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Cover: Fish species recorded in the Gowthami-Godavari Estuary, Andhra Pradesh: *Lutjanus johnii* (top left), *Triacanthus biaculeatus* (top right), *Acentrogobius cyanomos*, *Hemiramphus archipelagicus*, *Hypoatherina vagina*, *Oxyurichthys microlepis*. © Paromita Ray.

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REVIEW

Natural history notes on three bat species

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Abstract: Three bat species have long been considered to occur within the state of Rajasthan—the Lesser Mouse-Eared bat *Myotis blythii* Tomes, 1857, the Large Barbastelle *Barbastella dorjelingensis* Hodgson, in Horsfield, 1855 and the Serotine Bat *Eptesicus serotinus pachyomus* Tomes, 1857. Rajasthan is considered the type locality for two of these species—*Myotis blythii* and *Eptesicus serotinus pachyomus*. Despite targeted surveys, these bats have not been observed in Rajasthan for more than a century and a half. A chronological review of published literature reveals that the bats were never originally claimed to occur in Rajasthan and their inclusion among bats occurring in Rajasthan was a consequence of assumptions perpetuated as facts.

Keywords: Chiroptera, Large Barbastelle, Serotine Bat, Lesser Mouse-eared Bat, Rajasthan, India, British Museum, Captain Boys, Himalaya.

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Author contributions: All authors have contributed equally to this chronological literature review.

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INTRODUCTION

Bats (Chiroptera) are among the most widely distributed and diverse mammals in the world, second only to rodents in both regards (Sinha 1996). India is home to 127 species of bats (Talmale & Saikia 2018) and the state of Rajasthan has a long history of chiropteran study. There have been contributions by Blanford (1888–91), Ryley (1914), Wroughton (1918), Ellerman & Morrison-Scott (1951), Prakash (1963a,b, 1973), Agrawal (1967), Biswas & Ghosh (1968), and Sinha (1973, 1975, 1976, 1977) to chiropteran study in Rajasthan. Prakash's (1963a) study in Rajasthan was limited to nine bat species in the Thar Desert. Sinha (1980) carried out the first systematic study of bats covering all of Rajasthan, discussing in great detail, both the taxonomy and zoogeography of 21 species based on a field survey and published literature. Some of these 21 species were recorded for the first time in the state of Rajasthan (Sinha 1980). Sinha (1981), Sharma (1986), Bhupathy (1987) and Senacha & Dookia (2013) recorded a new species each for the state of Rajasthan. Srinivasulu et al. (2013) provided an 'intensive account' of 25 bat species recorded in Rajasthan.

However, despite targeted surveys and the consistent addition of new species to the list of bats occurring in Rajasthan, it is believed that three bat species have not been observed in the state for more than a century and a half: the Lesser Mouse-eared Bat *Myotis blythii* (Tomes, 1857), the Large Barbastelle *Barbastella darjelingensis* (Hodgson, in Horsfield, 1855) and the Serotine Bat *Eptesicus serotinus pachyomus* (Tomes, 1857). Rajasthan is in fact considered the type locality for two of these species—*Myotis blythii* and *Eptesicus serotinus pachyomus* (Thomas 1915; Wroughton 1918; Sinha 1980; Bates & Harrison 1997; Srinivasulu & Srinivasulu 2012; Srinivasulu et al. 2013). Information on these bats is fragmented, and the presence of these bats has only been questioned sporadically before in Rajasthan (Blanford 1888–91; Topal 1971). In addition to not being observed for more than a century, targeted field surveys such as by Sinha (1980) did not yield any results. The authors thus propose a thorough chronological review of published literature on these species to ascertain just why there has been absolutely no evidence of occurrence for such a long period of time.

OBSERVATIONS

Lesser Mouse-eared Bat *Myotis blythii* (Tomes, 1857)

The description for this species of bat (then *Vespertilio blythii*) was provided by R.F. Tomes (1857). Robert Fisher Tomes (1823–1904) was an English farmer and zoologist with an avid interest in Chiroptera. His description was based on a specimen preserved in the British Museum and thus he did not collect the specimen himself. Tomes (1857) wrote that the type specimen in the British Museum was labelled, "Hab. India, Nassenabad, from Mr. Warwick, 1848" and he added, "I believe collected by Captain Boys".

Tomes (1857) provides two pieces of information, a location in India, the fact that the specimen was sent to the British Museum by a Mr. Warwick in 1848. Now considering there already was a name attached to the specimen, why did Tomes (1857) speculate that the collector was Captain Boys? Where precisely "Nassenabad" is in India is also unknown, but Tomes (1857) created confusion by speculating that the collector might be Captain Boys. There is absolutely no mention of Rajasthan or as it was then known, Rajputana.

So what could be the reason behind this speculation? The "Mr. Warwick" referred to here was John Edington Warwick, a 'naturalist' employed by the Royal Surrey Zoological Gardens in Walworth, London at the time (not to be confused with the Zoological Gardens managed by the Zoological Society of London in Regent's Park) (Grigson 2016). The gardens sourced animals for their displays from at least three continents during Warwick's time (Editor 1835; Jardine 1858; Sclater 1870; Grigson 2016). Warwick appears to have occasionally sourced and procured animals back from overseas personally, such as giraffes from Egypt in 1836 (also brought back were five ostriches, 18 Numidian cranes, one camel and five jerboas) which became the subject of a book authored by him (Warwick 1836; Grigson 2016). The animals displayed at the gardens often became specimens for museums upon expiry. The gardens were clearly the final destination of many kinds of fauna from overseas, and it appears that Warwick's specimens were even sold to museums, such as the Cuban nightjar to the Derby Museum in 1849 (Sclater 1866), a year after the British Museum received the type specimen for *Myotis blythii*. It is therefore clear that although Warwick was certainly the source of the specimen, he was not necessarily the collector, prompting Tomes (1857) to speculate that perhaps it was Captain Boys who collected it from the field in India.

Which brings us to why T[illegible]

the collector might be Captain Boys. It is possible that Tomes (1857) connected Captain Boys to the locality "Nasirabad", and assumed that was what was meant by "Nassenabad" on the specimen label. However, there were multiple towns named "Nasirabad" in British India. A background on Capt. Boys might shed some light on such an assumption. Captain W.J.E Boys was an officer in the 6th Regt. Light Cavalry of the British East India Company and a known collector of specimens. Nasirabad in the district of Ajmer in Rajasthan has a very long history as a cantonment town. It is also quite possible that the label "Nassenabad" was a typological error since error by curators was not unheard of in the British Museum during that period (Benda & Mlíkovský 2008).

It should also be noted that Boys died three years before Tomes (1857) authored his description and thus could not be consulted to confirm nor refute the contents of the description or any work by subsequent authors. Nevertheless, the purported association of Captain Boys with Nasirabad, Rajasthan led to the perpetuation of certain assumptions regarding the type locality of this species, even though Tomes (1857) clearly never made any such claims.

It was Jerdon (1867) who first made the claim that the type specimen was procured from Rajasthan, and wrote that "The bat was found by Captain Boys in Nusserabad, Rajputana". Jerdon (1867) made three assumptions in this claim. The first is that the "Nassenabad" mentioned by Tomes (1857) is "Nusserabad". The second is that "Nusserabad" is in Rajputana (Rajasthan), thereby becoming the first author to connect an otherwise ambiguous locality to the state of Rajasthan. This is despite the fact there were multiple towns with the same name, which still exist to this day in independent India and Pakistan, including in the Indian states of Uttar Pradesh and Uttarakhand, where Boys was also known to be active. The third is that the collector of the specimen was Captain Boys. Therefore, Jerdon (1876) stated what was clearly a speculation by Tomes (1857) as fact.

Dobson (1878) in his 'Catalogue of the Chiroptera in the Collection of the British Museum', wrote that the type specimen was from "India" and from the "Warwick Coll." (Coll. =Collection). Dobson (1878) was thus most appropriate in his treatment of the specimen, for he did not include any speculative information in his account and mentioned the undisputed facts alone, which were that the type specimen was from India and that the origin was the collection of J.E. Warwick. Blanford (1888–91) was the first to question whether the locality of this specimen was correct, and wrote "This type of *V. blythii* was said to be from Nusserabad, in Rajputana, but this locality I think requires confirmation". However, Blanford (1888–91) did not stress this point any further and did not elaborate why he thought so.

Following Jerdon (1867), the aforementioned assumptions regarding the locality and collector are further perpetuated as facts by Thomas (1915) in the Bombay Natural History Society's Indian Mammal Survey, "Of this group of large grey species, the Indian representative is *M. blythii*, Tomes of which the Museum contains the type (skin and skull) from Nusserabad (Boys)". Which was in turn, further perpetuated by Ellerman & Morrison-Scott (1951), who claimed that the type locality of "1857, *Vespertilio blythii* Tomes" was "Nasirabad, Rajputana" and on distribution, commented, "Ranges to Simla, northern India". It should be noted that the text by Ellerman & Morrison-Scott (1951) did not exclusively focus on *Chiroptera*, but their text was a checklist on 'Palearctic and Indian Mammals- 1758 to 1946', and brought 'Rajputana' back into the discourse concerning this bat.

Nearly a century after Blanford (1888–91) questioned the locality of the report, Topal (1971) commented on the improbability of Nasirabad, Rajasthan being the origin of the type specimen discussed by Tomes (1857) on ecological grounds, and also suggested that the locality "Nassenabad" was in all likelihood, somewhere in the Himalayas. Topal (1971) wrote, "this site lies, on the one hand, at least 600 km. to the SW of the nearest locality of occurrence of *M. blythi*, and, on the other, in a climatically and zoogeographically utterly different region, separated by an extensive plain of hot and mostly dry climate from the Himalayas. It is therefore improbable that Nasirabad, Rajputana, could be the type-locality of *M. blythi*. Since Mussoorie, Chamba, Simla (Dodsworth 1914), Kashmir, and probably the locality Nassenabad all belong to the climatically and zoogeographically essentially uniform area of the western Himalaya, it is in all likelihood inhabited by a single form, the nominate one, of *Myotis blythi*."

Nevertheless, Sinha (1980) also gave "Nasirabad, Rajasthan" as the type locality for "*Vespertilio blythii* Tomes, 1857, *Proc. zool. Soc. Lond.*, 1857. p. 53" and citing Ellerman & Morrison-Scott (1951), described the distribution of the species in India to range from "Nasirabad (Rajasthan) to Simla, northern India". Sinha (1980) thus ignored Dobson (1878), Blanford (1888-91) and Topal (1971). Sinha (1980) only examined a female specimen sourced from Chamba (Himachal Pradesh) during this survey and not the type specimen in the British Museum.

Bates & Harrison (1997) in their book on *Bats of the Indian Subcontinent*, acknowledged Blanford (1888–91) and Topal (1971), by marking the locality in Rajasthan with a "?", on their distributional map for *Myotis blythii*. In the section on distribution, Bates & Harrison (1997), state the following, "Rajasthan: Nasirabad (type loc. of *blythii*, but Topal, 1971 suggests the correct locality is Nassenabad, possibly in the Himalayas)".

Srinivasulu & Srinivasulu (2012) in their book on: "Checklist of South Asian mammals" mentioned the type locality Nasirabad, Rajasthan without any further comment. Even more recently, Srinivasulu et al. (2013) (includes Y.P. Sinha as co-author) wrote that, "*Myotis blythi blythi* (Tomes, 1857) has been reported from Nasirabad (Ajmer District) which is also its type locality, but Topal suggests that the correct locality is Naseerabad, possibly in the Himalayas". While acknowledging the arguments made by Topal (1971), Srinivasulu et al. (2013) nevertheless perpetuated assumptions first made by Jerdon (1867) by including this species in their account of bats recorded in Rajasthan.

The Serotine Bat *Eptesicus serotinus pachyomus* (Tomes, 1857)

In the same publication, Tomes (1857) also provided a description for the Serotine Bat (then *Scotophilus pachyomus*), which was based on a specimen preserved in the British Museum. According to Tomes (1857), the collector was "Capt. Boys" and the specimen was from "Hab. India". There is no mention of Rajasthan (then known as Rajputana), but a non-specific type locality in the form of "India".

Dobson (1878) wrote in his catalogue that the type specimen for "*Scotophilus pachyomus*, Tomes" was from "India" and collected by "Capt. Boys (C)". This is completely consistent with Tomes (1857). As far as distribution in India is concerned, Dobson (1878) did not name *Rajputana* nor any contiguous region in the distribution of the species, but "India, where it inhabits the valleys of the Himalayas".

The first account of this species purportedly occurring in *Rajputana* or Rajasthan is by Wroughton (1918) in a manner similar to the last species by Jerdon (1867). In the Bombay Natural History Society's Indian Mammal Survey, in which Wroughton (1918) wrote, "Type Locality: Rajputana: Boys". It appears that this is an assumption presented as fact, quite possibly made on account of the collector of the type specimen being Captain Boys. Ellerman & Morrison-Scott (1951) further perpetuated this assumption, when they included "Rajputana" in the distribution area of this species. Therefore, once again, the purported association between Captain Boys and Rajputana or Nasirabad, caused the perpetuation of assumptions as facts regarding the type locality of the specimen.

Sinha (1980) also wrote that *E. serotinus pachyomus* "is found in Rajasthan" and that the type locality for "*Scotophilus pachyomus* Tomes, 1857, *Proc. zool. Soc. Lond.*, 1857. p. 50" as "*Rajputana*". Sinha (1980) then further added, "As informed by J.E. Hill (Brit. Mus.): It seems that Boy's collected the specimen in Rajputana, probably near Nasirabad, but labelled "India"; I failed to collect it in Nasirabad". J.E. Hill (now deceased) is consistent with Tomes (1857) and Dobson (1878) on the facts that Captain Boys collected the type specimen and that it was indeed labelled "India", however it is evident that the origin of the specimen being Nasirabad or anywhere else in *Rajputana* is guess work at best. Boys being the collector of the type specimen might well have informed Hill's speculation regarding the locality. Despite a clear lack of confirmation, Sinha (1980) included this species in his survey for Rajasthan. The three Indian specimens Sinha (1980) examined for this survey originated in "Kashmir".

Bates & Harrison (1997) included Rajasthan in the distributional area of the species but with the following caveat, "Rajasthan: no fixed locality (type loc. of *pachyomus*)". Rather pertinently, Bates & Harrison (1997) also did not mark any locality in Rajasthan on their distributional map for the subspecies. Srinivasulu & Srinivasulu (2012) in their book on: "Checklist of South Asian mammals" included Rajasthan in the distribution area for the subspecies *pachyomus* without providing any further details.

Srinivasulu et al. (2013) wrote that "The type locality of *Eptesicus serotinus pachyomus* (Tomes 1857) is "Rajputana" (present-day Rajasthan), India". Then, citing Sinha (1980), Srinivasulu et al. (2013) added "The type probably has been collected from Nasirabad (Ajmer District)". Despite a lack of confirmation regarding the origin of the type specimen and the absence of any other evidence of this bat's occurrence in Rajasthan, Srinivasulu et al. (2013) included this species in their account of bats recorded in Rajasthan.

In addition, Srinivasulu et al. (2013) also categorically stated, "The first account of bats from *Rajputana* (British name for Rajasthan and its surrounding states) dates back to 1857 in the work of R.F. Tomes who provided descriptions of *Scotophilus pachyomus* (presently *Eptesicus serotinus pachyomus*) and *Vespertilio blythi* (presently *Myotis blythi blythi*) collected from Nasirabad, 130 km south of Jaipur in the [illegible]".

However, it should be abundantly clear that Tomes (1857) never mentioned "Nasirabad" nor *Rajputana* in his accounts of the two species.

Large Barbastelle *Barbastella darjelingensis* (Hodgson, in Horsfield, 1855)

The first account of this species of bat purportedly occurring in Rajasthan is provided by Wroughton (1918). Wroughton (1918) includes "Rajputana" in the distribution of this species on account of a specimen in the British Museum, but does not mention a collector nor a specific locality within *Rajputana* for this specimen in the survey.

A close examination of the catalogue by Dobson (1878), reveals that in addition to the type specimen collected by B.H. Hodgson from the district of Darjeeling ("Darjiling" in the text) in northern West Bengal, there was one more specimen labelled from "India" with "Capt. Boys" named as the collector. There is no mention of *Rajputana* nor any specific locality in India for this specimen. Dobson (1878) also did not mention *Rajputana* in the distribution of this species in the accompanying account, "India (Darjiling, Khasia hills, Sikhim, Masuri, Simla); Yarkand".

This raises the obvious question, how then did Wroughton (1918) include *Rajputana* in the distribution of this species? Here too, it appears that the purported association between Captain Boys and Nasirabad or *Rajputana* (Rajasthan) led to the perpetuation of certain assumptions, similar to what transpired with the two species described by Tomes (1857).

Ellerman & Morrison-Scott (1951) also included *Rajputana* in the distribution area of this species. Sinha (1980) however, while pointing out that Wroughton (1918) and Ellerman & Morrison-Scott (1951) included "Rajputana" to the range of distribution of this species, mentions that he was unable to find any specimens in Rajasthan for his survey. However, here too, Sinha (1980) consulted J.E. Hill from the British Museum and wrote the following: "as informed by J.E. Hill (B.M.) the specimen from the British Museum is probably from Nasirabad but labelled as "India". J.E. Hill is consistent with Dobson (1878) on the fact that the specimen is labelled from just "India". However, it is quite clear that the origin of the specimen being "Nasirabad" is guess work. This is also the first instance of the specimen being alleged to have originated in Nasirabad, and not just *Rajputana*. It is quite possible that in addition to following Wroughton (1918) and Ellerman & Morrison-Scott (1951) as far as *Rajputana* is concerned, Hill speculated that the type locality was Nasirabad on account of the collector being Captain Boys (as Wroughton (1918) might have done for this species earlier for *Rajputana*), although Sinha (1980) does not mention Boys in this particular account.

In addition, the specimens that Sinha (1980) examined for this survey originated from locations in the Himalayas. Despite a clear lack of confirmation of the origin of the relevant specimen, Sinha (1980) included this species in his survey for Rajasthan. Bates & Harrison (1997) did not mention Rajasthan in the distributional area of this species in their text, nor did they mark any locality in Rajasthan on their distributional map for this species.

Srinivasulu & Srinivasulu (2012) in their book on: "Checklist of South Asian mammals" did not include Rajasthan in the distributional area for this species. Citing Wroughton (1918), Ellerman & Morrison-Scott (1951) and Sinha (1980), Srinivasulu et al. (2013) asserted, "*Barbastella darjelingensis* (Hodgson, 1855 in Horsfield 1855) has been reported from Nasirabad (Ajmer District)". Thus Srinivasulu et al. (2013) further perpetuated their assumptions by including this species to their account of bats recorded in Rajasthan.

DISCUSSION AND CONCLUSION

Our chronological review of literature reveals that many authors believed Captain Boys to be the collector of the relevant specimens for all three species. However, the original descriptions and account reveal that Boys was the collector of just two specimens (Tomes, 1857; Dobson, 1878). Tomes (1857) only traced the type specimen for *Myotis blythii* with certainty to J.E. Warwick of the Surrey Zoological Gardens in Walworth, London and merely speculated that Boys was the collector in India. Among the three species, only one specific locality was ever provided and this was the ambiguous "India, Nassenabad" for *Myotis blythii* (Tomes 1857). The relevant specimens for *Eptesicus serotinus pachyomus* and *Barbastella darjelingensis* were only described to have originated in "India" (Tomes 1857; Dobson 1878).

The erroneous belief regarding Boys evidently gained currency because authors either associated Captain Boys with *Rajputana* first and then Nasirabad (for *Eptesicus serotinus pachyomus* & *Barbastella darjilengensis)*, or in the reverse order (for *Myotis blythii*) (Jerdon 1867; Thomas 1915; Wroughton 1918; Sinha 1980). The connection between Captain Boys and *Rajputana* or Nasirabad is unclear. It could possibly be on account of Boys having been a cavalry officer and that Nasirabad was a cantonment town.

On examination of Boys's life, it is evident that he was rather mobile through northern India. In 1843, he served as assistant to the Commissioner of Kumaon (Uttarakhand) (Piddington 1843) and was also a combatant in the second Anglo-Sikh war (Grant 1849). Boys eventually expired in Almora (Uttarakhand) on 21 March 1854 (Editor 1854).

Authors such as Wroughton (1918) categorically associated Captain Boys with the collection of mammal specimens in "Rajputana" during the early period of Indian Mammalogy (second quarter of the 19th century), however an examination of his work reveals that Boys was by no means limited to just *Rajputana* nor mammals.

Such was Boys's prowess in collecting specimens, that he was unanimously elected a member of the Asiatic Society of Bengal in 1842 (Prinsep 1842). Specimen contributions by Boys range from a snail from Agra (Uttar Pradesh) (Benson 1864), a wasp from Almora (Uttarakhand) (Turner 1912), a bird from a location in between Sindh (now Pakistan) and Ferozepur (Indian Punjab) (Blyth 1846), to even a caracal from Jaipur in Rajasthan (Blyth, 1845). Strickland & Strickland, in Jardine (1852), wrote of the auction of Boys's ornithological collection in London which included, "the result of many years residence in the upper Gangetic provinces of India, ...an extensive series of birds, amounting to between 500 and 600 species. Some of them very rare". Piddington (1843) even wrote of the Asiatic Society of Bengal providing Boys with financial assistance for geological expeditions to the "Thibet passes" (India-Tibet border areas).

Thus it is evident that Boys was not limited to just *Rajputana* in his endeavours and spent a considerable amount of time in the Himalayas (Piddington 1843; Strickland & Strickland, in Jardine 1852; Turner 1912). Incidentally, the Himalayas are where Topal (1971) believed the type specimen of *Myotis blythii* to originate from based on its ecology, and where there are at least two localities by the name Nasirabad (one in Haridwar district in the state of Uttarakhand, and the other in the Hunza district of Pakistan Occupied Ladakh).

It should also be noted that errors in the provenance of specimens were not only common, but often translated to taxonomic errors of great magnitudes. In a notable example, the eminent curator and zoologist John Edward Gray made just such an error with a small cat specimen in the British Museum. Gray (1867) declared a new species based on the aforementioned specimen, *Pardelina warwickii* or Warwick's Cat, which was apparently from the Himalayas. The specimen, when alive was exhibited as a "Himalayan Cat" in the Surrey Zoological Gardens (hence named after J.E. Warwick). It was not until 1870, that zoologist Philip Sclater proved that the cat was a Geoffroy's Cat (*L. geoffroyi*) from South America, a species which had been described much earlier in 1844 (Sclater 1870). Thus not only was the specimen not from the Himalayas, it was not even Asian. Gray (1874), in his recantation, commented that, "there was an inclination of the dealers to give Himalaya as the habitat of animals of which they did not know whence they came, as animals of that country were interesting and fetched a good price".

Thus the authors propose that until there is tangible evidence of occurrence of these three species in Rajasthan—*Myotis blythii* Tomes, 1857, *Eptesicus serotinus pachyomus* Tomes, 1857, and *Barbastella darjeligensis*, Hodgson, in Horsfield, 1855—they should be omitted from lists and accounts of *Chiroptera* occurring in Rajasthan. The bats were never originally claimed to occur in Rajasthan (Tomes 1857; Dobson 1878) and their inclusion among bats occurring in Rajasthan was a consequence of assumptions perpetuated as facts.

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Research Article

HIBERNATING ABILITY OF *SCOTOPHILUS KUHLII* BY INFRARED CAPACITY

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ABSTRACT
In Indian continent, about 13 orders, 42 families, 180 Genera and 390 species of mammals are present. Of these, 8 orders, 23 families, 45 Genera and 66 species have been recorded from Thar Desert of Rajasthan. Out of 115 species of bats (17 megabats and 99 microbats) reported from India, eight micro bats found in the Thar Desert covering the Shekhawati region (Sikar and Jhunjhunu) of Rajasthan. Hibernation is an adaptive approach in bats that facilitates coping with low ambient temperatures and inadequate food during winter. The over-winter survival of hibernating bats depends on the quantity of energy that animals store prior to hibernation, the rate of depletion of these reserves and the duration of winter. In this study compare the Body temperature (T_{body}) of roosted *Scotophilus kuhlii* during summer and winter using Infra red camera (FLIR C2) in urban environment as historical old haveli of shekhawati region. Period of winter average body temperature is decreased by 9.8±1.13°C and bats with parasite are also decreased by 9.1±0.95°C as compare to summer season. During the winter arousals, bats exhibited movement following T_{body} increase of only 9.8±1.13 °C, compare to >30.1±1.56 °C increases during normal arousals of *S. kuhlii*. The maximum and minimum values of (T_{body}) in winter with parasites are 21.9±0.90°C and 20.2±1.10°C respectively.

INTRODUCTION
Chiropterans, identifying as bats, are the only factual flying mammals. Bats globally comprise of 1,116 species belong to 202 genera, 18 families. They constitute about a quarter of the entire mammal species and are second to Rodents in phrase of diversity. Thar Desert in Rajasthan has only 6% area of the total area of the country. Within this little area, with hostile climatic environment, about 15.8% (68 out of 428) mammalian species are surviving. In India, about 13 orders, 42 families, 180 Genera and 390 species of mammals are present. Of these, 8 orders, 23 families, 45 Genera and 66 species have been recorded from Thar Desert of Rajasthan. Out of 115 species of bats 17 megabats and 99 microbats are reported from the Thar Desert of India. On the Indian sub-continent, *Scotophilus* represented by two sub-species including *S. heathii* and *S. kuhlii* (Bates and Harrison 1997, Srinivasulu *et al.*, 2010a). *Scotophilus heathii* Horsfield, 1831 is distributed from Afghanistan to South China, including Hainan Island, south to Sri Lanka, Vietnam, Cambodia, Thailand and Burma. The genus *Scotophilus* is represented by 12 species with distribution ranges from South Africa to Indonesia and the Philippines (Simmons 2005). *Scotophilus kuhlii* Leach, 1821 was formerly ques-tioned as *S. heathii* (Tate 1942, Ellerman and Morrison-Scott 1951), however, the taxon was later identified as a distinct species (Peterson

1968, Hill and Thonglongya 1972, Corbet and Hill 1992, Koopman 1993, Bates and Harrison 1997, Simmons 2005). The species often mixed with its congeners, representing a complex of several species, and further studies are needed to clarify current taxonomic status (Bates *et al.*, 2008).

Hibernation and Arousal Capacity in Bats

Hibernation is an energy-saving strategy that is strongly influenced by the ambient conditions in a cave. When a bat is hibernating, low ambient temperatures lead to a decrease body temperature and metabolic rate. South Asia is characterized by harsh winter conditions, when feeding opportunities decline and low ambient temperatures there is increase in heat loss and thus it increases the thermoregulatory costs of bats. Because they are small flying animals, micro bats are not able to accumulate large fat reserves to maintain a constant body temperature. They have two other ways of coping with this problem: hibernation and migration (Davis, 1970; Fleming & Eby, 2003). Most European temperate zone bats are 'resident', usually selecting underground hibernation sites, such as fortifications, natural and man-made caves and ice cellars (Mitchell-Jones *et al.,* 2007). During hibernation, the bats reduce the difference between body and ambient temperature to an absolute minimum (*i.e.* become torpid) acting like heterotherms. This technique allows them to survive the winter with just a small amount of body fat (on average a maximum of 25% of their body weight). Bats hibernate from autumn to spring although the exact period varies between the species. This period is characterized by prolonged bouts of torpor, punctuated with periodic arousals, on average every two weeks, during which the bats return to endothermy (e.g. Daan & Wichers 1968, Brack & Twente 1985, Harmata 1985, 1987). According to Daan (1972), species of the genus *Myotis* such as the whiskered bat *M. mystacinus*, the Daubenton's bat *M. daubentonii* and the pond bat *M. dasycneme* wake up on average 9.0-13.3 times during a winter. These arousal frequencies are much lower than those given by Dunbar & Tomasi (2006) for the eastern red bat Lasiurus borealis in Canada, where a maximum of 39 arousals was recorded at an ambient temperature of 8^0C. Also the Greater Horseshoe Bats *Rhinolophus ferrumequinum* and the common Pipistrelle bat *Pipistrellus pipistrellus*, both European bat species, arouse more frequently than the three Myotis species (Avery 1985, Park *et al.*, 2000), probably due to their ability to forage during the winter. Bats arouse more readily in warm conditions than in cold conditions (e.g. Ransome 1971, Park *et al.,* 2000, Humphries *et al.,* 2002, Boyles *et al.,* 2007), a phenomenon also known in other mammals (e.g. Geiser & Kenagy 1988, Ortmann & Heldmaier 2000). In laboratory experiments, researchers (Thomas *et al.*, 1990) found that the little brown bat *Myotis lucifugus* uses approximately 84% of its winter fat reserve to cover the cost of arousals, whereas only 16% is needed to maintain the low metabolic rate. The energy expenditure during 80 days of hibernation is equivalent to one hour of flight (Kokurewicz 2004). During the warming phase of arousals, the heat generated (mainly by burning fat in brown adipose tissue and muscle shivering) causes the body temperature to rise from near ambient to euthermic levels (Smalley 1963, Hayward & Ball 1966). The whole process takes an average of 30 minutes (Barclay *et al.*, 1996, Lee *et al.*, 2002). A bat can stay aroused from hibernation torpor for 15 hours or longer (Twente & Twente 1987, Speakman *et al.*, 1991, Park *et al.*, 2000) with animals tending to remain endothermic longer at higher ambient temperatures (Harmata, 1985). Researchers have assumed that these periods of arousal are necessary for bats to eliminate accumulated metabolites, urine, escape from predators or to adjust

to changes in the temperature of their hibernacula (e.g. Prendergast *et al.,* 2002, Humphries *et al.,* 2003; Davydov, 2004). Other activities undertaken during these arousals include drinking and copulation (McCracken & Wilkinson 2000; Kokurewicz, 2004; Boyles *et al.,* 2006). Arousals are sometimes externally induced by disturbance resulting from exposure to air currents (Pflitsch & Piasecki, 2003), heat, light, sounds and physical contact (Davis 1970, Speakman *et al.,* 1991, Thomas 1995, Thomas & Geiser 1997, Johnson *et al.,* 1998). The annual bat census of all known underground hibernacula (Mitchell-Jones *et al.,* 2007) undertaken in order to monitor bat population can potentially be a source of such disturbance. The census is performed between 15 December and 15 February. Bat observers use torches, binoculars and sometimes mirrors (to look behind corners) to search for bats (e.g. Mitchell-Jones & McLeish 1999, Smirnov *et al.,* 2007). In the European census, bats are never handled for identification and most bat observers try to avoid creating non-tactile stimuli. However, during these censuses, bats are sometimes found to show signs of arousal. During a field experiment in a hibernacula, Thomas (1995) concluded that visits by bat observers caused a dramatic increase in the flight activity of bats, beginning within 30 minutes of the visit, peaking 1.0-7.5 hours later, and remaining significantly above baseline level for up to 8.5 hours. The increased level of activity is not just caused by bat observers, but also indirectly by the bats themselves. One arousing bat can start a cascade of arousals from other bats in the same hibernacula. The first bat may wake up a second bat, by sound or tactile stimuli (for example an active bat attempting to reinsert itself into a hibernating cluster or male bats trying to mate with the hibernating females).

