ecology and environmental conservation".

Level of study of the problem. It can be seen as an example of scientific research conducted in the world, can be cited scientific works by I.N. Laurenti (1768), A.M. Dumeril, and G. Bibron (1837-1854), A.E. Brem (1869), K.P. Schmidt (1922), R.F. Mertens (1929), Y. Hongue (2014), P. Alessandro (2014), and R. N. Jendrian (2020).

Of these, scientific research in the CIS countries P.S. Pallas (1771), A.A. Shtraux and A.M. Nikolskiy (1895-1905), P.V. Terentev and S.A. Chernov (1930-1954), I.D. Yakovleva (1964), N.N. Sherbak (1966), A.G. Bannikov (1977), S.A. Said-Aliev (1979), Ch. Ataev (1985), T.S. Sattarov (1993), N.B. Ananeva et al., (2004), K.D. Milto (2007), A.N. Gneteva (2020), and A. A. Kidovlar (2022)

The study of reptiles in the territory of our republic began mainly in the 50s of the last century. Examples of the first works are the researches and scientific literature of T.Z. Zohidov (1938, 1971) and O.P. Bogdanov (1961) who the well-known zoologists should be highlighted. In addition, by scientist as E.V. Vashetko (1970-2020), T. Yadgarov (1973), Z.Y. Kamalova (1978), D.A. Bondarenko (1994), Y.A. Chikin (2001), E.A. Peregontsev (2017) and F.Q. Jumayev (2022) conducted several researches.

In order to study reptiles, the research conducted in the Kashkadarya region was mainly carried out by R.N. Mecklenburshev (1948) V.P. Karpenko (1963-1965), and D.A. Bondarenko (1994).

However, these research works cannot provide complete information about the species composition and ecological characteristics of reptiles of the Kashkadarya region. Accordingly, it is of great scientific and practical importance to determine the species composition of reptiles, to develop protection measures, and to reveal their ecological features.

The connection of the research with the research plans of the higher educational institution where the dissertation was completed. The dissertation research was carried out under the scientific research plan of the Department of Zoology of the National University of Uzbekistan within the framework of the research program on the topic "Study and conservation of the biodiversity of the animal world of Uzbekistan" (2020-2022).

The purpose of the study: Determining the species composition and ecological characteristics of reptiles distributed in the Kashkadarya region, developing conservation measures for rare and endangered species.

Research tasks: Based on the above purposes, we aimed to perform the following tasks.

Determining the species composition of reptiles distributed in selected areas

of the Kashkadarya region and assessing the fauna of biotopes

Study the ecological status of regional reptiles and determine the impact of environmental changes.

Study of the state of anthropogenic effects on reptiles.

Study the importance of reptiles and develop an action plan for the protection of rare and endangered species.

As a research object are chosen reptiles distributed in the Kashkadarya region.

The subject of the research is the modern composition, distribution, ecological characteristics, number, impact of human activity, and improvement of species conservation measures of reptile fauna distributed in the Kashkadarya region.

Research methods: Zoological, herpetological, ecological, biometric, geometric morphology, and statistical methods were used during the research.

The scientific novelties of the research are as follows:

The modern state of reptiles of the Kashkadarya region was analyzed, and 35 species belonging to 23 genus, 12 families, and 2 orders were identified;

from reptiles - the species *Eremias nigrocellata* was found for the first time in the territory of the Kashkadarya region;

according to the distribution of reptiles in different biotopes of the Kashkadarya region, were determined as the dominant species of desert and foothill biogeocenosis is *Eremias velox*, the dominant species of foothill biogeocenosis is *Pseudopus apodus*, and the dominant species of mountain biogeocenosis is *Tenuidactylus fedtschenkoi*;

Eremias nigrocellata, *Platycephalus karelini*, *Echis carinatus*, *Lycodon striatus*, and *Gloydius caraganus* have been proven to be decreasing species in the Kashkadarya region;

mathematical models (matrices) of species belonging to Testudinidae, Lacertidae, Colubridae, and Psammophiidae families were created based on the morphological-geometric characteristics of reptiles using modern software;

the negative impact of the illegal use were revealed on the state of the species which distributed in territory of region, the rare and endangered *Testudo horsfieldii*, *Varanus griseus*, *Eryx tataricus*, and *Naja oxiana*;

it has been proven that individuals morphologically similar to representatives of subspecies *Testudo horsfieldii horsfieldii* and *Testudo horsfieldii bogdanovi* are distributed in the territory of the Kashkadarya region.

The practical results of the research are as follows:

as a result of the research, the current ecological condition of the reptiles of the Kashkadarya region was determined and changes in them were studied through modern programs, a plan of measures aimed at reducing the direct and indirect impact of abiotic and anthropogenic factors on the species was developed. *Phrynocephalus mystaceus*, *Eremias grammica* and *Macrovipera lebetinus* species have been determined should be relocated to other suitable habitats before the construction of oil and gas production facilities;

21 species of reptiles have been found to be used for extracting serum, in

folk medicine, for human consumption, and as entertainment, accessories, and pets; 11,350 individuals of reptiles were counted, and a cadastre of 34 species belonging to 2 orders and 12 families was developed;

The reliability of the research results is based on the compatibility of the obtained experimental results based on the zoological and herpetological methods and approaches used in the research with the theoretical data and statistically analyzed morphometric data based on modern programs (Past 4.10; Microsoft Office Excel, 2010; XLSTAT 2010, Morpho J; TPS until 64; TPS dig264;), the publication of the practical results of the dissertation published on foreign journals and the implemented of the developed recommendations.

Scientific and practical importance of research results. The scientific significance of the research results is explained by the fact that the species composition of reptiles in different biotopes of the Kashkadarya region was determined, the species composition was morphologically analyzed, the distribution characteristics were described, and the impact of anthropogenic changes occurring in the region on the reptile fauna was revealed.

The practical significance of the research results is served to maintain the cadastre of reptiles, to determine the distribution areas of rare and endangered species and to develop conservation measures, to assess the species composition of the reptile fauna using modern methods.

