

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ
АХМЕТ БАЙТҰРСЫНҰЛЫ АТЫНДАҒЫ ҚОСТАНАЙ ӨНІРЛІК УНИВЕРСИТЕТІ
Ө. СҰЛТАНҒАЗИН АТЫНДАҒЫ ПЕДАГОГИКАЛЫҚ ИНСТИТУТЫ



BAHTURSYNULY
UNIVERSITY



Қостанай мемлекеттік педагогикалық институтының құрметті профессоры,
биология ғылымдарының докторы Т.М. Брагинаның мерейтойына арналған
**БИОЛОГИЯЛЫҚ ӘРТҮРЛІЛІКТІ САҚТАУ ЖӘНЕ ЕРЕКШЕ
ҚОРҒАЛАТЫН ТАБИҒИ АУМАҚТАР ЖЕЛІСІН ДАМУ** атты
ХАЛЫҚАРАЛЫҚ ҒЫЛЫМИ-ПРАКТИКАЛЫҚ КОНФЕРЕНЦИЯНЫҢ
МАТЕРИАЛДАРЫ



МАТЕРИАЛЫ
МЕЖДУНАРОДНОЙ НАУЧНО-ПРАКТИЧЕСКОЙ КОНФЕРЕНЦИИ
СОХРАНЕНИЕ БИОЛОГИЧЕСКОГО РАЗНООБРАЗИЯ И РАЗВИТИЕ СЕТИ
ОСОБО ОХРАНЯЕМЫХ ПРИРОДНЫХ ТЕРРИТОРИЙ,
посвященной юбилею почетного профессора Костанайского государственного
педагогического института, доктора биологических наук Т.М. Брагиной



PROCEEDINGS
OF THE INTERNATIONAL RESEARCH AND TRAINING CONFERENCE
«CONSERVATION OF BIOLOGICAL DIVERSITY AND DEVELOPMENT
OF THE NETWORK OF SPECIALLY PROTECTED NATURAL AREAS»,
dedicated to the anniversary of the honorary professor of the Kostanay
state pedagogical institute, doctor of biological sciences T.M. Bragina

Қостанай 2024

УДК 502.17
ББК 20.18
Қ 68

РЕДАКЦИЯ АЛҚАСЫ / РЕДАКЦИОННАЯ КОЛЛЕГИЯ

Жауапты редакторлары:

Куанышбаев С.Б., доктор географических наук, член Академии педагогических наук Казахстана
Брагина Т.М., доктор биологических наук, профессор
Исакаев Е.М., кандидат биологических наук
Жарлыгасов Ж.Б., кандидат сельскохозяйственных наук, доцент
Есиркепова К.К., кандидат педагогических наук, профессор
Коваль А.П., кандидат экономических наук

Редакция алқасының мүшелері

Баубекова Г.К., магистр педагогических наук; *Баймагамбетова К.Т.* магистр туризма, *Божекенова Ж.Т.*, магистр биологии; *Рулёва М.М.*, магистр биологии; *Кожмухаметова А.С.*, магистр биологии; *Ручкина Г.А.*, к.б.н., ассоциированный профессор

Қ 68 Қостанай мемлекеттік педагогикалық институтының құрметті профессоры, биология ғылымдарының докторы Т.М. Брагинаның мерейтойына арналған Биологиялық әртүрлілікті сақтау және ерекше қорғалатын табиғи аумақтар желісін дамыту атты халықаралық ғылыми-практикалық конференцияның материалдары (Қазақстан Республикасы, Қостанай қ., 2024 жылдың 26 ақпан) / ғылыми редакторлары: С.Б. Куанышбаев, Т.М. Брагина. – Қостанай: Ахмет Байтұрсынұлы атындағы ҚҰУ, 2024. – 413 с.

Сохранение биологического разнообразия и развитие сети особо охраняемых природных территорий: Материалы междунар. научно-практ. конференции (26 февраля 2024 г., г. Костанай, Казахстан), посвященной юбилею почетного профессора КГПИ, д.б.н. Т.М. Брагиной / научн. редакторы: С.Б. Куанышбаев, Т.М. Брагина. – Костанай: КРУ имени Ахмет Байтұрсынұлы, 2024. – 413 с.

Conservation of biological diversity and development of the network of specially protected natural areas: Proceedings of the International research and training conference (February 26, 2024, Kostanay, Kazakhstan) dedicated to the anniversary of the honorary professor of the Kostanay State Pedagogical Institute, T.M. Bragina Dr. Sci. (Biol.) / science editors S.B. Kuanysbayev, T.M. Bragina. – Kostanay: Akhmet Baitursynuly KRU, 2024 – 413 p.

ISBN 978-601-356-339-8

В сборнике опубликованы материалы Международной научно-практической конференции «Сохранение биологического разнообразия и развитие сети особо охраняемых природных территорий», посвященной юбилею почетного профессора Костанайского государственного педагогического института, доктора биологических наук Т.М. Брагиной. В докладах рассмотрены итоги исследований и перспективы сохранения биологического разнообразия, охраны природных территорий и популяций видов особого природоохранного значения, формирования экологической сети и вопросы интеграции природоохранной деятельности и образования. Книга предназначена для ученых и практиков, работающих в области изучения и сохранения биологического разнообразия, преподавателей вузов, аспирантов, студентов, работников природоохранных учреждений.

УДК 502.17
ББК 20.18

Утверждено и рекомендовано к изданию Ученым советом Костанайского регионального университета имени Ахмет Байтұрсынұлы» от 31.01.2024 г., протокол № 2.

ISBN 978-601-356-339-8



9 786013 563398

© Костанайский региональный университет имени Ахмет Байтұрсынұлы, 2024
© Научно-исследовательский центр проблем экологии и биологии, 2024

За достоверность предоставленных в сборнике сведений и использованной научной терминологии ответственность несут авторы статей
На обложке: фото Т.М. Брагиной

**ПЛЕНАРЛЫҚ БАЯНДАМАЛАР.
ЕРЕКШЕ ҚОРГАЛАТЫН ТАБИГИ
АУМАҚТАР ЖЕЛІСІН ДАМЫТУ**



**ПЛЕНАРНЫЕ ДОКЛАДЫ.
РАЗВИТИЕ СЕТИ ОСОБО ОХРАНЯЕМЫХ
ПРИРОДНЫХ ТЕРРИТОРИЙ**



**PLENARY SESSION.
DEVELOPMENT OF THE NETWORK
OF SPECIALLY PROTECTED AREAS**

13. Труды Наурзумского государственного заповедника Текст / Под общ. ред. проф. А. Н. Формозова; Ком-т по заповедникам при Президиуме ВЦИК Вып. 2. – М.: Искра революции, 1949. – 315 с.

14. Nomination Dossier «SARYARKA – Steppe and Lakes of Northern Kazakhstan». [Electronic resource]. URL: <https://whc.unesco.org/en/list/1102/documents/> (Обращение 20.10.2023).