Bats lose 2-3.2% of their body weight during one arousal (Daan 1972, Boyles & Brack 2009), so additional, externally induced; arousals are an unwelcome burden on their energy budget. These arousals may mean that the bats will not have adequate fat reserves to sustain them through the winter. During a bat census, not all non-tactile stimuli can be avoided. Bat observers are a source of sound, light and heat. The light from a torch is often directed at the bat, especially to identify bats hidden deep in a crevice. We assume this can cause an arousal stimulus. Besides light, a torch also produces heat, another potential arousal stimulus. In this paper, we present an experiment aimed at determining if commonly used torches can raise the temperature in crevices by more than a threshold value and provide an arousal stimulus to bats hidden in crevices. As we did not want to repeat arousal experiments, we used the threshold value for arousal found by Speakman *et al.,* (1991). During a study performed in a respirometry chamber, Speakman *et al.,* (1991) found bats responded very strongly to a temperature increase of 58^0C. The experiment did not permit drawing any further conclusions, such as a sex-specific response rate, the effect of signal inhibition after repeated stimuli or the respond rate during different hibernation temperatures.

Vampire bats are receptive to power densities (a measure of emitted energy) greater than 50 μW/cm2 at distances between 13 and 16 cm (a power density of 1.8x10−4W/cm2 corresponds to 50 °C). This was first determined by quantifying the temperature at which vampire bats could not behaviorally distinguish between heat emitting and room temperature SUs. A positive linear relationship exists between the energy-threshold of heat detection and distance from stimuli. Through mathematical calculations, at a distance of 8 cm, vampire bats should be able to detect humans who emit radiation of 80 μW/cm2 (Kürten *et al.,* 1982) Temperature threshold measurements were directly measured by stimulating nerve fibers of thermoreceptors in the

nose-leaf and upper lip with a water-circulated brass thermode and recording the impulses/second at every 5 °C shift in temperature from 10 to 40 °C. These receptors have a threshold of 28 °C and a maximum temperature response to 40 °C, beyond which there was either no firing or an irregular firing pattern (Kürten, 1984 and Schäfer *et al.,* 1988). This threshold is 8 °C lower compared to those of warm receptor in other species of mammals, which implies extreme sensitivity to heat. After stimulation of these receptors, there is a transient increase in impulse activity which quickly decays due to adaptation and thus strengthens temporal acuity (Schäfer *et al.,* 1988).

Molecular mechanism of infrared detection

A family of TRP (transient receptor potential) channels, including TRPV1 (transient receptor potential vanilloid) and TRPA1 (transient receptor potential cation channel A1), is important in thermal and pain detection. (Gracheva *et al.,* 2010) TRPV1 channels are activated by capsaicin (a chemical which can be extracted from chili peppers), noxious temperature ranges (>43 °C), membrane-derived lipids, low pH, and voltage changes. (Rosenbaum *et al.,* 2007) Activation of TRPV1 by capsaicin results in calcium and sodium influx, and functionally allows for detection of painful thermal stimuli. (Rosenbaum *et al.,* 2007) TRPV1 may also act as a molecular thermometer in response to temperatures greater than 43 °C. The result is an inward calcium and sodium current similar to capsaicin-evoked currents. TRPV1 channels may also have voltage-sensitive properties responsible for its activation. (Matta *et al.,* 2007) Phosphorylation and mutations, especially at the C-terminus (carboxylic acid end of primary amino acid sequence), can alter the threshold temperature of heat-activation. (Rosenbaum *et al.,* 2007) The specific mechanism behind heat-activation of TRPV1 channels has yet to be deciphered. Regional migration involves bats migrating to and from a central hibernaculum where they spend the winter months in a state of hibernation. This type of movement is common among temperate species (Griffin 1970; Fleming and Eby 2003; Hutterer *et al.,* 2005) and is the best documented form of bat migration. During the summer months, females typically form maternity colonies where pups are born and reared while males remain solitary. In late summer, bats return to hibernacula (typically caves and abandoned mines) where mating occurs in a behaviour known as swarming (Fenton 1969; Parsons *et al.,* 2003; Piksa 2008; McGuire *et al.,* 2009). The bats then hibernate through the winter, emerge in the spring when females become pregnant, and males and females migrate back to their separate summer quarters. In micro bat have large deposit of adipose tissue, particularly around the neck and between the shoulder blades and originally these considered as a hibernating gland, because the size of adipose tissue deposits was observed to increase and decrease seasonally in hibernating mammals. Adipose tissue long thought to serve primarily thermogenic function.

(1) *Hibernation period (mid-November–early March):* Bats demonstrate very low or almost no activity and departure from the cave are very rare. Interval of lethargy in these bats is most often caused by (i) changes in ambient conditions outside cave, (ii) changes in the physiological condition of the hibernating bat (e.g. dehydration), or (iii) direct disturbance (Speakman & Race, 1989 and Thomas, 1995). During hibernation, average temperature and daily temperature range (i.e. the difference between daily maximum and minimum temperatures) are key factors predicting the general level of flight activity (Ransome, 1990, Park *et al.,* 1992 and Berková & Zukal, 2010). As temperature increases, so the percentage of nights with bat activity also

increases. Similarly, an increase in temperature fluctuation during the day will also result in bat arousals and increased flight activity. Note, however, that bat activity at the cave entrance has been recorded at temperatures as low as −13.2°C (cf. (Boyles *et al.*, 2006). Daily recordings were positive at maximum daily temperature exceeding 6.2°C, when some bat species are able to forage (Ransome, 1990). The activity within defined temperature groups (Berková & Zukal, 2010) was significantly lower during deep hibernation period than during late hibernation. Opinions on the level of activity desynchronization at sunset and loss of nocturnality during hibernation differ and the results of research are inconsistent, some supporting desynchronization and others not (e.g. (Park *et al.*, 1992, Thomas *et al.*, 1993, Nagel *et al.*, 1997 and Hope & Jones, 2012). Berková & Zukal, 2010 study indicate that activity at the cave entrance is synchronized with sunset, even in winter, and that a concentration of activity occurs between 3 and 3.5 h after sunset.

(2) *Late hibernation period (March–mid-April):* with intensive departure activity during the first quarter of the night. Movement activity inside the cave is relatively high and the bats are probably already preparing themselves for departure from the hibernaculum (Zukal *et al.*, 2005). Flight activity is positively affected by average daily temperature, and negatively so by minimum temperature during the preceding day. Bats react very quickly to temperature changes from day to day, with activity decreasing or increasing if temperatures drop or rise by more than 2°C. Such rapid changes in activity level become feasible as the bats move towards the hibernaculum entrance, enabling them to register fluctuations in ambient temperature (Glove & Altringham, 2008 and Zukal *et al.*, 2005) and, as a consequence, potential changes in insect abundance. Bats are capable of foraging at very low temperatures, e.g. Daubenton's bat Myotis daubentonii at temperatures as low as −3.3°C (Ciechanowski *et al.*, 2007). In some species, the activity increases during late hibernation period, presumably, as food availability is already higher and foraging effectively compensates for any energy loss (Dunbar *et al.*, 2007).

(3) *Spring migration (mid-April–early June):* a period of relatively high activity. At this time, the cave may serve as a transitional roost during the spring migration and, from around May, as a temporary roost for males as females already start to form summer colonies. Emergence activity in the first quarter of the night is high, and a small number of bats may re-enter the cave in the last part of the night. Average daily temperature and average daily atmospheric pressure at this time has a significant positive influence on overall flight activity. The degree of variability in activity explained by such climatic factors is the lowest during this period, however, suggesting that either temperature is no longer a limiting factor, or that endogenous rhythms have a strong influence on departure from the hibernaculum (Degn *et al.*, 1995, Harrje *et al.*, 1995, Simon *et al.*, 1999 and Berková & Zukal, 2010). However, the use of underground roosts including caves in the spring may be species specific; it may differ by region, and can also depend on roost structure (Perry, 2013, Park *et al.*, 1999, Skiba *et al.*, 1987).

(4) *Summer period (mid-June–end of July):* During this period, the cave is used only sporadically, though the bats visiting the roost stay the whole night, i.e. they enter before midnight and leave after midnight. This type of activity suggests that, during this period, the cave may be being used as a night roost between peaks in foraging activity or as a transitional day roost (Degn *et al.*, 1995 and Park *et al.*, 1999). At this time, the cave entrance is visited almost exclusively by males (Bauerová & Zima, 1988, Whitaker & Rissler, 1992) as adult females

occupy maternity roosts during lactation and return to these between foraging bouts, night roosts being used sporadically and for brief periods (Anthony *et al.*, 1981 and Lučan & Hanák, 2011).

(5) *Flight activity*: Flight activity at the night roost entrance is influenced by fluctuation in ambient temperature, rather than any absolute temperature threshold, the higher the difference between maximum and minimum daily temperature, the higher the activity level. This corresponds with a model proposing that activity changes in temperate insectivorous bats reflect changes in insect activity (Erkert, 1982), i.e. if day-insect abundance is high due to warmer nights, bat foraging activity may continue overnight with no visits registered at the cave entrance (low activity). On the other hand, when nights are cooler and the daily temperatures range is higher, bats will tend to spend more time in the night roost. Foraging activity is highest at dusk and just before dawn, after which the bats return to the day roost (Anthony *et al.*, 1981). This model is also supported by the influence of rainfall, with flight activity at the cave entrance increasing as rainfall increases whether the nights are warm or cold.

(6) *Autumn migration or swarming period (late July–mid-November):* This period is typified by very high general activity and an increasing number of bats entering the cave. With the break-up of the summer breeding colonies, activity at the cave entrance gradually increases as adult females and juveniles arrive (Řehák, 1994 and Horáček, 1978), often in small groups of 2–12. The majority of bats does not roost in the cave and probably arrive after the first foraging period; hence, peak activity tends to occur around midnight. Activity around the cave entrances in autumn probably enables juveniles to recognize potential hibernacula and to meet individuals of the opposite sex, which live separately during summer (Rivers *et al.*, 2006). Activity level is positively related to average daily temperature, atmospheric pressure and rainfall. Thus, when nights are warm and insect activity is high (high atmospheric pressure), the bats will quickly catch enough prey and will search for the cave entrances (swarming sites) in order to mate or obtain shelter it be raining (Parsons *et al.*, 2003, Berková & Zukal, 2010).

MATERIALS AND METHODS

In desert ecosystem, for the period of extreme summer between March and June, a highest diurnal temperature change is seen. The over-winter survival of hibernating bats depends on the quantity of energy that animals store prior to hibernation, the rate of depletion of these reserves and the duration of winter. The turn down in metabolic rate (MR) and body temperature (T_{body}) of a bat during hibernation enables a significant reduction of usage of nutrients and water, enhancing the probability of survival. Presumably, critical processes or functions that must be periodically restored at normothermic T_{body} for the organism's survival necessitate these arousals. Observations were recorded on January 21, 2016 to 20 December 2017 from Nawalgarh, Jhunjhunu, Rajasthan (27° 51' 5.80" N & 75° 16' 25.82" E) in Seth G B Podar College, Nawalgarh. For collection and comparison of different body part temperature FLIR C2 compact Thermal Imaging System was used. The FLIR C2 is pocket-sized thermal camera designed for hidden heat patterns of the body signal energy waste and structural defects. The C2's must-have features including MSX® real time image enhancement, high sensitivity with fully radiometric imagery. The mechanism of temperature perception is not known and there is no indication of an "intermediate substance" being involved between the sensory receptor cell

Figure 1: Study site

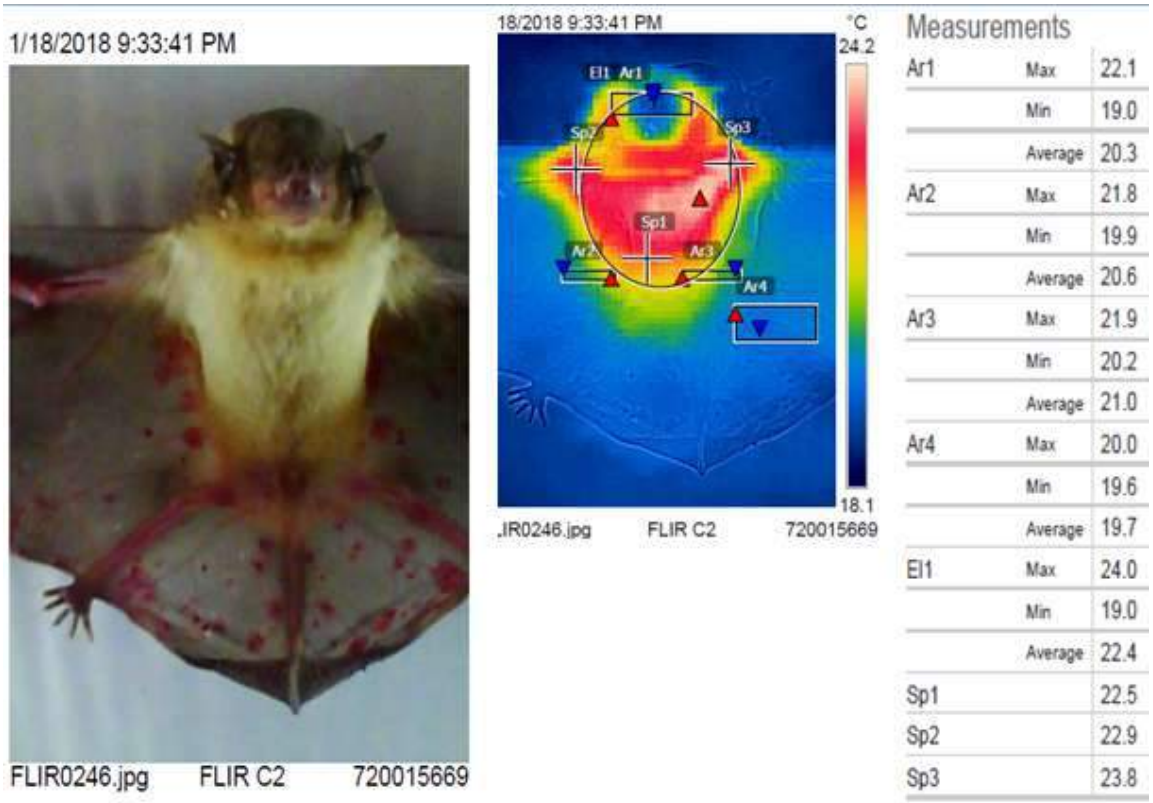
Figure 2: Characteristics features of *Scotophilus kuhlii*

and the heat waves. Anatomically the thermal sense organs have simple sensory cells and are usually localized by observation of the reactions of bats to temperature and the way their behaviour modifies on amputation of various parts of body of small mammals.

RESULTS AND DISCUSSION

Scotophilus kuhlii Leach, 1821: The external body, cranial and bacular measurements of the captured specimens were compared with the available literature. The forearm length (n=3) was 49.40±3.03 mm, the greatest length of the skull (n=3) was 18.98±0.61 mm. The mean frequency of maximum energy was 56.9±3.6 kHz, the mean start and end call frequencies were 103.5±12.3 kHz and 50.6±1.0 kHz.

In this study compare the Body temperature (T_{body}) of roosted *Scotophilus kuhlii* during summer and winter using Infra red camera (FLIR C2) in urban environment as historical old haveli of shekhawati region. Period of winter average body temperature is decreased by 9.8±1.13°C and bats with parasite are also decreased by 9.1±0.95°C as compare to summer season. During the winter arousals, bats exhibited movement following T_{body} increase of only 9.8±1.13 °C, compare to >30.1±1.56 °C increases during normal arousals of *S. kuhlii*. The maximum and minimum values of (T_{body}) in winter with parasites are 21.9±0.90°C and 20.2±1.10°C respectively.

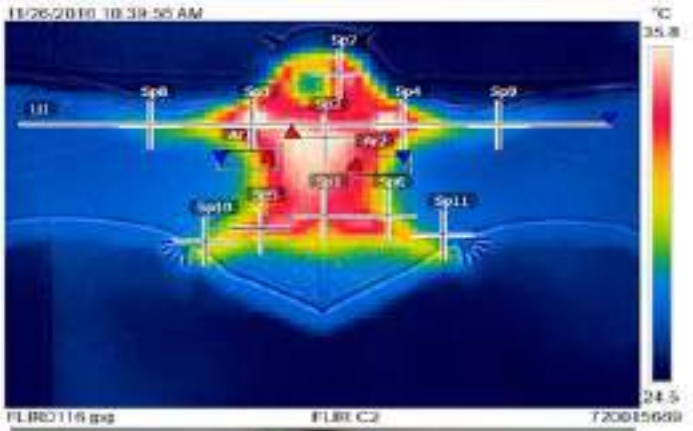


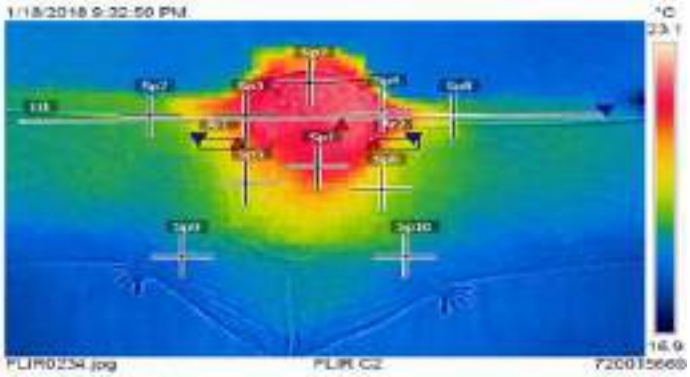
Summer

Measurements		°C
Ar1	Max	33.8
	Min	27.8
	Average	30.3
Ar2	Max	33.7
	Min	27.8
	Average	30.9
Sp1		33.5
Sp2		35.8
Sp3		35.2
Sp4		33.7
Sp5		32.8
Sp6		30.6
Sp7		34.6
Sp8		28.7
Sp9		27.9
Sp10		29.8
Sp11		27.8
Li1	Max	35.4
	Min	26.4
	Average	30.1

Winter

Measurements		°C
Ar1	Max	21.0
	Min	19.8
	Average	20.4
Ar2	Max	21.6
	Min	19.9
	Average	20.6
Sp1		21.7
Sp2		22.1
Sp3		21.7
Sp4		22.1
Sp5		20.0
Sp6		19.9
Sp7		19.4
Sp8		19.3
Sp9		18.4
Sp10		18.8
Li1	Max	22.4
	Min	18.9
	Average	20.3





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FTIR ANALYSIS OF ZINC OXIDE THIN FILMS GROWN AT DIFFERENT SUBSTRATE TEMPERATURE

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Abstract:* *ZnO thin films have drawn a lot of attention because of its variety of application. ZnO has the unique properties such as its wide range of band gap, high binding energy, high melting point and boiling point. So we have taken the ZnO target and using PLD we have deposited thin film on substrate of silicon and corning glass at different – different temperature. After deposition of the thin films the properties of these films were characterized by FTIR spectroscopy. FTIR analysis used for the calculation of bond position (peak) of zinc and oxygen at different wavelength. The analysis exhibits the unique properties of ZnO thin films and provide better understanding to experimental as well as phenomenological techniques.

Keywords: ZnO, PLD, FTIR

1. INTRODUCTION

The work is based on deposition of Zinc Oxide thin film using Pulsed Laser deposition (PLD) technique. Zinc oxide is an inorganic compound [1, 6, 7]. It is denoted by ZnO. It is a white powder which is basically insoluble in water and exhibits large band gap of around 3.3 eV at room temperature. It crystallizes in mainly two types of structure one is Hexagonal Wurzite and another one is Zinc Blend. Generally, The hexagonal Wurzite structure is the commonly found structure as it is most stable at ambient condition. Reportedly, the c/a ratio is nearly equal to 1.6 which is equal to the ideal value of c/a ratio of hexagonal structure unit cell. Zinc oxide has a linear structure in two dimensions which shows that there is a double bond between Zinc and Oxygen. In transparent electronics, Zinc oxide is mainly used in laser diode and light emmiting diode due to the wide range of its semiconductor bandgap . Because of its wide band gap, low cost, strong radiation hardness and high chemical stability, ZnO is regarded as one of the most promising candidates for UV photo detectors. Zinc oxide gas sensor has a good characteristic like chemical sensitivity to different adsorbed gases, amenability to doping, high chemical stability, non-toxicity, and low cost. Zinc oxide nanorods can detect change in electric current passing through ZnO nanowires due to adsorption of gas molecules. The sensor detects hydrogen concentration down to 10 ppm at room temp, whereas no response to oxygen.

Properties of ZnO

Property	Value
Lattice parameters at 300 K:	
a_0	0.32495 nm
c_0	0.52069 nm
a_0/c_0	1.602 (1.633 for ideal hexagonal structure)
u	0.345
Density	5.606 g/cm^3
Stable phase at 300 K	Wurtzite
Melting point	1975°C
Linear expansion coefficient (/°C)	a_0: 6.5 x 10^{-6}, c_0: 3.0 x 10^{-6}
Thermal conductivity	0.6, 1-1.2
Static dielectric constant	8.656
Refractive index	2.008, 2.029
Energy gap	3.4 eV (direct)

2. EXPERIMENTAL TECHNIQUES

Thin film deposition:-

Thin film means a layer of material in which range of particle be a fraction of nanometers to 100 micrometers. Thin film is a low dimensional material which is created by condensing molecule matter on a substrate. Thin films have some most interesting properties which differ from bulk materials from which they are made of. This happens because properties of thin film depend on number of some interrelated parameter and also depend on the fabrication technique [1]. There is some important parameter which define the optical, mechanical and coated material properties. These properties are: substrate of the material and quality of surface, degree of vacuum inside the coating chamber, during film growth flow of gases inside the coating chamber, evaporation rate and purity of coating material. The film deposition is divided into three major part: -

1. Production of films using physical or chemical deposition technique
2. Transportation to the substrate
3. Condensation for solid deposit

Pulse Laser Deposition:

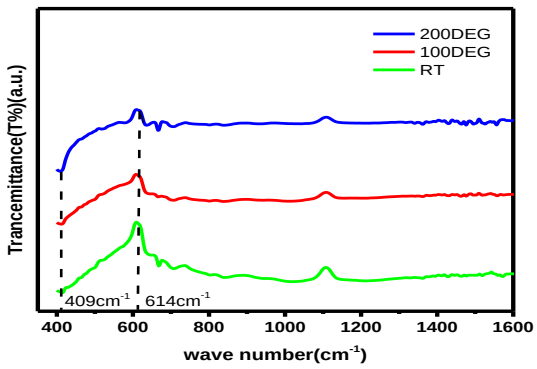
The technique pulse laser deposition has been used to deposit high quality thin films of materials. This technique uses high power laser pulses to melt, evaporate and ionize the material from the surface of a target. The vaporize material, containing neutral, ion and electron etc. known as laser-produced plasma plume. This material is vaporized from the target in a plasma plume which deposit it as [illegible] on substrate (substrate is as silicon wafer). This dep[illegible]its in presence of ultra-

high vacuum or presence of some background gas such as oxygen which is mainly use for background gas. There are large number of variable which affect the properties of thin films such as laser fluence, background gas and substrate temperature [2]. The process of pulse laser deposition technique divided into four stages: Laser ablation of target material and creation of plasma, Dynamic of the plasma, Deposition of the ablation material in the surface of substrate, Nucleation and growth of the film on the substrate surface. Step-flow growth, Layer by Layer growth, 3D growth are three growth mode in PLD technique[3].

FTIR (Fourier transform infrared spectroscopy):-
This technique reveals the infrared spectrum of absorption and emission of a solid, liquid, or gas. This technique use a beam of many frequencies and observes that what fraction is absorbed by the sample. The result of Fourier transformation is a spectrum of the signal at a series of discrete wavelengths. The range of wavelengths that can be used in the calculation is limited by the separation of the data points in the interferogram . The shortest wavelength that can be recognized is twice the separation between these data points [8, 9].

3. RESULT AND DISCUSSION:-

FTIR spectroscopy is an important technique to checking the vibrational spectrum and properties of thin films. Fourier transform infrared (FTIR) spectroscopy is the spectroscopy that deals with the infrared region of the electromagnetic spectrum that is light with a longer wavelength and lower frequency than visible light [5]. The surface to volume ratio (i.e. aspect ratio) for nanoparticles is higher than their bulk counterpart. As more atoms/molecules are arranging do not the surface of nanoparticle, the surface chemistry of these nanomaterials is of immense interest[4]. In order to quickly establish the presence or absence of the various vibrational modes present in ZnO nanoparticle, we performed FTIR spectroscopy of ZnO nanoparticles. In order to analyze spectrum peaks are correlated with FTIR spectroscopy correlation wave number. We have FTIR spectra of as prepared nanoparticles. The absorption and transmittance bands peak obtained of Zn–O bond and also authenticates presence of ZnO .



FTIR spectra of ZnO thin films grown with various temp

The absorption bands at around 409cm-1 and 614cm-1 are attributed to E1(TO) and A1 (LO) bending vibration of ZnO respectively . The observed absorption bands confirm the deposition of ZnO thin films with good structural properties.

4. CONCLUSION

Highly crystalline ZnO thin films were deposited on corning and Si (100) substrate using Pulsed laser deposition technique at varying substrate temperature (RT,1000C, 2000C). The films were found to be c-axis oriented with good crystal quality. The structural analysis of films was performed using FTIR technique. The observed absorption bands confirm the deposition of ZnO thin `films with good structural properties.

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EFFECT OF SWIFT HEAVY ION BEAM ON STRUCTURAL AND THERMAL PROPERTIES OF POLYCARBONATE FILMS

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Abstract: ***Polycarbonate (PC) films were prepared by a solution mixing method. The Electroactive properties of the ion beam irradiated single layer polycarbonate samples were illustrated by means of UV-Vis spectroscopy , FTIR, XRD , AFM , thermally stimulated discharge current , DSC to understand change in polymer morphology and relaxation properties. For XRD we conclude that the effect of carbon beam irradiation on polycarbonate film that crystallite size in polycarbonate is decreased by 11.31%. For UV–Visible absorption spectra we have illustrated the energy band gap and found that the energy band gap of polycarbonate decreases with ion fluence rate.***

Keywords: ***Polycarbonate, glass transition temperature, DSC.***

1. INTRODUCTION

Swift heavy ion beam irradiation is an effective technique to the modification of various properties of the polymeric material such as electrical, optical and thermal properties etc [1-5]. The organic polymer materials have attracted tremendous attention to their large potential application in the field of telecommunications, optics switching, electronics and mechanics [6-11]. Organic polymers generally have long-term stability and good process ability, outstanding optical, catalytic, electronic and magnetic properties, which are significantly different, their bulk states.. Organic polymer, PC are considered promising material due to its excellent properties such as light weight, color less, toughness and wide band gap material while inorganic zinc oxide is a transparent, wide band gap material of particular interest due to its optical, electrical, catalytic, gas sensing, thermal properties and great technological applications in various fields [12-15]. Ion beam irradiated thin film polymers plays very important role to improve the optical, electrical and thermal properties of polymeric insulating materials.

In this paper, we investigate the Electroactive properties of the ion beam irradiated single layer polycarbonate samples were illustrated by means of UV-Vis spectroscopy , FTIR, XRD , AFM , thermally stimulated discharge current , DSC to understand change in polymer morphology and relaxation properties. The analyses of these results are discussed in detail.

2. EXPERIMENTAL

Preparation of the samples

The circular samples of PC 25µm thickness and 5 cm in diameter have been used in the present study. The solution of particular concentration was prepared in a glass beaker by dissolving PC (5gm) in 100 ml toluene at room temperature (300C). The solution was kept for 24h to give homogeneous and transparent solution. The solution thus prepared was poured onto an optically plane glass plate floating in mercury pools and the solvent was then allowed to evaporate inside an oven at 400C for 24h to yield the desired samples. The dried sample was subjected to room temperature outgassing at 10-5 torr for a further period of 24 h to remove any residual solvent.

Coating of samples

The samples prepared having diameter 5 cm and thickness 25µm. For good ohmic contact, both the surface of the samples were vacuum aluminized usingVacuum Equipment Co (VEQCO) Delhi. Vacuum coating unit with Penning and Pirani pressure gauges, ST-A6P3; over central circular area of diameter 3.5 cm. both sides vacuum aluminized samples have been used for electrical conductivity measurements.

Irradiation of samples:

Polycarbonate films of size 1x1 cm2 were irradiated with C+5 ion beam of 55 Mev in the General Purpose Vacuum chamber (GPSC) (3x10-6 mbar) at IUAC New Delhi. The line current has been maintained at 1 pna and differences fluence rate 1x1011to 1x1013.

3. RESULT AND DISCUSSION

Short-Circuit TSDC:

The samples were thermally charged at 1500C with different value of poling field and constant time. The TSDC was recorded by means of electrometer (Scientific Roorkee, India) at a heating rate of 30C/min. In order to avoid the effect of ground loop and extraneous electrical noise the electrometer was carefully shielded and grounded [1-4].

The short circuit TSDC spectra are recorded in range of 280-480 K. The short-circuit TSDC spectra of PC (Pristine) show one peak at 418 K approximate temperature.

The peak current increases with temperature and poling field. The position of PC (Pristine) peak is shifted towards higher temperature side with increasing poling field. The peak current for all samples [7-10].

The TSDC peak in pristine PC is due to the motion of main chain segment and trapping of charge carriers in surface traps. The charge carriers of energy 0.6eV shows that surface traps are more dominant. The TSDC results of pristine samples are well reproducible. The TSDC of carbon ion beam irradiated samples are under observation.