Implementation of research results. Based on the scientific results obtained on the fauna, ecology and importance of reptiles of Kashkadarya region:

27 samples of reptiles distributed in the Kashkadarya region, consisting of 22 species belonging to 16 genus, were included in the unique object of the leading "Zoological collection" in the republic (Reference No. 4/1255-2292 of the Academy of Sciences of the Republic of Uzbekistan dated September 19, 2022). As a result, samples enriched the fund of reptile species in the Kashkadarya region, it possible to assess the modern state of their population distribution and prepare cadastral data.

The recommendations developed in connection with determining the diversity of reptile fauna in the Kashkadarya region, assessing its current state, and creating a cadastre were implemented practice in the Kashkadarya regional department of the State Committee for Ecology and Environmental Conservation of the Republic of Uzbekistan. (Reference No. 03-02/7-2224 dated October 13, 2022, of the State Committee for Ecology and Environmental Conservation of the Republic of Uzbekistan). As a result, it made it possible to assess the modern state of the distribution of populations of reptiles in the Kashkadarya region, develop conservation measures, and prepare cadastral data.

Approval of research results. The results of this research were discussed at 3 international and 3 national scientific-practical conferences.

Publication of research results. A total of 11 scientific works were published on the topic of the dissertation, of which 5 articles were published in scientific publications recommended for publication of the main scientific results of doctoral dissertations of the Supreme Attestation Commission at the Ministry of

higher education, science and innovations of the Republic of Uzbekistan, including 1 in the republic and 4 in foreign scientific journals.

The structure and volume of the dissertation. The dissertation consists of an introduction, 4 chapters, conclusions, practical recommendations, a list of references, and appendices. The volume of the dissertation is 111 pages.

THE MAIN CONTENT OF THE DISSERTATION

In the introduction, the relevance and necessity of the topic are based, the compatibility of the research with the priority directions of the development of science and technology of the republic is shown, the level of research of the problem is highlighted, the scientific and practical results of the research are described, the scientific and practical significance of the obtained results is revealed, the results of the research are introduction, published works and information on the structure of the dissertation.

The first chapter of the dissertation entitled “**Brief history of the research conducted on the study of reptiles**” contains information on the description of the research conducted on the study of reptile species in Uzbekistan, including Kashkadarya. Also, materials related to species composition, distribution, reproduction, nutrition, and importance of reptiles in the Kashkadarya region were analyzed. It was determined that the available materials are not sufficient to draw conclusions about the current status and ecological characteristics of reptiles.

In the second chapter of the dissertation entitled "Natural conditions of the research area, research materials, and methods", the physical-geographical condition of the research area and the methods of obtaining materials are shown.

During the research, 11 research areas were selected from different places in the Kashkadarya region (Tab. 1).

Table-1

The location of selected areas of the Kashkadarya region

Tanlangan hudud nomi	Number of transects	Length of transects (km)	Coordinates (DD)	Above of Sea level (m)
Desert A	15/12	54.5/23.4	38,87823N 64,6523055E	260-350
Desert A1	6/6	42.6/18.8	39,4093125N 65,4394043E	300-350
Desert A2	3/5	28.4/9.7	38,7038689N 65,6629283E	350-370
Desert A3	3/4	23.2/10.7	38,9175431N 65,8450074E	400-460
Desert A4	4/4	35.1/14.3	39,0333184N 66,488481E	470-500
Foothill B	3/3	20.8/8.5	38,3516947N 66,2818806E	760-830
Foothill B1	18/21	44.9/18.5	38,5441079N 66,5810921E	850-1200
Foothill B2	7/6	29.9/8.2	38,9022396N 67,121346E	1000-1500
Foothill B3	4/4	24/9.8	39,2523159N 66,8198763E	1000-1300
Mountain C	13/9	39.5/17.1	38,4874046N 66,861257E	1800-2200
MountainC1	7/3	28.6/8.1	38,7078356N 67,2152729E	2300-2700

In the field research, by transect and stational methods were mainly used. In the selected areas, 83 diurnal and 77 nocturnal transects with a total length of 516.1 km (369 km during the day and 147.1 km at night) were carried out.

Transect: Transects were marked and coordinates were obtained using Google Earth Pro software. The transect: are two types of, according to the method of S.T. Buckland (Buckland et al., 2001), long transect and short transect were distinguished.

The following equation FMP (Formozov-Malyshev-Pereleshin) (Formozov, 1932, Malyshev, 1936, Pereleshin, 1950) was mainly used to determine the population density in Transect (Eq. 1.)

$$D = \frac{\pi S}{2 dm} \text{ yoki } D = \frac{1,57S}{dm} \quad (1)$$

D-animal population density, S-number of road intersections; m-transect length (km); d — the average length of daily travel of animals (km).

In determining the age and sex of reptiles (Gibbons, 1976). (Gibbons, 1972, Fitch and Henderson, 1977), (Blandhard and Finster, 1933, Schaefer, 1934) and probing (Fitch, 1987) methods (in snakes) have been used.

The scales of reptiles have a species-specific arrangement. From the location geometry of these scales, signs are mathematically modeled on TPS64until and TPS264Dig programs using the method of Antigoni Kaliontzopoulou (2017).

When determining the diversity of reptiles in biotopes, alpha (a), beta (b), and gamma (g) diversity was calculated using the method of R. H. Whittaker (1960).