15. Rachkovskaya E.I. and Bragina T.M. (2012) Steppes of Kazakhstan: Diversity and Present State. In: Werger M., van Staaldouin M. (eds) Eurasian Steppes. Ecological Problems and Livelihoods in a Changing World. Plant and Vegetation, vol 6. Springer, Dordrecht, 2012. – pp. 103-148. DOI https://doi.org/10.1007/978-94-007-3886-7_3

MONTHLY VARIATION IN HOME RANGE OF A STEPPE-DWELLING RAPTOR

Месячные колебания ареала обитания степного хищника

Georgia H. Isted^{1,2}, Robert J. Thomas¹, Kevin S. Warner³,
Matt J. Stuber⁴, Ethan Ellsworth⁵, Todd E. Katzner⁶

¹ School of Biosciences, Cardiff University, Cardiff, UK

² Department of Biological Sciences and Raptor Research Centre,
Boise State University, Boise, ID, USA

³ Idaho Army National Guard, Boise, Idaho, USA

⁴ Division of Migratory Birds, US Fish and Wildlife Service, Portland, OR, USA

⁶ Bureau of Land Management, Boise, ID, USA

⁵ U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, Boise, ID, USA

Аңдатпа. Дала ландшафттарындағы құстар жылдық цикл кезінде мінез-құлқын өзгертеді. Біз GPS телеметриясын 10 ересек дала сұңқарларын (*Buteo regalis*) бақылау үшін қолдандық, олардың тіршілік ету ортасы жыл бойына қалай өзгергенін түсіну үшін. Аумақтық ересек сұңқарлардың үй ауқымының өлшемдері жыл ішіндегі күшті ауытқуларды көрсетті: ең аз сәуірден маусымға дейін және ең үлкен шілдеден қазанға дейін. Ареалдың ауқым өлшемінің үлгілері көбею уақыты мен көші-қон мінез-құлқы сияқты ішкі факторлармен, сондай-ақ өсімдік жамылғысының белгілі бір түрлерімен байланысты олжаның қолжетімділігі сияқты сыртқы факторлармен байланысты болуы мүмкін. Бұл нәтижелер дала құстарының өсімдік жамылғысының болжамды өзгерістеріне реакциясын түсінуімізге әсер етеді және адам әрекеті мен жабайы жануарлардың мінез-құлқы арасындағы әлеуеттік байланысты болжайды. Біз бақылаған құстар Солтүстік Американың батысының көп бөлігін қамтиды, сондықтан бұл даралар тұзақ қойған шағын аумақтан тыс жерде хабардар болуы мүмкін.

Түйінді сөздер: *Buteo regalis*, безді сұңқар.

Abstract. Birds in steppe landscapes change their behaviour over the annual cycle. We used GPS telemetry to track 10 steppe-dwelling adult Ferruginous Hawks (*Buteo regalis*) to understand how their home ranges varied across the year. Home range sizes of territorial adult hawks showed strong intra-annual variation, being smallest from April to June, and largest from July to October. Patterns in home range size were likely linked to intrinsic factors such as the timing of breeding and migratory behaviour, and to extrinsic factors such as prey availability associated with specific landcover types. These results have implications for our understanding of the response of steppe birds to predicted changes in land cover, and they suggest potential relationships between human activity and wildlife behaviour. Because the birds we tracked used a large portion of western North America, they are likely informative far beyond the small area where these individuals were trapped.

Key words: *Buteo regalis*, Ferruginous hawk, home range, seasonal variation.

Аннотация. Птицы в степных ландшафтах меняют свое поведение в течение годового цикла. Мы использовали GPS-телеметрию, чтобы отследить 10 взрослых степных ястребов (*Buteo regalis*), чтобы понять, как их ареал обитания менялся в течение года. Размеры домашнего ареала территориальных

взрослых ястребов демонстрировали сильные внутригодовые колебания: наименьшие с апреля по июнь и наибольшие с июля по октябрь. Модели размера ареала, вероятно, были связаны с внутренними факторами, такими как время размножения и миграционное поведение, а также с внешними факторами, такими как доступность добычи, связанная с конкретными типами растительного покрова. Эти результаты имеют значение для нашего понимания реакции степных птиц на прогнозируемые изменения растительного покрова и предполагают потенциальную связь между деятельностью человека и поведением диких животных. Поскольку птицы, которых мы отслеживали, использовали большую часть западной части Северной Америки, они, вероятно, информативны далеко за пределами небольшой территории, где эти особи оказались в ловушке.

Ключевые слова. *Buteo regalis*, королевский канюк.

Introduction. Animal movement is driven by a suite of processes acting across a variety of spatial and temporal scales (Nathan et al. 2008). For example, across the annual cycle, migratory species travel widely between well dispersed areas (Klaassen et al. 2014), and even non-migratory animals tend to show intra-annual variation in movement behaviours (van Beest et al. 2013). Birds, in particular, are exposed to different sets of processes and stressors during breeding, migration, and non-breeding periods (Silllett and Holmes 2002). Despite this, monitoring of many migratory species is typically limited to only one of these annual periods (Marra et al. 2015). That said, understanding threats and limits to populations throughout the annual cycle is important to guide conservation measures, especially for migratory species (Silllett and Holmes 2002, Klaassen et al. 2014, Marra et al. 2015). As such, by collecting movement data on birds, we can begin to understand and manage for their interactions with the landscape and climate across large spatial scales.

Home range, the area where activities such as foraging, breeding, and rearing young occur (Burt 1943), is often evaluated to identify habitats relevant to the survival of a species. Therefore, unbiased estimates of intra-annual variation in home range size can help to inform which factors are correlated with long term population stability. Improving home range estimates during all times of the year is also useful because knowing the size and location of home ranges can help to assess responses to intra-annual changes to the natural environment.

We evaluated monthly variation in home range of a steppe raptor, the Ferruginous Hawk (*Buteo regalis*), breeding in southwest Idaho, USA. Our overall goal was to better understand patterns of movement ecology and use of space by this species across the annual cycle. To do this, we evaluated month to month cycles in size of home range of this species across the year.

Methods

Study site & focal species

Ferruginous Hawks are diurnal raptors that occupy arid grasslands, shrub-steppe, and high-altitude deserts across western North America, from Canada to Mexico (Ng et al. 2020). This steppe-dwelling species typically is highly dependent on ground squirrels (*Sciuridae* spp.) and other small rodents for food (Schmutz and Fyfe 1987). Ferruginous Hawk migration is typically non-linear, with birds first migrating longitudinally, possibly responding to variation in rodent abundance, before completing their migration south (Ng et al. 2020). This raptor species is classified as vulnerable, imperilled, or critically imperilled in 18 of the 21 states and provinces across its range in the United States and Canada (NatureServe 2021).

We studied Ferruginous Hawks that nested within the Morley Nelson Snake River Birds of Prey National Conservation Area (NCA), in the state of Idaho, USA (Fig. 1A). At this site, Ferruginous Hawks typically arrive on territories during March, before laying eggs in mid-April (Howard 1975). Nestlings typically fledge in June and all birds depart from the natal site, usually traveling to Canada, in late July-August.

Capture & GPS data collection

To capture free-flying Ferruginous Hawks, we used mist nets and a robotic Great Horned Owl (*Bubo virginianus*) lure placed near the nest (Jensen et al. 2019). To capture nestlings, we removed them from the nest by hand. Adult birds were fitted with 30-g CTT-1030-BT3 Series GPS-GSM telemetry devices (Cellular Tracking Technologies, Rio Grande, NJ, USA). The units were programmed to collect GPS locations, altitude, speed, fix quality (2D or 3D fix), and horizontal and vertical dilution of precision (HDOP and VDOP), at 15-minute intervals during daylight hours throughout spring, summer, and autumn months. During the winter, interval length was increased (up to 6-hour intervals) due to reduced solar energy limiting recharging of batteries. Data collected were sent to a server via the GSM mobile phone network once per day. Nestling birds were fitted with 22-g Argos/GPS solar-powered Platform Transmitter Terminals (PTT; Microwave Telemetry, Inc., Columbia, MD, USA) that collected GPS locations, altitude, speed and fix quality at 3-h intervals, year-round. Prior to analysis we removed poor quality GPS points indicated by 2D fix quality (Poessel et al. 2018). We also removed points for which the horizontal or vertical dilution of position (HDOP or VDOP) was >10 (D'Eon and Delparte 2005). We calculated user equivalent range errors (UERE) from GPS points collected while devices were in a static position for a period of 17-30 days using the *ctmm* package in R (Noonan et al. 2019; R Core Team 2021) and we excluded fixes that were collected after sunset but before sunrise.