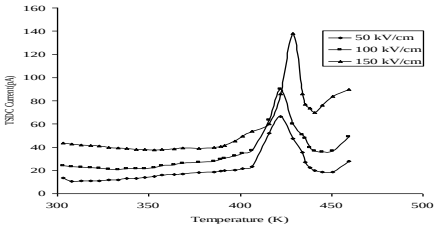

Fig.1. TSDC spectra of PC (Pristine) samples with different poling fields (i.e. 50kV/cm, 100kV/cm and150 kV) at 150°C.

XRD analysis:

The XRD spectra of pristine and ion beam irradiated 25 μm thick polycarbonate samples with fluence rate of 1×1011 to 1×1013 ions/cm2 is shown in Fig.2. The XRD characteristics of pristine PC is characterized by one prominent and three small peaks at 26.67˚ (d≈ 5.35 Å, d=λ/2 sin θ is the lattice spacing or crystalline interplaner distance), 26.67˚, 29.50˚, 35.16˚ respectively [1-3] XRD pattern shows that the peak intensity and full-width at half maximum (FWHM) increases with increase in fluence rate. The observed decrease in peak intensity and FWHM is generally associated with decrease in crystallinity of the polymer. The larger are the crystals of a given component, the sharper are the peaks on the XRD pattern for each crystal plane. Thus the breadth of the peak can be related to the crystal size. The average crystallite size L, have been calculated by Scherer formula [4-7].

$$L = \frac{k\lambda}{\beta \cos\theta} \qquad (1)$$

where β is the FWHM of the peak (in radian) and k is the shape factor whose value is equal to 0.9. Assuming k =0.9 in the above equation, the crystallite sizes of pristine and irradiated polycarbonate were calculated and these results are shown table1. The crystallite size in polycarbonate is decreased by 11.31% on C5+ (55 MeV) irradiation [5-7].

Table 1

XRD spectra data of pristine and ion beam irradiated polycarbonate

Fluence (Ion/cm^{-2})	2θ (degree)	β (degree)	L (Å)	d (Å)	Intensity
Pristine	16.78	4	0.34	5.27	1158.54
1×10^{11}	16.76	3.27	0.42	5.28	1069.08
3×10^{12}	16.74	2.80	0.49	5.29	1023.21
1×10^{13}	17.03	2.80	0.49	5.20	725.01

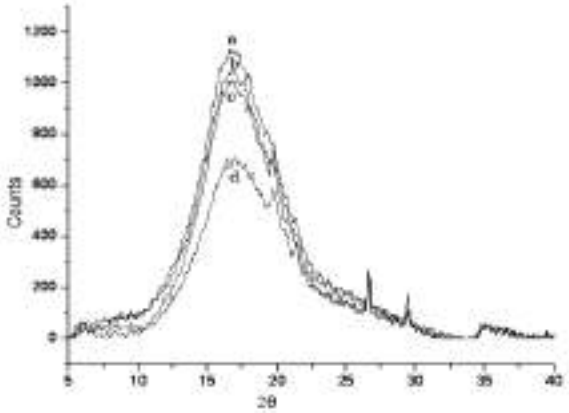

Fig. 2. XRD Spectra (a)pristine (b) 1×1011 fluence(c)3×1012 fluence (d) 1×1013 fluence carbon (55 MeV) ion beam irradiated polycarbonate film

Energy band gap analysis

UV–Visible absorption spectra of pristine polycarbonate and irradiated with carbon (C5+) ion beam 55 Mev in fluence rate of 1×1011-1×1013 ions/cm2 shown in the figure. It is shown that the fundamental absorption band is shifted towards higher wavelength side with increase in fluence rate. The optical band gap has been determined at different fluence rate from the fundamental absorption edge of UV-VIS spectra [2-4].

In order to evaluate the indirect band gap of pristine and irradiated samples the absorption Coefficient (α) and photon energy (hν) were calculated by the relation using UV-VIS absorption spectra:

The values of (αhν)1/2 were plotted as a function of photon energy (hν). From the intercept of the best-fit lines in the plots of (αhν)1/2 versus hν, the values of indirect band gap for the pristine and carbon(C+5) ion beam-irradiated samples with different fluance rate were determined . Similar procedure was followed for the determination of direct band gap except for the fact that (αhν)1/2 values were replaced by (αhν)2. The values of indirect and direct band gaps are presented in table 2 along with their standard errors for the pristine and carbon (C5+) ion beam irradiated polycarbonate samples [1-4].

Fig. 3 shows that band gap reduces with increase in fluence rate of high energy carbon ion beam due to addition of ionic species in polymer matrix during irradiation and due to formation of nanoclustures in polymer matrix, so that it become behave as a semiconductor. These ionic species causes the creation of nanostructured crystalline boundaries in polymeric material, which provide the sufficient space for charge carries for residing between conduction and balance band. The data provides new information for interaction of high energy carbon ion beam with polycarbonate at high fluence rate and it is not yet been reported in literature [6-10].

Table 2

Relevant data of UV-Vis spectra of pristine and carbon (55 MeV) ion beam irradiated polycarbonate film

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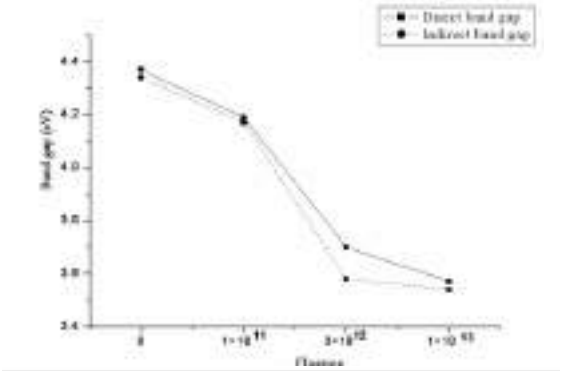


Fluence (ion/cm²)	Direct band gap (eV)	Indirect band gap (eV)
Pristine	4.37	4.34
1×10¹¹	4.19	4.17
3×10¹²	3.70	3.58
1×10¹³	3.57	3.42

Fig. 3. Fluence versus band gap of pristine and irradiated polycarbonate film

4. FTIR ANALYSIS

Fig.4 shows the Fourier transform infrared (FTIR) spectra of pristine and high energy carbon ion beam irradiated samples of PC. The vibration modes of chemical bonds are characterized by the absorption bands of FTIR spectra. The various absorption bands are indicated in pristine and ion beam irradiated samples under different fluence rate. The comparison of absorption band position was made with respect to FTIR spectra of pristine PC. It has been observed that at wavelength 828.96, 888.49, 1653.30, 2332.38 and 2362.37 cm-1 shows cross linking and 1688.29 cm-1 shows chain scissoring due to polar polymer [1-4].

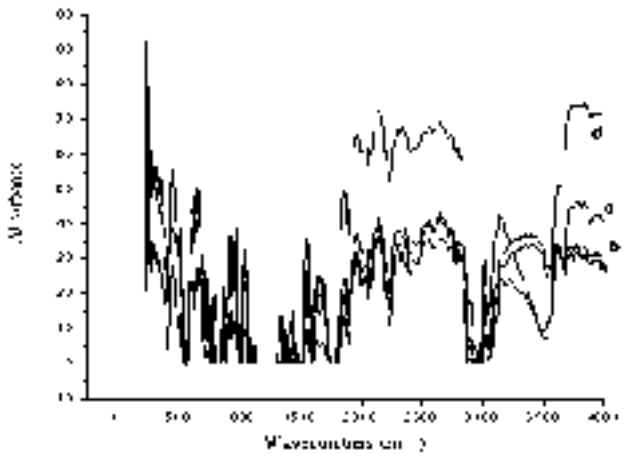


Fig. 4. FTIR Spectra of (a) pristine (b) 1×1011 fluence (c) 3×1012 fluence (d) 1×1013 fluence carbon (55 MeV) ion beam irradiated polycarbonate film

Differential scanning calorimetry Analysis

The DSC scans for the PC (Pristine) sample DSC thermograms were obtained in the range of 330-450 K by heating at of the 283 K/min with liquid nitrogen medium in UGC-DAE Consortium Indore (M. P.) – India. The Figure 5 shown that glass transition temperature of PC (Pristine) is 414.83 K [3-4].

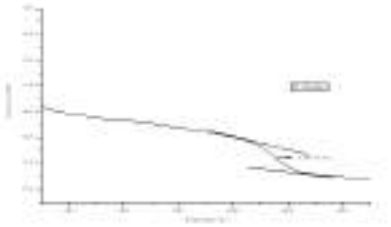
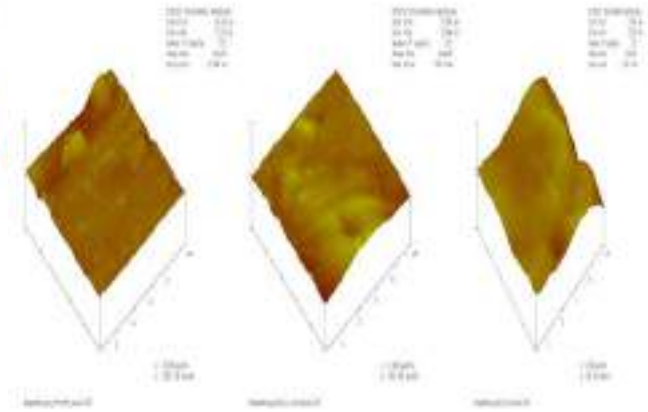


Fig. 5. DSC curve of PC (Pristine)

Atomic force microscopy

AFM was performed to examine the surface morphology and to measure roughness values for pristine and irradiated polycarbonate with fluence rate of 1×1011-1×1013 .Figure 6, 7 and 8 show three dimensional topographic scan of the samples respectively. Results reveal that ion beam irradiated surface was rougher as compared to the pristine sample surface. After irradiation the polymer film shows a remarkable change in yellow mounds with diameter from 1000-200 nm and topography (height) up to 5 nm. Results also shows large amount of pits of the order of 2.5nm-25 nm depth. The variation of rms roughness and dimension of the hills (average height and diameter) with fluence, measured from the manufacturer's software available with the microscope. The increase in the roughness is due to the change in cross linking density and degradation of a polymer surface. This result is consistent with other published works that report that ion beam irradiation can significantly change surface morphology[5—11].



5. CONCLUSIONS

The TSDC characteristics of pristine PC indicate the distribution of energetic traps at different depth. This is due to the fact that the activation energy is different for TSDC peaks appeared with different polarizing field and temperature. The differential scanning calorimetry spectra of PC gives the temperature position of phase change (i.e glass transition temperature), which is well agreed with the position of TSDC peak. However the TSDC measurement on irradiated samples in underway, therefore, it difficult to say anything about the effect of ion beam in TSDC characteristics of PC. FTIR results reveal that the effective change in intensity of absorbance peak according to the bond scissions and cross linking formation of nanoclusters. It is concluded that ion beam irradiation of PC using high

energy carbon ion beam created the nano clustures and reduces the energy band gap. The remarkable results are that the band gap energy is found to be a function of fluence rate and density of nano clusters. The decrease in crystallnity is an evidence for growth of nano clusters in PC after irradiation. Present investigation motivates the application of high energy carbon ion beam irradiated PC as a semiconductor and it is first time very low band gap observed by our research group. It is also observed that the surface roughness is highly influence by ion beam irradiation as presented in AFM study.

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First occurrence record of Indian Roundleaf Bat *Hipposideros lankadiva* in Rajasthan, India

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Abstract: An erroneously cited text of Wason by subsequent authors has led to the assumption that *Hipposideros lankadiva* was first recorded in Rajasthan in the Bhim Bharak caves of Jodhpur. A careful review of Wason's note revealed that it in fact mentioned another species from the genus, *H. fulvus.* This erroneous citation has led to several research articles published on the ecological aspects of this species to be misinformed. The authors discovered a small population of *H. lankadiva* in eastern Rajasthan and have monitored this new population since 2010. Since the Bhim Bharak cave location is erroneous, Kased Cave (26.2209N, 77.1024E) is the only location of *H. lankadiva* for Rajasthan and is therefore the first record of the species from the state.

Keywords: Bhim Bharak caves, Chiroptera, Jodhpur, Kased Cave, occurrence, population.

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Competing interests: The authors declare no competing interests.

Author details: Dr. Dharmendra Khandal PhD, has served as conservation biologist with Tiger Watch since 2003. His work with Tiger Watch has involved pioneering ground breaking initiatives in proactive anti-poaching, the monitoring of wildlife & scientific research. He has also forged new frontiers in the world of community based conservation through the Village Wildlife Volunteer program in the Ranthambhore Tiger Reserve. He is also the co-author of Unexplored Ranthambhore, a first of its kind book on the canids and striped hyena in Ranthambhore. Dr. Dau Lal Bohra PhD, is currently head of the Department of Zoology at the Seth Gyaniram Bansidhar Podar College in Jhunjhunu, Rajasthan. He has numerous research papers to his credit and is recognised for his significant contributions to vulture conservation in Rajasthan. Dr. S. Talmale PhD, is a taxonomist working on Indian small mammals and (Insecta) Odonata with several research papers and books to his credit. He is currently affiliated with the Zoological Survey of India.

Author contributions: All authors have contributed equally to this paper.

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INTRODUCTION

The Indian Roundleaf Bat *Hipposideros lankadiva* is endemic to southern Asia, and has been recorded from many parts of India, as well as neighbouring nations like Sri Lanka, Bangladesh, and Myanmar (Bates et al. 2015; Saha et al. 2015). *Hipposideros lankadiva* Kelaart, 1850 was described from the city of Kandy in the central hills of Sri Lanka (Bates & Harrison 1997). Three subspecies have been reported for this species of bat. The subspecies described from Sri Lanka is *H. lankadiva lankadiva* (Kelaart, 1850) and the subspecies from India is referred to as *H. lankadiva indus* (Andersen, 1918). The latter is small in size relative to the former (Bates & Harrison 1997). Bates et al. (2015) described a new subspecies, *H. lankadiva gyi* from Myanmar with its distribution in northeastern India, which is morphometrically similar to the Sri Lankan subspecies.

Many taxonomic accounts have contributed to chiropteran studies in Rajasthan, such as Blanford (1891), Ryley (1914), Wroughton (1918), Ellerman & Morrison-Scott (1951), Prakash (1963a,b, 1973), Agrawal (1967), Biswas & Ghosh (1968), and Sinha (1973, 1975, 1976, 1977). The first detailed taxonomic exploration of bats in Rajasthan was conducted by the Zoological Survey of India (Sinha 1980) which documented detailed descriptions, illustrations, and zoogeography of 21 bat species in the state. Later on, various explorers described new occurrence records and ecology of bats in Rajasthan (Sinha 1981; Sharma 1986; Bhupathy 1987; Bohra 2011; Senacha & Dookia 2013).

On the occurrence of *H. lankadiva* in Rajasthan

Bates & Harrison (1997) quoted a published note by Wason (1978) on the occurrence of *H. lankadiva* in the Bhim Bharak caves of Jodhpur, Rajasthan. However, Sinha (1980, 1996) did not discuss this bat's presence in the state, and this led to doubts about the occurrence of *H. lankadiva* in the state. Bats have been studied in the Thar desert by various scientists, especially those based in Jodhpur such as Prakash (1963a,b, 1973), Agrawal (1967), Biswas & Ghosh (1968), Sinha (1973, 1975, 1976, 1977, 1981), Sharma (1986), and Senacha & Dookia (2013). Thus, no prior reports of this species lent credence to the idea that the observation by Bates & Harrison (1997) is incorrect.

A careful review of Wason's (1978) note revealed that it mentioned another species from the genus—*H. fulvus*—and the inclusion of *H. lankadiva* was due to an error by Bates & Harrison (1997).

Srinivasulu et al. (2013), examined published literature and compiled a list of 25 bat species from Rajasthan, including *H. lankadiva* from the Bhim Bharak caves of Jodhpur. Interestingly, without physically verifying the note by Wason (1978), Srinivasulu et al. (2013) quoted the same distribution area for *H. lankadiva* in Rajasthan. It seems that while they may have followed Bates & Harrison (1997), they cited Wason (1978) for the occurrence of *H. lankadiva* in Rajasthan. Afterwards, many documents have included *H. lankadiva* for the state of Rajasthan (Menon 2014; Bates et al. 2015).

This erroneous citation has led to various research articles published on the ecological aspects of this species to be misinformed. For example, Dookia et al. (2017) expressed concern that *H. lankadiva* was not reported from the Thar desert since 1979. This erroneous location has also been used in spatial studies to predict new possible areas for the species (Venugopal 2020).

However, we recorded a small population of *H. lankadiva* in eastern Rajasthan and have monitored this new population since 2010, which was opportunistically discovered during a wildlife survey of the region. Since the Bhim Bharak cave location is erroneous, Kased Cave (26.2209N, 77.1024E) is the only location of *H. lankadiva* for Rajasthan and it is thus the first record of the species from the state.

Study Area

The population of *H. lankadiva* occurs in a natural cave between the Kailadevi Wildlife Sanctuary and National Chambal Gharial Sanctuary in Karauli, Rajasthan, India. The precise location is a Hindu religious site, known as the Kased Cave (26.2209N & 77.1024E) near the town of Karanpur (Figure 1). The cave is situated on a low hill close to the contiguous Vindhyan hill range of Kailadevi WS. Due to its holy status, no tree felling has occurred in its immediate vicinity although the local community has completely denuded its surrounding areas.

The cave is formed of sand stone. The main chamber of the cave is 12 x 12 m in size. This chamber is used by a "sadhu" (hermit) and other pilgrims alike to shelter, cook food, and perform devotional music. The height of the chamber is around 4.5–5.5 m from the centre, and form a dome shape. The surface is dark black in colour, as a result of exposure to smoke. In the main cave chamber, three narrow tube like tunnels further extend from it, one of them has a slow flowing stream and two of them are dry. When the pilgrims cook food for ritual offerings and create a disturbance, the bats move inside the narrow water tunnels. The water tunnel is 55–60 m long and a small stream flows through it year round. The main tunnel is 1–1.5 m high and 1–2 m [illegible] temperature

Figure 1. New distribution localities for Indian Roundleaf Bat *Hipposideros lankadiva* in Rajasthan, India

in this water tunnel stays the same year round, because it is underground and not affected by surface weather patterns. The temperature of the cave is usually close to the average annual temperature. During the study we found two other species of bats, *Lyroderma lyra* and *H. fulvus,* along with *H. lankadiva* at the same site.

The tree species found on the hill are *Anogeissus pendula, Mitragyna parvifolia, Crateva adansonii, Butea monosperma,* and exotic trees & herbaceous plants recently planted in the area by the guardians of the temple. A seasonal water stream forms a waterfall nearby. The surrounding area is high and the cave opening is in a depressed area, which makes it moist and cool. The nearby areas are comprised of a mosaic of agriculture fields and scrubland. The Chambal river 1.2km away from the cave site. An undulating landscape consisting of ravines exists between the Chambal river and Kased Cave.

MATERIAL AND METHOD

Basic data of habitat and the surroundings has been collected like measurements of the cave and vegetation species. Five individuals of the species were captured in hand nets at Kased Cave, Karanpur, and Karauli (Figure 1). Specimen and habitat photographs were taken with the help of Nikon D850 DSLR with 300 mm, 17–35 mm lens. Morphological data was taken by manual examination in which measurements were taken with a digital calliper and compared with earlier findings (Srinivasalu et al. 2010; Bates et al. 2015; Saha 2015). The captured bats have been released after taking morphometric measurements. All data was compared with available literature to conclude a final result. Lux meter was used to observe the intensity of light in the cave (Lacoeuilhe et al. 2014). To detect if light intensity influenced roost selection in bats, lux values were observed at places where the bats roost. MS6610 high accuracy 0~50,000 LUX digital luxmeters illuminometer was used to measure the value of light.

RESULTS

We captured 5 individuals of bats (three males and two females) for morphometric analysis. (Table 1). The morphometric data revealed that the bat matches with the subspecies *H. lankadiva indus*. The pelage of the bats varied from yellowish-brown to dark brown (Image 1). They were darker on the head & shoulders and paler on the underside. For species identification we compare morphometric analysis from Srinivasalu et al.(2010), Saha (2015), and Bates et al. (2015). The average value of FA (mm) in three male samples was found to be 85.99 ± 2.12 and in two females to be 83.70 ± 0.65, respectively. Similarly (Saha 2015) the mean value of FA (mm) was 87.64 ± 3.62.

In the study of Srinivasulu (2010) the HBL (mm) range was 87.0–106.0 in males and females as well. In this study we have also rendered the range and mean value of HBL (mm) reported in (78.11–98.57) 89.62 ± 10.47 males and (91.28–92.81) 92.05 ± 1.08 females.

On the comparison of tail length, our observation is supported by Srinivasulu et al. (2010) and Bates et al. (2015). According to Bates et al. (2015), the tail length was found to be 35.0–47.0 (mm) in males and 40.0–45.0 (mm) in females. According to Srinivasulu et al. (2010) the vast range length of the tail (mm) was 35.0–58.0. The mean TL (mm) recorded in this study is 33.36 ± 2.24 in males and 37.80 ± 0.48 in females.

Morphologically, there is no extraneous character variation from different species ranges in males and

Table 1. Morphological Characters of *Hipposideros lankadiva* (Kelaart, 1850).

Body characters	Srinivasulu et al. 2010	Saha 2015	Bates et al. 2015		Present study						
					Male				Female		
			Male	Female	Male 1	Male 2	Male 3	AVG	Female 1	Female 2	AVG
Forearm Length FA (mm)	75.0–99.0	87.64±3.62	80.1–87.0	75.0–89.0	86.76	83.59	87.62	85.99±2.12	83.24	84.16	83.70±0.65
Head Body Length HBL (mm)	87.0–106.0	98.1±4.24	NA	NA	78.11	98.57	92.17	89.62±10.47	92.81	91.28	92.05±1.08
Tail Length TL (mm)	35.0–58.0	51.45±2.34	35.0–47.0	40.0–45.0	30.84	35.12	34.12	33.36±2.24	38.14	37.46	37.80±0.48
Hind Foot Length HFL (mm)	12.0–20.0	19.35±1.0	12.0–16.0	13.0–16.0	15.77	19.29	17.53	17.53±1.76	14.52	13.88	14.20±0.45
Ear Length EAR (mm)	19.5–30.0	27.6±2.05	22.0–26.0	19.5–27.0	23.19	26.93	27.11	25.74±2.21	26.39	28.63	27.51±1.58
Length of Tibia TIB (mm)		35.55±2.48			35.02	33.89	34.46	34.46±0.57	33.15	34.09	33.62±0.66
No. of Supplementary Leaflets	4	NA	NA	NA	4	4	4	-	4	4	-
Narial Lappets	Well-developed	NA	NA	NA	Well-developed	Well-developed	Well-developed	-	Well-developed	Well-developed	-
Length of Third Metacarpal 3MT (mm)	NA	67.71±0.79	57.2–63.7	57.0–65.0	56.7	62.18	60.41	59.76±2.80	58.49	58.43	58.46±0.04
Length of Fourth Metacarpal 4MT (mm)	NA	NA	57.2–61.8	55.3–63.6	58.26	55.59	62.31	58.72±3.38	60.18	58.93	59.56±0.88
Length of Fifth Metacarpal 5MT (mm)	NA	NA	50.7–56.9	49.7–58.6	49.73	51.14	50.19	50.35±0.72	47.78	50.12	48.95±1.65
First Phalanx of the Third Digit 3D1P	NA	31.60±1.17	25.4–28.5	26.0–30.0	26.14	25.82	26.15	26.04±0.19	28.43	28.07	28.25±0.25
Second Phalanx of the Third Digit, 3D2P (mm)	NA	34.34±1.23	24.4–28.4	24.5–28.8	28.39	28.79	29.88	29.02±0.77	27.12	27.86	27.49±0.52
First Phalanx of the Fourth Digit 4D1P (mm)	NA	NA	19.0–21.8	19.4–21.1	20.11	21.23	20.44	20.59±0.58	21.16	20.78	20.97±0.27
Second Phalanx of the Fourth Digit 4D2P (mm)	NA	NA	11.2–14.0	12.5–14.1	9.96	11.49	12.23	11.23±1.16	11.56	11.93	11.75±0.26
Nose-leaf	NA	11.17±0.09	NA	NA	9.92	10.19	10.06	10.06±0.14	10.82	10.73±0.23	

Image 1. Portrait of Indian Roundleaf Bat *Hipposideros lankadiva*.

Image 2. Close of an Indian Roundleaf Bat *Hipposideros lankadiva* face.

females between our five samples and the reference value (Bates et al. 2015). *H. lankadiva* (Kelaart 1850) is a Large Leaf-nosed Bat having four (additional) supplementary leaflets on the nose-leaf with the 4th leaflet reduced, which is a key character of the species are present in all specimens (Image 1). The length of the ear is also an important parameter by which we can see the account of the species. According to Bates et al. (2015) the range of ear length (mm) in females was found to be 19.5–27.0, but in our study, the maximum value of female ear (mm) was found to be 28.63 and the average value was recorded as 27.51 ± 1.58. In the same cave, we found 89 *L. lyra* and four *H. fulvus* bats along with *H. lankadiva.*

We also surveyed the Bhima Bharak cave site at Jodhpur. No specimens of *H. lankadiva* were found in the main part of the cave (Shiva Temple) and in the lower part of the cave. We found 39 individuals of *Taphozous perforatus* and four *Rhinopoma hardwickii* at the cave. During this study, we personally communicated with Anil Wason to investigate if the species had ever been reported by him in the past, but Wason categorically denied ever observing or reporting *H. lankadiva*.

There was a considerable difference between the internal climate and light intensity inside Kased Cave and outer area of the cave, where the value of light intensity was measured to be 62 lux on the opening of the cave. By comparison, the internal light intensity at the site in Karauli was measured at zero lux. The bats prefer zero lux intensity area of the cave. Humidity of the Kased Cave in Karauli was also recorded at more than 50% with water source availability.

DISCUSSION

The species *H. lankadiva* has been observed for the first time in 2010 by the authors in Rajasthan, but it has been first reported now in 2022. This delay in reporting is because of the species already being listed on the bat checklist of Rajasthan, which was the consequence of the erroneous inclusion. Bates & Harrison (1997) erroneously included the bat in Rajasthan and some other reports strengthen [illegible] record

like Srinivasalu et al. (2013) and Bates et al. (2015). Srinivasalu et al. (2013) and Bates et al. (2015), have not only erroneously included the bat, but also cited a wrong reference for Wason (1978), i.e., Srinivasalu et al. (2013) mentioned "44(5): 305–306"; whereas Bates et al. (2015) mentioned "46(5): 331–332", while the correct reference is 43(5): 305–306. It seems like they mixed Wason (1978) with another reference, Wason & Misra (1981) and it is important to note that neither mentioned *H. lankadiva*. The erroneous report perpetuated and impacted many other studies like Venugopal (2020).

Venugopal (2020) used a habitat modelling approach (MaxEnt) based on known locations, to predict new possible geographic presence of *H. lankadiva*. The study also included the erroneous Bhim Bharak location, which misinformed the study and, in all likelihood, must have had an adverse impact on the results, which may have expanded the predicted distribution area of the species. Since this erroneous location is far from the other known locations and lies in a new biogeographic zone, the magnitude of the error could be substantial. The majority of the predicted suitable areas were in and around known localities which are in the Western Ghats and central India (Venugopal 2020). The predicted areas around western Gujarat and Rajasthan, may be due to inclusion of sites where this species has been incorrectly identified. The Jodhpur lies in totally different biogeographic zone.

It is proved that the report of *H. lankadiva* from the Bhim Bharak caves, Jodhpur, Rajasthan is erroneous, and must be omitted from the list of bats occurring in that particular part of Rajasthan, so that it does not continue to perpetuate and impact any further studies.

The newly reported site has a very small population and shows a decline in numbers. The Kased Cave location is under observation by the authors since December 2010 and at that time the number of bats was 150–200 as per personal records. At present, the number shows that the bats are declining in the area and their numbers are five times lower. In the most recent survey (October 2021) we recorded only 32–35 bats. The anthropogenic disturbance level in the cave has also increased. The conservation status of *H. lankadiva* is listed by the IUCN Red List as 'Least Concern' (Molur et al. 2008). Rajasthan is geographically the most largest state in India and only Sinha (1980) conducted comprehensive chiropteran species exploration work throughout the state. Most other studies are sporadic and opportunistic. There is still an immense opportunity for greater chiropteran exploration in the state.

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COMMUNICATION

Re-sighting record of Kelaart's Pipistrelle *Pipistrellus ceylonicus* (Kelaart, 1852) (Mammalia: Chiroptera: Vespertilionidae) from Rajasthan, India

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Abstract: Despite numerous studies and surveys targeting Chiroptera in Rajasthan since 1955, *Pipistrellus ceylonicus* has not been observed in the state for more than a century since 1913. Based on an adult male specimen recovered from Kusthala village in Sawai Madhopur district of Rajasthan, we report the occurrence of this species from the state after more than a century.

Keywords: Bat, occurrence, population, rediscovery, Sawai Madhopur,

Hindi: वर्ष 1955 से राजस्थान में काईरोप्टेरा से जुड़े कई अध्ययनों और सर्वेक्षणों के बावजूद, 1913 के बाद से, यानी लगभग एक सदी से भी अधिक समय से राज्य में पिपिस्ट्रेलस सीलोनिकस नहीं देखी गयी है। राजस्थान के सवाई माधोपुर जिले के कुस्तला गांव से प्राप्त एक वयस्क नर चमगादड़ नमूने के आधार पर, हम इसे रिपोर्ट करते हैं, जो एक सदी से भी अधिक समय के बाद राज्य में इस प्रजाति को देखा गया है।

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Competing interests: The authors declare no competing interests.

Author details: Dr. Dharmendra Khandal has served as conservation biologist with Tiger Watch since 2003. His work with Tiger Watch has involved pioneering ground breaking initiatives in proactive anti-poaching, the monitoring of wildlife & scientific research. He has also forged new frontiers in the world of community based conservation through the Village Wildlife Volunteer program in the Ranthambhore Tiger Reserve. He is also the co-author of Unexplored Ranthambhore, a first of its kind book on the canids and Striped Hyena in Ranthambhore. Dr. Dau Lal Bohra, is currently head of the Department of Zoology at the Seth Gyaniram Bansidhar Podar College in Jhunjhunu, Rajasthan. He has numerous research papers to his credit and is recognised for his significant contributions to vulture conservation in Rajasthan. Dr. S. Talmale, is a taxonomist working on Indian small mammals and (Insecta) Odonata with several research papers and books to his credit. He is currently affiliated with the Zoological Survey of India.

Author contributions: This bat was spotted and captured in an injured state by DK. Unable to rehabilitate it, after its natural death, its skull was removed by DLB for the identification of the specimen. The morphometric measurements were also carried out by him. SST identified this specimen and prepared the draft of this paper.