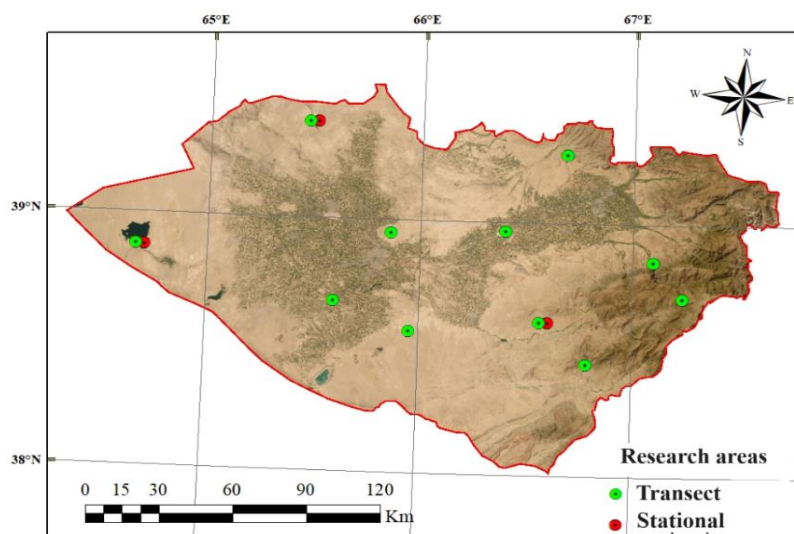


Figure 1. the map of the Kashkadarya region

In the third chapter of the dissertation entitled "**Species composition and features of formation of the reptile fauna in the biotopes of the Kashkadarya region**" studied various indicators of the reptile fauna.

3.1. Species composition and diversity indicators of the reptile fauna in the biotopes of the Kashkadarya region. 35 species of reptiles were recorded in 11 selected regions of the Kashkadarya region, and were determined that they belong to 2 orders, 12 families, and 23 genus (Table 2).

During our research, a total of 11350 reptiles were counted across the territory of the Kashkadarya region. When calculated for the whole region, the reptile species richness (gamma diversity) is equal to $\gamma=35$ species and the species richness indicator is equal to 3.533 according to the Margalef index, and diversity

indicators are equal to 2.935 according to the Shannon–Weaver index, 2.924 according to the Brillouin index. the relative diversity index is equal to 0.8323.

Table-2

Analysis of species composition of reptiles of Kashkadarya region

Family	Genus	Species
Testudinidae	<i>Testudo</i>	<i>Testudo horsfieldii</i> (Gray, 1844)
Agamidae	<i>Phrynocephalus</i>	<i>Phrynocephalus helioscopus</i> (Pallas, 1771)
		<i>Phrynocephalus interscapularis</i> (Lichtenstein, 1856)
		<i>Phrynocephalus mystaceus</i> (Pallas, 1776)
	<i>Paralaudakia</i>	<i>Paralaudakia bochariensis</i> (Nikolsky, 1897)
		<i>Paralaudakia lehmanni</i> (Nikolsky, 1896)
	<i>Trapelus</i>	<i>Trapelus sanguinolentus</i> (Pallas, 1814)
Gekkonidae	<i>Crossobamon</i>	<i>Crossobamon eversmanni</i> (Wiegmann, 1834)
	<i>Tenuidactylus</i>	<i>Tenuidactylus caspius</i> (Eichwald, 1831)
		<i>Tenuidactylus fedtschenkoi</i> (Strauch, 1887)
		<i>Tenuidactylus bogdanovi</i> (Nazarov, Poyarkov, 2013)
	<i>Teratoscincus</i>	<i>Teratoscincus scincus</i> (Schlegel, 1858)
Lacertidae	<i>Eremias</i>	<i>Eremias grammica</i> (Lichtenstein, 1823)
		<i>Eremias intermedia</i> (Strauch, 1976)
		<i>Eremias lineolata</i> (Nikolsky, 1897)
		<i>Eremias nigrocellata</i> (Nikolsky, 1896)
		<i>Eremias velox</i> (Pallas, 1771)
		<i>Eremias regeli</i> (Bedriaga, 1905)
Scincidae	<i>Ablepharus</i>	<i>Ablepharus deserti</i> (Strauch, 1868)
		<i>Ablepharus pannonicus</i> (Lichtenstein, 1823)
	<i>Eumeces</i>	<i>Eumeces schneideri</i> (Daudin, 1802)
Varanidae	<i>Varanus</i>	<i>Varanus griseus</i> ssp. <i>caspius</i> (Eichwald 1831)
Anguidae	<i>Pseudopus</i>	<i>Pseudopus apodus</i> (Pallas, 1775)
Boidae	<i>Eryx</i>	<i>Eryx tataricus</i> (Lichtenstein, 1823)
Colubridae	<i>Platycephs</i>	<i>Platycephs karelini</i> (Brandt, 1838)
		<i>Platycephs rhodorhachis</i> (Jan, 1865)
	<i>Hemorrhois</i>	<i>Hemorrhois ravergeri</i> (Menetries, 1832)
	<i>Elaphe</i>	<i>Elaphe dione</i> (Pallas, 1773)
	<i>Lycodon</i>	<i>Lycodon striatus</i> ssp. <i>bicolor</i> (Nikolsky, 1903)
	<i>Natrix</i>	<i>Natrix tessellata</i> (Laurenti, 1768)
	<i>Psammophis</i>	<i>Psammophis lineolatus</i> (Brandt, 1838)
Elapidae	<i>Naja</i>	<i>Naja oxiana</i> (Eichwald, 1831)
Viperidae	<i>Echis</i>	<i>Echis carinatus</i> (Schneider, 1801)
	<i>Macrovipera</i>	<i>Macrovipera lebetinus</i> (Linnaeus, 1758)
	<i>Gloydius</i>	<i>Gloydius caraganus</i> (Eichwald, 1831)

In each area, species diversity indices were calculated by the methods of C. E. Shannon (1948), L. Brillouin (1962) and the species richness index by the method of R. Margalef (1958) and the relative diversity index by the method of E. C. Pielow (1966) (Table 3).

Desert A area has the highest biological diversity in the desert region and includes 11 families, 17 genus, and 22 species of reptiles. In the territory, the dominant species are the *E. velox* (population density 0.62 ± 0.008 ind/ha), *E. grammica* (population density 0.57 ± 0.016 ind/ha) and *E. intermedia* (population density 0.47 ± 0.012 ind/ha).

Similarly, the species *E. lineolata* and *A. deserti* are of high ecological status. In this region, the population density of *T. Caspius*, *P. karelini*, and *N. oxiana* species were determined in the low indicators.

