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ON BIOLOGY OF HOUBARA BUSTARD (*CHLAMYDOTIS UNDULATA MACQUEENII*) IN BALOCHISTAN, PAKISTAN: A PRELIMINARY STUDY ON MIGRATION

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Abstract: Data on density, previous population levels, presence of occasional and regular flocks and direction of bird movement, collected during early and late winters for different broad localities suggest that Houbara gradually moves through diffused routes into and out of Balochistan (Pakistan), keeping a predominantly north-south direction during autumn and south-north direction during spring. These movements are largely controlled by temperature, but latitude gradient is more important in forcing autumn movements, and spring movements are more influenced by altitudes. Steep rocky hills act as strong barriers, while feeding grounds and human disturbance have little role in controlling such movements. Evidences suggest that bird movements are more controlled by external environmental factors than the internal biological clock of the species. The species depend more on walking for migratory movements, though may resort to different stretches of low flights. Overlapping of breeding and non-breeding ranges of the race suggest that mass scale movement occurring during autumn and spring does not strictly fall under the definition of migration, and can be regarded as population adjustments along its distribution range during summer and winter to fight unfavourable temperatures and associated biotic or abiotic factors.

Key words: Population movements, migratory routes, mode, migratory status, physical factors.

INTRODUCTION

Asian race (*Chlamydotis undulata macqueenii*), unlike other two races of Houbara mainly comprises of a migratory flock of birds. It largely breeds in relatively colder northern latitudes (Central Asia, Afghanistan and northern Iran) during summer and migrates into southern latitudes to winter in southern Iran, Pakistan, India and Gulf States (Ali and Ripley, 1983; Cramp and Simmons, 1980). This mass scale migration is a unique phenomenon in bustards. Though, there has been a general interest of the workers in this fascinating phenomenon, yet information on migratory routes, mode and behaviour remains sketchy. Present study was undertaken with the view that Balochistan, receiving the major chunk of the migratory flock during winter (Mian, 1983, 1984, 1988), can work as suitable tract to provide some basic information on this phenomenon.

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MATERIALS AND METHODS

Physical tours of favourable bustard tracts of Balochistan (Zhob, Punjpai, Chagai, Kharan, Sibi-Kacchi, Khuzdar, Punjgur, Makran, Lasbella) were conducted during early (September) and late (March) winter between 1984 and 1987 and absolute Houbara population density recorded by transect method (Mian, 1997).

Foot tracks of Houbara were searched in different localities for 15-30 minutes by different number of workers to develop relative density indices on previous population levels. Relative density estimates were compared with absolute population density figures as indicator of population movements. Field records were maintained on general orientation of Houbara movements, gathered from direct observations on the birds and/or through tracing foot tracks. These records were suitably organised to evolve a general direction of the bird movement for different areas. Information on general topography, size and orientation of the valleys and nearby mountains, temperature, vegetative state, human settlements and soil was also recorded.

General inferences were drawn from the data on population levels, general direction of the bird movements and indices of previous populations, as seen in the background of the various biotic and abiotic factors. These inferences were resolved to evolve broad patterns on routes and mode of migration. Activity and behaviour were traced through direct field observations on selected birds and/or through following their foot tracks. Information on the dates of arrival of Houbara and relative population levels during different parts of the wintering period in different broad localities was collected through the hunters and prominents of the area. This information was confirmed through the transect data collected on density estimates and used to develop general inferences on migration biology.

RESULTS

A synopsis of information on the status of the wintering population of Houbara, during different calendar months in different broad localities of Balochistan (Fig. 1) suggest that during early winter occasional birds appeared in early August at 31°N (Zhob), late August at 29.5° (Chagai), early September at 28° (Kharan) and 28.5° (Sibi-Kacchi), mid October at 27° (Rakshan) and late November or early December at 25.5° (Makran and Lasbella). A similar pattern was generally followed in early winter appearance of regular flock in different areas located at decreasing latitudes. The appearance of occasional (late November) and regular (late December) wintering flock in Khuzdar (28°N) did not fit into this basic pattern. No regular pattern was followed with regard to altitude gradient.

