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2007

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Conservation value of the shifting sand dune complex and lagoons in the Samur Divichi Lowlands (Northern Azerbaijan)

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Keywords:
Azerbaijan, Caspian Sea, conservation, Important Bird Area, lagoons, shifting sand dunes

Abstract

The Samur-Divichi Lowlands at the Caspian Sea coast in Northern Azerbaijan encompass the largest continuous complex of actively shifting sand dunes and lagoons (approximately 10,000 ha) of the country. Although listed as an Important Bird Area (IBA) it does not underlie any further protection. The site is especially important for the autumn migration of waterbirds, more than 70,000-80,000 pass each year, with about 5,000 wildfowl wintering (*Anas platyrhynchos*, *A. clypeata*, *A. crecca*, *A. querquedula*, *A. strepera*, *Aythya fuligula*, *Netta rufina*), and up to 5,000 *Fulica atra* (Bird Life International 2007). Along the coast of the prospering country recently lots of settlements have been constructed for recreation on less polluted and calm locations. The dunes might be also influenced by construction projects in the near future. Until now regard was only paid to the lagoons as a resting site for migratory birds. To strengthen the needs for protection, we studied the dunes with its floristic features, vegetation patterns and current land use. Six physiognomic landscape units with its accompanying vegetation communities arranged perpendicular to the beach were found. Vegetation is made up of 50 plant species – among them endangered psammophyts. Shallow lagoons with *Phragmites* and *Juncus* reeds are situated close to the sandy beach. They are connected by a narrow stripe of *Elaeagnus* scrubs to the first bare dune ridge with single *Agriophyllum arenarium*. Steep dune slopes are covered by *Rubus* sp. coppice. The valleys between the two main ridges show an undulating relief with *Artemisia arenaria* on hummocks and *Erianthus ravennae* on wet sites. Large inner lagoons with changing water levels, the so called '*Limans*', extend southwest wards of the ridges. Their open waters are surrounded by *Phragmites* reeds, approx. 1 km wide. Dune regulation activities and disturbances by every kind of buildings and road construction should be prohibited to protect these near-natural sites. To warrant secure migration for thousands of birds, some of them worldwide threatened e.g. the detected Sociable Plover (*Chettusia gregaria*), restrictions on hunting are urgently needed.

Schlüsselwörter:
Aserbaidschan, Important Bird Area, Kaspisches Meer, Lagunen, Wanderdünen

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Zusammenfassung

Das Samur-Divichi Tiefland and der Küste des Kaspischen Meeres im Norden Aserbaidschans beherbergt den mit ca. 10000 Hektar größten unzerschnittenen Komplex aus Dünen und Lagunen des Landes. Das Gebiet ist international als Important Bird Area (IBA) anerkannt, unterliegt aber keinem nationalen Schutz. Momentan werden entlang der Küste Aserbaidschans Feriendomizile an gering verschmutzten und ruhigen Stränden errichtet. Auch eine Beeinträchtigung des untersuchten Gebietes ist zu befürchten. Bisher standen die Lagunen lediglich als Rastgebiete für Zugvögel im Blickpunkt des Naturschutzes. Um jedoch die Notwendigkeit eines besseren Schutzes zu untermauern, untersuchten wir die Dünenkomplexe in Hinblick auf ihre Flora und Vegetationsmuster sowie der aktuellen Landnutzung. Wir fanden sechs physiognomisch unterscheidbare Landschaftseinheiten mit ihren begleitenden Vegetationstypen, die sich parallel zur Küste erstrecken. 50 Pflanzenarten wurden erfasst, darunter einige gefährdete Psammophyten. Flache Lagunen mit *Phragmites* und *Juncus* Rieden schließen sich an den Sandstrand an. Ein schmaler Streifen aus Ölweidengebüschen verbindet sie mit dem ersten von zwei offenen Dünenzügen, auf denen einzelne Exemplare von *Agriophyllum arenarium* wachsen. Die steilen westgewandten Dünenhänge werden von dichtem Gebüsch aus *Rubus* spec. überzogen. In den Dünentälern wächst *Artemisia arenaria* auf kleinen Hügeln und dazwischen *Erianthus ravennae* auf feuchteren Standorten. Südwestlich der Dünen liegen die landseitigen Lagunen, welche als *Limane* bezeichnet werden. Ihre offenen Wasserflächen werden von bis zu ein Kilometer breiten Schilfgürteln gesäumt. Um diesen naturnahen Dünenkomplex zu erhalten, müssen Regulierungsmaßnahmen und das Errichten von Bauwerken jeglicher Art untersagt werden. Die Jagd muss eingeschränkt werden, um den Durchzug tausender Zugvögel, unter ihnen weltweit gefährdete Arten wie der beobachtete Steppenkiebitz (*Gregaria chettusia*), zu gewährleisten.