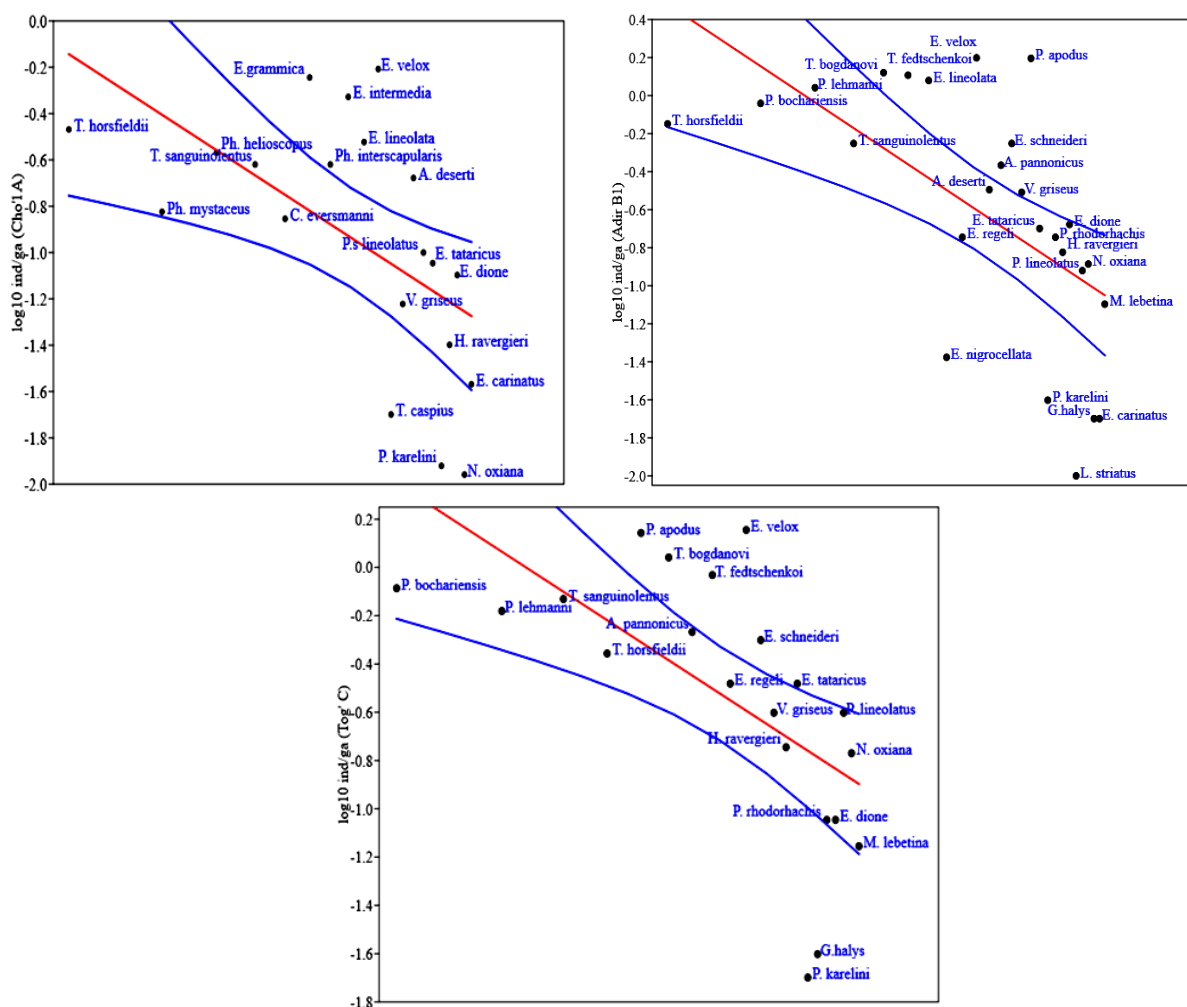


Figure 2. Distribution of species according to state regression

In the Foothill B1 area, 12 families, 19 genus, and 27 species of reptiles were recorded. The dominant species are the following: *E. velox* (population density 1.58 ± 0.072 ind/ha), *T. bogdanovi* (population density 1.52 ± 0.012 ind/ha), *T. fedtschenkoi* (population density 1.285 ± 0.053 ind/ha), *P. apodus* (population density 1.57 ± 0.0301 ind/ha).

The lowest density belongs to *E. carinatus*, *E. nigrocellata*, *P. karelini*, *G. caraganus* and *Lycodon striatus* species.

The Mountain C area is located in the mountain region at an altitude of 1800-2200 meters above sea level, In the area, and 22 species of reptiles belong to 18 genus 12 families, were recorded. The dominant species are *E. velox* (population density 1.43 ± 0.045 ind/ha) and *P. apodus* (population density 1.39 ± 0.071 ind/ha).

In addition to the dominant species, *T. fedtschenkoi* and *T. bogdanovi* species have a relatively high population density. The lowest density belongs to *P. karelini* and *G. caraganus* species.

In the general Kashkadarya region, were recorded the *E. velox* (population density 0.84 ± 0.05 ind/ha) as the dominant species of desert and foothill biogeocenoses, *P. apodus* (population density 1.39 ± 0.271 ind/ha). ha) as the dominant species of foothill biogeocenosis and *T. fedtschenkoi* (population density 0.732 ± 0.03 ind/ha) as the dominant species of mountain biogeocenosis. Also, some species have a wide habitat throughout the region, although the population density is low. These species are *H. ravergeri*, *T. sanguinolentus*, *N. tessellate*, *P. lineolatus*, *E. dione*, *P. rhodorhachis*, *P. lehmanni*, *T. horsfieldii*), which are found in at least 8 of the 11 biotopes studied.

In the Kahskadarya region, in general, the low-density indicators belong to *E. nigrocellata*, *P. karelini*, *E. carinatus*, *L. striatus* and *G. caraganus* species.

3.2. Features of formation of the reptile fauna in the biotopes of the Kashkadarya region. After determining the level of diversity, species richness, and dominant species in the biotopes, based on this information, correlation analysis on alpha diversity is performed to determine the degree of similarity of the fauna of each biotopes and to study which faunas have developed in parallel or jointly. The Pearson coefficient (ρ) value was calculated from the results of the analysis, and the fauna of the biotopes was shown to be similar and different by this value.