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INTRODUCTION

A small-sized bat *Pipistrellus ceylonicus* was initially recorded from Rajasthan at Mt. Abu during the mammal surveys of India, Burma, and Ceylon in 1911–1923 conducted by the Bombay Natural History Society (BNHS). In this survey two males and one female of this species were collected in March–July 1913 (Ryley 1914). Since that time, a large number of surveys targeting the chiropteran fauna of the state were undertaken e.g., Garg (1955); Prakash (1961, 1963, 1973); Agrawal (1967); Biswas & Ghosh (1968); Sinha (1975, 1976a,b, 1977, 1978, 1979, 1980a,b, 1981, 1983, 1996); Gaur (1981); Advani (1982); Ramaswami & Kumar (1963); Kumar (1965); Wason (1978); Agarwal & Gupta (1982); Lall (1985); Bhupathy (1987); Gupta & Trivedi (1989); Trivedi & Lall (1989); Sharma (1986); Agarwal et al. (1981); Trivedi (1991); Purohit & Senacha (2002, 2004a,b); Senacha (2003, 2006); Trivedi et al. (2003); Dookia (2004); Dookia & Tak (2004); Senacha & Purohit (2004); Trivedi & Lall (2004, 2006); Senacha et al. (2006); Srinivasulu & Srinivasulu (2006); Purohit et al. (2006); and Khandal et al. (2022). However, *Pipistrellus ceylonicus* was not recorded in any of these surveys (Figure 1).

MATERIAL AND METHODS

In November 2021, an injured adult male *Pipistrellus* was rescued from Kusthala village (25.9694^{0}N, 76.2929^{0}E) in Sawai Madhopur, Rajasthan (Image 1 & 2). The bat was treated at home and kept in a box but did not survive. The specimen collection site is near the state highway close to the village of Kusthala, in the district of Sawai Madhopur. The landscape is dominated by agricultural fields close to a small human settlement. The area lies near a very significant ecosystem, i.e., the forests of Ranthambhore Tiger Reserve which is barely 4.5 km away. Specimen and habitat photographs were taken with a Nikon D850 DSLR equipped with a 17–35 mm lens. Morphological data was taken by manual examination in which measurements were taken with a digital caliper.

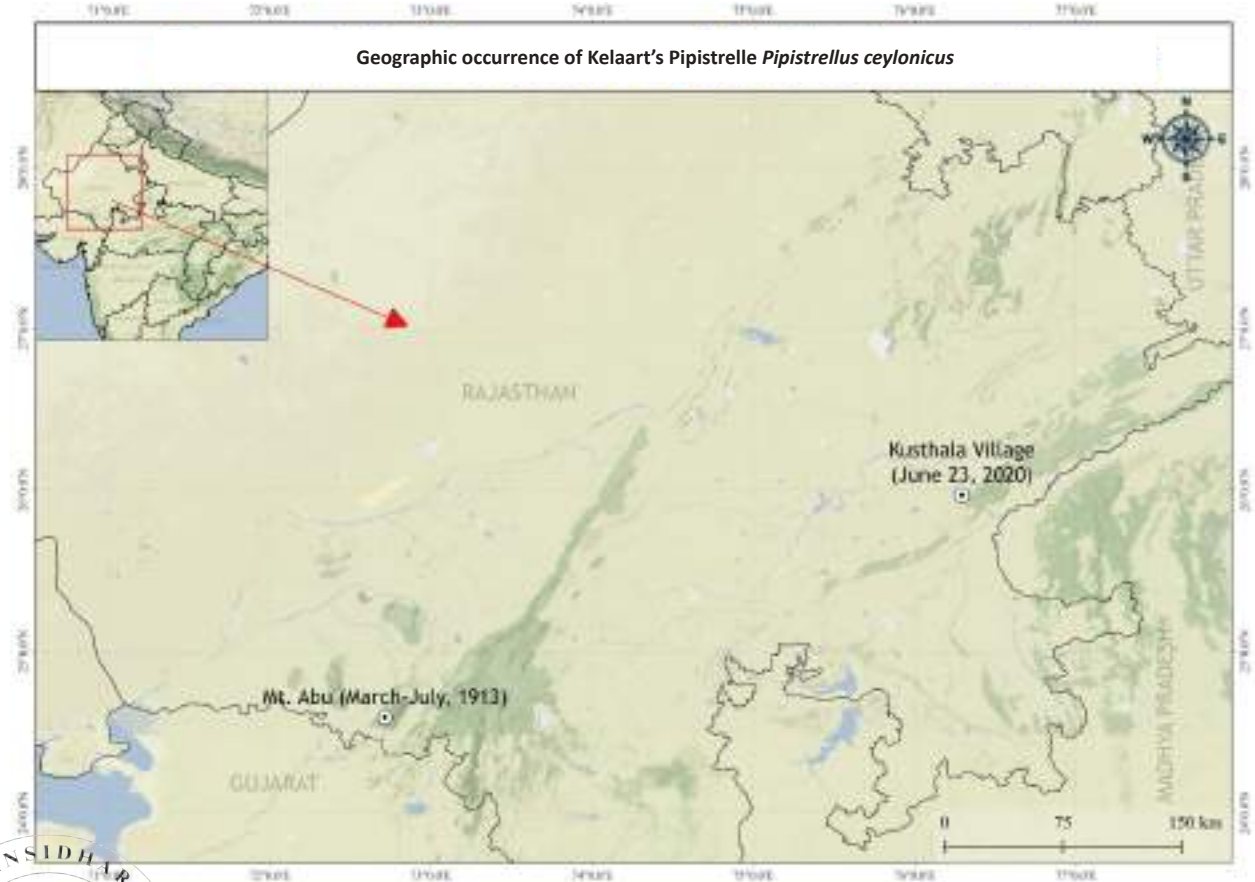

Figure 1. Map showing the new and old distribution localities for Kelaart's Pipistrelle in Rajasthan state.

Image 1. Portrait of Kelaart's Pipistrelle *Pipistrellus ceylonicus* (Kelaart, 1852) (present study)

Image 2. Close up of Kelaart's Pipistrelle *Pipistrellus ceylonicus* (Kelaart, 1852) (present study)

Table 1. Morphological, cranial and dental measurements of *Pipistrellus ceylonicus* (Kelaart, 1852) (all measurements are in millimeters)

	Measurement (mm)	Bates & Harrison (1997)	Korad & Yardi (2004) (n=7)	Present study (n=1)
1	Head and body length (HB)	45.5 - 64.0	46-51.4	41.2
2	Tail length (T)	30.0 - 45.0	29-38.5	31
3	Hind foot length, including claw (HF)	6.0 - 11.0	6-8.5	8.4
4	Forearm length (FA)	33.0 - 42.0	35-38.2	39
5	Wingspan (WSP)	227-262	227-252	243
6	5th Metacarpal length (5MT)	30.7 - 36.7	33.0-34.5	33.7
7	4th Metacarpal length (4MT)	32.6 - 38.5	34.4-35.8	34.8
8	3rd Metacarpal length (3MT)	33.0 - 39.0	34.5-36.4	33.1
9	Ear length (E)	9.5 - 14.0	9.5-14	11.2
10	Tibia length (Tb)	NA	13.5-15.0	14.1
11	Greatest length of skull (GTL)	14.4 - 15.8	13.5-15.5	14.9
12	Condylocanine length (CCL)	13.1 - 14.3	13.0-14.0	13.6
13	Zygomatic breadth (ZB)	9.2 - 11.0	9.0-10.0	9.2
14	Breadth of braincase (BB)	6.8 - 7.8	7.7-8.0	7.1
15	Postorbital constriction (PC)	3.7-4.3	3.8-4.5	3.9
16	Maxillary toothrow length (CM^3)	5.2 - 5.9	5.4-6	5.8
17	Mandibular toothrow length (CM_3)	5.7 - 6.5	5.6-6.6	6.2
18	Width across third molars (M^3-M^3)	6.2 - 7.2	6.6-7.8	6.8
19	Mandible length (M)	10.6 - 12.0	10.6-11.6	10.9
20	Width of rostrum (RW)	5.7-7.1	5.5-7.0	5.9

The specimen was preserved in 70% ethanol. Standard morphological measurements of the specimen and cranio-dental measurements of the extracted skull were taken using a digital calliper accurate to the nearest 0.1 mm and 0.01 mm, respectively. The morphological and craniodental description (Table 1) of the bat matched with descriptions provided by Bates & Harrison (1997) and Korad & Yardi (2004) confirming the specimen as *Pipistrellus ceylonicus* (Kelaart, 1852).

RESULTS AND DISCUSSION

Kelaart's Pipistrelle, *Pipistrellus ceylonicus* is a large sized *Pipistrellus* with a forearm length of 33–42 mm (Bates & Harrison 1997). They have variable dorsal pelage coloration ranging from grey-brown to chestnut, reddish or golden-brown colour. The ears, naked areas of the face, wings and interfemoral membrane are a uniform dark brown. The present specimen was grayish-brown dorsally and had dark hairs with pale grey tips on the ventrum (Image 1 & 2). The skull is robust with condylo-canine length of 13.6 mm and the upper toothrow length (cm ^{3}) is 5.8 mm (Image 3 A & B). The first upper incisor (i^2) is bicuspidate; the second incisor (i^3) is larger in size and two-thirds the height of i^2. The first small premolar (pm^2) intruded into the toothrow, and was not visible on the outside (Image 4 A & B). The upper canine and posterior premolar (pm^4) are almost in contact. The lower incisors are trifid and overlap slightly (Image 5).

Three subspecies under *P. ceylonicus* recognized from India by Ellerman & Morrison-Scott (1951), viz., *Vesperugo indicus* Dobson, 1878 (type from Mangalore, Malabar Coast, Karnataka), *Pipistrellus chrysothrix* Wroughton, 1899 (type from Mheskatri, Surat Dangs, Gujarat) and *P.c. subcanus* Thomas, 1915 (type from Yalala, Junagarh, Kathiawar, Gujarat). Individual body color variation was observed in individuals of the same colony of *P. ceylonicus* by Brosset (1962). Based on variation in colour, Khajuria (1978, 1980) has synonymised *crysothrix* with *indicus.* Lal (1984) has considered both *crysothrix* and *subcanus* as synonyms of *Pipistrellus cylonicus indicus.* Moratelli & Burgain (2019) considered all populations of *P. ceylonicus* from the mainland Indian subcontinent with distribution in eastern and southeastern Pakistan, India and Bangladesh are to represent three subspecies,

Image 3. *Pipistrellus ceylonicus* skull: A—Dorsal view| B—Ventral view. © Dharmendra Khandal.

Image 4. *Pipistrellus ceylonicus*, skull: A—Lateral view | B—Front view. © Dharmendra Khandal.

Image 5. *Pipistrellus ceylonicus,* lower jaw with dental arrangement. © Dharmendra Khandal.

Pipistrellus ceylonicus indicus Dobson, 1878.

Some of the earlier works on taxonomy, biology and ecology of bats of Rajasthan (Prakash 1961; Agrawal 1967; Biswas & Ghosh 1968; Sinha 1976a,b, 1978, 1980a,b) did not report any new occurrence data of *P. ceylonicus* from the state. Ghosh (2008), while preparing a catalogue of bats specimens available in the National Zoological Collection at Zoological Survey of India, Kolkata, mentioned the distribution of the species in Rajasthan based only on the past record by Ryley (1914) and without any new collection data.

In view of its widespread [illegible] and adaptable

nature, IUCN Red List categorized the species as 'Least Concern' (LC) (Srinivasulu & Srinivasulu 2019). It is apparently of rare occurrence and extensive surveys are needed to determine the status of the species in the state.

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VETERINARY DRUGS AND ASSOCIATED IMPACT ON VULTURE HEALTH IN ASIA

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Veterinary non-steroid anti-inflammatory drugs, which have caused a catastrophic decline in vulture populations due to poisoning, sold in veterinary pharmacies in India. Photo by D. Bohra.

Ветеринарные нестероидные противовоспалительные препараты, ставшие причиной катастрофического сокращения численности падальщиков в результате отравления ими, продающиеся в ветеринарных аптеках Индии. Фото Д. Бора.

Үндістанның ветеринариялық дәріханаларында улану нәтижесінде жемтіктермен қоректенуші құстардардың санының апатты азаюына экелген ветеринариялық қабынуға қарсы препараттар сатылуда. Д. Бордын фотосы.

There are over 500 million livestock in India, and without infrastructure to dispose of dead livestock animals, pastoralism has historically depended on vultures (*Gyps* sp.) as environmental sanitizers. In their absence, carcasses of dead animals spend time out in the open or are disposed by farmers in water, both of which create an increased risk of disease and water pollution. This carrion also creates a new source of food for dogs and rats, increasing their population. Feral dogs and rats are a major source of rabies infections, a known public health issue in India. Rabies infection is lethal unless vaccination immediately after exposure. The collapse in India's vulture population occurred because of unintended poisoning following the availability of cheap generic versions of diclofenac for human use till 2008. Diclofenac was introduced in 1973 as a painkiller for humans, but in the mid-90s, along with approval for a generic version in 1993, the pharmaceutical industry in India started producing large quantities of the drug. This lowered the price to a point that made diclofenac use in livestock economically viable and by 1994, diclofenac was widely available across veterinary clinics. Diclofenac was the first NSAID shown to be toxic to scavenging birds and has been banned for veterinary use in much of Asia vultures' range. Currently, there are fully gazetted bans on the manufacture, sale, and use of veterinary diclofenac in Bangladesh, Cambodia, India, Iran, Nepal, Oman, and Pakistan, and other countries are considering a similar ban. With the intervention of Human right commission in India, generic versions of multi dose packs of diclofenac for human use was banned in 2015 to stop misuse in animals treatments. In 2023, Ketoprofen, Aceclofenac more fully gazetted bans on the manufacture, sale and use of veterinary for vulture protection. Other then Diclofenac, Ketoprofen, Aceclofenac, two more agents including Nimesulide and their composition, and Flunixin are toxic to vultures. As per scientific reports and analysis in safety testing experiments have established that meloxicam and tolfenamic acid are safe. Use of medicines for One Health issue, and the use of veterinary medicines can have consequences affecting animal health, welfare, and ecosystems. According to Nambirajan, 2018 range of diclofenac 62.28 to 272.20 ng/g in 32 dead White-Backed Vultures (*Gyps africanus*). In another similar incidence, 14 White-Backed Vultures had diclofenac in kidneys in toxic range (70–908 ng/g), and in 12 Himalayan Griffons (*Gyps himalayensis*), diclofenac was in the range of 139.69 to 411.73 ng/g. In 2021, a new drug has caused four White-Rumped Vulture (*Gyps bengalensis*) deaths as nimesulide was detected in all the tissues (17–1395 ng/g). As veterinary aspects are critical to stakeholders of pharmaceutical industry, and we can leverage our multiple spheres of influence to help mitigate the animal and public health, as well as reduce the ecological footprints of the drug in-use in agriculture, there is also a need to analyze the drug influence on vulture health in Central Asia.

ВЕТЕРИНАРНЫЕ ПРЕПАРАТЫ И ИХ ВЛИЯНИЕ НА ЗДОРОВЬЕ СИПОВ В АЗИИ

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В Индии насчитывается более 500 миллионов голов домашнего скота, и без инфраструктуры для утилизации мёртвых животных скотоводство исторически зависело от сипов (*Gyps* sp.) как санитаров окружающей среды. В их отсутствие туши мёртвых животных гниют на открытом воздухе или выбрасываются фермерами в воду, что создаёт повышенный риск заболеваний и загрязнения воды. Эта падаль также создаёт новый источник пищи для собак и крыс, увеличивая их популяцию. Дикие собаки и крысы являются основным источником заражения бешенством, известной проблемой общественного здравоохранения в Индии. Бешенство приводит к летальному исходу, если не начать вакцинацию сразу после заражения. Коллапс популяции сипов в Индии произошёл из-за непреднамеренного отравления после появления дешёвых дженериков диклофенака для использования людьми до 2008 г. Диклофенак был представлен в 1973 г. в качестве обезболивающего для людей, но в середине 90-х гг., после одобрения дженерика в 1993 г., фармацевтическая промышленность Индии начала производить препарат в больших количествах. Это снизило его цену до уровня, который сделал использование диклофенака в животноводстве экономически выгодным, и к 1994 г. диклофенак стал широко доступен в ветеринарных клиниках. Диклофенак был первым нестероидным противовоспалительным препаратом (НПВП), который оказался токсичным для сипов и был запрещён для ветеринарного использования на большей части ареалов азиатских видов. В настоящее время полностью опубликованы запреты на производство, продажу и использование ветеринарного диклофенака в Бангладеше, Камбодже, Индии, Иране, Непале, Омане и Пакистане, а другие страны рассматривают возможность введения аналогичного запрета. Благодаря вмешательству Комиссии по правам человека в Индии в 2015 г. были запрещены версии многодозовых упаковок диклофенака для людей, чтобы остановить их использование при лечении животных. В 2023 г. для большей защиты сипов опубликованы запреты на производство, продажу и использование ветеринарных препаратов кетопрофена и ацеклофенака. Кроме диклофенака, кетопрофена, ацеклофенака, ещё два лекарства, нимесулид и его составляющие и флуниксин, токсичны для сипов. Научные отчёты и результаты испытаний на безопасность показали, что мелоксикам и толфенаминовая кислота безопасны для сипов. Использование лекарств для человека и домашнего скота может иметь последствия, влияющие на здоровье и благополучие животных в природных экосистемах. По данным Намбираджана, в 2018 г. концентрация диклофенака составляла от 62,28 до 272,20 нг/г у 32 мёртвых африканских сипов (*Gyps africanus*). В другом аналогичном случае у 14 африканских сипов диклофенак в почках находился в токсичном диапазоне (70–908 нг/г), а у 12 кумаев (*Gyps himalayensis*) – в диапазоне от 139,69 до 411,73 нг/г. Из них в 2021 г. во всех тканях четырёх бенгальских сипов (*Gyps bengalensis*) был обнаружен новый препарат, применявшийся как альтернатива диклофенаку для снижения смертности сипов, нимесулид (17–1395 нг/г). Поскольку ветеринарные аспекты являются ключевыми для сторон, заинтересованных в производстве лекарств, мы можем использовать наши многочисленные сферы влияния, чтобы помочь смягчить последствия для здоровья животных и населения, а также уменьшить экологические последствия использования лекарств. Кроме того, необходимо [illegible] влияния лекарств на репродукт[illegible] сипов в Центральной Азии

ВЕТЕРИНАРИЯЛЫҚ ДӘРІЛЕР ЖӘНЕ ОЛАРДЫҢ АЗИЯДА АҚБАС ҚҰМАЙЛАРДЫҢ ДЕНСАУЛЫҒЫНА ӘСЕРІ

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Үндістанда 500 миллионнан астам мал басы бар және өлген жануарларды жою үшін инфрақұрылымы болмағандықтан, мал шаруашылығы тарихта қоршаған ортаны қорғау санитарлары ретінде ақбас құмайларға (*Gyps* sp.) тәуелді болды. Олар болмаған жағдайда өлген жануарлардың өлекселері ашық жерде шіриді немесе фермерлер суға лақтырып тастайды, бұл қауіпті аурулардың көбеюі мен судың ластану қаупін арттырады. Бұл өлексе мұрделер иттер мен егеуқұйрықтар үшін жаңа қорек көзін жасап, олардың популяциясын арттырады. Жабайы иттер мен егеуқұйрықтар Үндістандағы белгілі қоғамдық денсаулық мәселесі болып табылатын құтырудың негізгі көзі болып табылады.

Вакцинациялау инфекциядан кейін бірден басталмаса, құтыру өлімге әкеледі. Үндістандағы ақбас құмайлар популяциясының құлдырауы 2008 жылға дейін адамға арналған диклофенактың арзан дженериктік нұсқаларының енгізілуінен кейін абайсызда улану салдарынан болды. Диклофенак 1973 жылы адамдарға ауырсынуды басатын дәрі ретінде енгізілді, бірақ 1993 жылы жалпы дженерик нұсқасы мақұлдағаннан кейін 90-жылдардың ортасында Үндістанның фармацевтикалық өнеркәсібі препаратты көп мөлшерде шығара бастады. Бұл оның бағасын мал шаруашылығында диклофенакты пайдалануды экономикалық тұрғыдан тиімді ететін деңгейге дейін төмендетті, ал 1994 жылға қарай диклофенак ветеринарлық клиникаларда кеңінен қолжетімді болды.

Диклофенак ақбас құмайларға улы болатын алғашқы стероидты емес қабынуға қарсы препарат болды және азиялық тұрлердің мекен ететін аймақтарының көп бөлігінде ветеринарлық қолдануға тыйым салынған. Қазіргі таңда Бангладеште, Камбоджада, Үндістанда, Иранда, Непалда, Оманда және Пәкістанда ветеринариялық диклофенакты өндіруге, сатуға және пайдалануға тыйымдар толығымен жарияланды, басқа елдер де осындай тыйымдарды қарастыруда. Үндістандағы Адам құқықтары жөніндегі комиссияның араласуының арқасында 2015 жылы жануарлар ауруларында қолданылуын тоқтату үшін диклофенактың көп дозалы пакеттерінің адамдарға арналған нұсқаларына тыйым салынды.

2023 жылы ақбас құмайларды көбірек қорғау үшін кетопрофен және ацеклофенак ветеринариялық препараттарын өндіруге, сатуға және қолдануға тыйым салынды. Диклофенактан басқа кетопрофен, ацеклофенак, тағы екі дәрі, нимесулид және оның компоненттері, флуниксин ақбас құмайлар үшін улы. Ғылыми есептер мен қауіпсіздік сынақтарының нәтижелеріне сәйкес мелоксикам мен толфенамин қышқылы ақбас құмайлар үшін қауіпсіз болып шықты.

Адамдарда және үй жануарлары үшін дәрілерді қолдану табиғи экожүйелердегі жануарлардың денсаулығы мен эл-ауқатына әсер ететін салдарға әкелуі мүмкін. Намираджанның деректері бойынша, 2018 жылы диклофенак концентрациясы 32 қаза болған африкалық ақбас құмайларда (*Gyps africanus*) 62,28-ден 272,20 нг/г-ға дейін ауытқиды. Тағы бір үқсас жағдайда 14 африкалық ақбас құмайдың бүйректерінде диклофенак улы диапазонда (70-908 нг/г), ал 12 құмайда (*Gyps himalayensis*) 139,69-дан 411,73 нг/г аралығында болды.

Олардың ішінде 2021 жылы ақбас құмайлардың өлімін азайту үшін диклофенакқа балама ретінде қолданылатын жаңа препарат, нимесулид (17–1395 нг/г) төрт бенгал құмайының (*Gyps bengalensis*) барлық тіндерінде анықталды. Ветеринариялық мәселелер дәрі-дәрмек өндірісіндегі мүдделі тараптар үшін маңызды болғандықтан, жануарлар мен қоғамдық денсаулыққа тигізетін әсерін азайтуға және дәрілерді қолданудың қоршаған ортаға тигізетін әсерін азайтуға көмектесу үшін көптеген [illegible] Сонымен қатар [illegible] Азиядағы ақбас құмайлардың р[illegible] ветеринариялық дәрі-дәрмектің әсе[illegible] келеді.

RAPTORS MORTALITY IN NORTHWEST RAJASTHAN, INDIA (2017–2022)

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A major contributing factor in declining populations of vultures is believed to be the widespread use of drugs such as Diclofenac, once commonly-used as a livestock anti-inflammatory drug. Use of Diclofenac is now banned in India. However, during the last 3 years, vulture's death cases are increasing not only in Rajasthan but also in other parts of India. From 2017–2022, a total of 791 vultures of 3 species i.e. Eurasian Griffon Vulture (*Gyps fulvus*), Cinereous Black Vulture (*Aegypius monachus*), and Egyptian Vulture (*Neophron percnopterus*) and 231 Steppe Eagles (*Aquila nipalensis*) were found dead at Jorbeer dumping site.

Jorbeer has been declared as conserved forest area, but dead livestock dumping site is not part of the protected area. The dramatic vulture decline observed across India leads to the emergence of a range of new ecological threats by influencing the numbers and distribution of other scavenging species. Increased feral dog populations have been reported all over in India, posing many associated disease risks, such as rabies, to humans and wildlife. India already has a very high incidence of rabies, and a severe shortage of quality rabies vaccine in rural areas could further aggravate the problem. Similarly, increased crow populations at carcass dumps in vicinity of settlements pose a risk of infections to poultry, domesticated birds, avian & humans. The situation has improved slightly after the ban on diclofenac (veterinary and human use) in India since 2015, but other drugs used to treat livestock continue to kill migratory raptors and vultures in northern India. The main drugs involved into this are Ketoprofen and Phenylbutazone. The existence of only a small proportion (<0.8%) of ungulate carcasses containing lethal levels of such drugs is sufficient to cause a rapid decline in vulture populations.

Strategic planning is needed to protect migratory vultures and eagles from Russia, Kazakhstan and Central Asian countries. While the number of vultures is declining day by day, the death toll in Rajasthan is a major part of the world percentage.

Eagles and vultures that died due to poisoning in India. Photo by D. Bohra.

Орлы и падальщики, погибшие в результате отравления в Индии. Фото Д. Бора.

Үндістанда уланудан қаза болған, буркіттер мен жемтіктермен қоректенушілер. Д. Бордын фотосы.

СМЕРТНОСТЬ ХИЩНЫХ ПТИЦ В СЕВЕРО-ЗАПАДНОМ РАДЖАСТАНЕ, ИНДИЯ (2017–2022 ГОДЫ)

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Vultures at the Jorber cattle burial site in India. Photo by D. Bohra.

Падальщики на скотомогильнике Джорбер в Индии. Фото Д. Бора.

Үндістандағы Джорбер мал қорымындағы жемтіктермен қоректенушілер. Д. Бордын фотосы.

Считается, что основным фактором, способствующим сокращению популяций падальщиков, является широкое использование такого препарата, как диклофенак, который когда-то широко использовался в качестве противовоспалительного лекарства для скота. Использование диклофенака теперь запрещено в Индии. Но за последние 3 года случаи смерти падальщиков растут не только в Раджастане, но и в других частях Индии. Всего за 2017–2022 гг. на свалке Джорбер были найдены мёртвыми 791 особь 3-х видов падальщиков, а именно белоголовые сипы (*Gyps fulvus*), чёрные грифы (*Aegypius monachus*) и стервятники (*Neophron percnopterus*), а также 231 степной орёл (*Aquila nipalensis*).

Джорбер был объявлен охраняемой территорией, но место утилизации мертвых животных не является частью охраняемой территории. Резкое сокращение численности падальщиков, наблюдаемое по всей Индии, ведёт к появлению ряда новых экологических угроз через опосредованное влияние на численность и распространение других видов неспециализированных падальщиков. По всей Индии сообщается о росте численности одичавших собак, что создаёт множество сопутствующих рисков, в том числе роста заболеваний, таких как бешенство у людей и диких животных. В Индии уже наблюдается очень высокий уровень заболеваемости бешенством, и абсолютная нехватка качественной вакцины против бешенства в сельской местности может ещё больше усугубить проблему. Аналогичным образом, увеличение численности ворон на скотомогильниках вблизи населённых пунктов создаёт риск заражения домашних, синантропных, диких птиц и людей. Ситуация немного улучшилась после запрета диклофенака (и в ветеринарии, и в медицине) в Индии с 2015 г., но другие препараты, используемые для лечения скота, продолжают губить мигрирующих хищников и падальщиков на севере Индии. Основными препаратами в этой области являются кетопрофен и фенилбутазон. Присутствие лишь небольшой доли (<0,8%) туш копытных, содержащих летальные уровни таких препаратов, достаточно, чтобы вызвать быстрое сокращение популяций падальщиков.

Стратегическое планирование необходимо для защиты мигрирующих падальщиков и орлов из России, Казахстана и стран Центральной Азии. В то время как численность падальщиков сокращается, [illegible] из них, кто погиб [illegible] общего числа.

СОЛТҮСТІК-БАТЫС РАДЖАСТХАНДАҒЫ ЖЫРТҚЫШ ҚҰСТАРДЫҢ ӨЛІМ-ЖІТІМІ, ҮНДІСТАН (2017–2022 ЖЫЛДАР)

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Ұсынылатын дәйексөз: *Бора Д.Л., Рао М.С.* Солтүстік-Батыс Раджастхандағы жыртқыш құстардың өлім-жітімі, Үндістан (2017–2022 жылдар). – Пернатые хищники и их охрана. 2023. Спецвып. 2: С. 172–174. **DOI:** 10.19074/1814-8654-2023-2-172-174 **URL:** http://rrrcn.ru/ru/archives/34999

Жемтіктермен қоректенуші құстардың популяциясының азаюына ықпал ететін негізгі фактор бір кездері малдарға қабынуға қарсы дәрі ретінде кенінен қолданылған диклофенак сияқты препаратты кенінен қолдану болып табылады. Енді Үндістанда диклофенакты қолдануға тыйым салынған. Соңғы 3 жылда жемтіктермен қоректенуші құстардың өлім-жітім саны Раджастханда ғана емес, Үндістаннын басқа бөліктерінде де өсуде. 2017–2022 жж аралығынын өзінде Джорбер қоқыс үйіндісінде жемтіктермен қоректенуші құстардын 3 түрінін 791 данасы өлі күйінде табылған, олар: ақбас құмай (*Gyps fulvus*), тазқара (*Aegypius monachus*) және жүртшы (*Neophron percnopterus*), сондай-ақ 231 бас дала қыраны (*Aquila nipalensis*).

