The White-headed yellow wagtail *Motacilla flava leucocephala* (Przewalski, 1887): migration, movements, and breeding and wintering ranges

Flavio Ferlini¹*, Elena Alexandrovna Artemyeva², Gombobaatar Sundev³

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**Abstract** - The subspecies *leucocephala* of the western yellow wagtail *Motacilla flava* is endemic to the Altai-Sayan Ecoregion (Central Asia). The occurrence of *leucocephala* is associated with saline water bodies and solonchak habitats. Its distribution, especially outside the breeding season, is still uncertain. The aim of this work is to better define the breeding range, migratory movements, and the wintering range of this subspecies and provide guidance to distinguish white-headed intraspecific hybrids from the true *leucocephala* subspecies. The reproductive range of *leucocephala* is concentrated near lakes and wetlands in the Great Lakes Depression (north-west Mongolia) and in the flat southern part of the Tuva Republic (Russian Federation). The small population uses two separate areas for wintering: the eastern equatorial Africa reached through the Great Rift Valley Flyway and the Indian subcontinent reached along a route that bypasses the great belt of mountains and plateaus of central Asia to the west.

**Key words:** *Motacilla flava*, subspecies, Asia, Africa, Middle East, Indian subcontinent, breeding, wintering, hybrids.

**Parole chiave:** *Motacila flava*, sottospecie, Asia, Africa, Medio Oriente, subcontinente indiano, nidificazione, svernamento, ibridi.

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**INTRODUCTION**

The wagtails first appeared in the Eastern Palearctic around 4.5 Ma (megaannum) ago and rapidly dispersed across the Palearctic, reaching Africa, which became a second source of wagtail diversity from around 2.9 Ma ago (Voelker, 2002; Finlayson, 2011). The process that led to the formation of the wagtail species and subspecies has been strongly influenced by climatic changes on the planet. The Croll-Milankovitch theory proposes that climatic oscillations occur through regular eccentricities in the Earth’s orbit around the sun every 100, 41, and 21 ka (kiloannum) (Bennett, 1997; Williams et al., 1998). The emergence of modern species of Palearctic birds (mostly evolving from ancestral species present since the Miocene) happened around 3.5 Ma ago. This data coincides with the main period of Central Asian desert formation and comes after the opening of the Strait of Gibraltar and the flooding of the Mediterranean Sea with the consequent aridification of the climate of the Palearctic (Finlayson, 2011). There was relatively little speciation or extinction among the Palearctic’s birds, which instead seem to have responded by adjusting their geographical ranges (Finlayson, 2011). During unfavorable glacial periods, many species experienced range contractions and fragmentations, while expanding again during interglacial periods (Hewitt, 2000; 2004; Holm & Svenning, 2014). The effects of Ice Ages on species ranges varied with latitude and topography: high latitudes were covered with ice or with permafrost, and temperate and tropical regions compressed towards the equator, increased aridity, reduced tropical forests considerably, while deserts expanded (Hewitt, 2004). Mountain regions between the forty-fifth parallels were significant because, given available lower land, montane species could descend as the climate cooled and survive oscillations in the same region (Hewitt, 2004).

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Even the appearance and composition of the modern avifauna of Central Asia was shaped during the Ice Ages; the formation processes of subspecies were greatly influenced by the high mosaicity of its landscape elements, which caused biotopic isolation. In addition to glacial fragmentation, a very common category of disjunctions are mountain breaks. For example, in the Altai-Sayan mountain system (nearly 1,065,000 km², 2,000 km from east to west, and 1,500 km from north to south, about 62% located in Russia, 29% in Mongolia, 5% in Kazakhstan, and 4% in China), intermontane basins and their ecological specificity supported the formation of a series of subspecies: *Aquila nipalensis nipalensis*, *Otis tarda dybowskii*, *Emberiza pallasi lydiae*, etc. (Kokorin et al., 2001; Baranov, 2012; 2013).

It is in this context that the “endemic form” *leucocephala* of the western yellow wagtail *Motacilla flava* was formed in the Altai-Sayan Ecoregion (Yashina, 2011; Baranov, 2012; 2013) (Fig. 1, 2, 3, and 4). The occurrence of *Motacilla flava leucocephala* is associated with saline water bodies and solonchak habitats (Baranov, 2012; 2013). In breeding season, it is distributed only in a limited area, but its distribution, especially outside the breeding season, is still uncertain, as evidenced by the following statements.

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Fig. 1 - Based on specimens collected in 1879 in Central Asia by Russian geographer and explorer Nikolay Mikhaylovich Przewalski, the female and male of *Motacilla flava leucocephala* were first represented in this color plate (Pleske, 1889). / Sulla base di esemplari raccolti nel 1879 in Asia centrale dal geografo ed esploratore russo Nikolay Mikhaylovich Przewalski, la femmina e il maschio di *Motacilla flava leucocephala* furono rappresentati per la prima volta in questa tavola a colori (Pleske, 1889).
«Breeding eastern Russia, Turkestan, and western Mongolia; in non-breeding season to Africa as far south as north-eastern Northern Rhodesia and northern Nyasaland, Arabia and north-western India». (Grant & Mackworth-Praed, 1952).

«Outer Mongolia, so far as is known. Winters in India, rarely in Africa». (Williamson, 1955).

«Breeding largely in north-west Mongolia, moves west of south to winter in north-west India». (Cramp, 1988).

«Breeds Central Asia; winter range unknown, possibly Pakistan». (Beaman & Madge, 1998).

«North-western Mongolia and the Tuva region in adjacent Siberia, and probably also in the neighbouring parts of northernmost Xinjiang, China. It probably winters mainly in India, but the exact wintering grounds are not known. Occurs in Xinjiang, Pakistan and probably Afghanistan, Uzbekistan, and Turkmenistan during migration. Also a vagrant to East Africa south to Zambibia and Malawi, with several sightings in e.g. Kenya. During migration it is a vagrant in the Middle East and Iran». (Alström et al., 2003).

«Breeds NW Mongolia, extreme NW China (Xinjiang) and adjacent parts of former URSS; winters probably mostly in India». (Tyler, 2004).

«SE Altai, NW Mongolia, NW China, but details poorly known, and frequently impossible to locate when searching for it within claimed breeding range; winters SE Africa and SW Asia». (Shirihai & Svensson, 2018).
The various opinions expressed by authoritative ornithologists regarding the distribution of the *leucocephala* subspecies of the western yellow wagtail, both during the breeding season and in winter, may seem paradoxical having passed well over a century after the description given by general Przewalski (1887a; 1887b). However, analyzing the data available today, we immediately realize that there are many valid reasons that led to this continuing uncertainty. The main ones can be summarized as follows:

- breeding range located in some geographical areas not easily accessible to researchers
- low density of the subspecies in the breeding range and in winter quarters
- possible confusion with leucistic individuals belonging to other species/subspecies
- possible confusion with pale headed individuals generated from the coupling of different subspecies (e.g. *lutea* × *beema* or *flava* × *flavissima*)
- presence of intermediate subjects deriving from *leucocephala* and *beema* mixed pairs.

The aim of this research is to better understand the breeding range, migratory movements, and the wintering range of *Motacilla flava leucocephala* and provide guidance to distinguish light-headed intraspecific hybrids from the true *leucocephala* subspecies.

### MATERIALS AND METHODS

The study is based on data and information obtained from 178 bibliographic sources, 29 travel reports, databases (including 5 relating to museum collections), and a few websites. Analyzing the photographic documentation, we have only considered male individuals, as females can easily be confused with that of the *beema* subspecies.