Monthly home range size

We estimated home range area for each bird in each month, using autocorrelated kernel density estimators (AKDEs) implemented in the *ctmm* package in R (Fleming et al. 2015; Calabrese et al. 2016; Noonan et al. 2019; R Core Team 2021). Calculating bird home range for each month allowed us to evaluate changes in home range size throughout the annual cycle, as well as to compare home range size between seasons. AKDEs are also useful because they control for irregular and uneven sampling rates.

We only estimated home range for bird-months where birds were range resident for ≥ 8 days and with ≥ 30 GPS points. Consequently, all periods of migration, including short migratory stopovers, were excluded from any analysis. During those months where birds were only partially range resident (i.e., spent a portion of the month wandering), we estimated home range using only the days when the bird was range resident. When birds established range residency in >1 area within the same month, we used the separate home range estimates to calculate a mean that we weighted by the duration spent in each home range.

Statistical modelling

We evaluated intra-annual (monthly) variation in home range size throughout the year using a generalised additive mixed model (GAMM; R package *mgcv*; Wood et al. 2016). We had one fixed in effect in our model, bird sex, and one random effect, individual bird identity. We tested model performance with and without a random effect for year, to account for response of birds to year-to-year variation. We fitted a cyclic smoothing spline to the month term in the model to capture non-linear relationships associated with this numerical term. As our data were continuous and zero bounded, we used the Gamma error family with a log link function.

Results. We evaluated GPS data from eight Ferruginous Hawks (five female, three male) captured as adults and two adult females captured as nestlings. Over the study period (May 2016 – Apr 2021), and after filtering described above, we considered 139,984 high-quality GPS locations collected during daytime across western North America (Fig. 1A,B,C). Individual birds were tracked from one to 35 months. After removing bird-months for which data were sparse, we estimated home ranges for 182 bird-months, with 11 to 20 home ranges per month.

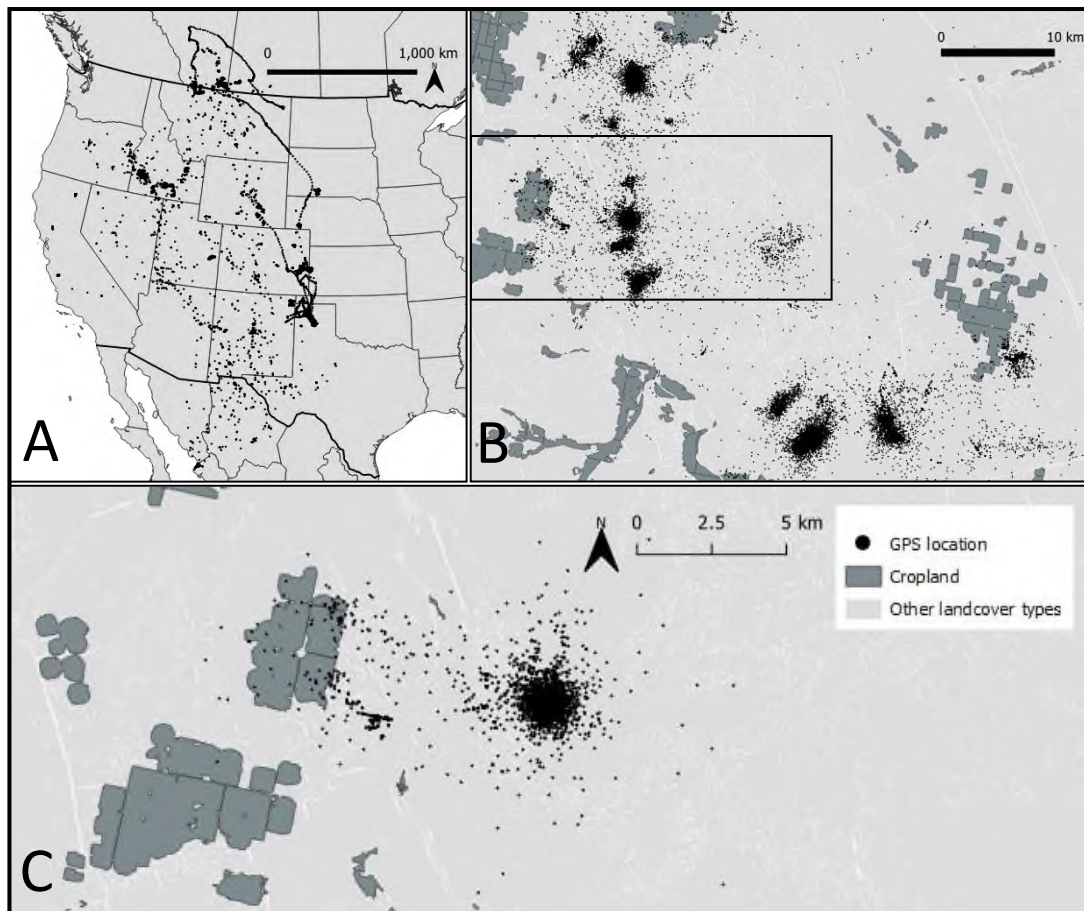


Fig. 1 – GPS locations of Ferruginous Hawks (black dots) **A**) tracked from their breeding location in Southwest Idaho from 2016 to 2021 across North America ($n = 12$); **B**) tracked throughout their breeding area in the Morley Nelson Snake River Birds of Prey National Conservation Area (NCA), Idaho; and **C**) a single individual tracked throughout the NCA during one breeding season. Dark grey patches show the distribution of cropland where hawks sometimes foraged and black box shows area shown in panel C.

Monthly home range size

Monthly home range size of adults during the breeding season (March – July) ranged from 0.01 to 3723.59 km² (115.81 ± 55.94 ; $\bar{x} \pm SE$; $n = 10$ birds, 76 bird months) and, outside of the breeding season (August – February), from 0.55 to 4085.41 km² (223.96 ± 50.05 ; $n = 9$, 106). There was a non-linear association between month and average home range size (i.e., the spline of month was highly significant; effective degrees of freedom (edf) = 4.54, $p < 0.001$; Fig. 2). Home range size was smallest during the breeding season months of May (2.59 ± 1.01 km², $n = 8, 15$), June (9.65 ± 2.26 km², $n = 10, 21$) and April (24.94 ± 23.18 km², $n = 8, 13$; Fig. 2). In contrast, empirical means of home ranges were largest during July (412.52 ± 216.78 km², $n = 9, 20$) and October (277.54 ± 119.50 km², $n = 9, 19$; Fig. 2). Overall, home range size in three months of the breeding season (April-June) was significantly smaller than during three months of the wintering season (November-January; $p < 0.001$). Monthly home range size of Ferruginous Hawks was different among the sexes, with males having slightly smaller home ranges than females ($\beta = -1.30$; $p = 0.04$). Including a random effect for year reduced model performance, and so we did not use such a term in our modelling efforts.