Джорбер қорғалатын орман аумақ деп жарияланды, бірақ қаза болған жануарлардын көмілген жері қорғалатын аумаққа кірмейді. Үндістанда байқалған жемтіктермен қоректенушілердін санынын күрт төмендеуі басқа мандандырылған емес жемтіктермен қоректенушілер түрлерінін көптігі мен таралуына әсер ететін бірқатар экологиялық қауіптерді тудырады. Үндістанда жабайы иттер санынын көбеюі туралы хабарланды, бұл адамдар мен жабайы табиғатқа құтыру сияқты ауруларды қоса алғанда, көптеген қауіп төндіреді. Үндістанда құтыру ауруы қазірдін өзінде өте жоғары және ауылдық жерлерде құтыруға қарсы сапалы вакцинанын абсолютті түрде болмауы мәселені одан әрі ушықтыруы мүмкін. Сол сияқты елді мекендер жанындағы малдын өлексе мүрделерін көметін жерлерде қарғалар санынын көбеюі үй, синантропты, жабайы құстар мен адамдарға жұқтыру қаупін тудырады. 2015 жылдан бастап Үндістанда диклофенакқа (ветеринарлық және медициналық қолдану) тыйым салынғаннан кейін жағдай біршама жақсарды, бірақ малды емдеу үшін қолданылатын басқа препараттар Үндістаннын солтүстігінде қоныс аударатын жыртқыштар мен жемтіктермен қоректенуші құстарды жоюды жалғастыруда. Бұл саладағы негізгі препараттар – кетопрофен және фенилбутазон. Мұндай препараттардын өлімге экелетін деңгейі түяқты жануарлардын өлекселерінде аз ғана бөлігінін болуы (<0,8%) жемтіктермен қоректенуші құстардын популяциясынын тез төмендеуіне себепші болады.

Ресейден, Қазақстаннан және Орталық Азиядан үшып қоныс аударатын жемтіктермен қоректенуші құстар мен қырандарды қорғау үшін стратегиялық жоспарлау қажет. Жемтіктермен қоректенуші құстар [illegible] болып келеді және [illegible] Үндістанда қаза болған құстардың [illegible] өмір популяциясынын маңызды себепші болып табылады.

Vultures at the Jorber cattle burial site in India. Photo by D. Bohra.

Падальщики на скотомогильнике Джорбер в Индии. Фото Д. Бора.

Үндістандағы Джорбер мал қорымындағы жемтіктермен қоректенушілер. Д. Бордын фотосы.

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Wings of Khichan: Unraveling the Ecology, Migration, and Conservation Challenges of Demoiselle Cranes in the Thar Region

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Abstract - *The Thar region in Rajasthan provides a habitat for a diverse range of migratory avian species, with the Demoiselle Crane (Anthropoides virgo) being prominent among them. These cranes gather in Khichan village, in search of favorable ecological conditions to sustain, lodge, and nurture their young ones. Anthropoides virgo, the smallest crane, boasts an average adult length of 90cm, featuring streamlined bodies, long rounded grey wings, and short toes and bills. Engaging in a cyclic migration pattern, Demoiselle cranes undertake a demanding journey, covering 5000 kilometers in around two weeks. Originating from Siberia, China, Mongolia, Russia, the Tibetan plateau, they navigate through the Dead Sea, Afghanistan, and Central Asia before settling in their winter habitat in India. Arrival in Khichan typically occurs in late September, and the cranes stay until early March before migrating back to the northern region during spring via the Central Asian Flyway (CAF). The conservation status of Demoiselle cranes, according to the IUCN Red List, is categorized as 'Least Concern.' Research data from 2022-23 indicates a peak winter population of up to 40,000, with estimates in early October ranging between 5000-7000 in Khichan Bird Sanctuary. Key roosting sites include waterbodies such as Vijaysagar Talab, Ratri Nadi, Nibli Nadi, and Teejaniyo Ki Nadi, while the 'Chugga Ghar' serves as a vital feeding ground.*

Despite their resilience, these cranes face threats such as food poisoning, predation by dogs, temperature fluctuations, and electric shocks from power lines. The primary cause of increased mortality is linked to power lines and excessive insecticide use in agricultural areas where the birds roost at night. This study closely examines the Demoiselle crane population, emphasizing habitat utilization, ecological behavior, and the challenges encountered during their winter stay in Khichan village, Rajasthan.

Key Words: Thar region, Migratory avian species, Demoiselle Crane (Anthropoides virgo), Khichan village, Ecological behavior, Threats to Demoiselle Cranes, Population dynamics, Rajasthan.

1.INTRODUCTION

The Central Asia Flyway (CAF), a migratory route guiding Demoiselle cranes to Gujarat and Rajasthan in India, underscores the significance of protected sites such as Important Bird Areas (IBAs), bird sanctuaries, wildlife refuges, and national parks in wetlands. These areas serve as crucial stopovers and wintering grounds for approximately half of India's 243 water bird species and 67 wetland-dependent birds [1] [12].

There are a total of fifteen crane species distributed globally [5]. Among them five crane species found in India, the Demoiselle Crane stands out, embarking on a majestic winter migration journey. Recognized locally as the Kurjan bird, the Demoiselle Crane's distinctive features include long legs, neck, and a compressed bill, with a bluish-grey body adorned by dark and light grey markings. Notably, the Demoiselle Crane holds a conservation status of "Least Concern" according to the IUCN Red List and is listed in Appendix II of CITES (2012). Winter sees thousands of Demoiselle Cranes descending upon Rajasthan's Thar Desert, with Khichan village in Phalodi district standing out as a world-renowned wintering ground, hosting the second-largest population globally (Gehlot et al., 2021). The region's Flyways, often considered as 'routes' for bird migration, play a pivotal role, with India positioned in three key flyway zones: Central Asian Flyway (CAF), East-Asian Australasian Flyway (EAAF), and Asian East African Flyway (AEF). Birds migrating across the Himalayan region confront significant physiological and climatic challenges as they traverse the highest peaks in the world. Ringing programs have contributed valuable data regarding the origins and destinations of these birds [6].

Approximately 370 migratory bird species utilize these flyways, with the Central Asian Flyway alone supporting at least 274 waterbird populations. Demoiselle Cranes, Siberian Cranes, and Hooded Cranes are among the species relying on the Central Asian Flyway [10]. Migratory birds are [illegible] threats resulting from human [illegible] including the use of

pesticides, deforestation, and industrialization [9]. Conservation hurdles in the area stem from inadequate management practices driven by a lack of understanding of Demoiselle Crane ecology, a shortage of scientific research, unchecked tourism, periodic pond desiccation, the hazard of electric cables leading to crane fatalities, and insufficient medical care for sick or injured birdS [8]. However, this study sets out to uncover the secrets of the Demoiselle Crane: understanding its population dynamics, unraveling migratory mysteries, and confronting the major threats it faces in the enchanting Khichan village in Thar Desert of Rajasthan, India.

1.1 Avian Migration and Its Importance

The ecological significance of migration, as evident in its impact on food production, climate, and conservation, underscores the importance of studying this phenomenon [10]. The Demoiselle Crane's migratory journey, spanning thousands of kilometers, highlights the need for conservation efforts to counter increased anthropogenic threats, habitat destruction, and alteration of resting grounds in their wintering sites [2] [3]. The migratory birds exhibit their highest winter population levels in December, January, and February.

The migration routes spanned between 2170 to 5600 km, while the transit migration covered distances from 1900 to 4600 km, lasting between seven to 13 days. Clearly, the Demoiselle Crane manages this period without the need for immediate energy replenishment, relying on resources accumulated before initiating the transit migration [7].

Every winter, numerous flocks of Demoiselle Cranes make their way to the Thar Desert in Rajasthan. Originating from Siberia, China, Mongolia, Ladakh, and the Tibetan Plateau, their migratory journey extends through Afghanistan and Central Asia before concluding in the north-western part of India, specifically at the Thar Desert. The purpose of this migration is to escape the harsh cold of the Arctic region by seeking warmer climates.

2. Historical perspective; Khichan as Wintering Ground

Khichan, recognized as a crucial wintering site, experiences an annual increase in the Demoiselle Crane population due to distinctive community initiatives [4]. Situated on the outskirts of the Thar Desert, Khichan lies along the migratory route of Demoiselle Cranes as they travel from their breeding grounds in Eurasia to bask in the milder winter climate of India. In late September, the initial flocks embark on their aerial journey from the plateaus, steppes, and wetlands of Mongolia and the Caucasus region. Covering approximately 5,000 kilometers in about two weeks, they traverse numerous international borders, soaring over the Himalayas. By November, a multitude of birds descends, and for a duration of five months, Khichan transforms into a 'crane village.'

3. Study Site

The latitude of Khichan village is 27.142930, and the longitude is 72.420227. The population density of this village is 7,025, as per the records collected in 2011. Khichan has been recognized by the Rajasthan Tourism Development Corporation (RTDC) as a tourist hotspot. Thousands of cranes spend the winter in Khichan, and they can be seen right in the middle of the village. Various sites were studied during the survey for data collection, such as agricultural fields, feeding grounds, wetlands, lakes, ponds, etc.

3.1 Feeding Ground (Chugga ghar)

The feeding ground of these cranes is the “chugga ghar,” which is located on the entry pathway of the village and covers an area of 6416 square meters where they feed upon grains. On a daily basis, a total of 2500 kilograms of grains are provided to the birds during the peak winter season. They come to the feeding ground in the early morning, forming a 'V'-flight pattern in the sky.

Fig -1: feeding ground in Khichan

Fig-2: V formation

3.2 Rivers (nadi) and Ponds (talab)

In the northern side of the village, there are two water bodies, “Vijaysagar Talab” (Pond) and “Ratri Nadi” (River). Another water body is situated in the southern region of the feeding ground, and that's “Teerjaniyo ki Nadi” (River). These rivers and ponds are used by the cranes as resting sites in the evening and a source of drinking water.

Fig -3: Roosting site (Vijaysagar talab)

4. Materials and Methods

Selected locations within Khichan's wintering grounds were surveyed for Demoiselle cranes from early September 2022 to late March 2023. Additional information was gathered from secondary sources, including newspapers, magazines, literature, and Mr. Seva Ram Mali, a local shop owner in Khichan. Mr. Mali has been maintaining records of the daily visits to the feeding ground, as well as details about injured, deceased, and rescued birds since October 2010. Surveys encompassed various areas in Khichan village, chosen based on previous data and local knowledge.

4.1 Data Collection

An initial reconnaissance survey was executed in the study area, specifically Khichan village, with the aim of identifying potential habitat locations for Demoiselle cranes. After identifying these sites, additional data collection activities were initiated. Surveys were conducted on foot within the study area, allowing for direct observations during both early morning and daytime hours. Binoculars (8 x 40), iPhone13 and a Canon PowerShot SX40 HS camera, equipped with a 12MP CMOS-based superzoom featuring a 35x zoom and a lens with a 24-840mm equivalent zoom range, were employed for this purpose. The selection of study sites was determined based on the distribution range of the Demoiselle crane.

The "Block Method" was employed to count the number through binoculars, as it proves to be a straightforward and precise technique for estimating the quantities of cranes within sizable and densely populated flocks, whether in flight or on the ground and with the aid of binoculars, tagged birds were also sought to determine their migratory patterns and origin. Comprehensive information regarding the birds' activities and daily routines was gathered through a questionnaire survey conducted among the locals of the village.

5. Findings and Interpretations

The migratory avian species, Demoiselle cranes, are observed in early September during the survey for the research. Our findings indicate that only a few of them migrate towards the Thar region of Rajasthan in the early winter. Their numbers range between 100-200 in the initial winter period, but by late September, it increases significantly to 3000-5000. These cranes cover vast distances, flying thousands of kilometers in search of optimal ecological conditions and habitats for feeding, roosting, breeding, and raising their young.

The Demoiselle cranes are observed in various regions of the Thar Desert, possibly due to the availability of suitable habitats and protection from the local community in Rajasthan. The ponds situated in Satlana village, Jodhpur district, serve as a secondary habitat for Demoiselle cranes in the Thar Desert. This village, located in Jodhpur district, provides a picturesque setting where Demoiselle cranes coexist with local bird species [11]

Survey Data was recorded from September 2022 to March 2023, representing the annual period of their migration. According to the data, the peak population is observed in January and February, coinciding with the peak of the winter season. During these months, the population status ranged from 35,000 to 40,000, marking the highest count to date. The entire Khichan village was surveyed and recorded an average species count of 35,000-40,000 during the peak winter season.

Table -1: Population status recorded in each month along with time from October 2022 to March 2023

DATE	TIME TO REACH THE FEEDING GROUND	TIME TO LEAVE THE GROUND	POPULATION
06/10/22	07:03 a.m.	10:13 a.m.	5000
06/11/22	07:45 a.m.	09:46 a.m.	9000
06/12/22	07:28 a.m.	09:27 a.m.	18000
06/01/23	07:08 a.m.	09:56 a.m.	32000
06/02/23	07:51 a.m.	11:12 a.m.	40,000
06/03/23	07:54 a.m.	10:43 a.m.	12000

we can conclude that during the early months of winters only few individuals are seen in the khichan village, and the population size increases as the winter increases in the central Asian parts and birds migrate towards the marshy areas of khichan.

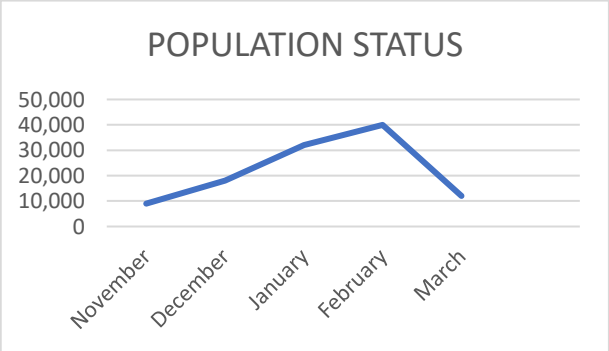

Fig -4: Population status of annual migration.

Mortality Of Demoiselle cranes

A total of 234 deceased individuals were documented between 2010 and 2021 in Khichan and its surrounding areas. The majority of these mortalities were discovered at Vijaysagar Talab and Ratri Nadi, identified as the two primary roosting areas for Demoiselle cranes. Chugga ghar served as their main foraging site. The causes of these mortalities were varied and included food poisoning, collisions with power lines, attacks by feral dogs, temperature increases, and injuries from Chinese manja. In some instances, natural factors were identified as the cause of mortality. They confront numerous other threats, including illegal trades, habitat loss, and hunting or capturing. Given these challenges, the conservation and management of Demoiselle cranes are imperative for the survival of this beautiful species [13]

Vijaysagar, a significant water source for birds to quench their thirst, attracts substantial congregations, consequently drawing predators like stray dogs. The power lines traversing the pond region, a major roosting site, have been accountable for obstructing the flight of birds and contributing to mortality. Figure 5 illustrates recorded reasons such as collisions with power lines, predation by stray dogs, and food poisoning caused by insecticides used in grain agriculture with high phosphorus content.

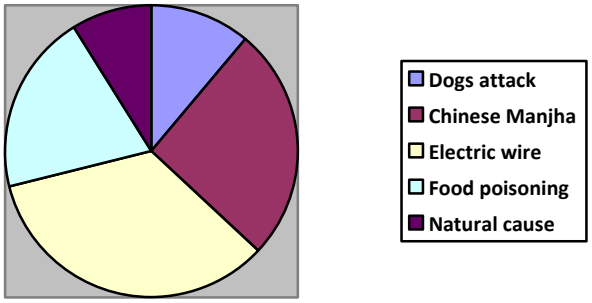

Fig -5: Major threats causing harm to Cranes.

The primary threat to the cranes in Khichan village arises from the presence of electric powerlines within the roosting and feeding grounds of the cranes. Another significant threat contributing to a high mortality rate is food poisoning. This is attributed to the ingestion of fertilizers and insecticides used in agricultural practices, which contain elevated concentrations of phosphorus. The cranes consume these substances through food grains or water in the ponds, which serve as their roosting sites and are contaminated by fertilizers and insecticides.

Fig -6: Demoiselle crane injured by feral dog attack.

Fig -7: Demoiselle crane collapsed with electric wires.

6. Conclusion

The population status is summarized in table 1 and their detail is plotted in the line graph shown in figure 4. We recorded 35,000 – 40,000 individuals in the peak month of winters i.e., January and February. They migrate to the thar region of Rajasthan by the month of September, and they stay there till late march and migrate back to their breeding grounds. The major threats causing the mortality of the cranes are summarized in Figure 5. The incidents and mortality rate of the birds are highest at the roosting site, with the primary causes being electric wires and food poisoning. The overuse of fertilizers and pesticides, particularly those with elevated phosphorus levels, can lead to infections in the gut of cranes, ultimately causing diseases and individual fatalities.

Fig -8: Demoiselle Cranes in Midair.

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Рабочая группа по журавлям (РГЖ) СССР создана в 1980 г. Основной предпосылкой создания РГЖ стало возникновение особого интереса к журавлям, как к малоизученной группе птиц, подвергающейся реальной угрозе исчезновения. Деятельность группы стимулировала исследования по журавлям и мероприятия по их спасению, повысила интерес профессиональных орнитологов и любителей природы к этим птицам.

В 1990 г. РГЖ фактически прекратила свою деятельность в связи с распадом СССР.

28 октября 2000 г. в Москве состоялось Учредительное собрание, объявившее о восстановлении деятельности **Рабочей группы по журавлям Евразии (РГЖЕ)** и определившее её цель: содействие охране и изучению журавлей в России и других странах дальнего и ближнего зарубежья.

Одной из основных задач группы является распространение информации о современном состоянии популяций журавлей и мест их обитания, принимаемых и предлагаемых мерах охраны, проводимых научных исследованиях и международных проектах.

The Crane Working Group (CWG) of the USSR was created in 1980. The main prerequisite for the CWG creation was the emergence of a special interest in cranes as a poorly studied group of birds that is under real threat of extinction. The group's activities stimulated research on cranes and measures for their conservation, increased the interest of professional bird watchers and nature lovers to these birds.

Due to the collapse USSR and other factors, in 1990 the Crane Working Group of the USSR ceased to be active.

On 28 October 2000 in Moscow **the Crane Working Group of Eurasia** activity was announced with the main goal to protect and research on different crane species. The general task is compilation and distribution of information about current status of crane populations and conservation measures both in Russia and worldwide.

информационный

БЮЛЛЕТЕНЬ №17

Рабочая группа по журавлям Евразии

NEWSLETTER #17

Crane Working Group of Eurasia

2023

Рабочая группа по журавлям Евразии
Институт проблем экологии и эволюции им. А.Н. Северцова
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Russian Bird Conservation Union

ИНФОРМАЦИОННЫЙ БЮЛЛЕТЕНЬ РАБОЧЕЙ ГРУППЫ ПО ЖУРАВЛЯМ ЕВРАЗИИ

№ 17

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На передней обложке фото А.А. Сасина: пара японских журавлей в Муравьевском заказнике, Амурская область

На задней обложке фото А.А. Сасина: Самка Снежинка, выращенная в Муравьевском парке устойчивого природопользования и выпущенная в природу, образовала пару и загнездилась

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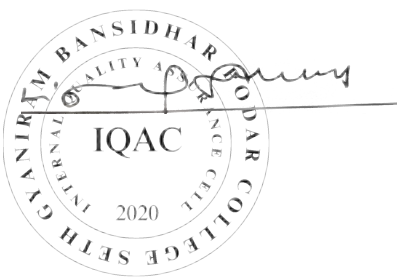
On the front cover by A. Sasin: The Red-crowned Crane pair in Muraviovka Wildlife Refuge, Amur Region

On the back cover by A. Sasin: The female named Snezhinka, reared in Muraviovka Park of Sustainable Land Use and released into the wild, formed pair with wild partner and nested

Approved by Scientific Council of A.N. Severtsov Institute of Ecology and Evolution Russain Academy of Science on 30 March 2023



Дорогие друзья!

Информационный бюллетень Рабочей группы по журавлям Евразии №17 содержит информацию за 2022 г. о гнездовании, миграциях, зимовках, мечении, разведении в неволе, реинтродукции и лимитирующих факторах, а также интересные факты и публикации.

Продолжается мониторинг стерха в Якутии, японского журавля на о. Кунашир (Сахалинская область), красавки в европейской части ареала, японских и даурских журавлей в Забайкалье и закавказского серого журавля в Грузии. В 2022 г. в Турции опять успешно загнездилась красавка, обнаруженная в 2021 г. в провинции Мерзифан. Интересны данные о встречах стерхов на европейском северо-востоке России.

Отрадно, что начатые в прошлом году акции в Башкирии и Курганской области по учётам серых журавлей на предотлётных скоплениях, продолжаются, и традиционно ведутся наблюдения за скоплениями в Ивановской и Ульяновской областях. Обнаружено самое северное предмиграционное скопление серых журавлей в азиатской части ареала в Якутии.

Традиционно представлена информация о результатах зимних учётов в рамках Международной сети по сохранению японского журавля.

Представлена информация о разведении и реинтродукции журавлей в двух основных центрах – Питомнике редких видов журавлей Окского заповедника и Станции реинтродукции редких видов птиц Хинганского заповедника. Мечение выпущенных на Станции реинтродукции японских журавлей позволило проследить их миграцию и помочь выжить в зимний период. Зимой 2022/2023 гг. к стерху, с 2007 г. прилетающему на зимовку в Иран, из Бельгии доставлена самка, они образовали пару и начали весеннюю миграцию.

Приведены предварительные результаты мечения серых журавлей и красавки в 2022 г. и данные о встречах меченых серых журавлей на месте зимовки в долине Хула в Израиле. Обобщены данные о возвратах меченых красавок на местах гнездования и зимовках.

Представлена информация об отравлении красавки и серых журавлей весной в Крыму и массовой гибели от отравления серых журавлей на Ставрополье зимой 2022/2023 гг., а также о вспышке птичьего гриппа на месте зимовки даурских и чёрных журавлей в Идзуми в Японии.

Из рубрики «Международное сотрудничество» можно узнать о постоянном взаимодействии между двумя основными территориями стерха – Национальным парком Кыталык на местах гнездования и Национальным природным резерватом «Озеро Поянг» на местах зимовки в Китае.

В разделе "Поздравления" продолжаем чевствовать наших юбиляров.

2022 год не обошёлся и без горьких потерь – безвременно ушли наши коллеги, воспоминания о которых представлены в рубрике "Наша память".

В последней рубрике дан список публикаций о журавлях, вышедших в 2022 г.

Редакторы

Dear friends!

The Newsletter of the Crane Working Group of Eurasia #17 contains information for 2022 on crane breeding, migrations, wintering, tagging, breeding in captivity, reintroduction and threats, as well as interesting facts, cranes in art and publications.

The monitoring of the Siberian Cranes in Yakutia, Red-crowned Cranes on Kunashir Island (Sakhalin Region), Red-crowned and White-naped Cranes in Transbaikalia, Demoiselle Cranes in the European part of their range and the Transcaucasian Eurasian Cranes in Georgia is continued. In 2022 in Turkey a Demoiselle Crane pair re-nested in Merzifon Province, where it bred in 2021. The data on Siberian Crane sightings in the Northeast of European Russia are very interesting.

It is gratifying that public actions on counts of Eurasian Cranes at staging areas, started in the last year in the Republic of Bashkiria and the Kurgan Region, are continuing and monitoring of crane pre-migratory congregations in the Ivanovo and Ulyanovsk Regions continue to be conducted. The most northern pre-migratory staging area of the Eurasian Crane in Yakutia, in the Asian part of its range, was discovered.

Information about the results of winter counts conducted within the framework of the International Red-crowned Crane Network (IRCN) is presented.

Results of breeding and reintroduction of cranes in the two main breeding centers – Oka State Nature Biosphere Reserve and Khingansky State Nature Reserve are presented. Tagging of released Red-crowned Cranes allowed to track their migration and help to survive during winter period. In winter 2022/2023, a female Siberian Crane was delivered from Belgium to wintering grounds in Iran where one Siberian Crane has been wintering alone since 2007. They formed a pair and began their spring migration.

Preliminary results of Eurasian and Demoiselle Cranes tagging in 2022 and data on sightings of tagged Eurasian Cranes at the wintering site in the Hula Valley in Israel are given. Data on returns of the tagged Demoiselle Cranes at breeding and wintering grounds are compiled.

Information about the poisoning of Demoiselle and Eurasian Cranes in the Crimea and mass deaths from the poisoning of Eurasian cranes in the Stavropol in the winter of 2022/2023 is presented, as well as data on the outbreak of avian influenza at the wintering site of White-naped and Hooded Cranes in Izumi, Japan.

From the section "International Cooperation" you can learn about the close cooperation between two main Siberian Crane territories – the Kytalyk National Park at breeding grounds in Yakutia, Russia, and the Poyang Lake National Nature Reserve at wintering grounds in China.

We continue to congratulate our colleagues in the “Anniversary” section.

In the “Our Memory” section we have published articles about our colleagues who passed away in 2022, a year not without sad losses.

The last section lists publications about cranes issued in 2022.

Editors

Satyendra Singh

Digitally signed by Satyendra Singh
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Благодарим М. Викельски, В. Фидлера, Б. Форнвег и Г. Хейне, Институт поведения животных Макса Планка, и С. Лей, Исследовательский центр экологических наук Китайской академии наук, за предоставление GPS-GSM передатчиков и поддержку дистанционного слежения за красавками, И.Г. Покровского за помощь в оформлении документов, И.В. Санникову за помощь в получении гранта РГО, Рабочую группу по журавлям Германии – за пластиковые кольца ELSA для индивидуального мечения, В.Н. Федосова, Ю.В. Бабичева, А.В. Давыгору за помощь в проведении работ.

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Records of Demoiselle Cranes color marked across the breeding range between 2013–2023

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Thanks to the mass tagging of Demoiselle Cranes with color-bands and GPS-GSM transmitters in Mongolia, Russia and Kazakhstan, the researchers are improving their information about the distribution of breeding and wintering grounds, determination of key staging areas, and migration routes as well as important environmental factors and features along flyways (Kanai et

al., 2000: Yumin, Fenqi, 2017; Galtbalt et al., 2022; Ilyashenko et al., 2022).

After a certain period of the time the batteries of the GPS tracking devices are drained and make it impossible to keep tracking the cranes. Because of this we have limited knowledge of the GPS marked cranes who have returned to these areas. Information on tagged crane sightings allows us to get additional data on the habitats during the entire annual cycle, social status and threats, as well as attracting photographers and bird lovers to bird watching.

European part of the range. In the late 1990s – early 2000s capture and color marking Demoiselle crane chicks in the Azov-Black Sea population was carried out under the guidance of Yury Andryushchenko of the Azov-Black Sea Ornithological Station, on the territory of the Crimea and the Azov Upland. Information on sightings of these tagged individuals has been published (Andryushchenko et al., 2006).

A new period of marking began with the possibility of tagging with color bands and GPS-GSM transmitters, as well as projects to study the genetics and population structure of crane species in different geographical locations. This mass effort was led by Elena Mudrik.

Work in 2017–2022 was conducted by members of the Crane Working Group of Eurasia under the leadership of Yury Andryushchenko with the participation of A. Bronskov, T. and D. Datsenko, A.I. and V.A. Koshelev, R. Chernichko, I.S. Naidanov (5 cranes); under the leadership of Elena Ilyashenko with the participation of V.Yu. Ilyashenko, P.V. Aksenova, I.P. Aryulina, V.P. Belik, A.G. Grinko, E.V. Gugueva, G.S. Dzhamirzoev, G.A. Kalmykova, K.D. Kondrakova, M.V. Korepov, S.Yu. Kostin, G.N. Moskov, R.A. Mnatsekanov, E.A. Mudrik, D.V. Politov, T. and A. Politovs, S.L. Popov, A.S. Urusova (149 cranes), and under the leadership of Michail Korepov with the participation of T.V. Seleznева and I.P. Aryulina (10 cranes).

Demoiselle Cranes of the Azov-Black Sea population (Ukraine, Crimea, Krasnodar Territory) were marked with yellow bands (in Ukraine) and with yellow bands with black two-digit alphanumeric code (in Russia), the Caspian and Volga-Ural breeding groups (Ciscaucasia, the Caspian Lowland, Cis-Urals and Western Kazakhstan) were marked with white rings with black two-digit alphanumeric or numeric code. There were a few exceptions in rare cases when, due to the absence of white rings, cranes were marked with red bands with white two-digit alphanumeric code. Small chicks were banded with individual combination of color small spiral bands. In 2022 Demoiselle Cranes were also banded with individual combination of color plastic bands ELSA.

In the Asian part of the range. In the 1980s–1990s in Transbaikalia, Demoiselle Crane banding was carried out under the guidance of Mikhail Golovushkin. During this period four returns were received. One return of a Demoiselle Crane banded with a red plastic band in the Daursky State Nature Reserve was received from India (Mundkur, 1992). Three more returns of dead Demoiselle Cranes banded with standard metal bands were received from a wintering site in India and along migration routes from Nepal and Pakistan (probably killed by hunters), according to information from the Russian Bird Ringing Center. In 2002 and 2003, 39 Demoiselle Cranes were tagged with standard metal and color plastic bands (10 in Transbaikalia and 29 in Mongolia) under the guidance of Oleg Goroshko. Tseveenmyadag Natsagdorj also led color banding of Demoiselle Cranes in Mongolia using green bands.

From 1999 to 2015, 235 chicks were banded with color bands by the Mongolian-German Biological Expeditions led by Michael Stubbe. Five returns, including three on the migration route in Pakistan and two from wintering grounds in India (one from Rajasthan and one from Gujarat) were recorded. One more return was registered at the breeding site in Mongolia 12 years after banding (Stubbe et al., 2016).

Colored bands and the first satellite transmitter tagging was performed by Japanese ornithologists in 1995 in Mongolia, Kazakhstan and the Trans-Baikal Territory in Russia (Kanai et al., 2000).

The next stage of tagging began with the possibility of mass tagging with color bands and GPS-GSM transmitters.

In Russia the work was conducted starting in 2015 in Transbaikalia Region in the Daursky State Nature Reserve under the leadership of Oleg Goroshko with the participation of S.B. Balzhimaeva and Chinese colleague prof. Guo Yumin (white bands with a two-digit alphanumeric code as well as color plastic rings ELSA) (45 cranes); in 2018 and 2019 in the Altai Territory and the Republic of Khakassia under the leadership of Elena Mudrik with the participation of E.I. and V.Yu. Ilyashenko, V.M. Mikhailovsky, D.V. Politov, T. and A. Politovs, K.A. Postelnykh, V.V. Shurkina (white bands with a black two-digit alphanumeric code) (13 cranes); in 2018 in the Trans-Urals [illegible] of the Orenburg Region) under the leadersh[illegible] Ilyashenko with the participation of V.Yu. I[illegible] L.V. Korshikov,

A.S. Nazin (red bands with a white two-digit digital alphanumeric code) (8 cranes).

In South-East Kazakhstan, tagging was carried out in 2017 in the Tien Shan under the leadership of Elena Ilyashenko with the participation of O.V. Belyalov, V.Yu. Ilyashenko, A.E. Gavrilov and S.Kh. Zaripova (one male was marked with yellow plastic ring ELSA), and in 2018–2020 in the vicinity of Lake Alakol and in the Almaty Region under the leadership of Andrei Gavrilov with the participation of A. Abaev, S.Kh. Zaripova, A. Isabekov, E. Myrzabekov, and A. Filimonov (red bands with a white two-digit alphanumeric code in 2018, and yellow bands with a black two-digit alphanumeric code in 2019 and 2020) (11 cranes).