During our research, the beta, zeta, and dark diversity of the biotope fauna of the region was determined. based on the method of Partel, M., Szava-Kovacs, R., and Zobel, M. (2011) according to Dark diversity analysis were determined that can be found Derafshi Snake (*Lytrohynchus ridgewayi* Boulenger, 1887) in Desert A, Desert A1, Foothill B, Foothill B1 and Mountain C areas, Steppe-runner (*Eremias arguta* Pallas, 1773) in Desert A4 and Adir B3 regions, Clifford's Diadem Snake (*Spalerosophis diadema* Schlegel, 1837) in Desert A, Desert A1, Adir B, Adir B1, and Mountain C areas, and Eurasian Blind Snake (*Xerotyphlops vermicularis* Merrem, 1820) in Foothill B1, Mountain C, and Mountain C1 areas. According to analysis, the reptile fauna of Kashkadarya region can be 39 species instead of 35 species.

Table-3

Indecators and index of reptiles of kashkadarya region

	Desert A	Desert A1	Desert A2	Desert A3	Desert A4	Foothill B	Foothill B1	Foothill B2	Foothill B3	Mountain C	Mountain C1	Total
Number of species	22	20	18	12	9	12	27	18	17	22	10	35
Individuals	1434	1113	343	585	316	313	2547	1237	578	2371	513	11350
Dominance index	0.08874	0.07794	0.1114	0.175	0.2206	0.1487	0.09544	0.1477	0.1476	0.1182	0.216	0.07679
Lower bound of dominance	0.4114	0.3133	0.3563	0.4478	0.2294	0.2330	1.2820	0.6499	0.4605	1.2210	0.3034	0.6693
Simpson index_1-D	0.9113	0.9221	0.8886	0.825	0.7794	0.8513	0.9046	0.8191	0.8524	0.8818	0.784	0.9232
Shannon–Veaver index_H	2.612	2.664	2.373	2.046	1.682	2.09	2.699	2.058	2.25	2.444	1.757	2.935
Brillouin index	2.567	2.612	2.265	1.987	1.62	1.997	2.666	2.022	2.175	2.416	1.704	2.924
Margalef index	2.888	2.709	2.398	1.883	1.216	1.914	3.433	2.107	2.517	2.703	1.601	3.533
Relative diversity _J	0.8451	0.8894	0.8764	0.7976	0.8088	0.8412	0.8101	0.7423	0.7941	0.7907	0.7329	0.8323

In the fourth chapter of the dissertation entitled “**The ecological description, distribution, and importance of reptiles of the Kashkadarya region**” studied the ecology, distribution in different environments across the region, importance, and current status of the reptiles of the region.

4.1. The ecological description and distribution of reptiles of the Kashkadarya region. The specific distribution of reptiles of the Kashkadarya region, in shrublands and semi-shrublands, open sandy areas, watersheds, slopes, forests and pastures, and agrocenosis and their surroundings of three major biogeocenoses that are Desert, Foothill, and Mountain zones, were studied (Fig 3). According to the results, the most of reptiles are distributed mainly in the shrublands, semi-shrublands, and watershed of the desert biogeocenosis and in the shrublands and plain meadows of the Adir biogeocenosis. It was recorded that 23 species of reptiles have conquered agroecosystems established in different zones. 5 species of reptiles were recorded as moisture-requirement reptiles.

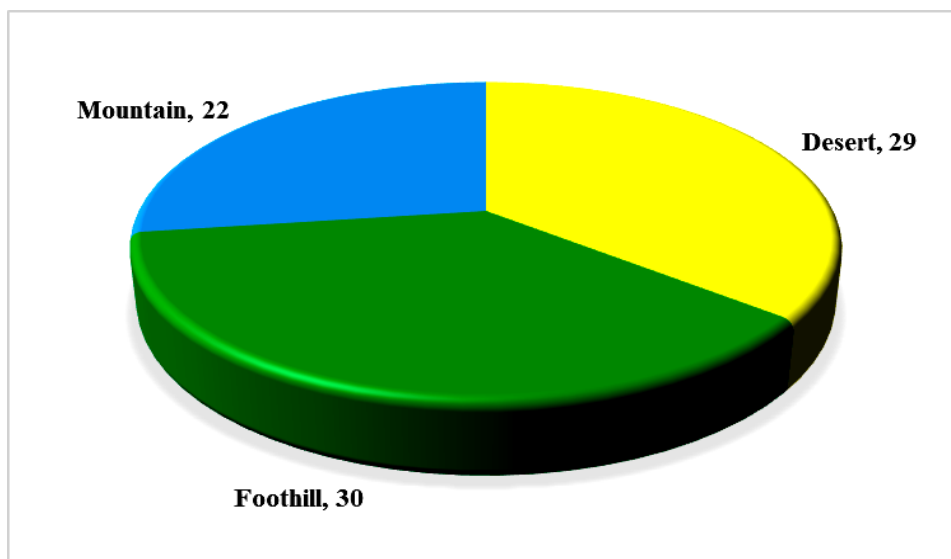


Figure 3. Distribution of reptiles in different biogeocenoses

During our research, the analysis of geometric modeling of morphological characters were carried out on populations. On geometrical modeling of the Central Asian desert tortoise were paid attention to different of the ratio of width distances of 3, 6, and 8 marginal scutes of carapace of the tortoise by observing the markers of the subspecies of tortoises presented in the Ph.D. dissertation of A.N. Gnetova (2020) intitiled "Систематика и распространение черепах рода *Agrionemys*" and 66 landmarks (marking points) were selected in the geometry of the scutes as a biometric parameter (Figures 4,5).

The samples from different biotopes and 5 holotype subspecies matrices were analyzed in Morpho J software. The analysis was carried out by gender, areals, and subspecies. No separation were observed in the analysis by gender. According to the analysis of subspecies, *T. h. horsfieldii* (Gray, 1844) and *T. h. bogdanovi* (Chkhikvadze, 2008) it were found that individuals morphologically similar to representatives of the subspecies are distributed (Figure 6).