### RESULTS

#### Breeding range of *Motacilla flava leucocephala*

Although the subspecies was known as early as 1879 and had been officially described in 1887 (Przewalski, 1887a; 1887b), in 1911 a nesting site was discovered for the first time; a clutch of two eggs was found on 13th July along the northwestern coast of the Achit Lake, north-west Mongolia (Grum-Grzhimaylo, 1914; Sushkin, 1925a; 1925b). In the same area on 30th June 1914, another nest was found with three eggs (probably a replacement brood) (Sushkin, 1938; Harvard University M & Morris, 2019). On 7th June 1926, a pair was present along the north-eastern shore of the Orok Lake (now Orog Lake), but Kozlova (1933) could not verify its nesting.

In Mongolia, the presence of birds during the reproductive period was recently confirmed, especially near lakes.

At the Achit Lake (Uvs Province) (Fig. 5), one individual was on the south-western shore on 30th May 2007 (Malmae-
us, 2007), at least three males were on the north-eastern shore on 18th June 2009 (not near the south-eastern edge of the lake) (Faveys, 2009), and one bird was on the south-western shore on 26th June 2013 (Rubythroat Birding Tours, 2013). Some individuals were recorded also on 22nd June 2016 (Valkenburg, 2016) and on 14th-15th June 2017 (Hellström, 2017).

At Airag Lake (Uvs Province), dozens were observed on 12th-13th May 2007 (Bayarhuu & Bräunlich, 2007; Bräunlich, 2007a).

At Bayan Lake (Uvs Province), one male was photographed and filmed on 18th July 2014 (Ennoi0202, 2014).

At Khar-Us Lake (Khovd Province), one specimen was collected on 8th July 1976 (Redkin, 2001), 20 individuals were present on 9th June 2005, and 75 were present on 10th June 2005 (John Allcock in eBird.org, 2019). Some specimens were recorded in early-May 2007 (Bräunlich, 2007b), in June 2012 (Buchheim, 2013; Buchheim & van der Heyde in Heiss & Eidam, 2015), and on 26th June 2013 (Shnayder, 2013). At the same lake, some specimens were observed on 4th June 2015 (Visa Rauste in Tarsiger.com, 2019), 26th June 2016 (east coast) (Valkenburg, 2016; Morten Venas in IBC, 2019), 1st July 2016 (quite numerous) (Dubois, 2016), 10th June 2017 (Jargal Lamjav in Flickr.com, 2019), 22nd June 2017 (Yann Muzika in orientalbirdimages.org, 2019), and 3 birds were present on 26th May 2018 (Tuvshintugs Sukhbaatar in eBird, 2019). During the breeding season (June) in 2012-2018, we counted 7-11 breeding pairs on western and south-western shores with reedbeds (Gombobaatar, pers. com.).

At the Khar Lake and Dörgön Lake (Khovd Province), 20 individuals were present on 11th June 2005 (John Allcock in eBird.org, 2019).

Further south, in the Gobi-Altai Province, at least two pairs and other individuals were recorded at Bayantooroi, an irrigated cropping settlement in a Gobi Desert oasis, 62 km south of Tsogt sum center on 27th June 2016, and on the same day, almost 3 birds (one with a grayer head) were seen at Alag Lake (largely dry in the middle of the desert with a very swampy environment with phragmites, 45° 08′ 00″ N 94° 30′ 00″ E, 1,033 m a.s.l.) (Dubois, 2016).

Recently, at Böön Tsagaan Lake (a large lake in Bayankhongor Province in the Gobi Desert), Paul French (pers. com.) observed the leucocephala on two occasions: a male and female together on 6th June 2018, and one male on 25th May 2019.

In the northern part of the Great Lakes Depression, the leucocephala was present in the endorheic basin of the Uvs Lake, through which it penetrated into the south of the Tuva Republic (Russian Federation) (Stepanyan, 1990; Tsvetkov et al., 2003; Koblik et al., 2006). Like beema, leucocephala nested only in the flat parts of the Republic, not penetrating the mountainous regions (Tsvetkov et al., 2003). Nesting white-headed yellow wagtails were established along the banks of the lakes Uvs, Shar-Nuur, Tere-Khol (Fig. 6), and Dus-Khol between the Oruku-Shina and Kosh-Terek rivers (Tsvetkov et al., 2003; Baranov, 2007; Redkin, 2011).

At Uvs Lake, one specimen was collected on 27th June 1987 on the northern coast (Redkin, 2001). At Tere-Khol, one specimen was collected on 29th June 1989 (Redkin, 2001), and on the southern shore two specimens on 10th June 1999, two specimens on 23rd June 1999, and two specimens on 18th June 2000 were collected (Faucett, 2016).

Fig. 6 - Por-Bazhyn, ruins of the ancient Uyghur fortress in Tere-Khol Lake, Tuva, Russia, 27th July 2011. / Por-Bazhyn, rovine dell’antica fortezza uigura nel lago Tere-Khol’, Tuva, Russia, 27 luglio 2011. (Photo / Foto: Zachary Collier, from flickr.com, CC BY 2.0).
Migratory movements and wintering range of *Motacilla flava leucocephala*

The white-headed yellow wagtail was first discovered by Przewalski (1887a; 1887b) in spring of 1879 migrating in Dzungaria (Northern Xinjiang, China), on the Ulungur River, and in Southern Altai. The first arrivals were observed on the 15th-27th April, but the subspecies may have appeared a few days earlier, and in May it ceased to appear. This subspecies was also observed, apparently in autumnal flight, on Tuosu Lake in Tsaidam (Haixi Mongol and Tibetan Autonomous Prefecture, Qinghai, China) on 12th September 1879 (Przewalski, 1887b), but this information is unreliable.

Sushkin (1914) observed the subspecies in small flocks on Lake Ulyungur (Fuhai County, Xinjiang, China) on 13th April 1914.

In May 1926, Kozlova (1933) encountered *leucocephala* in migration near Orog Lake (Bayanhkongor Province, Mongolia), and it was not a rare sighting, as their migration ended towards the end of May. On 4th August 1997, one adult and two juveniles (a possible family association) were in meadows 2 km west of Bjaruuchajnbulag (Byaruukhain Bulag) in Bordzongijn Gobi about 50 km south of Nomgon (Ömnögobi Province, Mongolia) (Stenzel et al., 2005).