1 Introduction

Sand dominated landscapes are rare features of the Caucasian lowlands and mainly restricted to the Caspian coast. Well preserved sandy beaches and dunes are conserved in the Shirvan and Absheron National parks, while in other parts of Azerbaijan large portions were displaced by settlements and industrial areas like Sumgait or Baku. Settlements for recreation are constructed along the coast on non protected sites today. Thus, it is to fear, that rare dune complexes will disappear. The largest continuous complex of shifting sand dunes of Azerbaijan is located in the Samur-Divichi lowlands on approx. 10,000 ha. Vegetation composition of sandy habitats is sketched by PRILIPKO (1970), who divides psammophytic vegetation on ridges and swamp vegetation between them.

The investigated area is listed as an Important Bird Area and belongs to a network of wetlands along the Caspian Coast. Together with the Absheron-Gobustan coastal stretch, the Kizil-Agach plain and the Lenkoran lowlands it provides resting sites for birds in the Caspian migration corridor (CASPIAN ENVIRONMENTAL PROGRAMME 2007). For further protection of the dunes and lagoons in the Samur-Divichi lowlands we investigated the following objectives in the course of the 'Pre-feasibility studies for NATURA 2000' in Azerbaijan realised by the Michael Succow-Foundation, Germany and financially supported by the MAVA Foundation, Switzerland:

(1) Description of relief patterns with its accompanied vegetation,

(2) Inventory of vascular plant species and birds and

(3) Analysis of threats and derivation of management recommendations for a proper protection.

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2 Study site

Located in northern Azerbaijan, the investigated dunes and lagoons of the Samur-Divichi lowlands (49°05' E; 41°19'N; -27 m a.s.l.) are embedded in a flat plain between the coast and foothills of the Greater Caucasus Mountains. The Caspian Sea in the east, swamps and arable land in the west border this landscape. Irrigation channels delimitate the researched area in the northwest and southeast, (fig.2). The studied area belongs in large parts to the same climatic region like Baku (cf. GOSKOMGEODESIYA 1993). Hence, climate data given here refers to Baku climate station, as regional data is not available (MÜHR 2005). The investigated area is characterised by a semi-arid climate, the winters are cool and wet, while the period between March to September is warm and dry (fig.1). Mean annual precipitation in the lowlands amounts less then 300 mm, the mean annual temperatures amounts approximately 15°C. The coastal plain surrounding the area is made up of fine sediments; Gleysols and Solontschaks predominate (MAMEDALIEV 1963). Sandy soils and dune ridges are limited to a 2 km wide stripe along the coast. The plain is covered by salinized fallows and meadows with *Cynodon dactylon* and *Iris spuria* (GROSSHEIM, 1948; PRILIPKO, 1970). Groundwater and the river Divichichai feed the meadows and *Limans*. Their drainage is influenced by transgressions of the Caspian Sea and manipulated by ditches and channels. Shallow water areas next to the sandy beach create a different lagoon type, which is presumably irregular flooded by the sea.

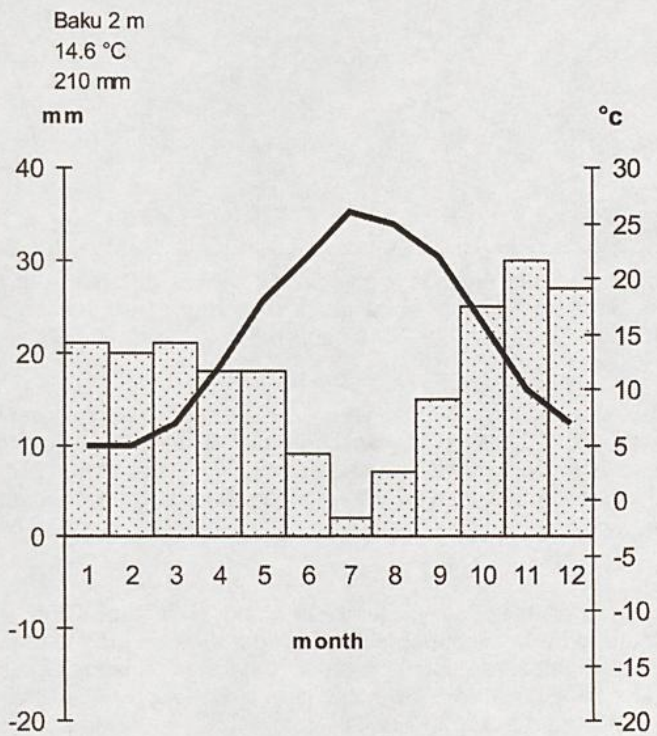

Fig. 1 Climate Table from Baku (MÜHR, 2005).

Abb. 1 Klimadiagramm von Baku (MÜHR, 2005).