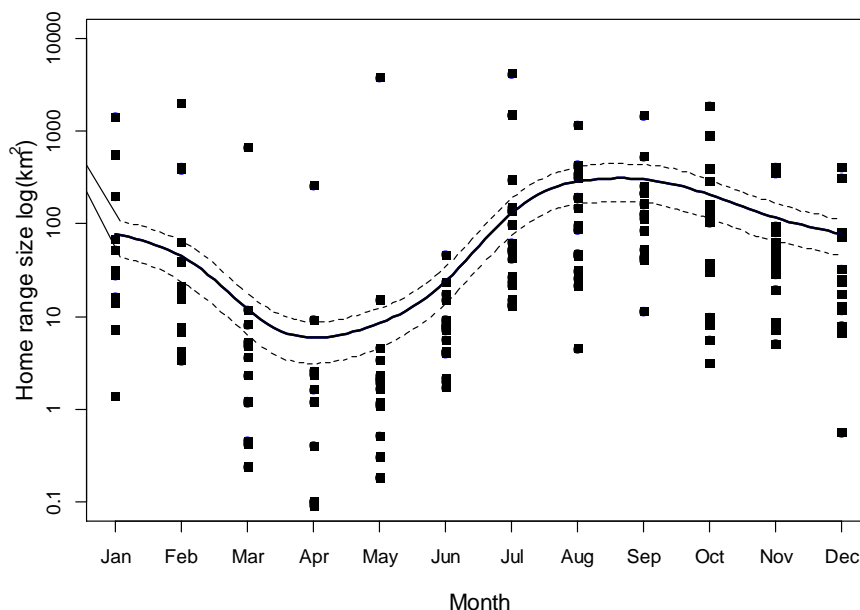


Fig. 2 – Generalised additive mixed model and 95% confidence intervals showing effect of month on mean monthly home range of Ferruginous Hawks (95% autocorrelated kernel density estimation, $n = 10$ adults hawks and 182 bird-months) tracked between 2016 and 2021 in North America.

Discussion. Ranging behaviour of animals responds to intrinsic factors such as age, sex, and breeding status, as well as extrinsic factors such as seasonality and resource availability. The patterns we observed, with the smallest home ranges during the months of the breeding season and larger home ranges at other times of year, fit our expectations for how territorial and migratory species behave. Similar to other raptor species, adult Ferruginous Hawks appeared as central place foragers that stayed close to the nest site during breeding months, presumably to defend their territory and rear young (Moss et al. 2014, Miller et al. 2017, Ng et al. 2020). The larger home ranges we observed during the wintering season could have been linked to reduction in habitat quality due to changes in factors such as prey availability (Moss et al. 2014), or reduction in defensive behaviour and sharing of resources (Grande et al. 2009).

There are two notable caveats to our inference regarding response to these resources. First, we were not able to test how variation in food availability between years may have influenced movement of these hawks. We expect that during years with less abundant food resources, home range sizes would be larger. Second, the sex-specific differences in home range size of these birds is notable. Such differences are detected for some adult raptors (female Red Kites *Milvus milvus* and Golden Eagles *Aquila chrysaetos* had larger home ranges than did males; Spatz et al. 2022, Braham et al. 2015; male Montagu's Harriers *Circus pygargus* have larger home ranges than do females; Krupiński et al. 2021), but not for others (Golden Eagles in Miller et al. 2017). In this case, it is unclear exactly what factors may have resulted in the sex-related differences we detected in ranging behaviour.

Although Ferruginous Hawks are widespread in western North American steppe habitats, their biology is poorly understood. The novel tracking technologies we deployed to track these birds thus provided new insight into their behaviours that may help their management in the future.

Acknowledgements. We thank the large number of people assisted in work to trap and telemeter the hawks studied in this project and provide reviews for this manuscript. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government. This work was supported by the US Fish and Wildlife Service, Idaho Army National Guard, and the US Geological Survey, as well as the authors' institutions. This research was conducted under IACUC protocol #006-AC18-003 from Boise State University, and #14-0303 from West Virginia University and complies with the Guidelines to the Use of Wild Birds in

Research. Research was conducted under US Federal Bird Banding Permit #23715 and Idaho Wildlife Collection Permit #110728.

Literature cited:

1. Braham, M., Miller, T., Duerr, A.E., Lanzone, M., Fesnock, A., LaPre, L., Driscoll, D. and Katzner, T. (2015). Home in the heat: Dramatic seasonal variation in home range of desert golden eagles informs management for renewable energy development. *Biological Conservation* 186:225–232.
2. Burt, W.H. (1943). Territoriality and home range concepts as applied to mammals. *Journal of Mammalogy* 24:346–352.
3. Calabrese, J.M., Fleming, C.H. and Gurarie, E. (2016). ctmm: an R package for analyzing animal relocation data as a continuous-time stochastic process. *Methods in Ecology and Evolution* 7:1124–1132.
4. D'Eon, R.G. and Delparte, D. (2005). Effects of radio-collar position and orientation on GPS radio-collar performance, and the implications of PDOP in data screening: Effects of radio-collar position. *Journal of Applied Ecology* 42:383–388.
5. Fleming, C.H., Fagan, W.F., Mueller, T., Olson, K.A., Leimgruber, P. and Calabrese, J.M. (2015). Rigorous home range estimation with movement data: a new autocorrelated kernel density estimator. *Ecology* 96:1182–1188.
6. Grande, J.M., Serrano, D., Tavecchia, G., Carrete, M., Ceballos, O., Díaz-Delgado, R., Tella, J.L. and Donazar, J.A. (2009). Survival in a long-lived territorial migrant: effects of life-history traits and ecological conditions in wintering and breeding areas. *Oikos* 118:580–590.
7. Howard, R. P. (1975). Breeding Ecology of the Ferruginous Hawk in Northern Utah and Southern Idaho. All Graduate Theses and Dissertations. 4489.
8. Jensen, M.K., Hamburg, S.D., Rota, C.T., Brinker, D.F. and Coles, D.L. (2019). An improved mechanical owl for efficient capture of nesting raptors. *Journal of Raptor Research* 53:14-25.
9. Klaassen, R.H.G., Hake, M., Strandberg, R., Koks, B.J., Trierweiler, C., Exo, K.-M., Bairlein, F. and Alerstam, T. (2014). When and where does mortality occur in migratory birds? Direct evidence from long-term satellite tracking of raptors. *Journal of Animal Ecology* 83:176–184.
10. Krupiński, D., Kotowska, D., Recio, M.R., Żmihorski, M., Obłoz, P. and Mirski, P. (2021). Ranging behaviour and habitat use in Montagu's Harrier *Circus pygargus* in extensive farmland of Eastern Poland. *Journal of Ornithology*, 162:325-337.
11. Marra, P.P., Cohen, E.B., Loss, S.R., Rutter, J.E. and Tonra, C.M. (2015). A call for full annual cycle research in animal ecology. *Biology Letters* 11:20150552.
12. Miller, T.A., Brooks, R.P., Lanzone, M.J., Cooper, J., O'Malley, K., Brandes, D., Duerr, A. and Katzner, T.E. (2017). Summer and winter space use and home range characteristics of Golden Eagles (*Aquila chrysaetos*) in eastern North America. *The Condor* 119:697–719.
13. Moss, E.H.R., Hipkiss, T., Ecke, F., Dettki, H., Sandström, P., Bloom, P.H., Kidd, J.W., Thomas, S.E. and Hörnfeldt, B. (2014). Home-range size and examples of post-nesting movements for adult Golden Eagles (*Aquila chrysaetos*) in boreal Sweden. *Journal of Raptor Research* 48:93–105.
14. Nathan, R., Getz, W.M., Revilla, E., Holyoak, M., Kadmon, R., Saltz, D. and Smouse, P.E. (2008). A movement ecology paradigm for unifying organismal movement research. *Proceedings of the National Academy of Sciences* 105:19052–19059.
15. NatureServe (2021). *Buteo regalis*. Available at: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.103222/Buteo_regalis [Accessed: 6 August 2021].
16. Ng, J., Giovanni, M.D., Bechard, M.J., Schmutz, J.K. and Pyle, P. (2020). Ferruginous Hawk (*Buteo regalis*). *Birds of the World*. Available at: <https://birdsoftheworld.org/bow/species/ferhaw/cur/introduction> [Accessed: 25 April 2021].
17. Noonan, M.J., Fleming, C.H., Akre, T.S., Drescher-Lehman, J., Gurarie, E., Harrison, A.-L., Kays, R. and Calabrese, J.M. (2019). Scale-insensitive estimation of speed and distance traveled from animal tracking data. *Movement Ecology* 7:35.
18. Poessel, S.A., Duerr, A.E., Hall, J.C., Braham, M.A. and Katzner, T.E. (2018). Improving estimation of flight altitude in wildlife telemetry studies. *Journal of Applied Ecology* 55:2064–2070.
19. R Core Team. (2021). A language and environment for statistical computing. R Foundation for Statistical Computing. R foundation for Statistical Computing