In Kazakhstan, observations of the species were very sparse in the post-reproductive period: one individual was ringed at Alakol Lake on 8th July 1981, and another was reported on Sorbulak Lake on 12th September (Gavrilov & Gavrilov, 2005). The white-headed yellow wagtail was more frequent in spring, especially in the Almaty Region, where the artisan well of Kanshengel Village (in the Tagum desert) is the best place to look for this rare passage migrant: one male on 10th May 2003 (Gavrilov & Gavrilov, 2005), one male on 7th May 2007 (Ashby et al., 2012), five birds (including three males) on 9th-12th May 2007 (Hendriks, 2007; Kennerley & Kovshar, 2007; Kovshar, 2012; Wassink & Oreel, 2008), a male on 9th May 2008 (Wassink, 2009a), one male on 9th May 2009 (Central Asia Birding, 2009), and one first-summer male on 15th May 2009 (Wassink, 2009b), one male on 10th May 2014 (Vassily Fedorenko in birds.kz, 2019) and another one on 19th May 2014 (Victoria Kovshar in birds.kz, 2019), one male on 6th May 2015 (van der Woude, 2015), one or two males on 30th April 2018 (Askar Isabekov in birds.kz, 2019) and one male on 6th May 2018 (Alan Van Norman in eBird, 2019). Occasional presences were also recorded at the Sorbulak Lake system: one male on 1st May 2006 (Belaylov & Karpov, 2012), another one on 7th May 2007 (Bird & Annenkova, 2007), one on 22nd April 2012 (Genadiy Dyakin in birds.kz, 2019), one male on 5th May 2012 (Vassily Fedorenko in birds.kz, 2019), one on 28th April 2013 (Vassily Fedorenko & Aibek Adilmagambetov in birds.kz, 2019), one male on 9th and 10th May 2014 (Vassily Fedorenko in birds.kz, 2019), and one on 21st and 29th April 2018 (Askar Isabekov in birds.kz, 2019). Isolated individuals were observed on 16th and 20th April 1988 in the Kopa Valley (Kovshar & Berezovikov, 2018). At Alakol Lake, one male was photographed on 9th May 2013 (Svetlana Aleinikova, Natalya Borovaya and Askar Isabekov in birds.kz, 2019) and another one on 9th May 2014 (Svetlana Aleinikova, Askar Isabekov and Valentín Zenkov in birds.kz, 2019). In the other regions of Kazakhstan, the subspecies appears only sporadically. In East Kazakhstan, one male was observed on 27th April 2011 at Zhuzagash (Ayazog District) (Gabor Papp in birds.kz, 2019) and another one was present on 7th May 2011 in the same locality (Gabor Papp in birds.kz, 2019; Harrison & Grieve, 2012a); on 13th May 2018, a male was photographed at Katon-Karagay National Park (Vorobyov, 2018). Otto Finsch saw light-headed yellow wagtails, probably of this subspecies, between the eastern end of Lake Zaisan and the Altai on 6th June (Grant & Mackworth-Praed, 1952). In the Karaganda Region, *M. f. leucocephala* was a rare passage migrant in northern Balkash Lake (Martin et al., 2018). In the Jambyl Region, the subspecies crossed the Chokpak Pass during spring migrations between 15th April and 9th May (Kolbintsev, 2001; Gavrilov & Gavrilov, 2005); in autumn before the year 2001, only one individual was recorded on 24th September, and another one was observed on 6th September 2001 (Kolbintsev, 2001; Gavrilov & Gavrilov, 2005; Mary Gustafson in eBird, 2019). In the Kostanay Region, one male was recorded at Zorsu Lake on 16th May 1997 (30 km north of Kostanay) (Erokhov & Berezovikov, 1999); two males were observed in groups with other western yellow wagtails near Burly (Karabalyk District) on 2nd July 2016 (Yuri Malkov in birds.kz, 2019). In the Aktobe Region, Bostanzhoglo (1911) observed an individual on 15th May at Lake Dzhumart-Kul near the scends of Bolshie Barsuki (between the Aral Sea and Shalkar city).

In Azerbaijan, a white-headed yellow wagtail was photographed at Besh Barmag (Syazan District) on 12th April 2012 in a large flock of other western yellow wagtails including several subspecies, such as *beema, lutea, thunbergi, flava* and *feldegg*: it was the first record for the country (Harrison & Grieve, 2012b; Heiss & Eidam, 2015). An observation on 1st May 2012 may also exist for the same locality (Azerbaijan Birding Data in eBird.org, 2019). A white-headed individual was photographed in the first half of April 2018 in Western Azerbaijan (Baumgarten, 2018). There is also a record at Alazan delta (Samukh District) on 20th April 2018 (Zulfu Ferelci in eBird.org, 2019), but we have not found photographic documentation of this specimen.

In the Middle East, the *leucocephala* subspecies was a vagrant in North-Eastern Iran, Turkey, Israel, Kuwait, and the United Arab Emirates (Alström et al., 2003; Porter & Aspinall, 2010; Kirwan et al., 2014; Eriksen & Porter, 2017).

In Iran, in the past the subspecies was reported in the north-east of the country (Southern Khurasan and Paropamisus) (Zarudny, 1911). A western yellow wagtail with a whitish head was observed in the Maranjab Desert (Isfahan Province) on 13th April 2013 (Klanderud, 2013), but this record was not included in the recent Iranian Checklist of the Species and Subspecies (Khalighi-zadeh et al., 2017). One male was photographed by Siavash Roshanian at Incheh wetland, Aq-Qala (Golestan Province) on 7th April 2017 (Iran Bird Records Committee, 2019).
In Turkey, a male was observed in the south Van marshes (Eastern Anatolia Region) on 25th April 2011 (first record for the country) (Kirwan et al., 2014).

In Israel, Joop Swaab observed an individual at Eilat in April 1980, and a male was observed by Alon Bear, Yaron Baser, and Ehud Dovrat at Shifdan on 7th April 1984. This bird, however, showed signs of being a hybrid (e.g. yellow back and white head) (Shirihi, 1996). It is considered rare in the spring (Yardbirds, 2020).

In Kuwait, the white-headed yellow wagtail was a rare passage migrant with presences usually reported between mid-April and mid-May (Al-Sirhan, 2009; 2010; 2018; Pope & Zogaris, 2012). A male was photographed on 20th April 2008 at Jahra East Outfall (Fägel, 2008).

In the United Arab Emirates, an individual attributed to leucocephala subspecies was at Dubai pivot fields on 11th April 2003 (the first record of this subspecies) (Balmer & Betton, 2003). An individual was observed at Abu Dhabi Bateen Park on 25th and 26th March 2005 (Balmer & Betton, 2005) and an adult male was at Abu Dhabi Golf on 8th-11th April 2006 (Balmer & Betton, 2006). Pedersen & Aspinal (2010) highlighted the possible confusion with intraspecific hybrids between lutea and beema.

In Oman, until 6th March 2017, only two records were known (one in May) (Eriksen, 2017; Eriksen & Porter, 2017).

There were also some reports for South-Eastern Europe, but without photographic documentation: a western yellow wagtail with a light head was observed, along with hundreds of individuals of flava andfeldegg subspecies, at Paphos (Paphos District, Cyprus) on 13th April 2016 (Stylianou, 2016), but leucocephala was not included in the list of subspecies accepted for this island (Richardson & Porter, 2020); in Greece, two birds similar to leucocephala were observed in May 1960 and May 1961 in the north-east (Raines, 1962; Bauer et al. 1969; Handrinos & Akriotis, 1997) and a very white-headed bird that resembled a white-headed yellow wagtail was observed on 14th April 2017 at Frangokastello (Chania, Crete) (Willsher & Willsher, 2017); in Italy, a western yellow wagtail with a white head was observed in a reed bed roost site at Miranola (Emilia-Romagna Region) on 18th April 2002 (Gianrella & Tinarelli, 2003).

In Africa, Ramsay (1923) stated that the leucocephala was a migrant in Egypt, but he did not provide detailed information and Nikolaus (1983) considered it a migrant and winter visitor in Sudan, but cited a single observation made in February along the Red Sea.

In Eritrea, the white-headed yellow wagtail was a relatively scarce passage migrant, but it was not a winter visitor (Ash & Atkins, 2009).

In Ethiopia, leucocephala was reported in the Oromia Region: one individual in March 1971 and two individuals in March 1972 were at the Koka Reservoir (Ash & Atkins, 2009; Gedeon et al., 2017); three birds were at Addis Ababa Bole International Airport on 27th February 2017 (Akash Gulalia in eBird.org, 2019).