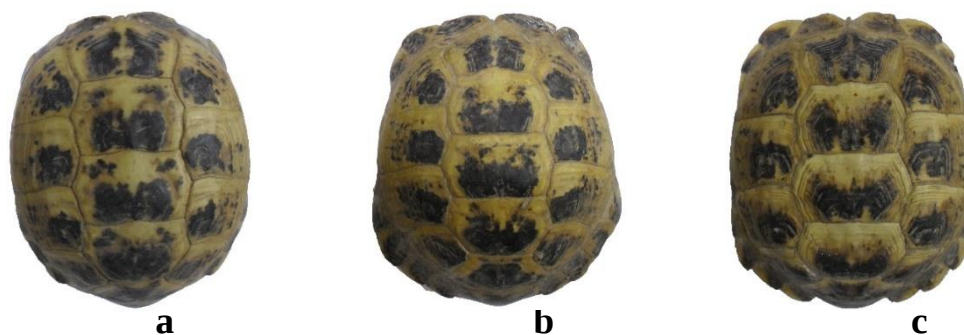


Figure 4. Morphological differences of tortoises distributed in Kashkadarya region (a-38.626572N 66.625393E 24.04.2020, b-38.862923N 64.708734E 04.05.2021, c- 38.451082N 66.134629E 07.06. 2021)

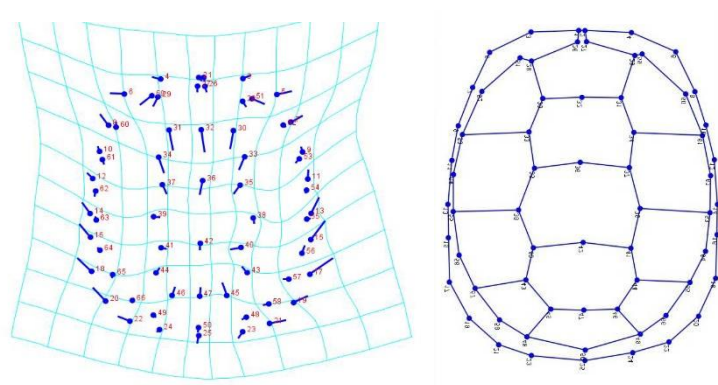


Figure 5. 2D location matrix of tortoise carapace scales

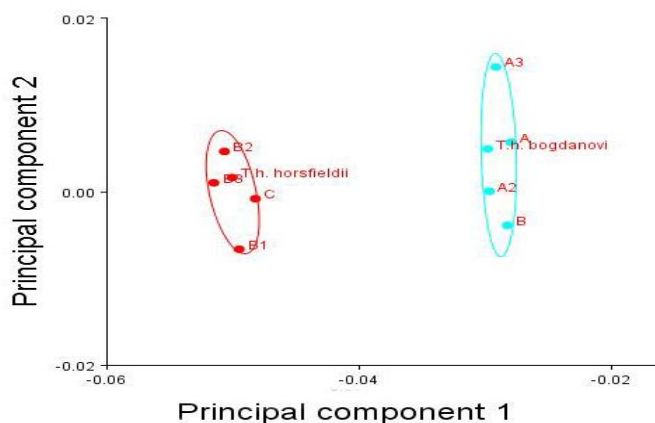


Figure 6. Morphological distribution of samples by subspecies

4.2. Importance and current status of reptiles of Kashkadarya region. Reptiles distributed in the Kashkadarya region are used in four directions (Table 3) and are important for hunting (11 species), economic (6 species) and serum extraction (4 species). Also, representatives of the gecko family, adapted to spread in residential areas, are of some importance in the fight against disease-carrying insects by limiting the number of insects (including flies, mosquitoes, roaches, etc.).

Table-4

The use directions from some reptiles distributed in the Kashkadarya region

№	Name of species	Economic importance	Importance of modern medicine	Species used on old medicine	Species used as entertainment, accessories and pets	Species used as human food
1	<i>T. horsfieldii</i>					
2	<i>Ph. helioscopus</i>					
3	<i>Ph. interscapularis</i>					
4	<i>Ph. mystaceus</i>					
5	<i>P. lehmanni</i>					
6	<i>T. sanguinolentus</i>					
7	<i>T. fedtschenkoi</i>					
8	<i>T. scincus</i>					
9	<i>E. grammica</i>					
10	<i>E. velox</i>					
11	<i>E. schneideri</i>					
12	<i>V. griseus</i>					
13	<i>P. apodus</i>					
14	<i>E. tataricus</i>					
15	<i>H. ravergeri</i>					
16	<i>E. dione</i>					
17	<i>N. tessellata</i>					
18	<i>N. oxiana</i>					
19	<i>E. carinatus</i>					
20	<i>M. lebetinus</i>					
21	<i>G. caraganus</i>					

(Exp. 1.:  - species of importance,  - species that negatively affect the state of use and  - species that partially negatively affect the state of use.)

In our research, the anthropogenic factors currently affecting the reptiles distributed in the territory of the region were studied. As a result, habitat expansion, agricultural and water management areas, energy production and mining, road construction, use of species as biological resources, use of species as entertainment things, and non-purpose killing factors were found to be affected reptiles directly and indirectly case and evaluated on a 5 scale and analyzed. Based

on the importance and current situation of the reptiles of the Kashkadarya region, by expansion of the protected and specially conserved areas, management of the developed land, management of the number of species, and development of breeding methods of certain species in terrariums, formation of the relationship of the residents with reptiles, legal regulation of use species were concluded that the current status of rare and endangered reptiles would be improved (Figure 7).