Late winter disappearance of regular and occasional populations (Fig. 1) did not follow a latitude associated pattern. It obeyed the altitude gradient. The populations disappeared earlier (January-February) in southern lowlands (sea level: Lasbella, Makran) and eastern lowlands (sea level: Sibi and Kacchi). The occasional populations persisted till early/mid April in highland valleys of Kharan (800 m) and Chagai (900 m) and till late April in Rakshan (1,000 m). In northern highlands (1,400 m), late winter

population build up started in mid February and continued till mid March, while some occasional birds persisted even till late April. The population disappeared rather earlier from Khuzdar (900 m, mid February) than demanded by altitude.

Figure 2 presents average density of mid September population at different geographical locations along with general direction of bird movement and orientation of valleys and mountains. A general look at the figures suggests that an appreciable population of Houbara was present in eastern and western Chagai, western and central Kharan, Sibi-Kacchi tract (eastern Balochistan), Pishin and Patao (Zhob). No significant population was present in favourable tracts of eastern and southern Kharan, Khuzdar, Rakshan, Makran and Lasbella.

During September, the birds/foot tracks were frequently spotted in depressions and dried water courses in eastern and western Chagai and western Kharan. Individuals or groups of two/three side by side casually walking birds were frequently observed to maintain almost straight walking lines for a considerable distance with a constant tendency of a consistent southward direction of their movement. In Chagai, population was very scattered in the northern parts (as represented by low densities), yet it gradually concentrated in southern parts. The maximum concentration appeared in south-western parts, where steep and rocky Raskoh range is gradually replaced by undulating sand dunes. Equally high concentrations were also observed in north-western Kharan with a southward population movement. In eastern Balochistan, the bird were evenly scattered in suitable habitats and no uniform pattern of bird movement was followed. In Zhob, foot prints indicated a westward movement, running parallel to the orientation of two mountains bounding rather narrow valley of Patao. Central Kharan exhibited low population densities with a predominantly eastward movement of the birds along the Raskoh Range.

Presentation of late winter densities (Fig. 3) generally suggests a distribution similar to that of early winter. However, comparatively higher populations were present in eastern Kharan, central Chagai, Maslakh and Rakshan valleys, while limited populations were spotted in Sibi-Kacchi, Kapir and Khuzdar. No significant population was recorded from Makran and Lasbella. The orientation of foot tracks and/or birds did not yield a consistent direction of movement in any locality.

Relative density figures evolved for different localities from track search data during early and late winter did not agree with population levels suggested through transect data for the respective area. This was especially true for early winter data regarding northern and central highlands where a higher previous population was always indicated. Reports carried by shepherds, nomads and/or hunters could also not be confirmed by the transect data.

Activity of Houbara traced through direct observations and/or through following the foot prints during September survey, suggested that the bird frequently moves towards *Anabasis* sp., *Ziziphus* sp., *Gaillonia aucheri* and other plant species, which bore fleshy shoots, fruits and/or leaves.

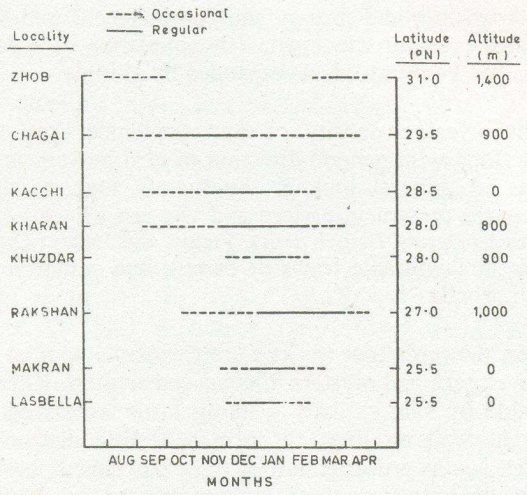

Fig. 1: **Periods of presence of regular/occasional populations of Houbara in different broad localities of Balochistan with relevant information on altitude and latitude.**