Van Someren (1931) claimed that specimens with white heads were obtained from eastern Uganda and Kenya in November and 21st April. In Uganda, an observation of the subspecies leucocephala was reported in Entebbe (Central Region) on 4th April 1967 (Pearson, 1972; Britton, 1980; Pearson & Turner, 1986). In Kenya, specimens showing the characteristics of the white-headed yellow wagtail were captured in the Nairobi area (Reynolds, 1974). An individual was seen at Solio Ranch (Laikipia County, Rift Valley Province) on 16th April 2009 (AfricanBirdClub, 2010), another one was observed on 1st March 2017 in Kiambu County (Central Province) (Samira Khan in eBird.org, 2019); a bird was present on 14th April 2017 at Amboseli National Park (Kajiado County, Rift Valley Province) (Ellen Miller and Michael Weaver in eBird.org, 2019), and three individuals were at Lake Nakuru National Park (Nakuru County, Rift Valley Province) on 23rd March 2019 (Sally Pfeiffer and Doug Pfeiffer in eBird.org, 2019).

In Tanzania, one male was recorded on March 2006 at Manyara Lake (Arusha and Manyara regions) (Beaman & Jännes, 2008) and two males were photographed on 5th April 2015 at Ngorongoro Crater Rim (Arusha Region) (Holmen, 2015). Keith et al. (1992) also cited the locality of Arusha Chini (Moshi Rural District), but the date of the observation is not known.

In Malawi, one specimen was captured on 26th March 1947 at Karonga (Northern Region) (Benson, 1951; Williamson, 1955; Constantine & Benson, 1977).

In Zambia, there was only one record near Luangwa (Lusaka Province), but Constantine (1971) did not specify the date. According to Grant and Mackworth-Praed (1952), a western yellow wagtail was captured at Kyanyani, Northern Rhodesia (today part of Zambia), on 3rd March 1905 and doubtfully classified as a beema, was instead a leucocephala.

In China, the white-headed yellow wagtail was found in the Junggar Basin (Xinjiang) during the migration (Zhengjie, 2009; CASD, 2019; Weiwenku.org, 2019). The subspecies was recorded at Ebi Lake (Bortala Prefecture) (XIEG, 2011) and ten individuals were observed in the Ili River Wetland (Ili Kazakh Autonomous Prefecture) in late summer 2016 (Huang Ya-dong et al., 2009).

In Pakistan, a male was captured by Hugh Whistler on 2nd May 1913 at Jhelum (Punjab Province); it was the only one of its kind seen, and was migrating in company of many M. f. beema (Ticehurst, 1915; Whistler, 1916; Baker, 1926). On 27th April 1938, Waite (1939) spotted a male from amongst a number of M. f. beema on a passage near Chhohi in Campbellpore (Attock District, Punjab Province). On 25th April 1939, five males were collected at Malpur (Rawalpindi District, Punjab Province) and on 10th May 1939, a male was observed at Khanna (Rawalpindi District, Punjab Province) (Whistler, 1940). In April 1940, 17 specimens were collected in the Rawalpindi District (Punjab Province) (Waite, 1962). Roberts (1992) stated «... is distinctly rare and only occurs for a brief period on spring passage when it can be encountered in the Potohar, Salt Range and around Jhelum, and Attock (Campbellpur) districts. Both H. Whistler and H. Waite collected a good series of specimens from these between 18 April and 10 May (Brit. Mus., Tring). The author has seen several individuals in full breeding dress on 4 May in company with large numbers of thunbergii on the shores of Rawal lake.» Grimm et al. (2008) confirmed that Rawal Lake (Is-
lamabad Area) was a good place to see the white-headed yellow wagtail. The *leucocephala* was also observed in the metropolitan areas of Rawalpindi and Islamabad (Yousuf et al., 2015). The subspecies was reported in the Swat Valley (Government of Khyber Pakhtunkhwa, 2013), and it was included in the Jammu and Kashmir birds check list (Department of Wildlife Protection, Govt. of Jammu and Kashmir, 2011). Even recently, the subspecies has been confirmed as a passage migrant (Murtaza & Ahmed Khan, 2010; Yousuf et al., 2015; Manzoor et al., 2017; PMDNDMA, 2019) and winter visitor in Pakistan (Fakhir Abbas & Madeeha Manzoor, pers. com.; Mirza, 1998; PMDNDMA, 2019).

The *leucocephala* subspecies was included among those observed in Nepal, but we did not find detailed data (Shrestha, 2001; Grimmet et al., 2016; Inskipp et al., 2016).

In India, a male was observed on 11th April 1965 alongside the Agra Canal, near Delhi, during an intense western yellow wagtail migration (Jackson, 1965). Strangely, the data was not reported in the book of Ganguli (1975) dedicated to birds in the Delhi area. A single male was observed in a flooded stubble field near the western Yamuna Canal, between Tihara and Malhala villages, in the Sonipat District (Haryana) on 10th January 2003 (Sharma, 2005). An individual was recorded at Okhla Bird Park, South-East of Delhi, on 12th April 2009 (Anand Arya in orientalbirdimages.org, 2019) and one was present on 11th April 2009 at Dadri (Uttar Pradesh) (Subhash in iNaturalist.org, 2019). In Rajasthan, the presence of individuals attributed to *leucocephala* was recorded: at Jawai Dam, near Pali (Marwar Region) on 22nd March 2015 (Lloyd Fernandes in eBird.org, 2019), at Bikaner (Bikaner Region) on 9th September 2017 (Partap Kataria and Raja Bandi in eBird.org, 2019), and at Churu (Bikaner Region) on 31st January 2019 (Gajendra Tanwar in eBird.org, 2019). In West Bengal, a male of the subspecies was photographed at Boshipota on 27th February 2011 (Das, 2011). In Assam, the white-headed yellow wagtail was migrant and wintering (Deka et al., 1996); between 10th and 27th April 1950, 18 specimens were captured at Phulbari (Lakhimpur District) and their skins are now preserved in the Museum of Zoology of the University of Michigan (University of Michigan Museum of Zoology, 2019). In Arunachal Pradesh, one individual was observed at Mandal Road (West Kameng District) on 12th May 2018 (Geetha Venkataraman and Sudeshna Dey in eBird.org, 2019). In Maharashtra, a few were recorded during the period from 2011-2013 near Solapur (Raghvendra et al., 2014). In Kanataka, a male was photographed at Hoskote Lake (Bangalore Rural) on 8th-9th April 2017 (Jayadevan et al., 2018), and in the same place another male was recorded on 24th and 31st March 2019 (Dipu Karuthedathu, Krishna Murgthy, J. Praveen, and Tejas Praveen in eBird.org, 2019).

In Andhra Pradesh, the subspecies was common in winter between 2007 and 2012 at Kolleru Wetland, but it seems strange that no other subspecies were present (Vasudeva Rao et al., 2014).

In Sri Lanka, until 1998 the subspecies was not known for the island (Henry, 1998), but an individual attributed to *leucocephala* was observed at Sevanagala (Monaragala District, Uva Province) on 2nd December 2018 (Benny Cottele in Observation.org, 2018).

Exceptionally, the subspecies was also observed in Japan. In the Tokara Islands (Kagoshima Prefecture) on 3rd May 1988 and 3rd May 2011, one bird was observed and photographed by Hirashima (Tokorozaki, 2011; Ikenaga et al., 2014). Erratic movements in the Far East are also known for other subspecies of the western yellow wagtail: on 13th May 2013 a *Motacilla flava feldegg* was observed in Beijing at Lake Shahe (Townshend, 2013), and an individual of *Motacilla flava beema* was observed in Japan at Takahama (Nagasaki) on 6th May 2014 (Ikenaga & Yanasawa, 2015). In addition to the greater ease of identification of subspecies of western yellow wagtail, the reports in spring of individuals exceptionally east from their usual migration routes is probably related to the winds that cross the highlands of Central Asia from west to east and that can “drag” the small passerines (Bolshakov, 2003).