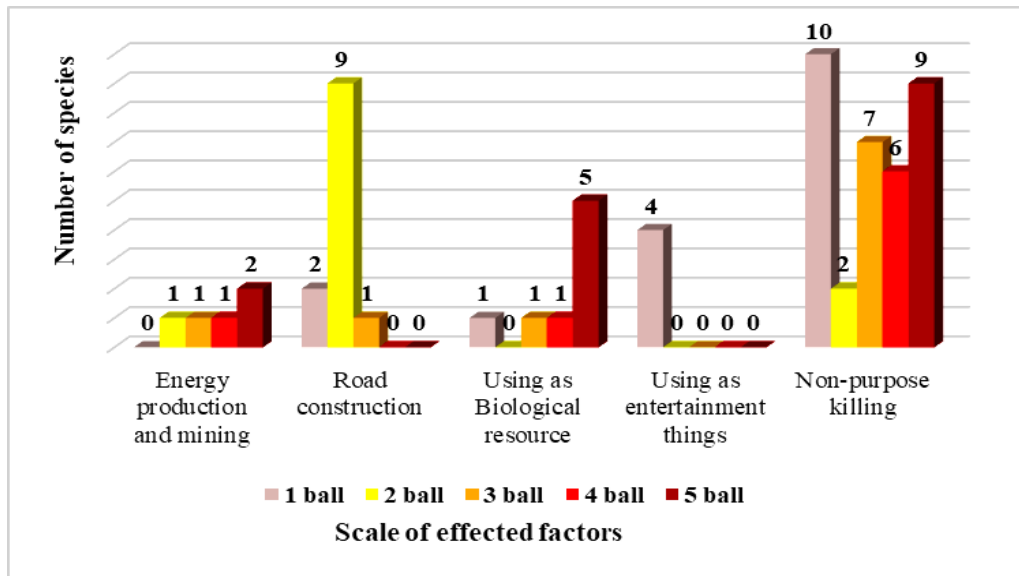


Figure 7. Anthropogenic factors affecting reptiles and conservation measures

CONCLUSIONS

As a result of the research conducted on the Doctor of Philosophy (PhD) dissertation on the topic “Fauna, ecology and importance of reptiles of the Kashkadarya region”, the following conclusions were provided:

1. Reptiles of the Kashkadarya region consist of 35 species belonging to 2 orders (Testudines, Squamata), 12 families (Testudinidae, Agamidae, Gekkonidae, Lacertidae, Scincidae, Varanidae, Anguidae, Boidae, Colubridae, Lamprophiidae, Elapidae, Viperidae) and 22 genus. Including; *E. nigrocellata* species was recorded for the first time in the fauna of the Kashkadarya region.

2. In the Kashkadarya region, were recorded *E. velox* (population density 0.84 ± 0.05 ind/ha) is the dominant species in desert and foothill biogeocenosis, *P. apodus* (population density 1.39 ± 0.271 ind/ha) is the dominant species in foothill biogeocenosis and *T. fedtschenkoi* (population density 0.732 ± 0.03 ind/ha) is the dominant species in mountain biogeocenosis Also, *E. nigrocellata*, *P. karelini*, *E. carinatus* (Schneider, 1801), *L. striatus* and *G. caraganus* were recorded the rarest species.

3. Fauna differences in biotopes based on beta diversity for Desert A and Desert A1 areas have 7%, for Foothill B2 and Adir B3 areas have 9%, for Foothill B2 and Mountain C areas have 16%, for Foothill B3 and Mountain C areas have 23% differences, Desert A and Desert A2 areas have 22% differences.

4. Based on the dark diversity analysis in the Kashkadarya region was determined that can be found Derafshi Snake (*Lytorhynchus ridgewayi* Boulenger, 1887) in Desert A, Desert A1 Foothill B, Foothill B1, and Mountain C areas, Steppe-runner (*Eremias arguta* Pallas, 1773) in Desert A4 and Adir B3 regions, Clifford's Diadem Snake (*Spalerosophis diadema* Schlegel, 1837) in Desert A, Desert A1, Adir B, Adir B1, and Mountain C areas, and Eurasian Blind Snake (*Xerotyphlops vermicularis* Merrem, 1820) in Foothill B1, Mountain C, and Mountain C1 areas.

5. 25 species in shrubs and semi-shrubs, 7 species in open sandy areas, 27 species in the river bank cenosis of desert biogeocenosis, 13 species in watersheds and slopes, 22 species in ephemeral and ephemerides meadows, 28 species in shrublands cenosis of foothill biogeocenosis, 12 species of coniferous forest, 18 species of slopes and watersheds, 10 species of pastures cenosis of mountain biogeocenosis, 23 species of reptiles in agroocenosis were determined to found and 5 species were identified as having a specific requirement for moisture.

6. Individuals morphologically similar to representatives of subspecies T.h. *horsfieldii* and T.h. *bogdanovi* are distributed in the Kashkadarya region was found, and was determined that they are distributed in 5 areas.

7. 21 species of reptiles distributed in Kashkadarya region were found important on extracting serum, in old medicine, and are used for human consumption, entertainment, accessories and pets.

8. It was determined that the purposeful and directed management of the developed lands in the Kashkadarya region, based on the scope of ecological influence - 30 species, by managing the number of species, developing methods of breeding certain species in nurseries, and releasing them into the natural environment according to an annual plan - has a positive effect on the condition of 6 species.

PRACTICAL RECOMMENDATIONS

In the conservation of reptiles of Kashkadarya region, it is appropriate to pay attention to their limiting factors and to stop these factors. Based on the anthropogenic factors, we recommend the following measures for the conservation of reptiles of Kashkadarya region.

- reshaping regulations on the legalization of obtaining an expert opinion determining the level of impact of objects on species in the construction of residential areas, agricultural and water management areas, and structures in the natural landscapes of the region.

- oil and gas production facilities in the area before construction, as far as possible, *Ph. mystaceus* (Pallas, 1776), *E. grammica* (Lichtenstein, 1823) and *M. lebetinus* (Linnaeus, 1758) species transfer to other suitable habitats.

- to control the illegal hunting of 8 species of reptiles that are used as biological resources and are currently under poaching.

- change the opinion that is in the minds of the local population to reptiles, using mass media and regional outreach.

- conducting monitoring by responsible organizations and announcing the

results of the statistical analysis of the dynamics of limiting factors as a result of 5-year monitoring.

- to encourage the establishment of terrariums legally and to control the situation of releasing representatives of rare species into nature based on the annual plan.

- the creation of community organizations based on volunteers aimed at breeding reptile species in terrariums and releasing the obtained offspring into the wild.