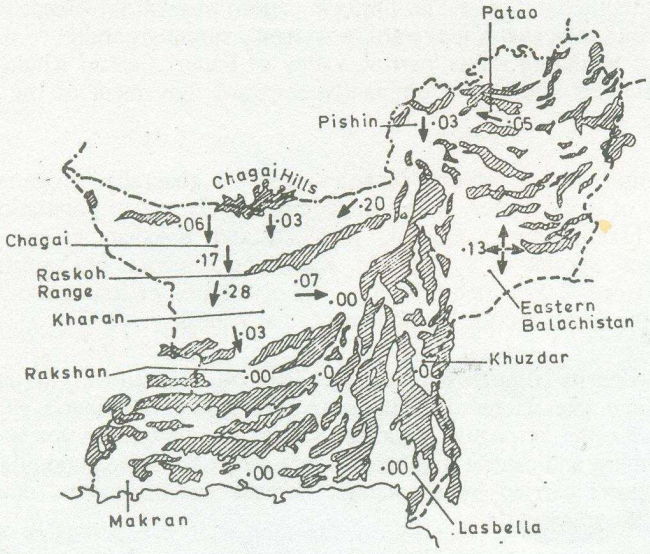

Fig. 2: **Line sketch of Balochistan showing population density of early wintering Houbara at different locations. Arrows represent direction of more frequently met flock of birds.**

DISCUSSION

Conventional and more reliable methods, like, ringing, banding or colour marking, usually employed in studies on bird migration, are rather difficult and of limited value when employed for Houbara. This is because of a wide distribution, cursorial mode, limited population and camouflaging plumage in this bird species, all making its casual detection as difficult. No safe practical trapping technique, generally required for such studies, is available in this species (Taylor, 1985, 1985a). Further, exploitation of such techniques for Houbara also demands an international co-operation, involving a battery of careful field workers scattered widely along its distribution range (Central Asian States, Afghanistan, Pakistan, India, Iran). Technique involving radio tracking of selected birds is expensive and requires wider network of trained researchers. Satellite tracking is also expensive and can only be exploited on a few birds hence is of a limited value. Under these circumstances, unconventional methods, like, exploiting population levels, period of stay, direction of the moving birds and behavioural studies used in conjunction with physico-biotic conditions can be the best possible alternative. This can give an entering wedge into studies on migration biology with limited financial implications.

Part of the year exploited for present studies on immigrating (September) and emigrating (March) flock can be justified. Available records on Houbara (Iran: Scott, 1975; Mansoori, 1974, 1985; Razdan and Mansoori, 1989; Cholistan: Mirza, 1985; Sindh: Surahio, 1981; Balochistan: Mian and Surahio, 1983; Mian, 1984, 1988) suggest that though some sporadic birds can be seen during August-September, yet the major part of the flock appears in different wintering grounds during October-November. These reports also suggest that though the bird populations appreciably decrease in different wintering grounds by February, yet the evacuation is not complete till March. Results of our studies on population fluctuations (Mian, 1997a) also suggest presence of appreciable populations of Houbara in different tracts between October-November and February-March.

Routes

Depending upon our results, tentative routes adopted by autumn migrating flock have been proposed (Fig. 4). Almost same routes appear to be adopted by back migrating flock during spring with slight adjustments under the available physico-biotic conditions. These migratory routes generally agree with those suggested previously (Mian, 1984, 1988), based upon information gathered from local hunters/populace through questionnaires.