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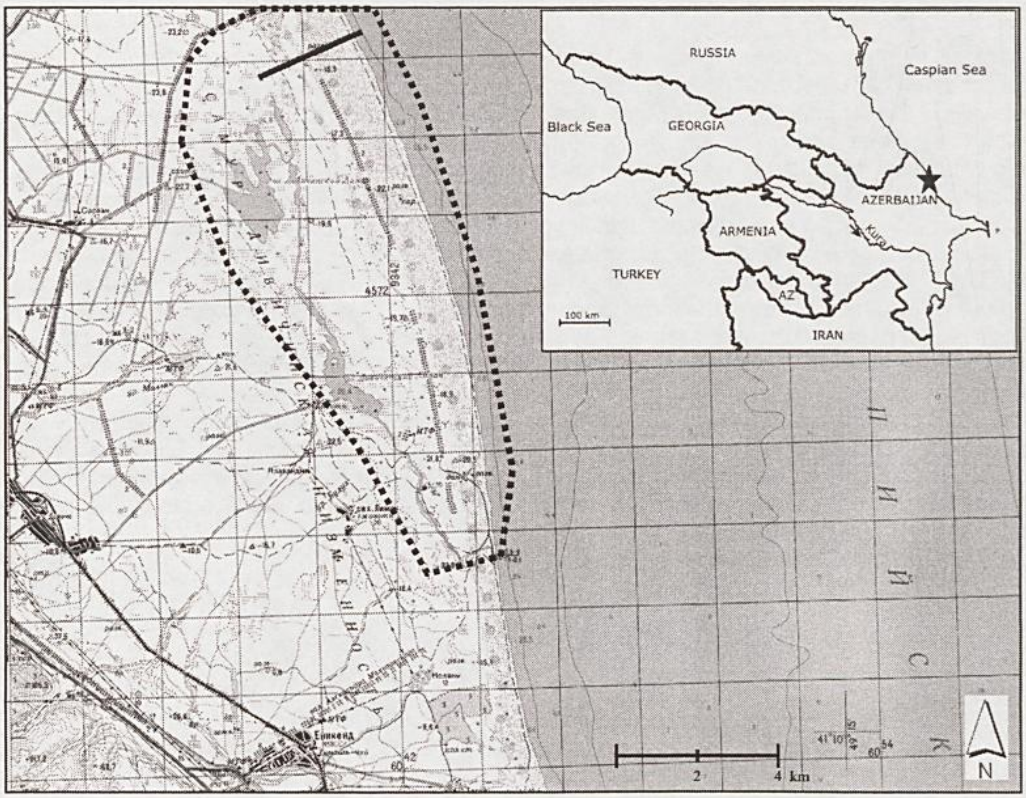

Fig. 2 Map of the dunes and lagoons in the Samur-Divichi lowlands with the investigated area (dotted line) and location of the cross section (full line). *(based on topographical maps 1:100000 Skworzov 1978)*. Inset: Transcaucasian Republics and location of the study site.

Abb. 2 Karte der Dünen und Lagunen der Samur-Divichi Niederung mit dem Untersuchungsgebiet (gepunktete Linie) und der Lage des Transsekts (durchgehende Linie). *(Kartengrundlage topographische Karte 1:100000 Skworzov 1978)*. Kleine Karte: Transkaukasische Republiken mit der Lage des Untersuchungsgebietes.

3 Methods

The dune complex was investigated in September and November 2006. To describe the vegetation, we established a transect perpendicular from the coast to the inner lagoon. Along them we determined vegetations types, recorded the clearly marked extension of those, studied changes in soil texture and estimated the elevations of the dunes. We used a landscape ecological cross section (Billwitz et al. 1997) to visualise the physiognomic landscape units and their accompanying vegetation. The Flora Aserbaidshana (Karjagin, 1950-61) and the Exkursionsflora von Deutschland (Rothmaler et al. 2002) were used to determine the plant species. The nomenclature follows IPNI (2004). To acquire data on migratory birds, we observed birds using binoculars and a telescope. The birds' nomenclature follows Svensson et al. (1999).

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4 Results

4.1 Relief patterns

The dune complex (approx. 12 km long) consists of single segments disposed parallel to the beach (fig.3). A flat wall divides the sandy beach from the beach lagoon with its shallow waters above clayey ground. The lagoon is 300-400 m wide and its depth decreases towards the dunes, where the natural sequence is interrupted by a 3 m high dike of gravel. The dike itself is partly buried by the dunes. Two, up to 10 m high dune ridges compose the core of the complex. Due to active sand transport steep slopes developed at the lee sides. The relief of the dune valleys is undulating with sandy hummocks of up to 1 m height. The area of the inner lagoon or '*Liman*' varies between 1600 and 7000 ha (PATRIKEEV 2004) depending on water supply.

4.2 Flora

In the study area 50 species of vascular plants were detected (Annex 1). Among the four wood species encountered *Tamarix ramosissima, Populus alba* (agg) and *Elaeagnus caspica* are indigenous species, while *Pinus brutia* is planted. Typical lianas occurring in salt influenced woodlands are *Cynanchum acutum*, *Asparagus verticillatus* and *Clematis orientalis*. The herbaceous plants we found can be subdivided into three groups: (1) Psammophytic species, e.g. *Artemisia arenaria*, *Agriophyllum arenarium, Convolvulus persicus* and *Tournefortia sibirca* are restricted to the coastal zone. (2) Halophytic species are *Salicornia europaea, Suaeda salsa* and *Petrosimonia brachiata* – the last even grows on salt crusted soils. (3) Salt resistant helophytic species (*Juncus acutus, Samolus valerandi, Scirpoides holoschoenus*) predominate in wetlands.