In Mongolia, the Wildlife Science and Conservation Center of Mongolia team under the leadership of Nyambayar Batbayar has banded 363 Demoiselle Cranes with green plastic bands with a white three-digit alphanumeric code since 2013. Between 2015 and 2023, they have 60 records from Mongolia and India (Table 1, 2). The Mongolian Bird Conservation Center under the leadership of Purev-Ochir Gankhuyag and Amarkhuu Gungaa, together with a Chinese colleague Prof. Guo Yumin banded 65 Demoiselle Cranes with green plastic bands with white three-digit numeric code from 2018 to 2021. 25 out 65 cranes were fitted with transmitters. The Mongolian-German Biological Expeditions led by Michael and Annegret Stubbe used yellow plastic bands with a four-digit code and German metal standard bands from the ringing center Hiddenssee (beringungszentrale@lung.mv-regierung.de). Their project banded 37 Demoiselle Cranes in 2017 and 31 Demoiselle and one White-naped Cranes in 2019.

Most Demoiselle cranes marked with color bands were chicks, and relatively few of them were adults. So, it is often not possible to assign sex of the individuals. Some of the adults were assigned a sex based on behavior and size observation in the field. The sex of Demoiselle Cranes tagged in Russia was determined by the molecular genetic method using the EE0.6 marker (Mudrik et al., 2013).

Most of the records were for Demoiselle Cranes of the Asian part of the range, due to the large number of tagged birds and regular monitoring both at breeding sites in Transbaikalia and Mongolia, and at wintering grounds in India, mainly in Kheechan Village in the Rajasthan State, and Vadla Wetland Complex near Nal Sarovar Bird Sanctuary (Ramsar Site), and in the Kachchh District in the Gujarat State (Table 1).

Records of cranes of the Azov-Black Sea population are presented in Table 2, those of the Caspian and Volga-Urals breeding groups – in Table 3, and those of the Asian part of the range – in Table 4.

Six returns were dead or injured birds – two from the Caspian breeding group that died in Saudi Arabia during illegal hunting along the flyway, two from Southeast Kazakhstan and Mongolia that died in Pakistan, also as a result of hunting, one from Transbaikalia who died in India because of a collision with a power line, and one from Mongolia who died due to poisoning in India.

In conclusion, it should be said that although mass color marking of Demoiselle Cranes was carried out recently across its breeding range, the resighting information comes from a limited number of locations outside breeding area.

In the future, the teams need to make additional efforts to record the marked individuals to make the banding work more useful to assess survival and dispersal of the species.

Capture and tagging were carried out under the permission of state environmental authorities in each country.

We thank M. Wikelski, W. Fiedler, B. Fornweg and G. Heine, Max Planck Institute for Animal Behavior, and C. Lei, Environmental Science Research Center of the Chinese Academy of Sciences, for providing GPS-GSM transmitters and supporting Demoiselle Crane remote tracking, I.G. Pokrovsky for help in tag deliveries and permissions for capture, I.V. Sannikova for assistance in obtaining a grant from the Russian Geographical Society, the Crane Conservation Germany for ELSA plastic rings for individual tagging, V.N. Fedosov, Yu.V. Babichev, A.V. Davygora for help in carrying out the work.

Таблица 2. Встречи красавок азово-черноморской популяции

Table 2. Records of Demoiselle Cranes of Azov-Black Sea Population

NN	Левая голень Left tibia	Правая голень Right tibia	Пол, возраст Gender, age	Дата мечения Date of tagging	Место мечения Place of tagging	Дата встречи Date of record	Место встречи Place of record	Наблюдатель Observer	Примечание Note
1	Спирал. кольца **Б-3-З** Spiral bands **W-G-G**	Передатчик на белом кольце Tag on white band	самец male Juv	24.06. 2018	Россия, Краснодарский край, Тамань Russia, Krasnodar Region, Taman	25.03. 2019	Россия, Краснодарский край, Тамань Russia, Krasnodar Region, Taman	Р. Мнацеканов R. Mnatsel-kanov	Летел с родителями Flying with parents
2	Желтое кольцо Yellow band **X2**	Передатчик на белом кольце Tag on white band	самка female Juv	17.06. 2019	Россия, Крым Russia, Crimea N 45°21'28" E 32°34'59"	21.08. 2019	Турция, Зонгулдак Turkey, Zonguldak 411781E 4561622N	Бурак Татар Burak Tatar	Был один, без родителей, с небольшой раной на крыле. 22 августа выпущен и продолжил миграцию, согласно данным передатчика It was alone, without family, with small wounds on the wings. On 22 August it was released and continued migration according to remote tracking
3	Желтое кольцо Yellow band **X1**	Кольца **К-Б-К** Bands **R-W-R**	самка female Ad	04.05. 2021	Russia, Crimea, Tarkhankut NP	16.08. 2021	Россия, Крым, оз. Джарылгач Russia, Crimea, Dzharylgach Lake	Т. И Д. Жеребцовы T. and D. Zerebtsov's	Место предмиграционного скопления Staging area
					Russia, Crimea, Tarkhankut NP	5.05. 2022	Россия, Крым, с. Медведево Russia, Crimea, Medvedevo	Е. Ильяшенко E. Ilyashenko	Место гнездования, насиживала кладку Breeding site, female incubated a clutch
4	Желтое кольцо Yellow band **X3**	Кольца **К-К-Б** Bands **R-R-W**	самка female Ad	06.05 2021	Россия, Крым, Тарханкутский нац. парк Russia, Crimea, Tarkhankut NP	5.05. 2022	Россия, Крым, Тарханкутский нац. парк Russia, Crimea, Tarkhankut NP	Е. Ильяшенко E. Ilyashenko	Место гнездования, насиживала кладку Breeding site, female incubated a clutch
5	Желтое кольцо Yellow band **X4**	Кольца **Б-Б-К** Bands **W-W-R**	самец male Ad	06.05. 2021	Россия, Керченский п-ов, с. Багерово	16.08. 2021	Россия, Крым, оз. Джарылгач Russia, Crimea, Dzharylgach Lake	Т. И Д. Жеребцовы T. and D. Zerebtsov's	Место предмиграционного скопления Staging area

Таблица 3. Встречи красавок прикаспийской и волго-уральской группировок

Table 3. Records of Demoiselle Cranes of Caspian and Volga-Ural breeding groups

NN	Левая голень Left tibia	Правая голень Right tibia	Пол, возраст Gender, age	Дата мечения Date of tagging	Место мечения Place of tagging	Дата встречи Date of record	Место встречи Place of record	Наблюдатель Observer	Примечание Note
1	Белое кольцо White band **69**	Спирал. кольца **К-Ж-3** Spiral **R-Y-G**	Самец Male Juv	26.06. 2017	Республика Калмыкия, пос. Сарпа Republic of Kalmykia, Sarpa	6.09. 2020	Россия, Республика Калмыкия, Уралан Russia, Republic of Kalmykia, Uralan	Н. Дорофеева N. Dorofeeva	Место предмиграционного скопления Staging area
2	Белое кольцо White band **96**	Передатчик на белых кольцах Tag mounted to white bands	Самка Female Ad	12.05. 2019	Ростовская область, Тихий Лиман Rostov Region, Tikhy Liman	20.08. 2019	Россия, Ростовская область, Кормовое Russia, Rostov Region, Kormovoye	Е. Ильяшенко E. Ilyashenko	В группе из 70-80 особей на пруду у ж/т In a group of 70-80 cranes
3	Красное кольцо Red band **32**	Передатчик на белых кольцах Tag mounted to white bands	Самец Male Ad	16.05. 2019	Ростовская область, Тихий Лиман Rostov Region, Tikhy Liman	Май 2020 May 2020	Россия, Ростовская область, Кормовое Russia, Rostov Region, Kormovoye	Ю. Бабичев Yu. Babichev	Гнездовая территория Breeding site
						4.09. 2020	Republic of Калмыкия, Уралан Republic of Kalmykia, Uralan	Н. Дорофеева N. Dorofeeva	Место предмиг-рационного скопления Staging area
4	Белое кольцо White band **50**	Передатчик на белых кольцах Tag mounted to white bands	Самец Male Juv	25.06. 2019	Республика Калмыкия, Кормовое Republic of Kalmykia, Kormovoye	4.09. 2020	Republic of Калмыкия, Уралан Republic of Kalmykia, Uralan	Н. Дорофеева N. Dorofeeva	Место предмиг-рационного скопления Staging area
5	Желтое кольцо Yellow band	Передатчик на белых кольцах Tag mounted to white bands	Самец Male Juv	28.06. 2019	Западный Казахстан Western Kazakhstan	Осень 2019 Autumn 2019	Саудовская Аравия Saudi Arabia	Mohammad Tay	Убит во время миграции Killed during migration
6	Белое кольцо White band	Передатчик на белых кольцах Tag mounted to white bands	Самка Female Juv	25.06. 2019	Волгоградская область Volgograd Region	5.09. 2019	Саудовская Аравия Saudi Arabia	Mohammad Tay	Убит во время миграции Killed during migration
7	Белое кольцо White band **Z5**	–	Самец Male Juv	3.07. 2021	Республика Калмыкия, Чкалов Republic of Kalmykia. Chkalov	15.08 .2021	Россия, Ростовская обл., Курганный Russia, Rostov Region, Kurgany	Е. Ильяшенко E. Ilyashenko	Местро предмиг-рационного скопления Staging areas

Таблица 4. Встречи красавок из азиатской части ареала

Table 4. Records of Demoiselle Cranes of Asian part of the range

№	Передатчик или цвет и номер кольца на левой голени Transmitter or color bands on left tibia	Передатчик или цвет и номер кольца на правой голени Transmitter or color bands on right tibia	Пол, возраст Gender, age	Дата мечения Date of tagging	Место мечения Place of tagging	Дата встречи Date of sighting	Место встречи Place of sighting	Наблюдатель Observer	Примечание Note
Красавки, помеченные в Юго-Восточном Казахстане / Demoiselle Cranes tagged in Southeastern Kazakhstan									
1	Желтое кольцо + станд. кольцо **Yellow band** + metal ring **B144801**	–	самец male Ad	09.05. 2017	Юго-Восточный Казахстан, Алматинская обл., оз. Тузколь Southeastern Kazakhstan, Almaty Region, Lake Tuzkol	30.10. 2019	Индия, штат Раджастан, Лукарансар, Биканер India, Rajasthan Lukaransar, Bikaner	Daulal Bohra	Место зимовки Wintering grounds
						07.02. 2022	Индия, штат Раджастан, Фалоди, Джодхпур, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	Daulal Bohra	Место зимовки Wintering grounds
2	Передатчик на двух красных кольцах Transmitter on two red bands	Желтое кольцо Yellow band **B1** + metal band **AK136**	Juv	09.07. 2019	Алматинская обл., пос. Коктума Almaty Region, Koktuma	08.09. 2020	Пакистан, Раджапур Pakistan, Rajapur	Desi Mahool	Убит охотником на миграционном пути, найден передатчик Was killed by hunter on migration route, the transmitter was found
Красавки, помеченные в России/ Demoiselle Cranes tagged in Russia									
3	Красное кольцо Red band	Передатчик на двух красных кольцах Transmitter on two red bands	самка female Juv	03.07. 2018	Оренбургская обл., пос. Коскуль Orenburg Region, Koskul	23.12. 2019	Индия, Гуджарат, Нал Саровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Suresh Kumar, Ramesh Kumar Selvaraj	Место зимовки Wintering grounds
4	Красное кольцо Red band	–	самец male Juv	09.07. 2018	Республика Алтай, Курайская степь Republic of Altai, Kurai Steppe	03.01. 2023	Индия, Раджастан India, Rajasthan	Dau Lal Bohra	Место зимовки Wintering grounds

5	Белое кольцо White band **K6**	Белое кольцо White band	самка female Juv	10.07. 2018	Республика Алтай, Чуйская степь Republic of Altai, Chuya Steppe	20.02. 2019	Индия, Раджастан, Джодхпур, Фалоди, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	Dau Lal Bohra	Место зимовки Wintering grounds
6	Белое кольцо White band **U3**	–	самка female Juv	18.07. 2019	Республика Хакасия, Гальджа Republic of Khakasia, Galdzha	15.01. 2023	Индия, Гуджарат, Нал Саровар, Ахмедабад и Сурендранагар India, Gujarat, Nal Sarovar, Ahmedabad & Surendranagar	Dau Lal Bohra	Место зимовки Wintering grounds
7	Белое кольцо White band **U4**	–	самка female Juv	18.07. 2019	Республика Хакасия, Гальджа Republic of Khakasia, Galdzha	14.01. 2022	Индия, Гуджарат, Вадла India, Gujarat, Vadla,	Harindra Baraiya, Gani Sama	Место зимовки, в стае из около 5 тыс. ос. Wintering ground, in a flock of 5,000 cranes
						17.01. 2023	Индия, Раджастан India, Rajasthan	Dau Lal Bohra	Место зимовки Wintering grounds
8	Метал. кольцо Metal band B435202	Широкое синее кольцо **3G3** Wide blue band **3G3**	Juv	13.07. 2003	Забайкальский край, Торейские озера, мыс Мырген Transbaikalia, Torey Lakes, Myrgen Cape	07. 2016	Россия, Торейские озера, протока Уточи Russia, Torey Lakes, Utochi	Svetlana Balzhimaeva, Oleg Goroshko, Yury Bazhenov	В паре с птенцом. Партнер без колец. In pair with a chick. The partner without bands
9	Передатчик Backpack transmitter	Широкое белое кольцо снизу, узкое зелёное кольцо сверху Wide white band at the bottom and narrow green band at the top	Ad самка female	29.05. 2016	Забайкальский край, Торейские озера Transbaikalia, Torey Lakes	21.06. 2016	Россия, Забайкальский край, Агинская степь, оз. Хабцагайтуй Нур Большой Russia, Transbaikalia, Aginskaya steppe, Lake Khabtsagaitui Bolshoi	Svetlana Balzhimaeva	Летнее скопление негнездящихся птиц Summer gathering of non-breeding cranes
						19.07. 2016	Россия, Забайкальский край, Агинская степь, оз. Хабцагайтуй Нур Большой Russia, Transbaikalia, Aginskaya steppe, Lake Khabtsagaitui Bolshoi	Svetlana Balzhimaeva	Летнее скопление негнездящихся птиц Summer gathering of non-breeding cranes

9	Передатчик рюкзачкового типа Back-pack transmitter	Широкое белое кольцо снизу, узкое зелёное кольцо сверху Wide white band at the bottom and narrow green band at the top	Ad самка female	29.05. 2016	Забайкальский край, Торейские озера Transbaikalia, Torey Lakes	09.08. 2022	Россия, Забайкальский край, Агинская степь, оз. Хабцагайтуй Нур Малый Russia, Transbaikalia, Aginskaya steppe, Lake Khabtsagaitui Malyi	Svetlana Balzhimaeva	Гнездовая пара с птенцом. Партнер без колец. In a pair with a chick, the partner without bands
10	Узкое зеленое кольцо Narrow green band	Передатчик на широком белом кольце Transmitter attached to wide white band	Ad	17.05. 2016	Забайкальский край, оз. Зун-Торей Transbaikalia, Lake Zun-Torey	01.07. 2017	Россия, Забайкальский край, оз. Барун-Торей Russia, Transbaikalia, Lake Barun-Torey	Svetlana Balzhimaeva	В паре без птенцов, партнер без колец In a pair without chicks, the partner without bands
11	Передатчик рюкзачкового типа Back-pack transmitter	Широкое белое кольцо снизу, узкое синее кольцо сверху Wide white band at the bottom and narrow blue band at the top	Ad	29.05. 2016	Забайкальский край, Агинская степь, оз. Хабцагайтуй Нур Transbaikalia, Aginskaya steppe, Lake Khabtsagaitui	20.06. 2018	Россия, Забайкальский край, Агинская степь, оз. Хабцагайтуй Нур Большой Russia, Transbaikalia, Aginskaya steppe, Lake Khabtsagaitui Bolshoi	Svetlana Balzhimaeva	В паре без птенцов, партнер без колец, в группе журавлей In a pair without chick, partner without bands, in a crane gathering
						26.07. 2021		Svetlana Balzhimaeva	В скоплении негнездящихся птиц In a gathering of non-breeding birds
12	Передатчик Transmitter	Кольца **зеленое-черное** сверху вниз Bands **green-black** from up to down	Ad	18.05. 2016	Забайкальский край, Даурский зап-к, Торейские озера Transbaikalia, Daursky SNR, Torey Lakes N 49.93934; E 115.71472	29.01. 2019	Индия, Раджастан, Кичан India, Rajasthan, Kheechan	Roland Van der Vliet	Место зимовки Wintering grounds
						05.02. 2019		Dau Lal Bohra	
						15.05. 2021	Россия, Забайкальский край, Даурский зап-к, озеро Зун-Торей Russia, Transbaikalia, Daursky SNR, Lake Zun-Torey	И. Дмитриев I. Dmitriyev	Место гнездование, в паре с немеченой птицей Breeding grounds, in a pair with non-tagged crane
						21.11. 2022	Индия, Раджастан India, Rajasthan	Dau Lal Bohra	Место зимовки Wintering grounds

13	Передатчик на широком белом кольце – Transmitter attached to wide white band	Узкое красное кольцо Narrow red band	Juv	21.08. 2016	Забайкальский край, р. Борзя, Transbaikalia, Borzya River	29.06. 2019	Россия, Забайкальский край, оз. Якша Большая	Oleg Goroshko	В территориальной паре без птенцов, партнер без колец In a territorial pair, a partner without bands
14	Белое кольцо White band T7 (tibia) + metal band **B435185** (tarsus)	Передатчик на белых кольцах Transmitter on two white bands	самка female Juv	30.07. 2018	Забайкальский край, Агинская степь, с. Будулан Transbaikalia, Aginskaya Steppe	16.10. 2018	Индия, Уттар-Прадеш India, Utar-Pradesh, Shahjehanpur, about 350 km south east of Dehradun	Harindra Baraiya, Gani Sama	Подобран раненым под ЛЭП на пути к месту зимовки, умер в зоопарке Was found with wound due to collision with power lines
15	Белое кольцо White band A**5** (tibia) + metal band B550462 (tarsus)	Передатчик на белых пласт. кольцах Transmitter on two white bands	самка female Juv	02.08. 2019	Забайкальский край, 5 км на юго-восток от с. Новый Дурулгуй Transbaikalia, 5 km east Novy Durulgui	31.01. 2021	Индия, Раджастан, Джодхпур, Фалоди, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	Dau Lal Bohra	Место зимовки Wintering grounds
16	Белое кольцо White band (tibia)	–	Juv	30.07. 2020	Забайкальский край, окрестности Торейских озер Transbaikalia, Torey Lakes	24.06. 2021	Монголия, провинция Дорнод, оз. Чух Mongolia, Dornod province, Chukh Lake	Baasansuren Erdenechimeg	Места гнездования, в группе неразмно-жающихся птиц Breeding grounds, in a group of non-breeding cranes

Журавли-красавки, помеченные в Монголии / Demoiselle Cranes tagged in Mongolia

Центр сохранения и изучения диких животных Монголии / Wildlife Science and Conservation Center of Mongolia

–	Зелёное кольцо Green band **4Y5**	Juv	13.08. 2014	Хентий, Биндэр, оз. Увур Бурд Khentii, Binder, Uvur Burd Lake	09.01. 2023	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Gani Sama	Место зимовки Wintering grounds

18	–	Зелёное кольцо Green band **4Y9**	Juv	13.08. 2014	Хентий, Биндэр, оз. Увур Бурд Khentii, Binder, Uvur Burd Lake	25.01. 2015	Индия, Раджастан, Кичан India, Rajasthan, Kheechan	Asad Rahmani	Место зимовки Wintering grounds
						08.02. 2017	Индия, Раджастан, около Фапади India, Rajasthan, Falodi	Subhush Gogi	Место зимовки Wintering grounds
19	–	Зелёное кольцо Green band **4Y7**	Juv	16.07. 2015	Хентий, долина р. Хурх Khentii, Khurkh River Valley	27.01. 2018	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Dhyey Shah	
20	–	Зелёное кольцо Green band **Y77**	Juv	30.07. 2015	Хентий, долина р. Хурх Khentii, Khurkh River Valley	29.01. 2016	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Sandeep Damre	
21	–	Зелёное кольцо Green band **V77**	Juv	30.07. 2015	Хентий, долина р. Хурх Khentii, Khurkh River Valley	29.01. 2016	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Sandeep Damre	Место зимовки Wintering grounds
22	–	Зелёное кольцо Green band **Y78**	Ad	16.06. 2016	Хентий, Биндэр, южнее оз. Увур Бурд Khentii, Binder, Uvur Burd Lake	8.07. 2019	Монголия, Хентий, Биндэр, оз. Баян Бурд Mongolia, Khentii, Binder, Bayan Burd Lake	S.Tuvshintugs	Место гнездования. В паре с немеченой птицей, гнездились Breeding grounds
23	–	Зелёное кольцо Green band **Y79**	Ad	17.06. 2016	Хентий, долина р. Хурх Khentii, Khurkh River Valley	31.05. 2017	Хентий, долина р. Хурх Khentii, Khurkh River Valley	S.Tuvshintugs	Место гнездования. Breeding grounds
						23.12. 2018	Индия, западный Гуджарат, Дварка, Митапур India, Western Gujarat, Dwarka, near Mithapur	Dishant Parasharya, Rupal Vaidya	Место зимовки Wintering grounds

23	Зелёное кольцо Green band **Y79**	Ad	17.06. 2016	Хентий, долина р. Хурх Khentii, Khurkh River Valley	15.06. 2019	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	S.Tuvshintugs	Место гнездования. Breeding grounds
					09.06. 2020		S.Tuvshintugs	
					22.07. 2022		S.Tuvshintugs	
					23.02. 2023	Индия, Гуджарат, Дварка India, Gujarat, Dwarka		Место зимовки Wintering grounds
24	–	Зелёное кольцо Green band **Y94**	Ad	23.06. 2016	Хентий, долина р. Хурх Khentii, Khurkh River Valley	03.06. 2018	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley		Место гнездования. Breeding grounds
						08.03. 2022	Индия India		Место зимовки Wintering ground
						29.01. 2023	Индия, Гуджарат, Порбандер India, Gujarat, Probander		Место зимовки Wintering ground
25	–	Зелёное кольцо Green band **Y45**	Ad	23.06. 2016	Хентий, долина р. Хурх Khentii, Khurkh River Valley	30.05. 2017	Монголия, Хентий, долина р. Хурх, Mongolia, Khentii, Khurkh Valley	S.Tuvshintugs	Место гнездования. Breeding grounds
						03.06. 2018		S.Tuvshintugs	
						07.06. 2019		S.Tuvshintugs	
						06.06. 2020		S.Tuvshintugs	
26	–	Зелёное кольцо Green band **2Y4**	Ad	24.06. 2016	Хентий, долина р. Хурх Khentii, Khurkh River Valley	29.06. 2017	Монголия, р. Зуух Баян, долина р. Хурх Mongolia, Zuukh Bayan River, Khurkh River Valley	G. Batbayar	Место гнездования. Breeding grounds
27	–	Зелёное кольцо Green band **S04**	Juv	6.08. 2016	Хентий, долина р. Хурх Khentii, Khurkh River Valley	27.04. 2018	Китай, пров. Внутренняя Монголия, д. Хуаде China, Inner Mongolia, Huade village		На пролёте During migration
						22.01. 2022	Индия, Гуджарат, Нал Саровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Suresh Kumar	Места зимовки Wintering ground

28	–	Зелёное кольцо Green band **S05**	Juv	06.08. 2016	Хентий, долина р. Хурх Khentii, Khurkh River Valley	02.03. 2020	Индия, Раджастан, Джодхпур, Фалоди, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	Dau Lal Bohra	Места зимовки Wintering grounds
29	–	Зелёное кольцо Green band **S30**	Juv	07.08. 2016	Хентий, долина р. Барун Баян Khentii, Baruun Bayan River	19.03. 2023	Пакистан, Вазиристан, Вана Pakistan, Wana Lower Waziristan	Ehsanullah Wazir	Миграционный путь, пойман охотниками Migration route, was caught by hunters
30	–	Зелёное кольцо Green band **S76**	Juv	30.06. 2017	Хентий, долина р. Хурх Khentii, Khurkh River Valley	31.07. 2019	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	S.Tuvshintugs	Места гнездования Breeding grounds
31	–	Зелёное кольцо Green band **S88**	Juv	02.07. 2017	Хентий, долина р. Хурх Khentii, Khurkh River Valley	18.02. 2019	Индия India		Места зимовки Wintering grounds
32	–	Зелёное кольцо Green band **T03**	Juv	25.07. 2017	Хентий, долина р. Арангат Khentii, Arangat River Valley	14.01. 2021	Пакистан Pakistan	Dau Lal Bohra	Найден погибшим на пути миграции Died during migration
33	–	Зелёное кольцо Green band **T06**	Juv	25.07. 2017	Хентий, долина р. Хурх Khentii, Khurkh River Valley	05.06. 2019	Монголия, р. Шуус Mongolia, Shuus River	S.Tuvshintugs	Места гнездования Breeding grounds
						18.05. 2021	Монголия, р. Шуус Mongolia, Shuus River	Tseveenmyadag	Места гнездования, гнездился Breeding grounds (nested)
34	–	Зелёное кольцо Green band **S81**	Juv	29.06. 2017	Хентий, долина р. Хурх Khentii, Khurkh River Valley	26.07. 2019	Монголия, Хентий, р. Хурх к западу от Биндер Mongolia, Khentii, Khurkh River	S.Tuvshintugs	Места гнездования, в группе из 76 ос. Breeding grounds, In a group of 76 ind.
35	–	Зелёное кольцо Green band **S84**	Juv	23.07. 2017				S.Tuvshintugs	
36	–	Зелёное кольцо Green band **S82**	Juv	23.07. 2017				S.Tuvshintugs	

37	Зелёное кольцо Green band **H17**	Juv	05.08. 2018	Хентий, Баян-Адрага, долина Сайхан Khentii, Bayan-Adraga, Saikhan Valley	09.01. 2022	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Harindra Baraiya, Gani Sama	Место зимовки Wintering ground
38	– Зелёное кольцо Green band **H33**	Juv	01.08. 2018	Хентий, долина р. Хурх Khentii, Khurkh River Valley	26.07. 2019	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	S.Tuvshintugs	Места гнездования, в группе из 76 ос. Breeding grounds, In a group of 76 ind.
					21.07. 2022	Монголяи, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	Tseveenmyadag	Места гнездования, в группе из 81 ос., из них 8 с кольцами Breeding grounds, In a group of 76 ind., incl. 8 with bands
39	– Зелёное кольцо Green band **T16**		22.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	09.06. 2022	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	S.Tuvshintugs	
40	– Зелёное кольцо Green band **T21**		22.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	21.07. 2022	Монголия, Хентий, долина р. Хурх, зап-к Хуитен Mongolia, Khentii, Khurkh, Khuiten Nature Reserve	Tseveenmyadag	Места гнездования, в группе из 81 ос., из них 8 с кольцами Breeding grounds, In a group of 76 ind., incl. 8 with bands
41	– Зелёное кольцо Green band **T22**		22.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	25.07. 2022	Монголия, Хентий, р. Хурх к западу от моста Биндер Mongolia, Khurkh River	Tseveenmyadag	Места гнездования Breeding grounds
42	– Зелёное кольцо Green band **T23**		22.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	14.01. 2022	Индия, Гуджарат, Вадла India, Gujarat, Vadla,	Harindra Baraiya, Gani Sama	Место зимовки, в стае из около 5 тыс. красавок Wintering ground, in a flock of 5,000

43	–	Зелёное кольцо Green band **T40**		25.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	21.07. 2022	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh Valley	Tseveenmyadag	Места гнездования, в группе из 81 ос., из них 8 с кольцами Breeding grounds, In a group of 76 ind., incl. 8 with bands
44	–	Зелёное кольцо Green band **T42**		25.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	21.07. 2022	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh Valley	Tseveenmyadag	Места гнездования,в группе из 81 ос., из них 8 с кольцами Breeding grounds, In a group of 76 ind., incl. 8 with bands
45	–	Зелёное кольцо Green band **T44**		27.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	25.07. 2022	Монголия, Хэнтий, Батширээт Mongolia, Khentii, Batshireet	Tseveenmyadag	Места гнездования, в группе из 24 ос., из них 4 с кольцами Breeding grounds, In a group of 24 ind., incl. 4 with bands
46	–	Зелёное кольцо Green band **T13**	Juv	22.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	21.07. 2022	Монголия,Хентий, долина р. Хурх Mongolia, Khentii, Khurkh Valley	Tseveenmyadag	Места гнездования, в группе из 81 ос., из них 8 с кольцами Breeding grounds, In a group of 76 ind., incl. 8 with bands
47	–	Зелёное кольцо Green band **T14**	Juv	22.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	21.07. 2022	Монголия, Хентий, долина р. Хурх, Mongolia, Khentii, Province, Khurkh River Valley	Tseveenmyadag	Места гнездования, в группе из 81 ос., из них 8 с кольцами Breeding grounds, In a group of 76 ind., incl. 8 with bands

48	–	Зелёное кольцо Green band **T51**	Juv	27.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	31.01. 2020	Индия, Раджастан India, Rajasthan	Dau Lal Bohra	Найден на месте зимовки среди погибших от отравления журавлей It was found among poisoned cranes at wintering ground
49	–	Зелёное кольцо Green band **T53**	Juv	2019	Хентий Khentii	20.07. 2022	Монголия, Хэнтий, р. Дунд Баян, к юго-западу от с. Хурх Mongolia, Khentii, Dund Bayan	Tseveenmyadag	Места гнездования Breeding grounds
50	–	Зелёное кольцо Green band **H37**	Juv	24.07. 2019	Хентий, долина р. Хурх Khentii, Khurkh River Valley	21.07. 2022	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	Tseveenmyadag	Места гнездования, в группе из 81 ос., из них 8 с кольцами Breeding grounds, In a group of 76 ind., incl. 8 with bands
51	–	Зелёное кольцо Green band **H54**	Juv	25.07. 2020	Хентий, долина р. Хурх Khentii, Khurkh River Valley	23.12. 2020	Индия, Раджастан India, Rajasthan	Dau Lal Bohra	Место зимовки Wintering grounds
52	–	Зелёное кольцо Green band **H58**	Juv	25.07. 2020	Хентий, долина р. Хурх Khentii, Khurkh River Valley	11.06. 2022	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	Tseveenmyadag	Места гнездования,в группе из 15 ос. Breeding grounds, In a group of 15 ind.
53	–	Зелёное кольцо Green band **H64**	Juv	26.07. 2020	Хентий, долина р. Хурх Khentii, Khurkh River Valley	25.07. 2022	Монголия, Хентий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	Tseveenmyadag	Места гнездования, в группе из 24 ос., из них 4 с кольцами Breeding grounds, In a group of 24 ind., incl. 4 with bands