Our results suggest that the species adopt a general north-south orientation during spring migration with slight variation forced under location of barriers to Houbara movement. This indicates that the flock of Houbara enters Balochistan from/through Afghanistan. These findings go in a good degree of conformity with reports on Pakistan (Roberts, 1985) and Iran (Mansoori, 1974, 1985; Scott, 1975; Razdan and Mansoori, 1989). The movement of the populations from Iran into Balochistan, as suggested by some reports (Anonymous, 1972; Karim and Hasan, 1983), could not be confirmed.

Very diffused migratory routes adopted by Houbara, as suggested by the present results, have been reported previously (Mian and Surahio, 1983; Mian, 1984, 1988, Goriup, 1983). At places, however, the migrating flocks pass through narrow valleys where migratory routes appear to be slightly defined. Migratory flock has to pass through rather defined routes in western Chagai, Zhob, Punjpai and Rakshan. Well-defined migratory routes suggested for this species (Roberts and Savage, 1971; Anonymous, 1972; Karim and Hasan, 1983) can only be attributed to limitations of previous observations to more accessible parts of the Province.

Adoption of diffused migratory routes can save species from probable hunting losses (Mian, 1989). The major part of the population of this race funnels through the western flanks of Chagai. The species, in the recent years, have started meeting a heavy hunting pressure both in early (Chagai) and late (Kharan) winters through the hands of falconers in this migratory funnel zone (Mian, unreported data).

Movements

Present results suggest that Houbara keeps a slow and gradual penetrance towards southern latitudes during autumn and towards northern ones during spring. Such a movement continues in the major parts of Balochistan and for the major parts of the wintering season, stable populations appearing between December and January. The stable populations with little direction oriented movements appear for an extended period (early September to mid February) in central lowlands (Sibi-Kacchi), located at an almost sea level. On the basis of the presently available results the migratory movements appear to be influenced by:

i. Steep rocky hills

Absence of Houbara in central and eastern Kharan and presence of appreciable populations in adjacent parts of Chagai during September suggest that east-west oriented range (Raskoh) of steep mountains act as a physical barrier to direct southward population movements. A similar explanation can be afforded for population build up in Kharan and late appearance of populations in central and eastern Chagai during March. Variation in the direction of autumn migrating flock in Zhob, Punjpai, eastern Chagai and central Kharan can also be explained on identical logic. The steep mountains with rocky background are believed to constitute and unfavourable habitat for Houbara (Ali and Ripley, 1983; Cramp and Simmons, 1980; Mian and Surahio, 1983; Mian, 1984, 1988).

ii. Latitude temperature complex

Late arrival of autumn migrants in southern latitudes seems fairly explained on physical distance of these tracts from summering grounds. Such a pattern has been indirectly indicated by suggesting the appearance of autumn migrants in early September in northern (Cholistan, Mirza, 1985) and in mid October in southern (central Sindh, Surahio, 1981) latitudes. The latitude (distance) logic does not conveniently explain pattern of population build up in Khuzdar, where probably other physico-biotic factors control late arrival of the bird flock.

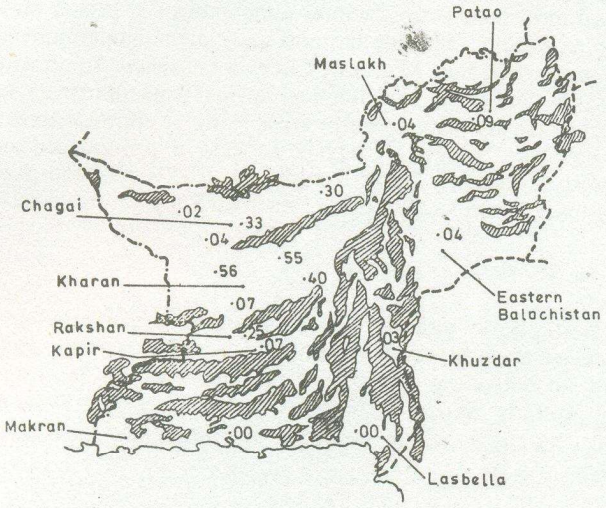

Fig. 3: **Line sketch of Balochistan showing population density of late wintering Houbara at different locations.**