4.3 Vegetation

a) Beach lagoon with *Phragmites* reed

Only little parts of this swamp show open water conditions, most of the area is covered by dense reed with predominating *Phragmites australis*. Also *Typha angustifolia, Alisma lanceolata* and typical species of salt influenced reeds such as *Samolus valerandi* and *Schoenoplectus littoralis* grow in these brackish water of max. 40 cm depth.

b) Beach lagoon with *Juncus* reed

Phragmites australis stands are displaced by *Juncus* reeds on sites with water levels near the soil surface. Hummocks of *Juncus maritimus* and *J. acutus* change with lawns composed of annual salt tolerant herbs like *Salicornia europaea, Suaeda salsa* and *Centaureum pulchellum* or perennials like *Calamagrostis epigejos, Lactuca tatarica* and *Inula britannica*.

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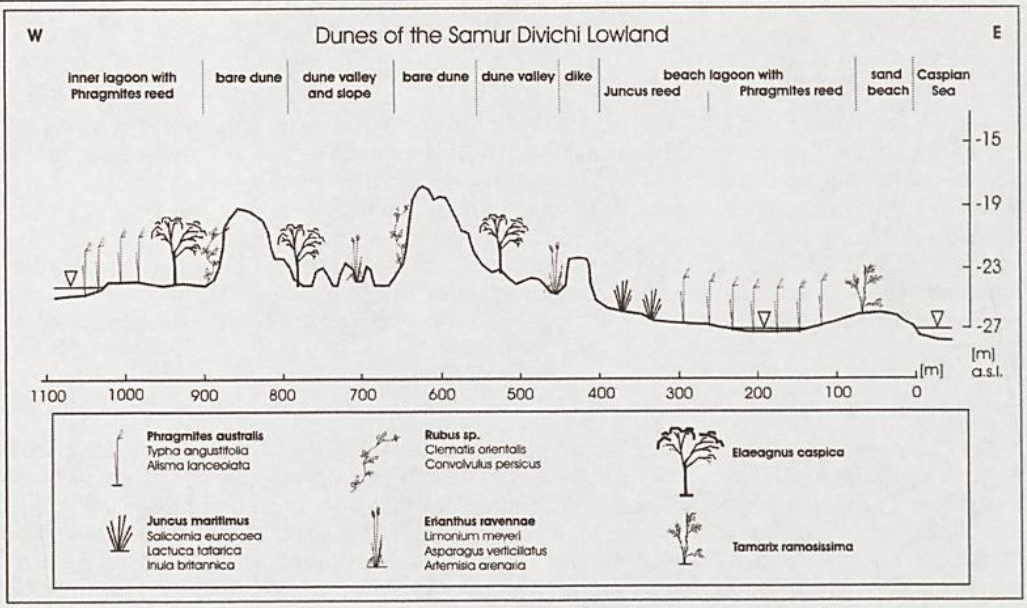

Fig. 3 Cross section of the dune complex with physiognomic landscape units and predominating plant species.

Abb. 3 Transsekt durch den Dünenkomplex mit physiognomischen Landschaftseinheiten und den vorherrschenden Pflanzenarten.

c) Dune valleys

Huge perennial grasses, shrubs and semi shrubs are typical plant species between the dunes. *Erianthus ravennae* is the dominant grass with its up to 3 m high stems. Other abundant species are *Limonium meyeri, Asparagus verticillatus* and *Glycyrrhiza glabra*. Important species e.g. *Senecio erucifolius, Cephalaria transsylvanica* and *Odontites vulgaris* do occur. The formative tree of this complex is *Eleagnus caspica*, some stands of *Pinus brutia* were planted in the dune valleys.

d) Bare dunes and slopes (fig.4)

Only single individuals of special adapted plant species survive on the active shifting dunes like some typical Caspian psammophyts e.g. *Artemisia arenaria, Agriophyllum arenarium, Melilotus caspica* and the endangered *Convolvulus persicus* (OGAR 2001). The steep slopes are covered by a coppice of *Rubus* sp., *Salsola tragus* and *Clematis orientalis* benefiting from infiltrated water.

e) Inner Lagoon

Around the so called *Divichi Liman* large *Phragmites* reeds extend and only little parts of this lagoon consist of open water. The dense and up to 4 m high reeds reflect the same species composition as the beach lagoon with *Typha latifolia, Schoenoplectus littoralis* and *Samolus valerandi*.

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Fig. 4 Bare shifting sand dunes (Pic.: Jan Peper, Sept. 2006).

Abb. 4 Offene Wanderdünen (Foto: Jan Peper, Sept. 2006).