**НАУЧНЫЙ СОВЕТ DSc.02/30.12.2019.B.52.01 ПО ПРИСУЖДЕНИЮ
УЧЕНЫХ СТЕПЕНЕЙ ПРИ ИНСТИТУТЕ ЗООЛОГИИ**

НАЦИОНАЛЬНЫЙ УНИВЕРСИТЕТ УЗБЕКИСТАНА

ЯНГИБОЕВ ЭЛМУРОД ЧОРШАНБИЕВИЧ

**ФАУНА, ЭКОЛОГИЯ И ЗНАЧЕНИЕ ПРЕСМЫКАЮЩИХСЯ
КАШКАДАРИНСКОЙ ОБЛАСТИ**

03.00.06 – Зоология

**АВТОРЕФЕРАТ ДИССЕРТАЦИИ ДОКТОРА ФИЛОСОФИИ (PhD)
ПО БИОЛОГИЧЕСКИМ НАУКАМ**

Ташкент – 2024

Тема диссертации доктора философии (PhD) по биологическим наукам зарегистрирована в Высшей аттестационной комиссии при Кабинете Министров Республики Узбекистан за номером B2021.3.PhD/B643

Диссертация выполнена в Национальном университете Узбекистана.

Автореферат диссертации на трех языках (узбекском, английском и русском (резюме)) размещен на веб-странице Научного совета (www.izoology.uz) и в Информационно-образовательном портале «Ziynet» (www.ziynet.uz).

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Ведущая организация:

Бухарский государственный университет

Защита диссертации состоится «12» июня 2024 г. в 10⁰⁰ часов на заседании Научного совета DSc.02/30.12.2019.B.52.01 при Институте зоологии (Адрес: 100053, г.Ташкент, ул. Боғишамол, дом 2326. Актовый зал Института зоологии. Тел.: (+99871) 289-04-65; факс: (+99871) 289-10-60; Email: zoology@academy.uz)

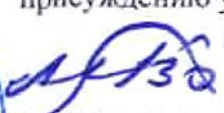
С диссертацией можно ознакомиться в Информационно-ресурсном центре Института зоологии (зарегистрировано за №1716-AP). Адрес: 100053, г.Ташкент, ул. Боғишамол, дом 2326. Тел.: (+99871) 289-04-65.

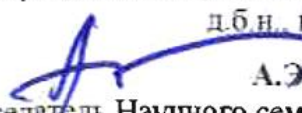
Автореферат диссертации разослан «30» мая 2024 года.

(реестр протокола рассылки №3 «30» мая 2024 года)




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ВВЕДЕНИЕ (аннотация к диссертации доктора философии (PhD))

Целью исследования: является определение видового состава и экологических особенностей пресмыкающихся, распространенных в Кашкадарьинской области и разработка мероприятий по сохранению редких и исчезающих видов.

Объектом исследования является пресмыкающихся, распространенные в Кашкадарьинской области.

Предметом исследования являются современный состав фауны, распространение, экологические особенности, численность, антропогенное, а также совершенствование мероприятий по сохранению фауны рептилий, распространенных на территории Кашкадарьинской области.

Методы исследования: При исследованиях использовали зоологические, герпетологические, экологические, биометрические, морфолого-геометрические, статистические методы.

Научная новизна исследования заключается в следующем:

Проанализирован современный видовой состав пресмыкающихся Кашкадарьинской области и выявлено 35 видов, относящихся к 23 родам, 12 семействам и 2 отрядам;

из пресмыкающихся - вид *Eremias nigrocellata* обнаружен впервые на территории Кашкадарьинской области;

По распространению рептилий в различных биотопах Кашкадарьинской области определены доминирующий вид пустынного и предгорного биогеоценоза - *Eremias velox*, доминирующий вид предгорного биогеоценоза - *Pseudopodus apodus*, и доминирующий вид горного биогеоценоза - *Tenuidactylus fedtschenoi*;

доказано, что *Eremias nigrocellata*, *Platycephalus karelini*, *Echis carinatus*, *Lycodon striatus* и *Gloydius caraganus* являются исчезающими видами в Кашкадарьинской области;

на основе морфолого-геометрических характеристик пресмыкающихся с использованием современного программного обеспечения созданы математические модели (матрицы) видов семейств Testudinidae, Lacertidae, Colubridae и Psammophiidae;

раскрыто отрицательное воздействие от незаконного использования редких и исчезающих видов *Testudo horsfieldii*, *Varanus griseus*, *Eryx tataricus* и *Naja oxiana* на состояние герпетофауны региона;

доказано, что особи, морфологически сходные с представителями подвида *Testudo horsfieldii horsfieldii* и *Testudo horsfieldii bogdanovi* распространены на территории Кашкадарьинской области.

Внедрение результатов исследования. На основе полученных научных результатов по фауне, экологии и значению пресмыкающихся Кашкадарьинской области:

27 образцов пресмыкающихся, распространенных в Кашкадарьинской области, состоящих из 22 видов, относящихся к 16 родам, вошли в уникальный объект ведущей «Зоологической коллекции» республики

(Справка № 4/1255-2292 Академии наук Республики Узбекистан от 19 сентября 2022 года). В результате, образцы обогатили фонд видов пресмыкающихся Кашкадарьинской области, позволили оценить современное состояние распространения их популяций и подготовить кадастровые данные.

Рекомендации, разработанные в связи с определением разнообразия фауны пресмыкающихся Кашкадарьинской области, оценкой ее современного состояния и созданием кадастра, внедрены в практику в Кашкадарьинском областном управлении Государственного комитета экологии и охраны окружающей среды Республики Узбекистан (Справка № 03-02/7-2224 Государственного комитета экологии и охраны окружающей среды Республики Узбекистан от 13 октября 2022 года). В результате, это позволило оценить современное состояние распространения популяций пресмыкающихся в Кашкадарьинской области, разработать природоохранные мероприятия и подготовить кадастровые данные.

Структура и объем диссертации. Структура диссертационной работы состоит из введения, 4 глав, выводов, практических рекомендаций, списка использованной литературы и приложений. Объем диссертации составляет 111 страниц.

E'LON QILINGAN ISHLAR RO'YHATI
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