**Other pale-headed wagtails**

Western yellow wagtails with white or very pale heads were recursively observed during breeding season in the Volga Valley, in the territories of the Ulyanovsk Oblast and the Chuvash Republic. In the Ulyanovsk Oblast, individuals with a “pale head” performing nesting behavior were recorded near Ulyanovsk city (Zavolzhye, Kulikovka, June 2012), in the Ulyanovsky District (Barataevka village, on 18th June 2013) and in the flat meadows in three Trans-Volga districts (Staromaynsky, Cherdaklinsky - on 7th June 2013 at Cherdakly - and Melekessky - on 31st May 2016, surrounding the city of Dimitrovgrad), especially along the coast of the Kubyshev reservoir (Moskvichev, 2013a; 2013b; 2013c; Oleg Borodin, AndreyMoskvichev and Natalya Neverovain in volgabirds.ru, 2019). A male with a pale head was at Cherdakly (Cherdaklinsky District) in May 2013 and May 2014 (Artemyeva, pers. com.), and a male with a white head was photographed by Tatjana Kezhevatova (pers. com.) on 31 May 2016 at Kulikovka (Melekessky District). In the Chuvash Republic, the presence and nesting of wagtails with white or very pale heads were documented in the Iresinsky District in summer 2011 and 2012 (Artemyeva & Muraveyev, 2012a; 2012b; Yakovlev et al., 2012).

In the past, Sushkin (1925c) found a breeding individual with a white head on the Belaya River, about 40 km north of Ufa (Republic of Bashkortostan).

Near Gorny Shchit carp fish factory ponds (Yekaterinburg, Sverdlovsk Oblast) an individual with a completely white head was observed on 6th July 2013 (Reshetkova, 2013).

A specimen with pale head collected on 12th June 1843 at Lake Bulukhta (Pallasovsky District, Volgograd Oblast) is preserved in the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg).

A specimen was collected in the Zhanakala District (West Kazakhstan Region) on 25th April 1862, and it is preserved in the Zoological Institute of the Russian Academy of Sciences (Saint Petersburg). Sushkin (1914), talking about *Motacilla flava leucocephala*, stated «... in the Chaikar District regularly breeding.»; the Chaikar District
roughly coincides with the current Mugalzhar District (Aktobe Region, Kazakhstan). Western yellow wagtails with pale heads were observed in May 1915 near Aktobe (Aktobe Region, Kazakhstan) (Karamzin, 2003). Sushkin (1925c) found a breeding individual with a white head in the basin of Turgai River near Amangeldi (Kostanay Region, Kazakhstan).

In analogy with what was observed in northern France where the mixed couples *M. f. flava* and *M. f. flavissima* generate pale-headed intergrades colloquially known as channel wagtail (Dubois, 2001; 2007), the individuals with white or very pale heads observed in the previous russian and kazakhs areas were first generation interspecific hybrids between *M. f. lutea* and *M. f. beema* (Sotnikov, 2006; Artemyeva & Muravyev, 2012a; 2012b; Redkin, 2013). In the Ulyanovsk Oblast and Chuvash Republic, in the breeding season, the *flava* subspecies was largely dominant, with a marginal presence of *beema*, while in Asian Russia and Kazakhstan *beema* was prevalent (Moskvichev et al., 2011; Artemyeva et al., 2013; Muravyev, 2013). In almost all of these locations the *lutea* subspecies was present with very low densities; in European Russia, the density in the previous districts of the Ulyanovsk Oblast and Chuvash Republic was 1-10 nesting pairs in squares of 50 × 50 km, while in the same areas the other subspecies have an overall density ten times or even a hundred times higher (Muravyev & Artemyeva, 2012; 2016; Artemyeva et al., 2013; 2014; 2015a; 2015b; Korepov & Korepova, 2013; Moskvichev, 2013b; 2013c; 2013d; Korepov et al., 2014; Nikiforova, 2015; Lebedeva, 2017). The same situation (with *beema* instead of *flava*) also occurred in Asian Russia and Kazakhstan. Probably the difficulty for *lutea* to finding partners of its subspecies favors the establishment of mixed couples.

Wagtails with a white head also appeared in completely unexpected places. The best known case was the English one; an individual (now in the British Museum) attributed to the *leucocephala* subspecies was feeding flying young when it was spotted by C. B. Ticehurst at Wittersham (Kent County) on 19th June 1908 (Williamson, 1955). This record was reviewed by the BOU List Committee in 1949 as *M. f. beema* together with five other specimen records of *beema* and all six were considered to be *M. f. flava* (British Ornithologists’ Union Records Committee, 2007). A bird apparently similar to *leucocephala* was observed near Colonia (Germany) in summer 2014, but after examination of photographs of the bird in flight, it emerged that it was leucistic (the eighth primary on each wing was white) (Gray, 2014). A wagtail showing a whitish head (with some dark grey tinge) and broad wing bars was observed from 28th to 31st March 2019 at Lut Chau (Hong Kong), but considering also its call, it most likely was a leucistic eastern yellow wagtail (Birding Hong Kong, 2019; ovingthetodiesforever.blogspot.com, 2019). On 1st May 2019, a possible white-headed yellow wagtail was discovered by Haiming Zhao at Cape Nanhui (Shanghai, China), but the bird had a mottled mantle and scapulars and a pale basal to the lower mandible, thus also in this case it was not possible to attribute the specimen with certainty to the *leucocephala* subspecies (Shanghai Birding, 2019).

**DISCUSSION**

**Breeding habitat and range of Motacilla flava leucocephala**

Breeding ecology of the subspecies is not well documented. Major references (Dawaa et al., 1994; Fomin & Bold, 1991; Gombobaatar et al., 2011; Gombobaatar & Leahy, 2019) on birds in Mongolia have not mentioned the breeding ecology of this subspecies. However, these references pointed out that this subspecies occurs and breeds in open valleys of large lakes in the Great Lakes Depression (west Mongolia). The data collected in this study confirm this indication (Fig. 7).