4.5 Birds

During the survey 73 bird species were recorded, four of them are listed on the IUCN Red List (2007): Species of category 'Near Threatened' is the Little Bustard (*Tetrax tetrax*) (1 record). The observed Greater Spotted Eagle (*Aquila clanga*) and Lesser Kestrel (*Falco naumanni*) are species of category 'Vulnerable' and the Sociable Lapwing (*Vanellus gregarius*) (11 records) is 'Critically Endangered'. Three species further observed are listed in the Azerbaijan Red Book: White-tailed Eagle (*Haliaeetus albicilla*) (2 records), Steppe Eagle (*Aquila nipalensis*) (1 record) and several of the resident Purple Gallinules (*Porphyrio porphyrio*). Along the beach among others, Whimbrels (*Numenius phaeopus*), Green Sandpipers (*Tringa ochropus*) and Great Black-headed Gulls (*Larus ichthyaetus*) were detected. Kingfisher (*Alcedo atthis*), Moustached Warbler (*Acrocephalus melanopogon),* Lapwings (*Vanellus vanellus*), pipits (e.g. *Anthus pratensis*) and larks (e.g. *Alauda arvensis*) were recorded on the salt lawns at the beach lagoon. On the latter ca. 4500 Coots, about 200 Red-crested Pochards (*Netta rufina*) between other ducks and 13 Great White Egrets (*Egretta alba*) were observed. On surrounding grasslands with its small ponds 53 Greylag Geese (*Anser anser*), 52 Ruddy Shelducks (*Tadorna ferruginea*) and 30 Common Shelducks (*Tadorna tadorna*) were found. Grey Herons (*Ardea cinerea*) and Cormorants (*Phalacrocorax carbo*) breed on groups of White Poplar trees (*Populus alba* agg.).

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5 Discussion

5.1 Bird area

Summarising own data and literature review, among sheer numbers of waterfowl and other migrating species up to now seven Red List species could be recorded for the surveyed area. Additional to our observations PATRIKEEV (2004) mentions Dalmatian Pelicans (*Pelecanus crispu*, IUCN status 'Vulnerable') and many duck species on migration (e.g. Marbled Duck (*Marmaronetta angustirostris*), White-headed Duck (*Oxyura leucocephala*), status 'Vulnerable' and 'Endangered', respectively) the Ferruginous Duck (*Aythya nyroca,* status 'Near Threatened'). Ferruginous Duck was found breeding in several pairs on the *Liman*. Mentioned by Shelton (2000), the wetland is highly valuable as a bottleneck-stop-over site for numerous bird species due to narrowing lowland areas, encompassed by the Caspian Sea and the Greater Caucasus massif. Therefore, the *Divichi Liman* has to be regarded as an important part of the network of wetlands- along the migration corridor of the west Caspian coast. However, the listing as IBA does not automatically imply any protection status yet (PATRIKEEV & WILSON 2000).

5.2 Current utilisation and threats

The main threat for wildlife arises from very intensive hunting. The official period of hunting, stated by the Azerbaijani Hunting Society, last from September 15th to March 15th. Amateur hunting of waterfowl and shorebirds is widespread in all Caspian neighbouring states; mainly aimed on meat and plumage. The *Divichi* wetlands have a certain tradition as a popular hunting destination, as they were already in the late 19th to early 20th century managed as a private hunting reserve of the Russian Royal Family. From the 1930s on commercial centralized wildfowl harvesting began here as in other wetland regions of Azerbaijan. Only at this site, up to 150,000 waterfowl were shot per year in the 1930s to 40s, about 225,000 shots per year in the 1960s or 51,630 Coots plus 720 ducks and geese shot within 28 days in the early 1980s. These numbers illustrate elaborately the extent of officially sanctioned hunting. Beside disturbance of migratory birds at their resting sites and the collateral killing of endangered species, the deposition of lead accumulating in the food chain (up to 100 kg lead pellets per hunter and month!) might be the biggest long-term threat. (CASPIAN ENVIRONMENTAL PROGRAMME 2007, PATRIKEEV 2004, PATRIKEEV et al. 2000, SHELTON 2000). The excessive number of more than 100 shots per hour was witnessed in November 2006.

Grazing is only in parts a threat to the landscape complex described. Intensive grazing occurs next to little settlements at the *Liman* on well water supplied pasture land. On the contrary, only little numbers of cattle were found grazing within the shifting dunes, not able to degrade the vegetation in a serious way. PRILIPKO (1970) mentioned an extensive pasturing as the traditional land utilisation of sandy areas along the coast. Approximately 30 years ago, a dike was constructed parallel to the coast and several pine plantations were founded. The dike is partially buried by the dunes, while the pine stands are in a good condition but not able to stop the dune shift. In Soviet times, adjacent fish nurseries and nutria farms affected the lagoon by artificial changes of the water regime. Today, economic meaningful forms of land use in the area are inshore fishing and hunting. Especially on the seaside and next to the *Liman* several huts of fishermen and hunters are spread into the landscape but do not affect the dune system complex.