20. Schmutz, J.K. and Fyfe, R.W. (1987). Migration and mortality of Alberta Ferruginous Hawks. *The Condor* 89:169.
21. Sillett, T.S. and Holmes, R.T. (2002). Variation in survivorship of a migratory songbird throughout its annual cycle. *Journal of Animal Ecology* 71:296–308.
22. Spatz, T., Katzenberger, J., Friess, N., Gelpke, C., Gottschalk, E., Hormann, M., Koschkar, S., Pfeiffer, T., Stübing, S., Sudfeldt, C. Rösner, S., Schabo, D.G, and Farwig, N. (2022). Sex, landscape diversity and primary productivity shape the seasonal space use of a migratory European raptor. *Journal of Avian Biology* 10: p.e02925.
23. van Beest, F.M., Vander Wal, E., Stronen, A.V., Paquet, P.C. and Brook, R.K. (2013). Temporal variation in site fidelity: scale-dependent effects of forage abundance and predation risk in a non-migratory large herbivore. *Oecologia* 173:409–420.
24. Wood, S.N., Pya, N. and Säfken, B. (2016). Smoothing parameter and model selection for general smooth models. *Journal of American Statistical Association* 111:1548–1563.

CONSERVATION AT A CROSS-ROADS

Сохранение на перекрестках

Kenward R.

*European Sustainable Use Group, rue de la Science 10, B-1000 Brussels, Belgium
e-mail: reke@ceh.ac.uk*

Аңдатпа. Табиғатты қорғаудың екі көрінісі биоалуантүрлілік туралы конвенциядан (БҰҰ КБР) келді. Куньмин-Монреаль 2030 жылға қарай жердің 30% - қорғауды ұсынады ("30x30" төмендеу тәсілін қолдану арқылы). Биоалуантүрлілік және Экожүйелік қызметтер жөніндегі үкіметаралық ғылыми-саяси платформа (МПБЭУ) Біріккен Ұлттар Ұйымының Тұрақты даму мақсаттарына қол жеткізу үшін адамзаттың үштен бірінің жабайы тірі ресурстарға тәуелділігін пайдалануды ұсынады. Бұл идеялардың шектен шығуы "архологиялық жер" және "жер-бақ" планетасының болашағына әкелуі мүмкін екендігі атап өтілді. "Төменнен жоғары" тәсіл үшін автоматтандырылған нұсқаулықты пайдалану табиғатты сақтау үшін де, кеңірек басқару үшін де қанағаттанарлық болуы мүмкін.

Түйінді сөздер: сақтау, басқару, шешім қабылдауды қолдау, Жер Архологиясы, Жер-Бақ.

Аннотация. Два видения сохранения пришли из Конвенции по биоразнообразию (КБР ООН). Куньмин-Монреаль рекомендует защитить 30% земель к 2030 году (навязывая нисходящий подход «30x30»). Межправительственная научно-политическая платформа по биоразнообразию и экосистемным услугам (МПБЭУ) предлагает использовать зависимость почти трети человечества от диких живых ресурсов для достижения Целей устойчивого развития Организации Объединенных Наций. Отмечается, что доведение этих представлений до крайности может привести к будущему планеты «Архологическая Земля» и «Земля-сад». Использование автоматизированного руководства для подхода «снизу вверх» может быть более удовлетворительным как для сохранения природы, так и для более широкого управления.

Ключевые слова: сохранение, управление, поддержка принятия решений, Архология Земли, Земля – Сад.

Abstract. Two visions of conservation have come from the UN's CBD. Kunming-Montreal recommends protection for 30% of the earth's land by 2030 (imposing a top-down '30x30' approach). IPBES proposes that the dependence of close to a third of humans on wild living resources should be used to help achieve the Sustainable Development Goals of the United Nations. It is noted that taking these visions to extremes could result in 'Archology Earth' and 'Garden Earth' futures for the planet. Using automated guidance for a bottom-up approach may be more satisfactory both for conservation and governance more widely.

Key words: Conservation, governance, decision-support, Arcology Earth, Garden Earth.

МАЗМҰНЫ Ұ СОДЕРЖАНИЕ Ұ CONTENTS

А. Байтұрсынұлы атындағы Қостанай өңірлік университетінің Басқарма Төрағасы-Ректоры, С. Б. Куанышбаевтың құттықтау сөзі	3
<i>Приветственное слово на открытии конференции председателя Правления-Ректора Костанайского регионального университета имени А. Байтұрсынұлы С.Б. Куанышбаева</i>	
<i>Chairperson of the Board-Rector of Akhmet Baitursynuly Kostanay Regional University S.B. Kuanyshbayev's welcome words to the opening of the Conference</i>	