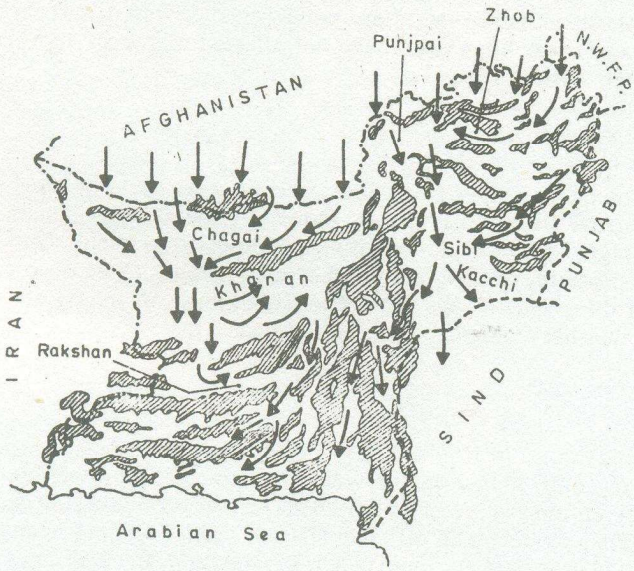

Fig. 4: **Line sketch of Balochistan showing proposed migratory routes adopted by autumn migrating flock of Houbara. The hatched areas represent approximate location of the mountains.**

An almost complete absence of bird population, for the major part of winter in northern highlands and during mid winter in Chagai suggest the influence of temperature in forcing southward movements. Low winter temperatures at higher altitude (>900 m) may cause autumn migration. Altitude-latitude associated temperature gradient, in the western flanks (Kharan, Rakshan, Makran), forces a consistent southward movement of the flock. Early disappearance of bird flock in spring from the tracts located at lower altitudes (Sibi-Kacchi) and its persistence in areas lying at almost similar latitude but at higher altitudes (Rakshan, Kharan, Chagai) suggest a pronounced effect of rising temperature on spring migration. Gradual withdrawal of population during late winter under increasing altitude appears explainable under such logic.

iii. Feeding grounds

General observations on migratory flock suggesting that Houbara grazes during migratory movements may indicate significance of feeding grounds in such movements. Our results provide no indication of a special preference of autumn migrating flock for favourable feeding grounds. Spring movements, however, appear to be more influenced by feeding grounds, as suggested by build up of populations in areas having suitable feeding conditions.

iv. Disturbance

Human disturbances can potentially influence migratory movements in this wary species. However, such disturbances can though affect local movements, yet are not sufficiently potent to influence migratory movements. Severe disturbances coming from falconers in Chagai, year after year, have not affected migratory movements through a gateway located in western Chagai.

v. Biological clock

Influence of internal biological clock in controlling time of onset of migration is hard to be separated from other factors. However, there are evidences to suggest that appearance of migrating flock in a specific area varies considerably between the years in response to temperature, rainfall and vegetative condition. These observations suggest a greater control of external physico-biotic conditions on migratory movements as compared with internal biological clock of the species/race.

Mode

Migratory activities in Houbara have been generally visualised believing that flight is adopted for reaching summering or wintering grounds. However, no report suggests sighting of flock on long migratory flight. This has resulted in a considerable confusion. Different workers have recorded different sizes of migrating flock, part of day exploited for migration and approximate dates when a migratory flock reaches or leaves some area. Size of migrating flock appearing in literature (Mian and Surahio, 1983; Mian, 1984, 1988; Alekseev, 1980) merely indicates number of birds seen together. Difficulties have frequently been encountered to offer valid explanation for certain observations on biology of the species, like mother embarking upon migratory

movements with very young chicks, still unable to take longer flight (Mian, 1985); the possibility of this basically cursorial bird getting exhausted during longer stretches of flight (Siddiqi, 1972) and strictly avoiding steep and rocky mountains even during migration (Mian, 1984, 1988).