The Great Lakes Depression is a semi-arid depression bordered by mountains: Mongol-Altai in the west, Tannu-Ola in the north, Khangai in the east, and Gobi-Altau in the south. The depression is 600-650 km in length with a width of 200-250 km in the north and 60-100 km in the south with a total area of about 186,600 km² (Borodavko, 2009). The elevation of the basin floor is from 1,700 m a.s.l. to 760 m a.s.l., decreasing to the north and southeast. The maximum elevation of the mountains is 4,000 m a.s.l.; there are some mountains with an elevation between 2,000 and 3,000 m a.s.l in the lake catchment (Borodavko, 2009). The depression contains six major lakes of Mongolia: salineUvs Lake, Khyargas Lake, and Dörgön Lake; and fresh water Khar-Us Lake, Khar Lake, and Airag Lake, as well as a number of smaller lakes and various sized ponds and other wetlands (Tsersenodnom, 1971; Tarasov et al., 1994). In addition, it includes 14,000 km² of solonchaks and large sandy areas. The major rivers are Khovd, Zavkhan, and Tes. The terraced lake shores are covered by steppe and desert vegetation. *Phragmites sp.* is abundant in the river deltas and close to the shore-line and the shallow-water littoral is covered by rich aquatic vegetation, including *Myriophyllum verticillatum*, *Zannichelia pedunculata*, and *Utricularia vulgaris* (Sevastyanov et al., 1994). Some lakes in the Great Lakes Depression with vast reed beds (some of the last remaining in Central Asia) create a unique ecosystem. The sharp contrast of high mountains and steppe and the desert steppe bordering the diverse wetlands creates a highly distinct landscape. The subspecies is also present at Achit Lake and its surrounding wetlands, in the Mongol-Altau Range. The Achit Lake is a freshwater lake lying in an intermountain basin at 1,435 m a.s.l. and it is connected to the Khar-Us Lake, in the Great Lakes Depression, through the ecological corridor constituted by the course of the Khovd River. All these lakes are included in the Mongolian Plateau: the Inner Mongolia Autonomous Region of China and the entire territory of Mongolia constitute its core region, with an area of about 2.75 million km² (Sneath, 1998; National Statistical Office of Mongolia, 2008). In the plateau, a number of lakes have shrunk remarkably in recent decades as a result of intensive human activities and climate change (Tao et al., 2015). The number of lakes with a water surface area >1 km² decreased from 785 in the late 1980s to 577 in 2010, with a greater rate of decrease (-34.0%) in Inner Mongolia of China than in Mongolia (17.6%). The statistical analyses suggested that in Mongolia precipitation was the...
dominant driver for the lake changes (Tao et al., 2015). Fortunately for the *leucocephala* and for threatened species nesting only in the aquatic environments of Western Mongolia (e.g. white-headed duck *Oxyura leucocephala* and dalmatian pelican *Pelecanus crispus*), until 2010 the lakes of the Great Lakes Depression, as well as those in the Mongol-Altai Mountain Range, had shown no signs of contraction, while further south, in the Valley of the Lakes, the surface of Böön Tsagaan Lake had decreased by 14.2% in 1990-2010, and the Orog Lake dried up in August 2009 (Tao et al., 2015). The lakes of this last geographical area have been repeatedly visited in breeding season without observation of the white-headed yellow wagtail (Bâlon & Burban, 2008; Dufourny, 2010; Kehoe & Khayankhayrvaa, 2014; Rockjumper, 2016; Van Beirs & Khayankhayrvaa, 2016; Oláh et al., 2018). This suggests that French’s observation in early June 2018 and late May 2019 (pers. com.), as well as that of Kozlova’s (1926) on 7th June 1926 were attributable to late migrants. However, considering also the presence of couples and other individuals in late June in wetlands in the Gobi-Altai Province (Dubois, 2016), the possible nesting of the subspecies in the Gobi-Altai Mountain Range and in the Valley of the Lakes (south-west Mongolia) should be further investigated.

The northernmost reproductive area occupied by the *leucocephala* is the flat southern part of the Tuva Republic (Russian Federation) between the Örük-Shina and Kosh-Terek rivers (Fig. 8), but it should be pointed out that Sushkin (1925c) explicitly excluded the presence of the subspecies in the Uvs Lake Basin in the early decades of the 20th century and Dementiev and Gladkov (1954) did not include the *leucocephala* among the subspecies of western yellow wagtail that nested until the 1950s in the Soviet Union and indeed explicitly stated that its breeding range included only north-west Mongolia. The white-headed yellow wagtail therefore began to expand its breeding range into Russian territory only from the beginning of the second half of the 20th century (Vaurie, 1959; 1960). The northern expansion of the breeding range is also common to other subspecies of the western yellow wagtail both eastward (*feldegg* and *lutea*) (Ferlini, 2016; Ferlini & Artemyeva, 2020), and westward (*cinerocapilla*) (Ferlini, 2015) and is probably related to ongoing climate change.

The subspecies *beema* also arrived in the same area, but probably at a later date. The situation is well summarized by Redkin (2011): «Judging from our collections and field observations, as well as from the results of studying the collection materials of ZMMGU and ZIN, only phenotypically pure *beema* populations nest in the Turan and Kyzyl basins. In the south of Tuva (south of the Tannu-Ola ridge), the situation is more complicated and requires special commentary. For primary researchers and us the nesting of yellow wagtails was established along the shores of lakes Ubsu-Nur, Shara-Nur and Tore-Khol.
During our studies in 1999-2000, mixed settlements were found in all three points, represented by individuals of the pure phenotypes of each of the forms under discussion, and by a fairly large number of specimens with intermediate characteristics. It is noteworthy that from collection materials (ZMMGU) and visual observations of V.Yu. Ilyashenko (Redkin, 2011), in 1987-1989 in the same points nested only *leucocephala*. At the same time, we studied a specimen of a male collected in the summer 1980 on Lake Ubsu-Nur, which had intermediate characteristics between *leucocephala* and *beema* (CGPGU). These circumstances suggest the irregular nesting of *beema* outside the source nesting area (south of East Tannu-Ola) together with the white-headed form *leucocephala*. At the same time, the level of hybridization of these forms is quite high. Of the 60 specimens collected at the Ubsu-Nur, Sharâ-Nur, and Tere-Khol lakes in 1999 and 2000, 45.0% were attributable to the phenotype *leucocephala*, 18.3% to *beema* and 36.7% to *leucocephala x beema* intraspecific hybrids (Redkin, 2011).

After reporting the presence of the *leucocephala* subspecies at Achit Lake in 1911 and 1914, Sushkin (1938) stated: «... there are no other representatives of *B. flava*, and there are generally no yellow wagtails in this area, but only in a small amount of *M. citreola*.»

Today, however, we know that the subspecies *beema* already occupied this area in 2007 and that, mating with *leucocephala*, it generated individuals with intermediate traits between the two subspecies (Hellström, pers. com.; Malmaeus, 2007). Individuals with intermediate traits were also present at Achit Lake in June 2017 (Hellström, 2017). During the last few years, *beema* has been observed in the reproductive period also at the Khar-Us Lake (Silas Olofson, pers. com.) and it is therefore foreseeable that also in this area an intraspecific hybridization process may begin.

The data collected do not confirm the breeding of the white-headed yellow wagtail in the north-eastern part of China (Xinjiang). During visits and research carried out in reproductive period in areas potentially suitable for the presence of lakes (e.g. Sayram Lake in Bortala Prefecture, Ulungur and Kanas lakes in Altay Prefecture) in the northern part of Xinjiang, the *leucocephala* subspecies has never been encountered (only sporadically observed *M. f. feldegg* of the form *melanogrisea* which here reaches the farthest east of its breeding range) (Kilburn, 1998; Ferlini, 2016; Brelsford, 2017; Dev, 2018; Liu Xu, 2018).
Migratory movements and wintering range of Motacilla flava leucocephala

Though the white-headed yellow wagtail has a reproductive range confined to the heart of the Asian continent and is of limited size when compared with those of the other four asiatic subspecies (lutea, beema, feldegg and thunbergi) that extend from Eastern Europe to Central Asia, it has wintering ranges that are disjointed in Asia and Africa (Fig. 9).

Based on the number of reported birds (sometimes also groups), the Indian subcontinent hosts the majority of the leucocephala population in winter. The individuals seem to be distributed mainly in the northern and eastern part of India and in Pakistan (probably in the north-eastern part), as already hypothesized by some authors (Ali & Ripley, 1987; Grimmett & Inskipp, 2003). In the same area, individuals with intermediate characteristics leucocephala x beema, generated by mixed couples in the Tuva and Achit Lake area, should also appear. The presence of the white-headed yellow wagtail in Sri Lanka should be confirmed and documented, as the island is one of the wintering areas favored by the lutea subspecies, so here, as in the rest of the subcontinent, there is the possibility of confusing leucocephala with intraspecific hybrid lutea x beema with a very pale head.