ПЛЕНАРНЫЕ ДОКЛАДЫ. ЕРЕКШЕ КОРГАЛАТЫН ТАБИГИ АУМАКТАР ЖЕЛІСІН ДАМУ

ПЛЕНАРЛЫҚ БАЯНДАМАЛАР. РАЗВИТИЕ СЕТИ ОСОБО ОХРАНЯЕМЫХ ПРИРОДНЫХ ТЕРРИТОРИЙ

PLENARY SESSION. DEVELOPMENT OF THE NETWORK OF SPECIALLY PROTECTED AREAS

Брагина Т.М.	8
Наурзумская экологическая сеть (Эконет) – история создания и современный статус	
<i>Naurzum ecological network (Econet) – the history of creation and current status</i>	
Georgia H. Isted, Robert J. Thomas, Kevin S. Warner, Matt J. Stuber, Ethan Ellsworth, Todd E. Katzner	16
Monthly variation in home range of a steppe-dwelling raptor	
<i>Месячные колебания ареала обитания степного хищника</i>	
Kenward R.	22
Conservation at a cross-roads	
<i>Сохранение на перекрестках</i>	
Михайлов Ю.Е.	28
Первая достоверная фиксация исчезновения эндемичного вида жуужелиц (Coleoptera, Carabidae) на вершине Южного Урала	
<i>The first reliable detection of endemic carabid species extinction (Coleoptera, Carabidae) in the summit of the South Urals</i>	
Нурушев М.Ж., Нурушев А.Ж., Кәкімжан Б.М., Нурушев Д.А.	34
О значимости Ботай-Улытауского номадизма в эволюции Евразии	
<i>About the significance of Botai-Ulytau nomadism in the evolution of Eurasia</i>	
Плохих Р.В., Несипбаев К.Б., Королева И.С.	38
Особо охраняемые природные территории Казахстана как оазисы устойчивого туризма	
<i>Specially protected natural areas of Kazakhstan as sustainable tourism oases</i>	
Соловьев С.А., Исакаев Е.М.	45
Орнитофауна и население птиц ООПТ природный парк «Птичья гавань» в период карантина по коронавирусной инфекции (Covid-19) в городе Омске	
<i>Avifauna and ornithocomplexes of the protected area Nature park «BIRD HARBOR» during the quarantine period for coronavirus infection (COVID-19) in the city of Omsk</i>	
Тарасовская Н.Е., Алиясова В.Н., Клименко М.Ю., Байбусынова А.К.	51
Возможности использования пойменных растений в качестве сырья для заменителей чая и кофе	
<i>The possibilities of using of flood-plain plants as the surrogates of tea and coffee</i>	

- Тимофеев Ю.В., Миноранский В.А.** 57
Колебания численности журавля-красавки (*Anthropoides virga* L.) в районе заповедника «Ростовский» и их причины
Monitoring of the Demoiselle Crane (Anthropoides virgo L.) in the Rostov nature reserve and their reasons

ФЛОРА МЕН ӨСІМДІКТЕР ҚАУЫМДАСТЫҒЫН САҚТАУ МӘСЕЛЕЛЕРІ

ПРОБЛЕМЫ СОХРАНЕНИЯ ФЛОРЫ И РАСТИТЕЛЬНЫХ СООБЩЕСТВ

PROBLEMS OF CONSERVATION OF FLORA AND PLANT COMMUNITIES

- Айдарханова Г.С.** 64
Видовое разнообразие растений в местах проведения подземных ядерных испытаний
Biological diversity of plants at the underground nuclear testing sites
- Алека В.П.** 67
Распространение дикорастущих ягодных кустарников в лесах Северного Казахстана
Distribution of wild berry bushes in the forests of Northern Kazakhstan
- Байтелиева А.М., Азатов Н.М.** 71
Биоморфы и онтогенез некоторых видов подсемейства Луковые (Allioideae), внесенных в Красную книгу Республики Казахстан
Biomorphs and ontogenesis of some species of the onion subfamily (Allioideae), included in the Red book of the Republic of Kazakhstan
- Брагина Т.М., Бекмағамбет М.С.** 77
Боярышники рода *Crataegus* L. (Rosaceae) во флоре Казахстана in-situ и ex-situ.
Hawthorns of the genus Crataegus L. (Rosaceae) in the flora of Kazakhstan in-situ and ex-situ
- Брагина Т.М., Соколовская Т.Н.** 81
Разнообразие и характеристика некоторых сортов пшеницы, культивируемых в Костанайской области
Diversity and characteristics of some wheat varieties cultivated in the Kostanay Region
- Джаныспаев А.Д., Иващенко А.А., Алмабек Д.М., Абидкулова К.Т.** 86
Редкие виды лекарственных растений Алматинского государственного заповедника и прилегающих территорий
Rare species of medicinal plants of the Almaty state reserve and adjacent territories
- Джиенбеков А.К., Баринаева С.С., Нурашов С.Б., Веселова П.В., Саметова Э.С.** 92
Первые сведения о водорослях русла реки Сырдарья в Кызылординской области, Казахстан
The first information about algae of the Syrdarya riverbed in Kyzylorda region, Kazakhstan
- Егинбаева А.Е., Атаюу Е., Қонысжан Д.Қ.** 98
Хромтау ауданының топырақ және өсімдік жамылғысы ерекшеліктерін негіздейтін топонимдер
Toponyms characterizing the features of the soil and vegetation cover of the Khromtau district
- Ермолаева О.Ю., Рогаль Л.Л.** 104
Редкие виды грибов и растений участка Цаган-Хак заповедника «Ростовский» (Ростовская область, Россия)
Rare species of fungi and plants of the Tsagan-Hak site of the Rostov Nature Reserve (Rostov region, Russia)
- Зейнелова М.А.** 109
Флористическое разнообразие по типам экосистем участка Терсек-Карагай Наурзумского заповедника
Floristic variety by ecosystem types of the site Tersek-Karagay of Naurzum Reserve
- Зейнелова М.А.** 115
Мониторинг биоразнообразия флоры и растительности Наурзумского заповедника
Monitoring the biodiversity of flora and vegetation of the Naurzum Reserve

Ивашенко А.А., Грудзинская Л.М., Нелина Н.В.	121
Сохранение редких видов лекарственных растений Западного Тянь-Шаня в природе и культуре <i>Preservation of rare species of medicinal plants of the Western Tien-Shan in natural and introduced conditions</i>	
Ивашенко А.А., Чаликова Е.С.	126
О современном состоянии некоторых популяций Тюльпана Грейга (<i>Tulipa greigii</i> Regel) в Южном Казахстане <i>About the current state of some populations of the Tulipa greigii Regel in South Kazakhstan</i>	
Исмаилова Ф.М.	131
Изучение распределения основных типов растительных сообществ на территории ГНПП «Буйратау» <i>Studying the distribution of the main types of plant communities on the territory of the Buyratau State National Natural Park</i>	
Ишмуратова М.Ю., Тлеукенова С.У., Гаврилькова Е.А.	137
Современный список редких и исчезающих растений флоры Карагандинской области <i>Modern list of rare and endangered plants of flora of the Karaganda region</i>	
Кәдірбек А.Ж., Нүрекина О.А.	142
Өсімдіктердің өсу және дамуына дубильді заттардың әсерін зерттеу <i>Study of the influence of dabile substances on the growth and development of plants</i>	
Konysbayeva D.T., Myrzabayeva M.T., Gorbulya V.S., Suyundikova Zh.T.	145
Expansion paths of decorative and flower culture in the composition of the urban flora of Astana city <i>Пути расширения декоративной и цветочной культуры в составе городской флоры города Астаны</i>	
Курбанбаева Ж.Д., Тлеубергенова Г.С., Галактионова Е.В.	150
Анализ жизненных форм растений березовых лесов Кызылжарского района Северо–Казахстанской области <i>Analysis of life forms of flora of birch forests in the Kyzylzhar district of the North Kazakhstan region</i>	
Лиу Ю., Шибистова О.Б., Гуггенбергер Г.	156
Влияние стехиометрии доступных биогенных элементов на ферментативную активность степной почвы Северного Казахстана <i>Effect of the stoichiometry of available nutrients on the enzymatic activity of steppe soil of Northern Kazakhstan</i>	
Матецкая А.Ю., Скиба Ю.А., Хорошавина А.В., Ерёменко М.М.	160
Изучение ценопопуляций <i>Bellevalia speciosa</i> Woronow ex Grossh. (Asparagaceae) в Ростовской области <i>Study of cenopopulations of Bellevalia speciosa Woronow ex Grossh. (Asparagaceae) in Rostov region</i>	
Премина Н.В.	167
Лилия саранка- краснокнижный вид Западно-Алтайского заповедника <i>Lilia saranka is a red-book species of the West Altai Nature Reserve</i>	
Рожков Ю.Ф., Кондакова М.Ю.	171
Мониторинг состояния лесных экосистем Олекминского заповедника с использованием космических снимков высокого и сверхвысокого разрешения <i>Monitoring the state of forest ecosystems of Olekminsky Reserve using high-resolution and ultra-high resolution satellite images</i>	
Салмуханбетова Ж.К., Димеева Л.А.	179
Обзор полезных растений Северного Приаралья <i>Overview of useful plants of the Northern Aral Sea region</i>	