5.3 Aims of Conservation

The described coastal habitat has no national or international protection status yet although it reflects the great diversity of wetlands of international importance in the Capian region. 50 years ago the area of onshore water bodies amount 80,000 ha. Today, it has reduced to

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22,000 ha (CASPIAN ENVIRONMENTAL PROGRAMME 2007) The Samur Devichi Lowlands, the Absheron-Gobustan coastal stretch (including shoals, lakes and water reservoirs, most of them polluted by oil and waste) and the Kura delta are considered as the most important wetlands of Azerbaijan by the CASPIAN ENVIRONMENTAL PROGRAMME (2007). Samur Divichi Lowlands, as part of the wetland chain along the west Caspian migration corridor it is of vital international concern. Together with the dunes of Sarykum, Dagestanski Zapovednik, Russia, these unique habitats are singular in the broader region. Further aims of conservation should consider the peculiarity of a shifting dune complex for Azerbaijan and the west Caspian coast. Up to now no boundaries, no protection regimes or land use programmes exist for this unique landscape. To preserve these habitats, questions on their status, boundaries and management have to be cleared on a national level (CASPIAN ENVIRONMENTAL PROGRAMME 2007). The unique well preserved dune complex of the Samur-Divichi lowlands should accomplish the following tasks in the network of conservation areas in the country:

The preservation of

(1) the only active shifting dunes in connection with natural lagoons in Azerbaijan,

(2) habitats for rare species (e.g. psammophileous plants) and

(3) stop over site for migratory birds of international importance.

To execute these tasks it is advisable to conserve the area as nature reserve. Trials to stop dune shifting or the construction of summer houses should be prohibited. Although it is an ambitious target, hunting has to be stopped concerning thousands of killed birds per year.

6 Conclusions

A complex of beach lagoon, active shifting dunes with steep slopes and valleys as well as large extended wetlands on the landside remained in the Samur-Divichi lowlands. On the one hand they are an important habitat for rare psammophytic plant species in Azerbaijan, on the other hand they are of international importance providing resting sites for migratory birds at a bottleneck of the migration corridor between Caspian Sea and the Greater Caucasus range. Little efforts have to be done to protect the dunes in their current state. A challenge for the nature conservation in Azerbaijan is the essential prohibition of hunting. We recommend the establishment of a nature reserve containing the dunes and surrounding wetlands.

References

BILLWITZ, K., HENDL, M. & LIEDTKE, H. (1997): Allgemeine Geoökologie. – In: Lehrbuch der Allgemeinen Physischen Geographie. 635-720; Gotha (Justus Perthes Verlag).

BIRD LIFE INTERANATIONAL (2006). www.birdlife.org/datazone/sites/index.html?action=SitHTMDetails.asp&sid=158&m=0 (accessed 12/03/2007)

CASPIAN ENVIRONMENTAL PROGRAMME (2007): Regional action plan for protection of Caspian habitats. http://enrin.grida.no/caspian/additional_info/habitat.pdf (accessed 16/01/2007)

GOSKOMGEODESIYA (1993): Agroklimaticheskii Atlas Aserbaischanskoi Respubliki (Agroclimatological Atlas of the Republic of Azerbaijan). Gosudarstvennyy Komitet Azerbaydschanskoy Pespubliki po Geodesii i Kartografii. Baku.

GROSSHEIM, A.A. (1948): Rastitelny Pokrov Kavkasa (Vegetation of the Caucasus). Moskau (MOIP Publ.).

IPNI (2004): Interanational Plant Name Index. www.ipni.org

IUCN (2007): IUCN Red List of Threatened Species. www.redlist.org (accessed 12/02/2007)

KARJAGIN, I.I. (1950-61): Flora Aserbaidschana (Flora of Azerbaijan Volume I-VIII). Baku (Isdatelstvo Akademii Nauk Aserbaidschanskoi SSR.)

MAMEDALIEV, JU.G. (1963): Atlas Aserbaidschanskoi SSR (Atlas of the Azerbaijan SSR). Baku - Moskau: (Gosudarstvnnogo Geologitscheskovo Komiteta SSSR).

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MÜHR, B. (2005): Klimadiagramme weltweit. www.klimadiagramme.de.(accessed 16/01/2007)

OGAR, N. (2001): Costal plants. – In: Caspian Environment Programme (CEP). http://enrin.grida.no/caspian/additional_info/habitat.pdf (accessed 16/01/2007)

PATRIKEEV, M.P. & WILSON, M. (2000): Azerbaijan. – In: HEATH, M.F. & EVANS, M.I. (2000): Important Bird Areas in Europe: Priority sites for conservation. Vol. 2. Cambridge, (BirdLife Conservation Series No. 8).

PATRIKEEV, M. P. (2004): The Birds of Azerbaijan. Sofia-Moscow (Pensoft).

PRILIPKO, L.I. (1970): Rastitelny Pokrov Aserbaidschana (Vegetation of Azerbaijan). Baku (Elm).

SHELTON, N. (2001): Where to watch birds in Azerbaijan. Baku (Halal Print).

SKWORZOV, G.A. (1978): Topographical map 1:100 000 K-39-99 Saisan. (General staff of the Sowjet military).

SVENSSON, L., Grant, P.J., Mullarney, K. & Zetterström, D. (1999): Der neue Kosmos-Vogelführer. Stuttgart (Kosmos).

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Annex 1 Detected plant species and occurrence in the landscape units.