On the basis of spring observations, it would seem that the birds, when embarking on the journey to the north, avoid crossing the complex deserts and mountains of the Tibetan Plateau still largely covered in snow and bypass it to the west. Similarly to what has been observed for other passerines (Dolnik, 1990; Bolshakov, 2001; 2003; Irwin & Irwin, 2005), the white-headed yellow wagtail reaches the southern slopes of the Himalayas and follows its trend towards the north-west until it meets the Hindu Kush mountain range. Given the relative frequency with which the subspecies is reported in the Rawalpindi and Islamabad areas, it is possible that crossing Hindu Kush takes place at the point of least amplitude, perhaps using the Khyber Pass and the other passes not far from Kabul. Once past this barrier, it is not clear what path is followed, as there are no signs for a long stretch. However, it is known that after crossing Hindu Kush, about 15% of passerines turn north-east and cross the western part of the Tien Shan, while 85% turn north-east only after reaching the deserts around the 39th parallel North (Bolshakov, 2003; Irwin & Irwin, 2005; Newton, 2008; Rasmussen & Anderton, 2012). The point where the subspecies regularly passes in spring is the Chokpak Pass (between 15th April and 9th May) (Kolbintsev, 2001; Gavrilov & Gavrilov, 2005).
through which it reaches the Taukum desert, the Sorb-
ulak Lake system, the Alakol Lake, and also the East
Kazakhstan Region. The reproductive area is probably
reached by crossing the Junggar Basin (Xinjiang) and
then the Altai Mountain.

The autumn migration probably occurs following
routes similar to the spring ones, although it is possible
that, in analogy to other passerines, the mountains are
partially crossed as they are less inhospitable than dur-
ing the spring period (Dolnik, 1990; Bolshakov, 2001;
2003; Irwin & Irwin, 2005; Newton, 2008).

A minority fraction of the leucocephala population
in autumn heads west along the Great Rift Valley Fly-
way (probably single individuals herded with members
of other subspecies) to reach and winter in Equatorial
East Africa (Kenya, Uganda, Tanzania, northern Ma-
lawi, and, to be reconfirmed, Zambia) (Ferlini, 2020).
In the spring, migration follows the Rift Valley (Feb-
uary - early-April) in a northerly direction in Africa,
then crossing the Arabian Peninsula (March - April)
and the rest of the Middle East (April - early-May) to
the north-east on a rather broad front before converging
towards south-eastern Kazakhstan (mid-April - May).
Also in this case, the scarce units of white-headed yel-
wagtail migrate together with their conspecifics of
other subspecies.

The route between Asia and Africa is certainly used
both by intermediate individuals leucocephala x bee-
ma from the southern part of the Tuva Republic and
from Achit Lake, and by first generation intraspecific
hybrids lutea x beema from the Volga valley and, po-
tentially, from Kazakhstan. Even the pale-headed birds
observed in Greece are more likely to be lutea x beema
hybrids. Hence, as also highlighted by Campbell and
Moran (2016), in the Middle East, Eastern Mediterr-
anean, and Africa much attention must be paid when
observing western yellow wagtails with pale heads to
discriminate true leucocephala from other apparently
similar intermediate forms. In the Mediterranean basin,
a similar problem could derive from the observation
of specimens of channel wagtail (flava x flavissima),
usually rather similar to beema, with a particularly pale
head.

Characteristics of males of different forms of western
yellow wagtail with pale head

Based on the examination of individuals observed
and/or photographed in nature and specimens preserved
in museums, we provide some items for distinguishing
the true male of Motacilla flava leucocephala from appar-
ently similar individuals.

Motacilla flava leucocephala

• White head with a variable amount of very indistinct
  pale grey smudges on ear-coverts, sides of rear crown,
  and nape (Grant & Mackworth-Praed, 1952; Cramp,
  1988; Beaman & Madge, 1998; Alström et al., 2003;
  van Duivendijk, 2010; Gombobaatar & Leahy, 2019).

• Behind the orbit, possible presence of a very broad
  superciliary stripe feebly indicated (Sushkin,
  1925c).

• Yellow throat with white upper throat, chin and
  malar more extensive than beema (Williamson,
  1955; Alström et al., 2003; Gombobaatar & Leahy,
  2019).

• The lores and upper-most ear-coverts of the darkest
  birds are pale grey like the crown and ear-coverts
  (thus lacking the prominent loral stripe and eye-
  stripe on the ear-coverts shown by beema) (Alström
  et al., 2003).

• A pale blue-grey band across the nape separates the
  white of the head from the mantle (Whistler, 1916;
  Williamson, 1955), with the colors between the head,
  back, and neck not clearly demarcated. Sometimes
  the nape is pale and yellowish forming an indistinct
  yellowish semicollar that “dilutes” into the back
  (Sushkin, 1925c).

• Back yellowish olive, more yellowish-tinged than in
  flava and beema, homogeneous in color, with no spots;
  rump of the same color of the back or yellowish citrine
  to pyrite yellow (Sushkin, 1925c).

• Borders of wing-coverts broad (about 5 mm), whitish
  to primrose yellow, slightly wider than in flava and
  beema (Sushkin, 1925c; Alström et al., 2003).

• The large inner coverts have wide light margins which
  include the tip of the feathers, often with shaded
  coloration from white to yellowish cream.

• Under side lemon yellow to lemon chrome, with the
  exception of the white throat (Sushkin, 1925c).

• Most individuals show white tibia feathers (but
  this is also shown by some beema) (Alström et al.,
  2003).

In Figs. 10 and 11, skins of males with different
amounts of gray on their head are presented.

Intraspecific hybrid Motacilla flava leucocephala x
Motacilla flava beema

• Light head with grayish shades; wider and noticeable
  whitish eyebrow behind the eye.

• The passage of color from the nape to the back is rather
  definite, less nuanced than leucocephala.

• Back with predominance of greyish-green shades,
  darker than leucocephala and usually with more or
  less marked speckles or mottling.

In Fig. 12, a presumed intraspecific hybrid Motacilla
flava leucocephala x Motacilla flava beema.

First generation intraspecific hybrid Motacilla flava
lutea x Motacilla flava beema

• Light-head with forehead from pale ash to whitish
  shade; hat, lores and ear-coverts from ashy gray to pure
  white (Sotnikov, 2006; Artemieva & Muraviev, 2012a;
  2012b; Redkin, 2013). Individuals with completely
  white heads are very similar to leucocephala, but the
  specimens with gray-shaded heads have gray-blackish
  lores. In leucocephala, the lores are white or pale grey
  like the crown and ear-coverts.
• Back yellowish-gray or greenish-gray, darker than that of *leucocephala*, with more or less marked speckles or mottling. In *leucocephala*, the coloring is homogeneous.

• The rump is often lighter than the back, with more evident yellow-greenish shades compared to *leucocephala*.

• As in *leucocephala*, the larger outer coverts have wide clear margins which include the tip of the feathers, but proceeding inwards the margins gradually decrease until they disappear from the tip of the feathers in the area where they overlap the innermost scapular thus giving the impression of a pale bar that progressively narrows and disappears.

• Yellow tibia feathers, but they can also be white as *leucocephala*.

• Compared with *leucocephala*, it is a smaller bird size (Sotnikov, 2006).

In Fig. 13 and Fig. 14, presumed first-generation intraspecific hybrids *Motacilla flava lutea* x *Motacilla flava beema*.
Fig. 11a - *Motacilla flava* with a pale head in the collection of the Zoological Institute of Russian Academy of Sciences (Saint Petersburg).

*Motacilla flava* con testa pallida nella collezione dell’Istituto Zoologico dell’Accademia russa delle scienze (San Pietroburgo). (Photo / Foto: Alexander Lvovsky).