54	–	Зелёное кольцо Green band **H66**	Juv	26.07. 2020	Хентий, долина р. Хурх Khentii, Khurkh River Valley	25.07. 2022	Монголия, Хэнтий, долина р. Хурх Mongolia, Khentii, Khurkh River Valley	Tseveenmyadag	Места гнездования, в группе из 24 ос., из них 4 с кольцами Breeding grounds, In a group of 24 ind., incl. 4 with bands
55	–	Зелёное кольцо Green band **H67**	Juv	26.07. 2020	Хентий, долина р. Хурх Khentii, Khurkh River Valley	25.07. 2022	Монголия, Дорнод, долина р. Хурх Mongolia, Dornod Khurkh River Valley	Tseveenmyadag	Места гнездования, в группе из 24 ос., из них 4 с кольцами Breeding grounds, In a group of 24 ind., incl. 4 with bands
56	–	Зелёное кольцо Green band **H81**	Juv	28.07. 2020	Хентий, р. Арангат Khentii, Arangat River	16.01. 2021	Индия, Гуджарат India, Gujarat	Rumi	Места зимовки Wintering grounds
57	–	Зелёное кольцо Green band **T94**	Juv	25.07. 2021	Дорнод, долина р. Хурх Khentii, Khurkh River Valley	07.03. 2022	Индия, Раджастан, Джодхпур, Фалоди, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	Dau Lal Bohra	Место зимовки Wintering grounds
						08.02. 2022	Индия, Раджастан, Джодхпур, Фалоди, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	Sumit Dookia	Место зимовки Wintering grounds
58	–	Зелёное кольцо Green band **H96**	Juv	21.07. 2022	Хентий, долина р. Хурх Khentii, Khurkh River Valley	07.01. 2023	Индия, Гуджарат, Нал Саровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Gani Sama	Место зимовки Wintering grounds
59	–	Зелёное кольцо Green band **H87**	Juv	20.07. 2021	Хентий, долина р. Хурх Khentii, Khurkh River Valley	09.01. 2023	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Harindra Baraiya	Место зимовки Wintering grounds
						07.02. 2023		Daulal Bohra	Место зимовки Wintering grounds

60	Зелёное кольцо Green band **T59**	Juv	22.07. 2021	Хентий, долина р. Хурх Khentii, Khurkh River Valley	22.01. 2023	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Gani Sama	Место зимовки Wintering grounds
61	– IOAC	Juv	19.07. 2022	Хентий, долина р. Хурх Khentii, Khurkh River Valley	22.03. 2023	Пакистан, Банну Pakistan, Bannu	Ehsanullah Wazir	Миграционный путь, пойман охотниками Migration route, was caught by hunters
62	– Зелёное кольцо Green band **K58**	Juv	20.07. 2022	Хентий, долина р. Хурх Khentii, Khurkh River Valley	26.01. 2023	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Vyom Vyas	Место зимовки Wintering grounds
63	– Зелёное кольцо Green band **K70**	Juv	22.07. 2022	Хентий, долина р. Хурх Khentii, Khurkh River Valley	26.01. 2023	Индия, Гуджарат, Налсаровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Gani Sama	Место зимовки Wintering grounds
Монголо-Германская биологическая экспедиция / Mongolian-German Biological Expeditions								
64	Станд. метал. кольцо Standard metal band **AA11934**	Жёлтое кольцо Yellow band **1177**	Juv	14.07. 2017	Завхан, 10 км западнее Аймал- центр Улиастай Zavkhan, 10 km W of Aimalcenter Uliastay	21 and 23.12. 2021	Индия, Раджастан, Джодхпур, Фалоди, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	Daulal Bohra Madhumita Panigrahi	Места зимовки Wintering grounds
65	Станд. метал. кольцо Standard metal band **AA11939**	Жёлтое кольцо Yellow band **1799**	Juv	15.07. 2017	Завхан, 45 км севернее Улиастай Zavkhan, 45 km north of Uliastay	01.06. 2018	Монголия Mongolia	Nyambayar Barbayar	Места гнездования Breeding grounds
66	Д. метал. кольцо Standard metal band **CA01903**	Жёлтое кольцо Yellow band **1907**	Juv	20.07. 2017	Арханғай, 25 км восточнее Тариат Arkhangai, 25 km east of Tariat	18.02. 2022	Индия, Раджастан, India, Rajasthan,	Dau Lal Bohra	Место зимовки Wintering grounds

67	Станд. метал. кольцо Standard metal band **CA011910**	Жёлтое кольцо Yellow band **1916**	Juv	27.08. 2017	Арханга́й, Цэцэрлэг, место предмиграционного скопления Arkhangai, Tsetserleg, staging area	27.08. 2018	Западная Монголия Western Mongolia	Guo Yumin	Место скопления Staging area
						17.11. 2018	Индия, Гуджарат, Нал Саровар, Вадла India, Gujarat, Nal Sarovar, Vadla	Harindra Baraiya	Место зимовки Wintering ground
						07.12. 2022	Индия, Раджастан, Кичан India, Rajasthan, Kheechan	Dau Lal Bohra	Место зимовки Wintering ground
68	Станд. метал. кольцо Standard metal band **CA011909**	Жёлтое кольцо Yellow band **1917**	Juv	21.07. 2017	Арханга́й, 10 км восточнее Цэцэрлэг, Arkhangai, 10 km east of Tsetserleg	23.12. 2918	Индия, Гуджарат, Катч, India, Gujarat, Kutch	Harindra Baraiya	Место зимовки Wintering ground
69	Станд. метал. кольцо Standard metal band **CA004817**	Жёлтое кольцо Yellow band **1001**	Juv	04.07. 2017	Уверхангай, 5 км западнее Арвайхээр Uverkhangai, 5 km west Arvaycheer	18.12. 2018	Индия, Раджастан India, Rajasthan	Dau Lal Bohra	Место зимовки Wintering grounds
70	Станд. метал. кольцо Standard metal band **CA011935**	Жёлтое кольцо Yellow band **1795**	Juv	15.07. 2017	Завхан, 40 км севернее Улиастай Zavkhan, 40 km north of Uliastay	24.12. 2018	Индия, Гуджарат, Порбандар, д. Кутияна India, Gujarat, Porbandar, Kutiyana village	Mr. Vikrant Zala Dishant Parasharya	Место зимовки, найден погибшим Wintering grounds, was found died bird
71	Станд. метал. кольцо Standard metal band **CA012996**	Жёлтое кольцо Yellow band **1931**	Juv	09.07. 2019	Дорнод, 35 км юго-западнее Дашбалбар Dornod, 35 km southwest Dashbalbar	28.11. 2019	Индия, Гуджарат, около д. Кадол India, Gujarat, near Kadol Village	Harindra Baraiya	Место зимовки Wintering ground
72	Станд. метал. кольцо Standard metal band **CA012998**	Жёлтое кольцо Yellow band **1933**	Juv	10.07. 2019	Дорнод, 35 км юго-западнее Дашбалбар Dornod, 35 km southwest Dashbalbar	28.11. 2019	Индия, Гуджарат, около д. Кадол India, Gujarat, near Kadol Village	Harindra Baraiya	Место зимовки Wintering ground

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73	Зеленое кольцо Green band **125**	Juv	26.07. 2018	Хентий, сум Баян-Овоо, р. Керелен Khentii, Bayan-Ovoo soum, Kherlen River 47.77268, 112.25044	05.12. 2022	Индия, Раджастан India, Rajasthan	Dau Lal Bohra	Место зимовки Wintering grounds
74	–	Зеленое кольцо Green band **167**	Juv	02.08. 2019	Восточная Монголия, Eastern Mongolia N 49.08284; E 112.50300	29.01. 2020	Индия, Раджастан, Джодхпур, Фалоди, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	Dau Lal Bohra	Место зимовки Wintering grounds
75	**142**	Передатчик Transmitter	Juv	17.07. 2019	Дорнод, Чойбалсан, р. Керулен Dornod, Choibalsan, Kherulen River	06.03. 2022	Индия, плато Деккан, 600 км восточнее г. Мумбай India, the Deccan Plateau region, about 600 km east of Mumbai	Mr. Vivekanand Krishnamurthy	Водохранилище в полупустыне, в стае из около 1000 ос. Reservoir in semi-arid area, the crane was in a flock of 1,000 cranes

О.А. Горошко, Даурский заповедникб Россия / Oleg Goroshko, Daursky State Nature Reserve, Russia

76	–	Белое кольцо White band **T5** (tibia) + Metal band **B435183** (tarsus)	Juv	23.07. 2018	Дорнод, оз. Галутын Нур Dornod, Lake Galutyn Nur	20.02. 2020	Индия, Раджастан, Джодхпур, Фалоди, Кичан India, Rajasthan, Jodhpur, Phalodi, Kheechan	С. Волков S. Volkov	Место зимовки Wintering grounds
						06.06. 2020	Монголия, Дорнод, Гурванзагал, долина р. Ульдза Mongolia, Dornod, Gurvanzagal soum, Ulz River	Baasansuren Erdenechimeg	Места гнездования Breeding grounds

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माध्यमिक स्तर पर अध्ययनरत् किशोर विद्यार्थियों में आत्महत्या की प्रवृति व मानसिक असंतुलन का अध्ययन करना

*दलीप सिंह
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मुख्य शब्द– *संवेगात्मक परिपक्वता, दबाव, तनाव, कुण्ठा, किशोर विद्यार्थी आदि।*

सार-संक्षेप

मानसिक रूप से स्वस्थ या सुसमायोजित व्यक्ति अपने व्यवहार में संवेगात्मक परिपक्वता का प्रमाण देता है। इसका अभिप्राय यह है कि उसने भय परिपक्वता ईर्ष्यों जैसे संवेगों को नियंत्रण में रखने और इनको वांछनीय ढंग से व्यक्त करने की क्षमता होती है । मानसिक रूप से स्वस्थ व्यक्ति का एक निश्चित जीवन दर्शन होता है। किशोर बालक भविष्य की नींव है, अतः वह सुसमायोजित व मानसिक रूप से स्वस्थ रहकर ही देश का भावी समाज का निर्माता बनता है। अतः शिक्षक को चाहिए कि विद्यार्थियों के सामने केवल महँगी उच्च शिक्षा या व्यावसायिक शिक्षा से संबंधित जानकारी न दें। अपितु सरल, सुलभ तथा व्यवसाय के बारे में जानकारी दें, ताकि विद्यार्थी अपनी आकांक्षाओं का विकास उचित दिशा में करें विद्यार्थियों में व्यास शिक्षा के प्रति अनावश्यक दबाव , तनाव एवं कुण्ठा को शिक्षक एवं अभिभावक उचित मार्गदर्शन देकर कम कर सकते हैं, क्योंकि दबाव, तनाव एवं कुण्ठा विद्यार्थी के मानसिक स्वास्थ्य को प्रभावित करती है, जिससे विद्यार्थी अपेक्षा के अनुसार परीणाम नहीं दे पाते एवं अनुचित कदम उठाते है। अतः शिक्षकों एवं अभिभावकों को विद्यार्थियों में आत्मविश्वास जगाना चाहिए, उचित मार्गदर्शन देना चाहिए ताकि माध्यमिक स्तर पर अध्ययनरत् किशोर विद्यार्थी जीवन से संबंधित दृष्टिकोण के प्रति सकारात्मक सोच का विकास कर सके।

सम्प्रत्यात्मक पृष्ठभूमि

शिक्षा का कार्य जीवन भर चलता रहता है। व्यक्ति जन्म से लेकर मृत्यु तक कुछ न कुछ सीखता रहता है। शिक्षा एक ऐसी प्रक्रिया हैं जो मनुष्य की जन्मजात शक्तियों के स्वाभाविक और साम्राज्यपूर्ण उन्नति में योगदान देती है, उसकी वैयक्तिकता का पूर्ण विकास करती है, उसे अपने वातावरण से सामंजस्य स्थापित करने में सहायता देती है। उसे जीवन और नागरिकता के कर्तव्यों और दायित्व के लिए तैयार कर उसके व्यवहार, विचार और दृष्टिकोण में ऐसा परिवर्तन करती है जो समाज, देश और विश्व के लिए हितकर होता है। इस परिवर्तन का नाम विकास है। विकास करना मनुष्य जाति का ही लक्षण हैं। विकास की प्रक्रिया में बालक कुछ सोपानों या अवस्थाओं में से गुजरता है जिन्हें चार भागों में वर्गीकरण किया गया है। शैशवास्था, बाल्यावस्था, किशारावस्था, प्रौढावस्था किशोरावस्था का महत्वपूर्ण स्थान है। इस अवस्था को तूफान व संवेगो की अवस्था कहा जाता है। लक्ष्यविहीन शिक्षा का कोई मूल्य नहीं है। शिक्षा द्वारा किशोर बालक की मुल प्रवृत्तियों का शोधन तथा मार्गन्तीकरण इस प्रकार किया जाना चाहिए , जिससे न केवल यह स्वयं के लिए अपितु राष्ट्र के लिए भी हितकारी व कल्याणकारी है। कोचिंग का हब बन चुके राजस्थान का कोटा शहर अब आत्म हत्या का हम बनने जा रहा है। यहाँ गुणवत्तापूर्ण शिक्षा प्राप्ति के उद्देश्य से देशभर से आये छात्र में आत्महत्या की प्रवृति आम होती जा रही है। अभी हाल ही में दो और बच्चों के खुदकुशी कर लिए जाने की खबरें सामने आई ये छात्र जो देश के भावी कर्णधार हैं जिनसे देश को संवारने की उम्मीद है , वह छोटी सी असफलता बर्दाश्त नहीं कर पा रहे है। यह हमारी शिक्षा व्यवस्था और अभिभावकों के विश्वास की एक बड़ी नाकामी है। वर्तमान शिक्षा व्यवस्था छात्रों में असंतोष को जन्म दे रही है। गुणवत्तापूर्ण तथा रोजगार परक शिक्षा के अभाव में देश में शिक्षित बेरोजगारी का ग्राफ बढ़ता जा रहा है तो दूसरी तरफ प्रतिस्पर्धा हो रही शिक्षा से औसत दर्जे के छात्रों में हीनता की भावना बलवती हो रही है , जो उनके आत्महत्या का प्रमुख कारण है।

आज बच्चों पर सपने थोपे जा रहें है । उन्हें बताया जा रहा है कि नम्बर ही सब कुछ है । 90-95 तथा इससे अधिक फीसदी अंक वाले छात्रों का ही नामांकन देश के प्रमुख विश्वविद्यालयों में हो रहा है । शेष औसत दर्ज के छात्रों में निराशा घर कर रही है । माध्यमिक स्तर पर अध्ययनरत सभी छात्र छात्राएँ /किशारोवस्था के अन्तर्गत आते है । किशोर विद्यार्थी अन्तमुखी और बहिमुखी व्यक्तित्व वाले होते हैं । कतिपय किशार विद्यार्थियों में माता पिता ऐसे होते हैं कि वो - उन पर दबाव डालते हैं कि आपको उच्चतम अंक प्राप्त करने है, ऐसे में उन किशोर विद्यार्थियों के समक्ष समायोजन की समस्या उभरती है । अतः उनके मानसिक स्वास्थ्य पर तीव्र प्रभाव पड़ता है और किशोर भ्रमित अवस्था का शिकार हो जाता है । किशोर विद्यार्थियों के मानसिक स्वास्थ्य के असंतुलित होने के कारण किशोर विद्यार्थियों के समक्ष समायोजन की समस्या आ जाती है । ऐसी परिस्थिति में किशोर एकांतप्रियाशील अल्पभाषी , संदेही और शंकालु प्रकृति के हो जाते है। जो युवाओं में आत्महत्या का प्रमुख कारण बनता है । विद्यार्थी जीवन से सम्बन्धित अनेक ऐसी परिस्थितियों तथा कारण होते है, जो विद्यार्थी में असन्तोष पैदा कर देते है । विद्यार्थी के मानसिक एवं संवेगात्मक

है, जिन्हें वह पूरी नहीं कर पाता तथा दुःखी होकर रह जाता है । उसे अच्छी शिक्षण संस्था में प्रवेश नहीं मिल पाता है। अच्छे अंकों से परीक्षा पास करने के बाद भी विद्यार्थी को मनचाहा विषय महाविद्यालय तथा तकनीकी शिक्षण संस्थाओं में प्रवेश नहीं मिल पाता है । इन सब परिस्थितियों का विद्यार्थी पर प्रतिकूल प्रभाव पड़ता है और वह असन्तुष्ट होने के कारण अपनी मानसिक और शारीरिक समस्याओं का विघटनकारी प्रवृतियों में उपयोग करने लगता है किशोर विद्यार्थियों में यही व्याकुलता अशान्ति असन्तोष , आत्महत्या का प्रमुख कारण बनता है । माध्यमिक स्तर पर अध्ययनरत् किशारे विद्यार्थियों में व्यवहार सम्बंधी अनेक समस्याएँ तथा व्यवहार प्रवृतियाँ पाई जाती हैं । इन समस्याओं का समाधान करने में परिवार ही वह स्थान जहाँ सबसे पहले बालक का समाजीकरण होता है । किशोरावस्था में जो मानसिक , शारीरिक , सामाजिक तथा संवेगात्मक परिवर्तन होते हैं .

ये व्यक्तित्व विकास की दृष्टि से अत्यंत महत्वपूर्ण होते हैं । यह जीवन का सबसे कठिन काल हैं । IQUIT माध्यमिक शिक्षा को विद्यार्थी जीवन निर्माण की संज्ञा दी गई है । प्राय माध्यम :िक स्तर पर विद्यार्थियों में अध्ययन आदते विकसित हो जाती है । उत्तम अध्ययन आदतों के परिणामस्वरूप विद्यार्थी में भविष्य की सफलता एवं असफलता का निर्धारण होता है । यदि विद्यार्थियों की अध्ययन आदतों से सम्बन्धित नींव कमजोर होगी तो उनको शैक्षिक जीवन में प्राप्त होने वाली सफलता सम्बन्धी भवन भी कमजोर होगा । किशोर विद्यार्थियों में सफलता एवं असफलता के बीच नव किशोर विकास एवं लक्ष्यों की प्राप्ति के लिए निरन्तर प्रयास चलता रहता है । इन प्रयासों की सफलता एवं असफलता पर विद्यार्थियों की उपलब्धि अभिप्रेरणा का गहन प्रभाव पड़ता है । इस समय स्कूल जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों में आत्महत्या की प्रवृत्ति बहुत ज्यादा बढ़ रही है ।

अध्यन के उदेश्य

1. माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों में बढ़ती आत्महत्या प्रवृति के कारणों का अध्ययन करना माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के मानसिक असंतुलन को प्रभावित करने वाले तत्वों का अध्ययन करना ।
2. माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के परिवारिक वातावरण का अध्ययन करना माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के शैक्षिक वातावरण का अध्ययन करना । माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के सम्पूर्ण समायोजन का अध्ययन करना ।
3. माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों में बढ़ती आत्महत्या की प्रवृति के मध्यमानों में सार्थक अंतर नहीं है माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के मानसिक असंतुलन के माध्यमानों में सार्थक अंतर नहीं है । माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के पारिवारिक वातावरण के माध्यमानों में सार्थक अंतर नहीं है । माध्यमिक स्तर

विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के शैक्षिक वातावरण के माध्यमानों में सार्थक अंतर नहीं है ।

शोध विधि

प्रस्तुत शोध में सर्वेक्षण विधि का प्रयोग किया गया है । प्रस्तुत शोध में जयपुर जिले के माध्यमिक स्तर के विद्यालय एवं शिवान संस्थाओं के 100 किशोर विद्यार्थियों का चयन किया गया । प्रस्तुत शोध में स्वनिर्मित प्रश्नावली का प्रयोग किया गया है । परिकल्पनाओं के आधार पर शोध निष्कर्ष - परिकल्पना :1 माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों में बढ़ती आत्महत्या की प्रवृत्ति के मध्यमानों में सार्थक अन्तर नहीं है माध्यमिक . स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों में बढ़ती आत्महत्या प्रवृत्ति के कारणों का अध्ययन किया गया है जिसमें विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के मध्यमानों में सार्थक अन्तर नहीं पाया गया । अर्थात् हो सकता है 13 से 19 वर्ष के माध्यमिक स्तर के विद्यालय जाने वाले विद्यार्थी तथा कोचिंग जाने वाले विद्यार्थी समान शैक्षिक , पारिवारिक व मानसिक स्वास्थ्य संबंधी समस्याएँ रखते हैं । अतः इसका कारण यह हो सकता है कि किशोर विद्यार्थी मानसिक अवसाद के शिकार हो या उनके परिवार की आर्थिक स्थिति नहीं हो या फिर वह सोशल मीडिया का अत्याधिक उपयोग करते हो । परिकल्पना -2 माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के मानसिक असंतुलन के मध्यमानों में सार्थक अन्तर नहीं है । माध्यमिक स्तर पर विद्यालय जाने वाले कोचिंग जाने वाले किशोर , विद्यार्थियों के मानसिक असंतुलन का अध्ययन किया गया है जिसमें विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के माध्यमानों में सार्थक अन्तर पाया गया । अर्थात् विद्यालय जाने वाले किशोर विद्यार्थियों की अपेक्षा कोचिंग जाने वाले किशोर विद्यार्थियों में मानसिक असंतुलन ज्यादा पाया गया है । अतः इसका कारण हो सकता है कि विद्यार्थियों के परिवार की आर्थिक दशा सही नहीं हो , पड़ोस का वातावरण अच्छा न हो या फिर उनका निवास स्थान ऐसी जगह पर हो जहाँ ध्वनि प्रदुषण ज्यादा हो जिससे विद्यार्थी पढ़ाई पर ध्यान केन्द्रित न कर पाते हो । परिकल्पना -3 माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के पारिवारिक वातावरण के मध्यमानों में सार्थक अन्तर नहीं है माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के पारिवारिक वातावरण का अध्ययन किया गया है जिसमें विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के मध्यमानों में सार्थक अन्तर नहीं पाया गया । अतः हो सकता है विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों में पारिवारिक वातावरण से संबंधित समस्याएँ जैसे परिवार की आर्थिक स्थिति , माता पिता का व्यवहार परिवार के अन्य सदस्यों के साथ व्यवहार तथा समायोजन से संबंधित समस्याएँ दोनों घरों में - समान रूप से पायी जाती है । माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के शैक्षिक वातावरण के मध्यमानों में सार्थक अन्तर नहीं है माध्यमिक स्तर पर विद्यालय जाने वाले व कोचिंग जाने वाले . किशोर विद्यार्थियों के शैक्षिक वातावरण का अध्ययन किया गया है जिसमें विद्यालय जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों के मध्यमानों में सार्थक अन्तर पाया गया । विद्यालय [illegible]

कि कोचिंग जाने वाले विद्यार्थियों में पढ़ाई का दबाव ज्यादा हो या अच्छे नम्बर न आने के कारण उनमें मानसिक तनाव की स्थिति उत्पन्न हो जाती है ।

सम्बंधित कार्य का पूर्व अध्ययन

1. दोना एशबराइड रेबका पेज)2000) * इस शो में एकल संयुक्त परिवार के किशोर विद्यार्थियों के आत्म सम्मान का किया गयाइन्होंने निष्कर्ष में पाया कि एकल परिवार के घरों के बच्चे संयुक्त परिवार के बच्चों की तुलना में कम खुश थे और उन किशोरी के आत्मसमान में कमी पाई गयी जिनके सम्बन्ध माता पिता से कमजोर थे । -

2. मंदरा जैनी , मेरी केरोल्यन बी).2000) इस शोध में अफ्रीकी अमेरिकी किशोर विद्यार्थियों के आत्मसमान पर माता - पिता - पिता की वैवाहिक स्थिति और उनके आय के प्रभाव का अध्ययन किया गया में पाया गया कि अविवाहित माता पिता के किशोरों में आत्मसमान अधिक - की तुलना में विवाहित माता

3. पटेल एम)2000) " अध्ययन का मुख्य उद्देश्य 13 से 16 आयु वर्ग के किशोर के पारिवारिक वातावरण व उनके आर्थिक स्तर का अध्ययन करना था निष्कर्ष के रूप में पाया गया कि परिवार की आर्थिक स्थिति किशोर विद्यार्थियों के मानसिक स्वास्थ्य को प्रभावित करती है ।

4 . सरकार, ए) .2001) इस अध्ययन का मुख्य उद्देश्य माध्यमिक स्तर के किशोर छात्र छात्राओं के पारिवारिक / वातावरण व उनके व्यवहार का अध्ययन करना था अध्ययन में पाया रूप से स्वस्थ बच्चों की तुलना में

5. मजीद ए)Goon) इस अध्ययन का मुख्य उदेश्य माध्यमिक स्तर के किशोर विद्या के असन्तुलन के विभिन्न आयामों का अध्ययन करना था । इन्होंने निष्कर्ष में पाया कि प्रथम कारक आत्मस्वीकृति पर था जो एक से एक खुद के प्रति स्वीकार रवैया परिलक्षित योगदान के लिए दिया गया था द्वितीय कारक संयुक्त समूह , तृतीय कारक छात्र छात्राओं के / अस्तित्व स्वायतता चतुर्थ कारक उदारता व अन्तिम व पाँचवा कारक के रूप में मानसिक स्वास्थ्य उभर कर सामने आया ।

6. मुजवानी ई).2004छात्रा के विद्यालय वातावरण पारिवारिक / इस शोध का मुख्य उद्देश्य कोचिंग करने वाले छात्र " (वातावरण का अध्ययन करना था । इन्होंने में पाया कि माध्यमिक स्तर पर कोचिंग जाने वाले किशोर विद्यार्थियों के मानसिक स्वास्थ्य पर परिवार की आर्थिक स्थिति माता पिता का सम्बन्ध व विद्यालय वातावरण का प्रमुख प्रभाव - छात्राओं में मानसिक तनाव ज्यादा पाया गया । / समस्याओं के कारण छात्र (पड़ता है । शैक्षिक

7. द सी 2004) .सी.डी.) " के अनुसार आत्महत्या करने के प्रमुख तरीकों में 10-प्रतिशत युवा 49 वर्ष के बच्चों में 19 बन्दुक से आत्महत्या करने वाले, इसका तरीका जिसमें प्रतिशत किशोर शामिल है घुटन या लटककर आत्महत्या 38 करने वाले तथा अन्तिम व तीसरा तरीका जो युवा वर्ग अपनाते हैं, जिसमें प्रतिशत युवा वर्ग शामिल है जो जहर 7 खाकर अपना जीवन समाप्त करते हैं ।

अरोड़ा समृद्धि मार्या .8, एनड्राबी और शर्मा नीरू)2004 ने किशोरावस्था में होने वाली दुर्बलताओं से जुड़ी सामाजिक (मनोविज्ञान की रूपरेखा का अध्ययन किया इन्होंने वाक्य पूर्ति जाँच मूल्य प्राप्ति एवं संपत्ति सूची क्रोध का उपयोग किया परिणामों ने यह प्रकट किया कि दुर्बल किशोर अपने परिवार , अध्यापक और अपने समान व्यक्तियों के साथ स्वस्थ संबंध रखते हैं , लेकिन दूसरे लिंग के सदस्यों के साथ मित्रता देखने को नहीं मिलती है । इनमें से अधिकतम लोक उच्च मूल्य प्राप्ति रखते हैं और अधिक विद्यालय संपादन दिखाते हैं जाँच की व्याख्या यह प्रकट करती है , यद्यपि न दुर्बल किशोरी के पास उच्च मूल्य प्राप्ति है , परन्तु उनमें लक्ष्य की कमी और इसका कारण उनके अन्दर संसार के विषय में कम जानकारी तथा जिंदगी जीने के कम मौके है ।

9. केली , टी कोमेरिअस जे एण्ड क्लार्क डी) .2004 इस शोध में किशोरावस्था में मादक पदार्थों के सेवन से " (विकृत मानसिक असंतुलन व व्यवहार परिवर्तन के कारण आत्महत्या प्रवृत्ति पर अध्ययन किया गया जिसमें पाया गया कि जो युवा शराब का सेवन करतेहैं , उनमें मानसिक असंतुलन व आत्महत्या की प्रवृति , शराब का सेवन नहीं करने वाले युवाओं की तुलना में अधिक पाई जाती है "

10. केविन , मरजरीबेक)2005) शोध का मुख्य उद्देश्य किशोरी में पाये जाने वाले मानसिक असन्तुलनमहत्या प्रवृति को प्रभावित करने वाले कारकों का अध्ययन करना था इन्होंने निष्कर्ष में पाया कि विद्यार्थियों की शैक्षिक समस्याएँ उनमें आत्महत्या का प्रमुख कारण बनता है ।

11. कश्यप और चीना)2005) इस शोध में किशोर विद्यार्थियों की समस्याओं का मनोवैज्ञानिक निर्धारकों के आधार पर] अध्ययन किया गया । इन्होंने निष्कर्ष में पाया कि किशोर विद्यार्थियों में चिन्ता हताशा , शैक्षिक , भावनात्मक , अपरिपक्वता आदि के कारण अत्यधिक समस्याएँ पायी जाती है ।

12. सईद नाबीला और के) भारती कुमारी .2005) समायोजन एवं अधिगम शैली का तुलनात्मक अध्ययन किया गया । शोध क निष्कर्ष में पाया कि लड़के एवं लड़कियों दोनों का ही संवेगात्मक , सामाजिक , शैक्षिक एवं सम्पूर्ण समायोजन अच्छा पाया गया और समायोजन प्राप्तांकों एवं अधिगम शैली में सहसम्बन्ध पाया गया ।

13. इवेनथीया वतरीका काउ)2006) इस शोध में किशोरों की उच्च शिक्षा में माता पिता के योगदान का अध्ययन का - पिता अपने बच्चों की पढ़ाई में सहयोग करते हैं उनमे मानसिक - किया गया । इन्होंने निष्कर्ष में पाया कि जो माता तनाव कम पाया जाता है ।