- Турабжанова М.Б.** 182
Изучение урожайности кедра на территории Западно-Алтайского заповедника
Study of cedar yield on the territory of the West Altai Nature Reserve

ФАУНА МЕН ЖАНУАРЛАР ӘЛЕМІН ЗЕРТТЕУ ЖӘНЕ САҚТАУ

ИЗУЧЕНИЕ И СОХРАНЕНИЕ ФАУНЫ И ЖИВОТНОГО МИРА

STUDY AND CONSERVATION OF FAUNA AND WILDLIFE

- Алиясова В.Н., Тарасовская Н.Е.** 188
Плейстоценовые хищные (Carnivora) Павлодарского прииртышья
Pleistocene Carnivora of the Pavlodar irtysk region
- Амангельдиева Қ.А., Нүрекина О.А.** 190
Қостанай облысының дәнді дақылдарының зиянды жәндіктері
Harmful insects of grain crops of Kostanay region
- Байбусенов К.С.** 194
Экологизированные системы защиты рапса от основных насекомых-вредителей для снижения риска природному биоразнообразию
Ecologized systems for the protection of rapeseed from major insect pests to reduce the risk to natural biodiversity
- Байтелиева А.М., Азатов Н.М.** 200
Современные методы мониторинга краснокнижников Felidae Казахстана.
Modern methods of monitoring the red book Felidae of Kazakhstan.
- Батряков Р.Р.** 205
Летнее население гусеобразных птиц на водоемах Наурзумского заповедника в 2018-2023 гг.
Summer population of Anseriformes bird species on the lakes of the Naurzum Nature Reserve in 2018-2023.
- Брагин А.Е.¹, Катцнер Т.², Брагин Е.А.³** 212
Динамика гнездовой группировки степного орла в Актюбинской области в 2018-2023 годах
Dynamics of the nesting group of the steppe eagle in Actobe region in 2018-2023
- Брагина Т.М., Тарасенко Е.Л.** 217
Конкурентные группы диких опылителей медоносной пчелы карпатской породы (*Apis mellifera carpathica* Avetisyan, Gubin, Davidenco, 1966).
*Competitive groups of wild pollinators of the carpathian honey bee (*Apis mellifera carpathica* Avetisyan, Gubin, Davidenco, 1966).*
- Габдуллина А.У., Кадырбеков Р.Х.** 221
Дополнение к фауне жуков-усачей (Coleoptera, Cerambycidae) Катон-Карагайского государственного национального природного парка
Addition to the fauna of longhorn beetles (Coleoptera, Cerambycidae) of the Katon-Karagai State National Natural Park
- Дудкин С.И.** 223
Донское запретное пространство в системе сохранения биоразнообразия и ресурсного потенциала Нижнего Дона и Азовского моря
The Don forbidden space in the system of conservation of biodiversity and resource potential of the Lower Don and the Azov sea
- Егинбаева А.Е., Атасов Е., Тулегенова А.Е.** 228
Бескарагай ауданының жануарлар дүниесінің географиялық атаулардағы көрінісі
Description of the animal world in the geographical names of the Beskaragai district
- Есенбекова П.А., Кенжеғалиев А.М.** 233
Солтүстік Тянь-Шань Ұзынқара шатқалы жартылай қаттықанаттылары (Hemiptera, Heteroptera)
Hemiptera (Heteroptera) of the gorge Uzynkara of the Northern Tien Shan

Забашта А.В.	239
Обитание индийского дикобраза <i>Hystrix indica</i> в Восточном Предкавказье во второй половине XVIII века <i>The habitat of the indian porcupine Hystrix indica in the Eastern Caucasus in the second half of the XVIII century</i>	
Златанов Б.В., Айтжанова М.О.	242
Заметки по фауне и экологии мух-журчалок (Diptera, Syrphidae) Заилийского Алатау (Юго-Восточный Казахстан). <i>Notes on the fauna and ecology of hoverflies (Diptera, Syrphidae) of the Zailiyskiy Alatau (South-Eastern Kazakhstan)</i>	
Kaczensky P., Salemgareyev A., Linnell J. D. C., Zuther S., Walzer Ch., Huber N., Petit Th.	248
Post-release movement behaviour and survival of kulan reintroduced to the central steppes of Kazakhstan <i>Передвижение после выпуска и выживание кулана, восстановленного в центральных степях Казахстана</i>	
Ковшарь В.А.	260
Редкие и особо-охраняемые виды птиц резервата «Иле-Балхаш» <i>Rare and protected bird species of the Ile-Balkhash reserve</i>	
Кулиш А.В., Моисеенко О.И.	266
Находки новых видов Decapoda в акватории Опуковского природного заповедника (Крым, Россия) <i>Finding new species of Decapoda in the water area of Opuksky Nature Reserve (Crimea, Russia)</i>	
Құрметбек Т., Саримсакова А.А., Нурушев М.Ж.	270
Ақбөкендердің (<i>Saiga tatarica</i>) популяциясын ату туралы заңнама қаншалықты тиімді? <i>How effective is the legislation on the shooting of the saiga (Saiga tatarica) population?</i>	
Ли Н.Г.	273
Макрофизиологический подход в исследовании биоразнообразия эктотермных организмов (обзор) <i>Macrophysiological approach in studying the biodiversity of ectotherm organisms</i>	
Липкович А.Д.	279
Редкие виды околоводных птиц на территории государственного природного биосферного заповедника «Ростовский», его охранной зоны и сопредельных водоемах <i>Rare species of waterbirds on the territory of the Rostovsky State Nature Biosphere Reserve, its protected zone and adjacent water bodies</i>	
Надолинский Р.В., Надолинский В.П., Дудкин С.И.	282
Влияние изменения солёности на видовой состав и численность ихтиопланктона Таганрогского залива Азовского моря <i>Influence of salinity changes on species composition and the number of ichthyoplankton in the Gulf of Taganrog of the Azov Sea</i>	
Небесихина Н.А., Гогоу М.Л.	288
Размерно-возрастная и генетическая структура ручьевой форели (<i>Salmo trutta</i>) бассейна реки Бзып <i>Size-age and genetic structure of brook trout (Salmo trutta) of the Bzyp river basin</i>	
Попов А.В., Брагина Т.М.	294
Видовой состав и структура уловов рыб в модельных водоёмах Узункольского района Костанайской области <i>The species composition and structure of fish catches in the model reservoirs of the Uzunkol District of the Kostanay Region</i>	
Пришутова З.Г.	298
Жужелицы зональных степных сообществ заповедника «Ростовский» <i>Ground beetles of zonal steppe communities of the Rostovsky Reserve</i>	