1) *M. f. leucocephala*, male/maschio, Urungu Lake, Dzungaria, China, 04/01/1879, Przhevalsky.
2) *M. f. leucocephala*, male/maschio, Orog Lake, Mongolia, 05/21/1926, Kozlova.
3) Presumed/Presunto *M. f. lutea x M. f. beema*, male/maschio, Bulukhta Lake, Volgograd Oblast, Russia, 06/12/1843.
4) *M. f. leucocephala*, male/maschio, Orog Lake, Mongolia, 05/19/1926, Kozlova.
5) Presumed/Presunto *M. f. lutea x M. f. beema*, male/maschio, Žańaqala District (West Kazakhstan Region), 04/25/1862, Severtsev.
6) *M. f. beema?*, female/femmina, river Chagan, right-hand side of the river Ural/ fiume Chagan, lato destro del fiume Ural, 07/16/1862, Severtsev.
7) *M. f. leucocephala*, male/maschio, Orog Lake, Mongolia, 05/21/1926, Kozlova.
8) *M. f. leucocephala*, male/maschio, lower river Tsagai-norich-gol, Khara-gobi, 06/27/1914, Sushkin.
9) *M. f. leucocephala*, male/maschio, Orog Lake, Mongolia, 05/11/1926, Kozlova.
Fig. 11b - *Motacilla flava* with a pale head, in ventral and lateral view, in the collection of the Zoological Institute of Russian Academy of Sciences (Saint Petersburg). / *Motacilla flava* con testa pallida, in versione ventrale e laterale, della collezione dell’Istituto Zoologico dell’Accademia russa delle scienze (San Pietroburgo). (Photo / Foto: Alexander Lvovsky). Below detail of specimen no. 1. / Sotto dettaglio dell’esemplare n. 1.
Fig. 12 - Presumed intraspecific hybrid *Motacilla flava leucocephala* x *Motacilla flava beema*, male, Achit Lake, Bayan-Ölgii and Uvs provinces, Mongolia, 15th June 2017. / Presunto ibrido intraspecifico *Motacilla flava leucocephala* x *Motacilla flava beema*, maschio, Ačit Nuur, province di Bajan-Ôlgij e Uvs, Mongolia, 15 giugno 2017. (Photo / Foto: Magnus Hellström).

Fig. 13 - Presumed first-generation intraspecific hybrid *Motacilla flava lutea* x *Motacilla flava beema*, male, Dimitrovgrad, Melekessky District, Ulyanovsk Oblast, 1st-2nd May 2016. / Presunto ibrido intraspecifico di prima generazione *Motacilla flava lutea* x *Motacilla flava beema*, maschio, Dimitrovgrad, distretto di Meleksesskij, Oblast’ di Ul’janovsk, 1-2 maggio 2016. (Photo / Foto: Natalya Neverova).

Fig. 14 - Presumed first-generation intraspecific hybrid *Motacilla flava lutea* x *Motacilla flava beema*, male, Kulikovka, Melekessky District, Ulyanovsk Oblast, 31st May 2016. / Presunto ibrido intraspecifico di prima generazione *Motacilla flava lutea* x *Motacilla flava beema*, maschio, Kulikovka, distretto di Meleksesskij, Oblast’ di Ul’janovsk, 31 maggio 2016. (Photo / Foto: Tatyana Kezhevatova).
Intraspecific hybrid *Motacilla flava flava* x *Motacilla flava flavissima* (channel wagtail)

- Light gray head, often with a paler forehead both on the vertex and on the nape, with white supercilium, usually distinguishable, broad and very flared behind the eye (Dubois, 2001; 2007; Baxter, 2010). Occasionally the head may be completely whitish (Dubois, 2001; 2007).
- Occasionally green-yellow feathers on the crown, supercilium and ear coverts (Dubois, 2001; 2007).
- Lores often very light or absent, but they can also be marked.
- White sub-ocular patch, distinctly extensive in size and solid white, which extends well towards the rear of the ear coverts (Baxter, 2010).
- Compared with *leucocephala*: passage of color from the nape to the back rather definite, darker olive-green plumage of the back, whithish margins of secondary coverts normally smaller, yellow plumage of the legs.

In Fig. 15, a presumed intraspecific hybrid *Motacilla flava flava* x *Motacilla flava flavissima*.

CONCLUSIONS

The *Motacilla flava leucocephala* breeds from the third week of May along the banks of lakes; lakes are low and swampy at times, with a marked change in plant communities as they move away from the water. This means that the vegetation suitable for nesting and feeding the subspecies is normally located in a band less than a kilometer wide around the lakes. The overall surface suitable for reproduction is therefore very limited.

With respect to climate change, in the Mongolian part of the Altai-Sayan Ecoregion the increase in average annual temperature as much as 1.8-2.8 °C in just the first quarter of the 21st century could result in the expansion of the Gobi Desert and melting the glaciers that feed the lakes of the Great Lakes Depression with, in the long term, a possible contraction of their size, as has already happened in other areas of the Mongolian Plateau (Kokorin et al., 2001; Tao et al., 2015). If this trend becomes real, the impact on the *leucocephala* habitat will be significant. Another possible reason for the alteration of the reproductive environment is given by...
excessive cattle grazing near the lakes, which possibly also destroys nests containing eggs and chicks (Gombobaatar et al., 2011) (Fig. 16).

In the past (late 19th-early 20th century) the Motacilla flava leucocephala seemed not to be particularly rare. In fact Prjevalsky (1887), speaking of migration in the northern half of Xinjiang (China) on 15th-27th April 1879, stated: «They kept in small flocks, from five to ten individuals in each, and were frequently seen.», and Kozlova (1933) found it not uncommon in May 1926 at Orog Lake (Mongolia). Migrating flocks were observed also in Pakistan in 1939 and 1940 (Whistler, 1940; Waite, 1962). Still, in the mid-twentieth century as many as 18 specimens were captured in a few days (between 10th and 27th April 1950) in the same location in India (Lakhimpur District, Assam) (University of Michigan Museum of Zoology, 2019). Sushkin (1938) found this bird common during the breeding seasons of 1911 and 1914 at Acht Lake (Mongolia). From 2007 to 2017, instead, at the same lake a maximum of only 3 males were observed (Malmaeus, 2007; Faveys, 2009; Rubythroat Birding Tours, 2013; Valkenburg, 2016; Hellström, 2017), and Oleg Belyalov (in Birds.kz, 2019), despite looking for it, did not find leucocephala in 2009. During the 21st century, only dozens of birds have been reported near the lakes of both the Great Lakes Depression and southern Tuva (up to 75 at Khar-Us Lake, John Allcock on eBird.org, 2019) and, despite the increase in the number of ornithologists and birdwatchers, in the course of migration very small groups are rarely reported (usually individuals appear). Making a serious quantitative comparison between historical records and the current counts is materially impossible, however the feeling transmitted by these data is that there has been a numerical decline in the subspecies.

Considering also the new situation of partial overlap of area with beema (whose overall population is certainly much larger), one can well understand and share the concern expressed by Russian ornithologists for the conservation of the habitat of the leucocephala (Ondar & Shaulo, 2018) and for the danger that this subspecies could be “absorbed” by hybridization by beema (Ilyashenko, 2011).

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Fig. 16 - Western shore of Khar-Us Lake, Khovd province, Mongolia, 23rd July 2012. / Riva occidentale del lago Khar-Us, provincia di Hovd, Mongolia, 23 luglio 2012. (Photo / Foto: Gombobaatar Sundev).
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