Annex 1 Auftreten der erfassten Pflanzenarten in den einzelnen Landschaftseinheiten.

	landscape units				
plant species	Lagoons with Phragmites reed	Lagoons with Juncus reed	dune valley	bare dune	dune slopes
Agriophyllum arenarium				x	
Alhagi pseudalhagi		x		x	
Alisma lanceolata	x	x			
Artemisia annua			x		
Artemisia arenaria			x	x	x
Artemisia scoparia					x
Asparagus officinalis			x		
Asparagus verticillatus			x		
Suaeda salsa		x			
Bromus tectorum			x	x	
Calamagrotis epigejos		x	x		
Carex distans		x			
Centaurea arenaria			x		
Centaurium pulchellum	x	x			
Cephalaria transsylvanica			x		
Chondrilla juncea			x		
Clematis orientalis		x	x		x
Convolvulus persicus			x	x	
Cuscuta sp.			x		
Cynanchum acutum		x			
Cyperus flavescens	x				
Daucus carota			x	x	
Elaeagnus caspica		x	x		x
Erianthus ravennae			x		x
Glycyrrhiza glabra			x		x
Inula britannica		x	x		
Juncus acutus	x				
Juncus maritimus	x	x	x		
Lactuca tatarica	x	x			
Limonium meyeri		x	x		
Lotus tenuis		x			
Medicago caucasica			x	x	
Melilotus caspica			x	x	
Odontites vulgaris			x		
Petrosimonia brachiata		x			
Phragmites australis	x	x	x		
Pinus brutia			x		
Plantago lanceolata			x		
Populus alba (agg.)			x		
Puccinellia distans		x			
Rubus sp.					x
Salicornia europaea		x			
Salsola tragus					x
Samolus valerandi	x				
Schoenoplectus litoralis	x				
Scirpoides holoschoenus			x		
Senecio erucifolius			x		
Silene subconica			x		
Tamarix ramosissima		x	x		
Typha angustifolia	x				

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Annex 2 Observed bird species. Note that incomplete counts, especially due to hardly possible access of the Liman.

Annex 2 Beobachtete Vogelarten. Zu beachten ist die unvollständige Erfassung, vor allem wegen der erschwerten Zugangsmöglichkeiten zu den Limanen.

№	Species (English)	Species (Scientific)	Comments
	* = Near Threatened **= Vulnerable *** =Critically Endangered		[1] = observed 15.09.06 [2] = observed 18.11.06 Known or assumed (literature see above) status: breeding (B), winter guest (W), migration (M); min = minimum number counted
1	Little Grebe	*Tachybaptus ruficollis*	[2] min 11 on beach lagoons; B, W, M
2	Great Crested Grebe	*Podiceps cristatus*	[2] min 2 on beach lagoons; B, W, M
3	Great Cormorant	*Phalacrocorax carbo*	[1; 2] min 1500 migrating south, 5 hunting on beach lagoons; W, M
4	Pygmy Cormorant	*Phalacrocorax pygmeus*	[1; 2] min 240 flying to night roost; W, M
5	Grey Heron	*Ardea cinerea*	[1; 2] min 5; W, M
6	Great Egret	*Casmerodius albus*	[1; 2] min 28; B, W, M
7	Little Egret	*Egretta garzetta*	[2] B, W, M
8	Mute Swan	*Cygnus olor*	[2] min 12; W, M
9	Greylag Goose	*Anser anser*	[2] min 53; W, M
10	Ruddy Shelduck	*Tadorna ferruginea*	[2] min 52; W, M
11	Common Shelduck	*Tadorna tadorna*	[2] min 30; W, M
12	Eurasian Wigeon	*Anas penelope*	[2] min 10; W, M
13	Eurasian Teal	*Anas crecca*	[2] min 45; W, M
14	Mallard	*Anas platyrhynchos*	[1; 2] min 120; W, M
15	Northern Pintail	*Anas acuta*	[2] min 2; W, M
16	Northern Shoveler	*Anas clypeata*	[2] min 10; W, M
17	Red-crested Pochard	*Netta rufina*	[2] min 200; W, M
18	Common Pochard	*Aythya ferina*	[2] min 200; W, M
19	Common Merganser	*Mergus merganser*	[2] 3; W, M
20	White-tailed Eagle	*Haliaeetus albicilla*	[2] 2; W, M
21	Western Marsh-Harrier	*Circus aeruginosus*	[1; 2] min 15; B, (W?), M
22	Northern Harrier	*Circus cyaneus*	[2] min 4; W, M
23	Goshawk	*Accipiter gentilis*	[2] min 3; (W?), M
24	Eurasian Sparrowhawk	*Accipiter nisus*	[2] min 5; (W?), M
25	Long-legged Buzzard	*Buteo rufinus*	[1; 2] 1; W, M
26	Greater Spotted Eagle	*Aquila clanga* **	[2] 2; W, M
27	Steppe Eagle	*Aquila nipalensis*	[1] 1; M
28	Lesser Kestrel	*Falco naumanni***	[1] and nearby colonies recorded between May and August; B, M