Alternative hypothesis may suggest that this species mainly depends upon walking for its migratory movements. Observations on persistent walking lines and very frequent appearance of foot tracks in southern parts of western Chagai appearing to pass over the undulating sand dunes (preferred habitat), located towards the western extremity of the steep rocky Raskoh Range (not preferred as habitat) may provide some direct support to the hypothesis. This hypothesis can conveniently explain the following aspects of Houbara biology:

a) There are persistent reports from both summering (Alekseev, 1980) and wintering (Mian and Surahio, 1983, Mian, 1984, 1988; Mirza, 1985) grounds suggesting that Houbara during its migration stops for some days in different areas to exploit the available food. The bird is believed to stop every 1-3 km for grazing (Mian and Surahio, 1983). b). The species is basically cursorial. It can efficiently take short flights; but is not adapted for longer flights (Roberts and Savage, 1971). There is a possibility of this bird getting exhausted during longer flights (Siddiqi, 1972) required for bird migration. c). There is a gradual build up of populations in both summering and wintering grounds, slowly penetrating into deeper parts. The present study suggests that though population starts appearing in northern latitudes in August, yet occasional birds do not appear before early November in extreme southern latitudes (taking three months to reach a crow flight distance of about 500-600 km). Similarly occasional birds appear in southern parts of Central Asia in March, while these are not common in valleys of the Altai Mountains till late April or early May (Cramp and Simmons, 1980). d). Difficulties have been consistently faced in recording the time of initiation of migration. Ponomareva (1979) and Alekseev (1980) suggest that migration from summering grounds (Kyzylkum) starts in early August and lasts till November. Similar inconsistency is present in different reports suggesting the dates of initiation of spring migration from the wintering grounds (Mirza, 1985; Mian, 1984, 1988). The inconsistency appearing in such data can be attributed to the difficulties faced in recording the initiation of migratory movements when bird adopts walking for such movements. Flying flocks/birds can be easily recorded even by a casual observer and hence a consistency is expected in the reported dates of initiation of the migratory activity.

Our present hypothesis suggests that the species basically rely upon the cursorial mode to move between summering and wintering grounds. This does not exclude the possibility of occasional short or slightly longer low flights (suggested by limited data on satellite tracking. Launay, 1996, NARC, Abu Dhubai, personal communication) in response to some immediate demands. Such flights constitute a regular part of general habit of this species. The presently available information suggests that the bird keeps on moving casually, picking food but maintains a consistent orientation during migratory movements. The species has been reported to show extensive movements even during its regular foraging (Cramp and Simmons, 1980). Comparatively long legs with upright body posture suit this habit. Such a migratory behaviour is not expected to cause