14. मीणा , विनित)2006) ने अपने शोध कार्य में किशोरों की संवेगात्मक परिपक्ता का अध्ययन व परिपक्वता का उनके व्यक्तित्व पर पड़ने वाले प्रभाव का अध्ययन अपने शोध कार्य में किया अध्ययन में पाया गया कि किशोरों में सावैगिक स्थिरता समान नहीं होती ।

15. एम) आर राजू और ख्वाजा सहमुतुला.वी.2007) * इस शोध में विद्यालयी विद्यार्थियों में समायोजन समस्याओं का अध्ययन करना किया गया । शोध में 461 विद्यार्थियों को शामिल किया गया निष्कर्ष में पाया गया कि कक्षा का वातावरण शिक्षण विधियों एवं पिता की शिक्षा एवं व्यवसाय का विद्यार्थियों के समायोजन पर प्रभाव पाया गया ।

16. सी विद्या ., वी) .2007) " इस शोध में नवोदय , केन्द्रिय एवं राजकीय स्कूलों के विद्यार्थियों का मानसिक स्वास्थ्य एवं समायोजन समस्याओं का अध्ययन किया गया न्होने निष्कर्ष में पाया कि किशोर विद्यार्थी के व्यक्तिगत पारिवारिक तथा शैक्षिक कारक उनके समयोजन से सम्बन्धित समस्याओं को प्रभावित करते हैं ।

17. केडिसक केली ए मई) .2007) एडसेन्ट सुसाइड एलिटरेचर रिव्यू ने एममास्टर ऑफ साइंस एजुकेशन) .डी.ई.एस. स्कूल साइकोलॉजी में किशोर अवस्था में आत्महत्या पर अध्ययन कार्य किया शोध अध्ययन में (डिग्री किशोर अवस्था में आत्महत्या को प्रेरित करने वाले कारकों तथा किशोर के व्यवहार पर अध्ययन किया गया है । शोध में पाया गया कि किशोर अवस्था में आत्महत्या व उनके व्यवहार में परिवर्तन के अनेक कारण है , जिनमें पारिवारिक पृष्ठभूमि व्यक्तिगत समस्याएँ मनोवैज्ञानिक कारन तथा सामाजिक समस्याएँ प्रमुख रूप से उत्तरदायी है ।

18. कौर आर) .2007) " इस शोध में पारिवारिक वातावरण के संबंध में किशोरों की मानसिक स्वास्थ्य पर प्रभाव का अध्ययन किया गया । अध्ययन में पाया गया कि उच्च औसत और निम्न स्तर के पारिवारिक माहौल पर सरकारी और निजी स्कूल के छात्रों के मानसिक स्वास्थ्य प्रेरणा के बीच कोई महत्वपूर्ण अन्तर नहीं है ।

19. जिडेना , रूजेलोवा)2007) * इस शोध में 15 वर्ष तक की किशोर बालिकाओं की समायोजन संबंधी समस्याओं का अध्ययन एवं उनकी समायोजन समस्याओं का तुलनात्मक किया गया । इन्होंने निष्कर्ष में पाया कि असामाजिक व्यवहार माता बालिकाओं में समान पाया गया भावात्मक - पिता के साथ व्यवहार तथा समूह के साथ व्यवहार बालक - समस्याएं ओर चिन्ताएं बालक एवं बालिकाओं में समान रूप से प्रभाव डालती है ।

20. शर्मा सुनील कुमार)2007-08)th - अपने शोध कार्य में किशोरों की संवेगात्मक परिपक्वता का अध्ययन किया अध्ययन में पाया गया कि किशोर बालक और बालिकाओं के समायोजन में विभिन्नता पाई जाती है तथा किशोर बालिकाओं का शैक्षिक उपलब्धि स्तर किशोर बालकों से अधिक पाया जाता है ।

21. अकबर हुसैन , आशुतोष कुमार एवं आबिद हुसैन)2008) " ने माध्यमिक स्तर के किशोर विद्यार्थियों में समायोजन एवं शैक्षिक दबाव शीर्षक पर शोध कार्य किया निष्कर्ष में पाया गया कि पक्षियों के विद्याक्षिक दबाव अधिक पाया गया और सरकारी विद्यालयों के विद्यार्थियों में समायोजन का स्तर उच्चपास गया । -

22. स्टेफिन मेलिंक)2000) " इम्यूविंग मेन्टल हेल्दी हेल्थ लाइफस्टाइल चॉइस एण्ड फिजिकल हैल्थ ऑफ हिसपेनि एडोसेन्ट ए रेसोमाइज कंट्रोलिंग पाइलेट ने युवाओं के जीवन के विभिन्न पहलूओं का मानसिक स्वास्थ्य को प्रभावित

करने वाले सामाजिक वातावरण का अध्ययन किया अध्ययन में पाया कि विद्यालय आधारित प्रणाली नीति से विद्यार्थियों अर्थात युवाओं के मानसिक स्वास्थ्य में सुधार हो सकता है ।

23. साहरन , एम के तथा सेठी ., प्रियंका)2010) * शोध अययन के मुख्य उद्देश्य उच्च माध्यमिक छात्र छात्राओं के - मानसिक स्वास्थ्य पर घरेलूवातावरण के प्रभाव का अध्ययन करना था । इसके कि कथा -12 के ग्रामीण शहरी विद्यार्थियों का मानसिक स्वास्थ्य उच्च स्तर का पाया गया ।

24. मार्मा , धीरज कुमार)2010) - इनके अध्ययन का उद्देश्य किशोरों के परिवारों के सामाजिक , आर्थिक स्तर का उनकी शैक्षिक उपलब्धि समायोजन व दुश्चिंता के मध्य सबंध का अध्ययन करना था । इन्होंने इस अध्ययन के निष्कर्ष में पाया कि उच्च एवं मध्यम सामाजिक आर्थिक स्तर वाले किशोरी की शैक्षिक उपलब्धि एवं दुरिचिंता में कोई सार्थक अंतर नहीं है , किन्तु निम्न सामाजिक आर्थिक स्तर के किशोरों की शैक्षिक उपलब्धि एवं दुश्चिता में सार्थक सह संबंध है । -

25. मानसिंह)2011) " इस शोध में शिक्षित एवं अशिक्षित अभिभावकों के माध्यमिक स्तर पर अध्ययनरत विद्यार्थियों की शैक्षिक निष्पति एवं मानसिक स्वास्थ्य का अध्ययन किया गया । इन्होंने अपने अध्ययन में पाया कि जिन विद्यार्थियों के अभिभावक शिक्षित थे उन्होंने अपने बच्चों के सम्पूर्ण समयोजन व् सुरक्षा असुरक्षा जैसे आयामों पर - अधिक बल दिया तथा जो अभिभावक शिक्षित नहीं थे उन्होंने अपने बच्चों के आत्मसम्प्रत्यय अर्थात् बच्चों द्वारा स्वयं निर्णय लेने पर अधिक बल दिया गया । अतः निश्चित रूप से कहा जा सकता है कि शिक्षित अभिभावक की तुलना में अशिक्षित अभिभावक के बच्चों का मानसिक स्वास्थ्य अच्छा पाया गया ।

शोध का सारांश, निष्कर्ष एवं सुझाव

किसी भी राष्ट्र का भविष्य उसके किशोर पर निर्भर करता है । किशोर बालक के सर्वागीण विकास का कार्य शिक्षा द्वारा ही संभव है । एक सौद्देश्य नैतिक प्रक्रिया है , जो किसी निश्चित दिशा की और मुख होती है । लक्ष्यविहीन शिक्षा का कोई मुल्य नहीं है । शिक्षा द्वारा किशोर बालक की मुल मृतियों का शोधन तथा मार्गन्तीकरण इस प्रकार किया जाना चाहिए , जिससे न वल वह स्वयं के लिए अपितु राष्ट्र के लिए भी हितकारी व कल्याणकारी है । कोचिंग का हब बन चुके राजस्थान का कोटा शहर अब आत्म हत्या का हब बनने जा रहा है । यहाँ गुणवत्तापूर्ण शिक्षा प्राप्ति के उद्देश्य से देशभर से आये छात्रों आत्महत्या की प्रवृति आम होती जा रही है । अभी हाल ही में दो और बच्चों के बुदकुशी कर लिए जाने की खबरे सामने आई ये छात्र जो देश के भावी कर्णधार हैं जिनसे देश को संवारने की उम्मीद है , वह छोटी सी असफलता बर्दाश्त नहीं कर रहे है । यह हमारी शिक्षा व्यवस्था और अभिभावकों के विश्वास की एक बही नकामी है । वर्तमान शिक्षा व्यवस्था छात्रों में असंतोष को जन्म दे रही है ।

गुणवत्तापूर्ण के अभाव में देश में शिक्षक बद ता है तो दूसरी तरफ प्रतिस्पर्धा हो रही शिक्षा से औसत दर्ज के छात्रों में हीनता जी भावना बलवती हो रही है , जो उनके आत्महत्या का प्रमुख कारण है । आज बच्चों पर सपने थोपे जा रहे है। उन्हें बताया जा रहा है कि नम्बर ही सब कुछ है 90-95 तथा इससे अधिक नम्बरों अंक वाले

के प्रमुख विश्वविद्यालयों में हो रहा है । शेष औसत दर्जे के छात्रों में निराशा घर कर रही है । साथ ही हमारे किशोर विद्यार्थियों को समझना चाहिए कि सफलता एक ही झटके में नहीं मिलती । इसके लिए कड़ी मेहनत करनी पड़ती है । एक महत्वपूर्ण बात यह भी है कि सफलता एक साथ ही नहीं बल्कि धीरे एक - धीरे आती है ऊपर चढ़ने के लिए एक - छोटे लक्ष्य तय करके आ - सीढ़ी चढ़नी होती है । जरूरी है छोटेगे बढ़ा जाए एक लक्ष्य पूरा होतो अगले लक्ष्य की और कदम बढ़ाया जाना चाहिए , क्योंकि जब शुरूआत में ही बहुत बड़े सपने देखने लगते है तो अक्सर निराशा ही हाथ लगती है। ऐसा नहीं है कि देश में अवसरों की कमी है । युवाओं के पास भरपूर अवसर है । इन अवसरों का लाभ उठाने की कोशिश करनी चाहिए । युवा है तो जोखिम लेने के बारे में भी सोचेंगे । सोचना भी चाहिए क्योंकि इसके बिना बड़ी सफलता हाथ नहीं मिलती लेकिन जरूरी है कि जो जोखिम लेने जा रहे है उसका पूर्व आँकलन कर लिया जाये पूर्व ऑकलन यानी अपनी क्षमता को समझाना जरूरी है अपना घर फूंक देना समझदारी नहीं है । दुनिया जहाँ भाग रही है उस तरफ भामने से सफलता नहीं मिलेगी बल्कि कुछ नया करना ही होगा । रेस जीतनी है तो आविष्कार ही करना होगा । जब रोशनी की एक महीन लकीर अंधेरे को चीर सकती है जब एक तिनका दूबते का सहारा हो सकता है और एक आशा भरी मुस्कान निराशा के दलदल से बाहर ला सकती है तो फिर भला मौत को वक्त से पहले क्यों बुलाया जाए? जिन्दगी परीक्षा लेती है तो उसे लेने दीजिए होसलों से आप हर बाजी जीतने का दम रखते है यह विश्वास हर मन में होना चाहिए । मानव जीवन के लिए विकास की प्रक्रिया में किशोर अवस्था का महत्वपूर्ण स्थान है । बाल्यावस्था समाप्त होती है और शुरू होती है किशोर अवस्था यह अवस्था युवावस्था अथवा परिपक्वावस्था तक रहती है । यह - सतत प्रक्रिया है । इसे बाल्यावस्था तथा प्रौढ़ावस्था के मध्य का सन्धिकाल कहा जाता है । इस अवस्था की विडम्बना होतीहै कि बालक स्वयं को बढ़ा समझता है और बड़े उसे छोटा समझते है । किशोर विद्यार्थी अन्तमुखी ओर वाहमुखी व्यक्तित्व वाले होते है य किशोरों में माता पिता ऐसे होते है कि दो उन पर दबाव डालो है कि आपको उच्चतम अंक - ऐसे में उन किशोरों के समक्ष समायोज . प्राप्त करने हैंन की समस्या उमरती है । अतः उनके मानसिक स्वास्थ्य पर तीव्र प्रभाव पड़ता है और किशोर अमित अवस्था का शिकार हो जाता है ।

किशोर विद्यार्थियों के मानसिक स्वास्थ्य के असंतुलित होने के कारण किशोरों के समक्ष समायोजन की समस्या आ जाती है । ऐसी परिस्थिति में किशोर एकांतप्रिय लज्जाशील अल्पभाषी , संदेही और शंकर प्रकृति के हो जाते हैं । जो किशोर विद्यार्थियों में आत्महत्या का प्रमुख कारण बनता है । विद्यार्थी जीवन से सम्बन्धित अनेक ऐसी परिस्थितियों तथा कारण होते हैं जो विद्यार्थी में असन्तोष पैदा कर देते है । विद्यार्थी के सामने कदम कदम पर अनेक समस्याएँ आती है -, जिन्हें यह पूरी नहीं कर पाता तथा दुःखी होकर रह जाता है । उसे अच्छी शिक्षण संस्था में प्रवेश नहीं मिल पाता है । अच्छे अंको से परीक्षा पास करने के बाद भी विद्यार्थी को मनचाहा विषय विद्यालय तथा तकनीकी शिक्षण संस्थाओं में प्रवेश नहीं मिल पाता है । इन सबका पर प्रतिकूल प्रभाव पड़ता है और वह असन्तुष्ट होने के कारण अपनी मानसिक और शारीरिक समस्याओं का विघटनकारी प्रवृतियों में उपयोग करने लगता है कि यह व्याकुलता अशान्ति अका प्रमुख कारण बनता है । किशोरों में व्यवहार सम्बंधी अनेक समस्या तथा वाहार प्रकट होती है ।

करने में परिवार हो वह स्थान जहाँ सबसे पहले बालक का समाजीकरण होता है । किशोरावस्था मे सामाजिक तथा संवेगात्मक परिवर्तन होते हैं वे अत्यंत महत्त्वपूर्ण होते हैं । यह जीवन का सबसे कठिन काल है । सैद्धान्तिक दृष्टि से किशोरावस्थ जीवन के प्रथम पुनरावृति मानी जाती है । एक किशोर न तो बालक होता है और प्रौड हाई स्कूल के अंतिम वर्षों में अथवा कॉलेज जीवन के प्रथम , द्वितीय और तृतीय वर्षों में बालक प्राय किशोरावस्था में ही होता है । :

उस समय उसकी बुद्धि कार्य अभिवृति सम्प्राप्ति एक दूसरे से भिन्न होती है । किशोरावस्था में विभिन्न गुण परिपका - नयी विशिष्ट समस्या उत्पन्न - अवस्था में नहीं होते हैं । लेकिन प्रचुर मात्रा में होते हैं । इसीलिए इस अवस्था में नयी होती है । सर्वांगीण विकास से अभिप्राय बालक का मानसिक , भौतिक , सामाजिक , आध्यात्मिक , नैतिक एवं शारीरिक विकास है । प्रत्येक राष्ट्र के जीवन में माध्यमिक स्तर की शिक्षा काफी महत्वपूर्ण होती है । माध्यमिक शिक्षा को विद्यार्थी जीवन निर्माण की संज्ञा दी गई है । प्राय माध्यमिक स्तर पर विद्यार्थियों में अध्ययन आदते विकसित हो जाती है उत्तम अध्ययन आदतों के परिणामस्वरूप विद्यार्थी में भविष्य की सफलता एवं असलता का निर्धारण होता है । यदि विद्यार्थियों की अध्ययन आदतों से सम्बन्धित नींव कमजोर होगी तो उनको शैक्षिक जीवन में प्राप्त होने वाली सफलता सम्बन्धी भवन भी कमजोर होगा । किशोर विद्यार्थियों में सफलता एवं असफलता के बीच नव किशोर विकास एवं लक्ष्यों की प्राप्ति के लिए निरन्तर प्रयास चलता रहता है । इन प्रयासों की सफलता एवं असफलता पर विद्यार्थियों की उपलब्धि अभिप्रेरणा का गहन प्रभाव पड़ता है । इस समय स्कूल जाने वाले व कोचिंग जाने वाले किशोर विद्यार्थियों में आत्महत्या की प्रवृत्ति बहुत ज्यादा बढ़ रही है । इसके बहुत से पहलू है । जैसे सुसाइड अटेम्प पूर्णतः आत्महत्या यद्यपि बहुत से मानसिक स्वास्थ्य अस्पताल व मानसिक स्वास्थ्य संस्थाएँ उपलब्ध है जहाँ किशोर छात्र छात्राएँ अपनी /समस्या का समाधान पा सकते हैं लेकिन क्या कारण है कि लगातार इस प्रकार की घटनाएँ बढ़ती ही जा रही हैं ।

NCRB के अनुसार 2008 के औंकड़ों के अनुसार 2007 तक कुल 1976 छात्र छात्राओं विभिन्न परीक्षाओं में फेल होने के / कारण आत्महत्या है ।2006 में यह संख्या बढ़कर 2100 तक पहुँच गयी थी । 2006 का साल इस लिहाज से बहुत खराब माना जायेगा जिस दौरान 5857 छात्र छात्राओं यानि हर दिन परीक्षा के दबाव ने -16 विद्यार्थियों को आत्महत्या के लिए मजबूर किया । इन रिपोर्टों को देखने से लगता है कि आने वाले अगले वर्षों में यह स्थिति और भी भयानक रूप लेने वाली है । इस रिपोर्ट का एक दूसरा पहलू और भी दुःखद है जो हमारी पूरी शिक्षा व्यवस्था के उस आदर्श पर प्रश्न चिन्ह लगाता है जिसके महा वाक्य आनन्दमयी शिक्षा अनिवार्य शिक्षा , सर्व क्षा , खेल खेल में शिक्षा और अब शिक्षा का - अधिकार जैसे कई मुहावरों से भरे पड़े हैं । यह रिपोर्ट इन आडम्बरों की पोल खोलती है जिसके अनुसार पिछले वर्षों में हुई कुल आत्महत्याओं में केवल 21.8 प्रतिशत ऐसे लोग हैं जिन्होंने कभी किसी तरह से कोई स्कूली व अन्य औपचारिक शिक्षा नहीं ली क्या हम ऐसा कह सकते हैं कि स्कूल न जाने से कितने लोग आत्महत्या करने वाले मामलों में प्राथमिक शिक्षा ले चुके लोगों की संख्या सबसे ज्यादा यानि 252 % दूसरे स्थान पर माध्यमिक तक शिक्षा ले चुके। 2 % तथा दसवीं तक पढ़ने वाले 17.6 % हायर सैकण्डरी का 8.1 % स्नातक का 1 . 9 % तथा स्नातकोत्तर या इससे आगे पढ़ाई करने वालों का प्रतिशत ०३ है । विद्यार्थियों में आज नैतिकता %, सामाजिकता / [illegible]

आदतें , रहन सहन -, नित्यकर्म , योग और उत्तम परिवेश व वातावरण आदि की जानकारी होना अत्यधिक आवश्यचक है जो विद्यार्थियों के सर्वागीण विकास के लिए अति आवश्यक हैं । यह एक राष्ट्रीय चिन्ता का विषय है कि क्यों हमारे किशोर साथी खुदखुशी के रास्ते को अपना रहे हैं । हमारी शिक्षा व्यवस्था ऐसी हो गयी है कि बिना कोचिंग के हमारे बच्चे बेहतर कर ही नहीं पायेंगे , एक तरह से यह भारतीय परिवारों की सोच भी बन गयी है बच्चों को हर चीज के . लिए आज कोचिंग करने की जरूरत पड़ रही है । बात सिर्फ सिविल सर्विस की तैयार करने या आइआइटीआइआइएम जैसे संस्थाओं में दाखिला लेनेकी नहीं है बल्कि हर छोटी बड़ी तैयारियों के लिए आज बच्चों को कोचिंग पर ही निर्भर - रहना पड़ता है । कोचिंग कबी यह व्यवस्था उच्च स्तर की प्रतिस्पर्धा पैदा करती है, बढ़ती प्रतिस्पर्धा में पिछड़ना कभी कभी बच्चों में जानलेवा साबित हो जाता है । मेडिकल और इंजीनियरिंग की कोचिंग के लिए विख्यात कोटा शहर में एक के बाद कोचिंग छात्रों की खुदखुशी की घटनाएँ चिन्ताजनक है । बच्चों पर पढ़ाई का दबाव व अभिभावकों की उम्मीदें इसके लिए ज्यादा जिम्मेदार है । सरकार भले ही इन घटनाओं को लेकर चिन्तित दिखती है लेकिन रोकथाम को लेकर ठोस व ईमानदार प्रयास नजर नहीं आते ।

मेंटल हेल्थवीक)4 से 10 अक्टूबर , 2016) की रिपोर्ट के अनुसार इसी साल कोटा में मेडिकल की प्रवेश की तैयारी में लगी एक छात्रा ने आत्महत्या कर ली । 16 साल की यह लड़की बिहार से थी । पुलिस का कहना था कि स्नेहा नाम की इस लड़की पढ़ाई के अत्यधिक दबाव के कारण मानसिक तनाव से जुझ रही थी । ऊपर की गई घटनाएँ समाज में लगातार बढ़ती एक समस्या की तरफ इशारा कर रही है वह है बढ़ते दबाव की वजह से पैदा होता तनाव यह तनाव इस कदर बढ़ रहा है कि किशोर विद्यार्थियों के लिए इसे बर्दाश्त करना मुश्किल होता जा रहा है । नतीजतन वे हमलावर हो जाते हैं । कभी खुद पर तो कभी किसी और पर घटता पारिवारिक सहयोग अकेलापन सर्वोत्तम बनने की चाह ने उनके सोचने समझने और फैसला लेने की शक्ति को कुंद कर उ -नमें तनाव भर दिया है । मनोवैज्ञानिकों की माने तो सोसायटी , सिनेमा , सोशल मीडिया जैसे कई फैक्टर है , जो इस तनाव को और बढ़ा रहे हैं । किशोरावस्था माता पिता - तथा अध्यापक दोनों के लिए तथा साथ ही बालक के स्वयं के लिए समस्या प्रधान होती है । यह वह समय होता है जब व्यक्ति सांसारिक जीवन के लिए तैयारी करता है । समस्या का मुख्य कारण यह है कि किशोरावस्था , बाल्यावस्था और प्रौढावस्था के मध्य का काल है । इसका परिवर्तन का काल भी कहते हैं किन्तु इस तथ्य से अवगत व्यवहार करते हैं । उसको स्वतंत्र रूप से कार्य करने के अयोग्य समझते हैं और कभी कभी उससे प्रौढ़ जैसा व्यवहार करने की अपेक्षा - करते हैं ।किशोरावस्था को ठीक प्रकार से न समझने के कारण माता पिता का किशोरों के प्रति व्यवहार किशोरों में - अनेक समस्याओं को जन्म देने में सहायक होता है । किशोरावस्था में अस्थिरता के कारण किशोर को अनेक समस्याओं का सामना करना पड़ता है । उसमें मानसिक द्वन्द्र की स्थिति पैदा हो जाती है । सामान्यतया किशोर सामाजिक वातावरण के साथ समायोजन की समस्या अनुभव करता है । कभी वह स्वतंत्र रहना पसन्द करता है , किन्तु शीघ्र ही माता पिता के संरक्षण की आवश्यकता -अनुभव करता है । इस प्रकार माध्यमिक स्तर पर विद्यालय जाने वाले कोचिंग जाने वाले किशोर विद्यार्थियों में बढ़ती आत्महत्या की प्रवृति व मानसिक तनाव से ग्रस्त

नजर रखते हुए शोधार्थी के मन में इन समस्याओं का अध्ययन करने का विचार आया जिसके कारण द्वारा अपने शोध कार्य के लिए इस समस्या का चयन किया गया । समस्या से उभरने वाले प्रश्न निम्नांकित है 6.758. माध्यमिक स्तर पर अध्ययनरत किशारे विद्यार्थियों में अवसाद क्यों बढ़ता जा रहा है ? माध्यमिक स्तर पर अध्ययनरत किशोर विद्यार्थियों को शैक्षिक पारिवारिक मानसिक समस्याओं का सामना क्यों करना पड़ता है । अभिभावकों का प्रम एवं सहानुभूतिपूर्ण व्यवहार , बच्चों के लिए प्रेरणास्पद होने के साथ साथ तनाव कम करने में भी सहायक होता है । अभिभावकों को - किशोर विद्यार्थियों को घर में शांत वातावरण प्रदान करना चाहिए ताकि उनका मानसिक तनाव न बढ़े अभिभावकों को चाहिए कि वे बच्चों को घर के कार्यों में अत्यधिक व्यस्त न करें तथा उनके अध्ययन के लिए सुनिश्चित समय का निर्धारण करें । अत्यधिक कठोर अनुशासन , संरक्षण अस्वीकृति तथा उपेक्षा , इन प्रमुख दशाओं से बचकर अभिभावकों को अपने बच्चों के प्रति उचित संरक्षण देना चाहिए । किशोर विद्यार्थियों में आत्मविश्वास उत्पन्न करने के लिए माता - पिता को चाहिए कि वे ऐसा कार्य सौंपे, जिसे करके बालक आत्मसंतोष का अनुभव कर सकें , उसकी असफलता पर उसे दोषी ठहरना , हँसी उड़ाना और भला बुरा कहना ठीक नहीं है ।

शैक्षिक निहितार्थ

प्रस्तुत शोध अध्ययन के निष्कर्षों के आधार पर हम कह सकते है कि माध्यमिक स्तर पर अध्ययनरत् सभी बालक किशोरावस्था में होते है तथा ये अवस्था बच्चों के बनने तथा बिगड़ने की अवस्था कही जाती है , जिसमें वे भौतिक सुविधाओं की ओर ज्यादा आकर्षित होने लगते हैं , जो विद्यार्थियों में दुःख या कुण्ठा का कारण बनती है । इसीलिए किशोर मनोविज्ञान के अन्तर्गत शिक्षक तथा अभिभावक , किशोरों की स्थिति को समझने तथा उनको वांछित दिशा प्रदान करने में विशेष सहयोग दे सकते हैं ।

यह सहयोग इस प्रकार दिया जा सकता है

1. किशोरों में शारीरिक परिवर्तन के समय जो बाधायें उत्पन्न होती हैं , उनको खेलकूद , व्यायाम , शारीरिक शिक्षा माध्यम से दूर किया जा सकता है ।

2. किशोरों की शिक्षा में कला , विज्ञान , भूगोल , इतिहास आदि विषयों का समावेश किया जाना चाहिए ।

3. पाठ्य सहगामी क्रियाओं के द्वारा किशोरों के संवेगों को प्रशिक्षण दिया जा सकता है ।

4. सामूहिक योजना विधि द्वारा शिक्षण, सामूहिक कार्य स्काउटिंग गाइडिंग आदि के द्वारा किशोरों में स्वस्थ सामाजिक सम्बंध विकसित किये जा सकते हैं ।

5. मार्गदर्शन कार्यक्रम के द्वारा वैयक्तिक भिन्नता के आधार पर उन्हें व्यवसाय चयन में सहायता दी जा सकती है ।

6. जीवन दर्शन का महत्व बताते हुए किशोरों की यौन भावना का मार्गन्तीकरण किया जा सकता है । उनमें नैतिकता का विकास होता है और ये आत्महत्या व मानसिक असन्तुलन की प्रवृति से बच जाते हैं । किशोर , राष्ट्र को उत्तम नेतृत्व प्रदान करने वाला होता है ।

अतः किशोरों के मानसिक स्वास्थ्य पर अन्यर्थ दबाव न डालने की कोशिश माता पिता तथा शिक्षकों को करनी चाहिए - क्योंकि मानव जीवन में सफलता प्राप्ति हेतु जितना महत्व शारीरिक स्वास्थ्य का होता है, उतना ही महत्व मानसिक स्वास्थ्य का भी होता है । तथा मानव या व्यक्ति का मानसिक स्वास्थ्य उसके समायोजन पर निर्भर करता है । शिक्षा का एक प्रमुख कर्तव्य व्यक्ति को परिवर्तित वातावरण के अनुसार स्वयं को ढालने में सहायता करना होता है । इस उद्देश्य की प्राप्ति के लिए आवश्यक है । कि किशोर समायोजित हो । मानसिक रूप से स्वस्थ या सुसमायोजित व्यक्ति अपने व्यवहार में संवेगात्मक परिपक्वता का प्रमाण देता है । इसका अभिप्राय यह है कि उसने भय परिपक्वता ईष्यों जैसे संवेगों को नियंत्रण में रखने और इनको वांछनीय ढंग से व्यक्त करने की क्षमता होती है । मानसिक रूप से स्वस्थ व्यक्ति का एक निश्चित जीवन दर्शन होता है । किशोर बालक भविष्य की नींव है , अतः वह सुसमायोजित व मानसिक रूप से स्वस्थ रहकर ही देश का भावी समाज का निर्माता बनता है । अतः शिक्षक को चाहिए कि विद्यार्थियों के सामने केवल महँगी उच्च शिक्षा या व्यावसायिक शिक्षा से संबंधित जानकारी न दें अपितु सरल ., सुलभ तथा व्यवसाय के बारे में जानकारी दें , ताकि विद्यार्थी अपनी आकांक्षाओं का विकास उचित दिशा में करें विद्यार्थियों में व्याप्त शिक्षा के प्रति अनावश्यक दबाव , तनाव एवं कुण्ठा को शिक्षक एवं अभिभावक उचित मार्गदर्शन देकर कम कर सकते हैं , क्योंकि दबाव , तनाव एवं कुण्ठा विद्यार्थी के मानसिक स्वास्थ्य को प्रभावित करती है , जिससे विद्यार्थी अपेक्षा के अनुसार परीणाम नहीं दे पाते एवं अनुचित कदम उठाते है अतः शिक्षकों एवं अभिभावकों को विद्यार्थियों में आत्मविश्वास जगाना चाहिए , उचित मार्गदर्शन देना चाहिए ताकि माध्यमिक स्तर पर अध्ययनरत् किशोर विद्यार्थी जीवन से संबंधित दृष्टिकोण के प्रति सकारात्मक सोच का विकास कर सके ।

सन्दर्भ ग्रंथ सूची

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