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29	Eurasian Kestrel	*Falco tinnunculus*	[2] min 4; (B?), W, M
30	Merlin	*Falco columbarius*	[2] 3; W, M
31	Eurasian Hobby	*Falco subbuteo*	[1] 1; (B?), M
32	Common Quail	*Coturnix coturnix*	[2] 1; (W?), M
33	Purple Swamphen	*Porphyrio porphyrio*	[2] seen only 1, supposed to be common; B, W, (M?)
34	Common Moorhen	*Gallinula chloropus*	[2] seen only 10, supposed to be common B, W, M
35	Eurasian Coot	*Fulica atra*	[1; 2] min 4150 only on beach lagoons; B, W, M
36	Little Bustard	*Tetrax tetrax**	[2] 1; M
37	Northern Lapwing	*Vanellus vanellus*	[1] 40; [2] min 110; (B, W?), M
38	Sociable Lapwing	*Vanellus gregarius***	[1] 11; M
39	Grey Plover	*Pluvialis squatarola*	[2] 4; M
40	Common Snipe	*Gallinago gallinago*	[2] min 24; W, M
41	Whimbrel	*Numenius phaeopus*	[1] 1; M
42	Green Sandpiper	*Tringa ochropus*	[1] 4; (W?), M
43	Dunlin	*Calidris alpina*	[2] 20; W, M
44	Ruff	*Philomachus pugnax*	[1] 50-60; M
45	Caspian Gull	*Larus cachinnans*	[1; 2] W, M
46	Great Black-headed Gull	*Larus ichthyaetus*	[2] min 4; W, M
47	Common Tern	*Sterna hirundo*	[1] min 5; B, M
48	Rock Pigeon	*Columba livia*	[1; 2] common feeding on fields
49	Common Cuckoo	*Cuculus canorus*	[1] min 1; (B?), M
50	Little Owl	*Athene noctua*	[2]1; B, W
51	Short-eared Owl	*Asio flammeus*	[2] 1; (W?), M
52	Common Kingfisher	*Alcedo atthis*	[1; 2] common; B, W, M
53	European Bee-eater	*Merops apiaster*	[1] 50; B nearby recorded in spring and summer, M
54	Hoopoe	*Upupa epops*	[1] B, M
55	Calandra Lark	*Melanocorypha calandra*	[1; 2] flocks on fields; (B?), W, M
56	Crested Lark	*Galerida cristata*	[1; 2] B, W, (M?)
57	Sky Lark	*Alauda arvensis*	[2] W, M
58	Bank Swallow	*Riparia riparia*	[1] (B?), M
59	Barn Swallow	*Hirundo rustica*	[1] B, M
60	Common House-Martin	*Delichon urbica*	[1] B, M
61	White Wagtail	*Motacilla alba*	[1; 2] B, W, M
62	Yellow Wagtail	*Motacilla flava*	[1] (B, W?), M
63	Meadow Pipit	*Anthus pratensis*	[2] W, M
64	Water Pipit	*Anthus spinoletta*	[2] W, M
65	Goldcrest	*Regulus regulus*	[2] W, M
66	Winter Wren	*Troglodytes troglodytes*	[2] W, M

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67	Fieldfare	*Turdus pilaris*	[2] W, M
68	European Robin	*Erithacus rubecula*	[2] (B?), W, M
69	Whinchat	*Saxicola rubetra*	[1] M
70	Northern Wheatear	*Oenanthe oenanthe*	[1] M
71	Moustached Warbler	*Acrocephalus melanopogon*	[1] 3; B, (W?), M
72	Eurasian Reed-Warbler	*Acrocephalus scirpaceus*	[1] B, M
73	Common Chiffchaff	*Phylloscopus collybita*	[2] (W?), M
74	Great Tit	*Parus major*	[2] (B?), W, M
75	Lesser Grey Shrike	*Lanius minor*	[2] nests in colonies in dune shrubs; B, M
76	Eurasian Magpie	*Pica pica*	[1; 2] B, W
77	Eurasian Jackdaw	*Corvus monedula*	[2] mixed flocks of min 2000 with № 78; W, M
78	Rook	*Corvus frugilegus*	[2] mixed flocks of min 2000 with № 77; W, M
79	Carrion Crow	*Corvus corone*	[1; 2] B, W, (M?)
80	European Starling	*Sturnus vulgaris*	[1; 2] (B, W?), M
81	Spanish Sparrow	*Passer hispaniolensis*	[1; 2] B, (W?), M
82	Chaffinch	*Fringilla coelebs*	[2] (W?), M
83	Eurasian Linnet	*Carduelis cannabina*	[2] W, M
84	Reed Bunting	*Emberiza schoeniclus*	[1; 2] (B?), W, M
85	Yellowhammer	*Emberiza citrinella*	[2] W, M
86	Corn Bunting	*Emberiza calandra*	[1; 2] (B?), W, M

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Digitale Literatur/Digital Literature

Zeitschrift/Journal: Archiv für Naturschutz und Landschaftsforschung

Jahr/Year: 2007

Band/Volume: 46_2

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Artikel/Article: Michael Succow Foundation for Protection of Nature c/o Institute of Botany und Landscape Ecology , Greifswald University , 79-92