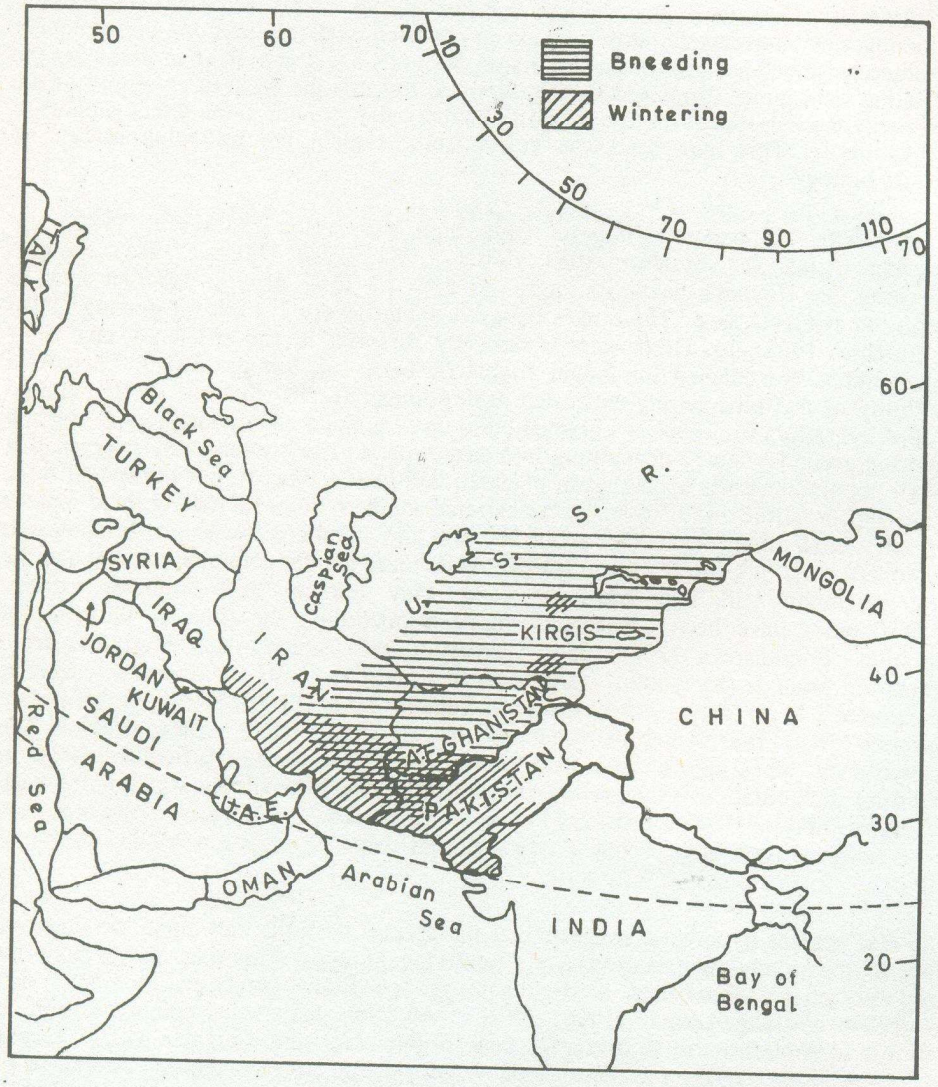

Fig. 5: **Distribution ranges of breeding and non-breeding populations of the Asian race of Houbara.**

physiological stress on the bird and can save the species from the excessive migratory losses.

Migratory status

Migration is defined as a periodic round trip of a population of a species/race between spatially isolated breeding and non-breeding grounds (Baker, 1978; Orr, 1970). Migratory movements in Houbara partially fit this definition, i.e., moving during regular seasons from northern to southern latitudes and vice versa, vacating some areas during summer and others during winter. However, available information on summering and wintering ranges suggests that breeding and non-breeding tracts of this species/race are overlapping (Fig.5) Under such conditions mass scale movements in this bird species occurring during autumn and spring does not fall under strict definition of migratory movements.

It appears that the Asian race of Houbara has a distribution range running from the Altati Mountains, through central Asia, Afghanistan, Iran, Iraq, Gulf States, Arabian States, Jordan, Israel, Pakistan, to parts of India. Population of this race is absent from parts of central Asia, Afghanistan and northern Iran, during winter and from southern and eastern parts of Balochistan, P[illegible]ab, Sindh and India during summer. Buffer areas exist where the populations persist [illegible]roughout the year. This race appears to have a wider distribution range during breeding season (summer) as demanded under biological requirements. Birds concentrate in a comparatively narrow distribution range during non-breeding season (winter) in response to availability of favourable temperature and feeding grounds. Thus, such movements can be regarded as population adjustments in an attempt to extract optimal benefits out of available physico-biotic variation, rather than as strict migration. Such a status equips the species/race to harvest the biotic benefits of migratory behaviour (finding optimal survival conditions under seasonal odds, saving over-exploitation of restricted tracts) as also saves it from the migratory stresses.

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