Саенко Е.М., Белорусцева С.А., Котов С.В. Состояние популяции раков Веселовского водохранилища <i>The state of the population of crayfish in the Veselovsky reservoir</i>	302
Сакбаев Д.Н., Жақсыбаев М.Б., Есенбекова П.А. Алматы қаласы Баум тоғайы қоңыздарының (Coleoptera) алуантүрлілігі <i>Biodiversity of Coleoptera Bauma Grove Almaty city</i>	307
Синявская (Килякова) В.С., Тихонов А.В. Новые встречи серого хомячка и степной мышовки, мышовки Штранда и темной мышовки на территории Ростовской области <i>New encounters of the gray dwarf hamster and the southern birch mouse, the Strand's birch mouse and the Severtzov's birch mouse on the territory of the Rostov region</i>	314
Тарасовская Н.Е., Клименко М.Ю., Гаврилова Т.В., Алиясова В.Н. Использование продуктов пчеловодства для консервации костных экспонатов в полевых условиях <i>Using of polymeric materials for the conservation of archeological and paleontological bone exhibits</i>	317
Тарасовская Н.Е., Клименко М.Ю. Сезонная динамика показателей зараженности гельминтами остромордой лягушки во влажные и засушливые годы <i>Seasonal dynamics of infection indicators by helminthes in moor frog in moist and dry years</i>	322
Тарасовская Н.Е., Клименко М.Ю. Спектральный анализ мышечных тканей охотничье промысловых животных Павлодарской области <i>X-ray analysis of hunting and commercial animals' muscle tissue from Pavlodar region</i>	328
Тастайбаева А.А. Биотопическое распределение наиболее распространенных саранчовых в Наурзумском заповеднике и на сопредельных территориях <i>Biotoxic distribution of the most common locusts in the Naurzum nature reserve and adjacent territories</i>	335
Timonen S. The migration ecology of finnish black-tailed godwits (<i>Limosa limosa</i>) <i>Миграционная экология финских больших веретенников (Limosa limosa)</i>	340
Чаликова Е.С. Птицы Сунгинского участка Сырдарья-Туркестанского природного парка <i>Birds of the Sunga section of the Syrdarya-Turkestan Natural Park</i>	344
Чередников С.Ю. Биоразнообразие ихтиофауны в запретном рыбном пространстве и сопредельной акватории дельты Дона <i>Biodiversity of ichthyofauna in the forbidden space and adjacent water area of the Don estuary</i>	351
Шупова Т.В. Лесопарки мегаполиса в системе сохранения видового разнообразия сообществ гнездящихся птиц <i>Forest parks of the metropolis in the system of conservation of diversity of nesting birds communities</i>	355

БІЛІМ БЕРУ ПӘНДЕРІНДЕГІ БИОЛОГИЯЛЫҚ ӘРТҮРЛІЛІК ЖӘНЕ ЕРЕКШЕ
ҚОРҒАЛАТЫН ТАБИҒИ АУМАҚТАР ТУРАЛЫ МАТЕРИАЛДАР

МАТЕРИАЛЫ О БИОЛОГИЧЕСКОМ РАЗНООБРАЗИИ И ОСОБО ОХРАНЯЕМЫХ
ПРИРОДНЫХ ТЕРРИТОРИЯХ В ОБРАЗОВАТЕЛЬНЫХ ДИСЦИПЛИНАХ

MATERIALS ON BIOLOGICAL DIVERSITY AND SPECIALLY PROTECTED NATURAL
TERRITORIES IN EDUCATIONAL DISCIPLINES

Астанина Л.А. Биоразнообразие в призме химического загрязнения <i>Biodiversity in the lens of chemical pollution</i>	361
Баубекова Г.К., Омарова К.И., Коваль В.В., Суюндикова Ж.Т. Экологизация в школьном курсе «География» <i>Ecologization in the school course "Geography"</i>	364
Белан О.Р. Проблемное обучение в экологическом образовании студентов вузов <i>Problem-based learning in environmental education for university students</i>	370
Брагина Т.М., Рулёва М.М. Жуки-щелкуны как удобный объект знакомства с местной фауной <i>Click beetles as a convenient object for exploring the local fauna</i>	373
Брагина Т.М., Сатмухамбетова Г.А. Изучение опасных видов длинноусых двукрылых в курсе школьной программы <i>The study of dangerous species of long-whiskered dipterans in the course of the school curriculum</i>	377
Жигадло О.А., Брагина Т.М. Модельные виды розоцветных как удобный объект изучения растительного мира в образовательном процессе <i>Model species of Rosaceae as a convenient object of studying the plant world in the educational process</i>	384
Кожмухаметова А.С., Божекенова Ж.Т. Жүйелік-белсенділік тәсілін пайдалана отырып биологиялық пәндерді оқытуды ұйымдастыру <i>Organization of teaching biological disciplines using a system-activity approach</i>	390
Нурушев М. Ж., Дарибай Т. О., Хуанбай Ж., Нурушев Д. А. Актуальность специальности «Биологические ресурсы» в образовательном процессе Республики Казахстан <i>Relevance of the specialty "Biological resources" in the educational process of the Republic of Kazakhstan</i>	395
Ручкина Г.А., Чернявская О.М. Организация работы студентов на лабораторно-практических занятиях естественно-научных дисциплин <i>Organization of student work in laboratory and practical classes in natural science disciplines</i>	402

Қостанай мемлекеттік педагогикалық институтының құрметті профессоры,
биология ғылымдарының докторы Т.М. Брагинаның мерейтойына арналған
**БИОЛОГИЯЛЫҚ ӘРТҮРЛІЛІКТІ САҚТАУ ЖӘНЕ ЕРЕКШЕ
ҚОРҒАЛАТЫН ТАБИҒИ АУМАҚТАР ЖЕЛІСІН ДАМУ** атты
ХАЛЫҚАРАЛЫҚ ҒЫЛЫМИ-ПРАКТИКАЛЫҚ КОНФЕРЕНЦИЯНЫҢ
МАТЕРИАЛДАРЫ

МАТЕРИАЛЫ
МЕЖДУНАРОДНОЙ НАУЧНО-ПРАКТИЧЕСКОЙ КОНФЕРЕНЦИИ
СОХРАНЕНИЕ БИОЛОГИЧЕСКОГО РАЗНООБРАЗИЯ И РАЗВИТИЕ СЕТИ
ОСОБО ОХРАНЯЕМЫХ ПРИРОДНЫХ ТЕРРИТОРИЙ,
посвященной юбилею почетного профессора Костанайского государственного
педагогического института, доктора биологических наук Т.М. Брагиной

PROCEEDINGS
OF THE INTERNATIONAL RESEARCH AND TRAINING CONFERENCE
«CONSERVATION OF BIOLOGICAL DIVERSITY AND DEVELOPMENT
OF THE NETWORK OF SPECIALLY PROTECTED NATURAL AREAS»,
dedicated to the anniversary of the honorary professor of the Kostanay
state pedagogical institute, doctor of biological sciences T.M. Bragina

Басуға 2024 ж. 21.02. берілді.
Пішімі 60x84/8. Көлемі 32,0 б.т. Тапсырыс № 016.

Подписано в печать 21.02.2024
Формат 60x84/8. Объем 32,0 п.л. Заказ № 016.

Ахмет Байтұрсынұлы атындағы
Қостанай өңірлік университетіндегі
Редакциялық-баспа бөлімінде басылған

Отпечатано в редакционно-издательском отделе
Костанайского регионального университета
имени Ахмет Байтұрсынұлы

Қазақстан Республикасы, 110000,
Қостанай қ., Байтұрсынұлы қ., 47

Республика Казахстан, 110000,
г. Костанай, ул. Байтұрсынова, 47