Wetlands and wintering waterbirds in Libya, January 2005 and 2006

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Abstract

Systematic surveys of mainly coastal wetlands in Libya were carried out for the first time in January 2005 and 2006, to identify sites of major importance for waterbirds in winter. In 2005, nearly 30,000 waterbirds were found, and in 2006 over 52,000, with large numbers of gulls recorded in both years. The surveys showed that Libyan wetlands are used by a range of species, notably the near-threatened Mediterranean endemic Audouin's Gull *Larus audouinii*, several other gull species, wildfowl and waders. Eurasian Cranes *Grus grus* were found well into the desert. Overall, Libyan wetlands are internationally important for waterbirds of Mediterranean lagoon ecosystems, including Greater Flamingo *Phoenicopterus roseus*, Kentish Plover *Charadrius alexandrinus* and Slender-billed Gull *Larus genei*. They also provide different types of typical Mediterranean wetland habitat. A number of species rarely recorded were observed, including birds new to Libya, but the Critically Endangered Slender-billed Curlew *Numenius tenuirostris* was not found. Waterbirds previously considered to winter exclusively south of the Sahara, such as Purple Heron *Ardea purpurea*, Squacco Heron *Ardeola ralloides* and Little Bittern *Ixobrychus minutus* were also observed. Sightings of colour-ringed birds indicated that waterbirds wintering in Libya had migrated there from eastern, northern and western Eurasia.

Key words: Libya, wetlands, waterbirds, winter, Mediterranean lagoons.

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In contrast to Morocco, Algeria and Tunisia to the west, and Egypt's Nile Delta and Valley to the east, Libya, with its relatively dry climate, is perceived as having comparatively few wetlands and waterbirds. It is also, ornithologically, the least known country of Mediterranean Africa. In a preliminary description of the birds of Libya, Bundy (1976) presents little information from the region east of the Gulf of Sirt. More recently, Wetlands International (2002a) notes that Libya has never contributed to the International Waterbird Census (IWC), and that the only data available are from a small number of expeditions. There are few recent papers on Libyan ornithology in general, or on waterbirds in particular. Of these, Meininger *et al.* (1994) deal mainly with the important nesting colonies of Lesser Crested Tern *Sterna bengalensis* (almost 100% of the Mediterranean population breeds in Libya), Massa (1999) reports some new species for Libya, and Brehme *et al.* (2002a,b,c) refer mainly to older observations. Defos du Rau *et al.* (2003) describe the birds recorded during a short survey of some coastal areas in April 2001. A recent paper by Gaskell (2005) provides valuable new information on the status and distribution of some Libyan birds in 2004 and 2005.

There has been increasing interest in Libyan wetlands over the last 10 years. In 1995 the UNEP Mediterranean Action Plan (MAP), which brings together 21 countries round the Mediterranean, including Libya, within the framework of the Barcelona Convention ("Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean"), adopted a 'Protocol concerning Specially Protected Areas (SPA) and Biological Diversity in the Mediterranean'. Annex II of the Protocol includes a 'List of Endangered or Threatened Species', including 15 waterbirds, for which a Bird Action Plan has been developed (UNEP MAP RAC/SPA 2003). Moreover, in 2000 Libya became a Contracting Party to the Ramsar Convention, designating two wetlands in the Jebel Akhdar area northeast of Benghazi. In 2005 Libya joined the African-Eurasian Waterbird Agreement (AEWA), an agreement under the Convention on Migratory Species (CMS). In January 2005, the Environment General Authority (EGA), the official Libyan body responsible for the implementation of international agreements relating to biodiversity, co-sponsored the first ornithological survey of wetlands in Libya, under a Memorandum of Agreement with the RAC/SPA and AEWA, and with support from Wetlands International, the Instituto Nazionale per la Fauna Selvetica (INFS) (Italy) and the Office National de la Chasse et de la Faune Sauvage (ONCFS) (France).

The survey was carried out by the authors of the present paper. The general aim was to fill some of the gaps in knowledge of wintering waterbirds in Libya, and more specifically: 1) to search for Slender-billed Curlew, a Critically Endangered species that winters on shallow brackish coastal pools, marshes and ponds in the region (Ledant & Lafontaine 1994; Wetlands International 2002b), 2) to investigate the status in Libya of the other 14 species in the RAC/SPA Bird Action Plan, 3) to carry out the first comprehensive midwinter waterbird census in Libya, and 4) to identify wetlands of major importance for wintering waterbirds.

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Wetlands of international importance were defined in accordance with the numerical criteria of the Ramsar Convention (i.e. those regularly supporting 20,000 or more waterbirds, or those regularly supporting at least 1% of the individuals in a population of one species or subspecies of waterbird, the current 1% thresholds being listed in Wetlands International 2002b). Additionally, the more qualitative criterion for determining sites of international importance under the Ramsar Convention, that "a wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region" was taken into account.

A repeat survey was carried out in January 2006. The present paper provides a summary of the findings of the two surveys, concentrating on the third and fourth aims of the project. A much more detailed account of the 2005 survey is available on the EGA and RAC/SPA websites (Azafzaf *et al.* 2005a); a similar detailed account for 2006 is in preparation. A report on cormorants *Phalacrocorax* spp. has already been published (Azafzaf *et al.* 2005b).

Methods

From 3 to 17 January 2005, as many wetlands as possible were surveyed along the Libyan coastline, from the border with Tunisia in the west to the border with Egypt, a distance of some 1,500 km (Fig. 1). The survey was performed by eight ornithologists. In view of the vast area to be covered, the group often split into smaller teams, covering different wetlands or different sectors of some large wetlands; counts were made at all times of the day, using binoculars and telescopes, and care was taken to eliminate possibilities of double counting. In all, 65 sites were covered. Water levels in the coastal wetlands generally were lower than average, although there was heavy rainfall during the survey in both the Tripoli and Benghazi areas. From 20 to 30 January 2006, a second survey of coastal wetlands was organised by EGA, with the same participants, joined by three additional Libyan ornithological trainees. The 2006 survey covered 57 sites (including all of the most important sites covered in 2005), with a further four inland dams near Tripoli covered by Libyan members of the team on 5 January. In winter 2005/06, rainfall was much heavier in areas near the border with Tunisia and some sites, notably Sebkhet Boukamesh, which had been dry in January 2005, were flooded and holding waterbirds in January 2006. In other areas round the Gulf of Sirt and east of Benghazi the rainfall (and hence water levels in the wetlands) was not appreciably different from that in January 2005, except that the important site of Temimi was much drier in 2006. Some inland sites were covered, among them four dams including the Wadi Zaret Dam inland of Tripoli (Fig. 1). The oasis of Jaghbub, 250 km south of Tobruk was covered in 2005 but not 2006. Sebkhet el Hammam, near Houn, 300 km inland from the Gulf of Sirt, was covered in 2006 only. The major inland oases of the south, such as Kufa, Sebha and Ghadames, were not visited.

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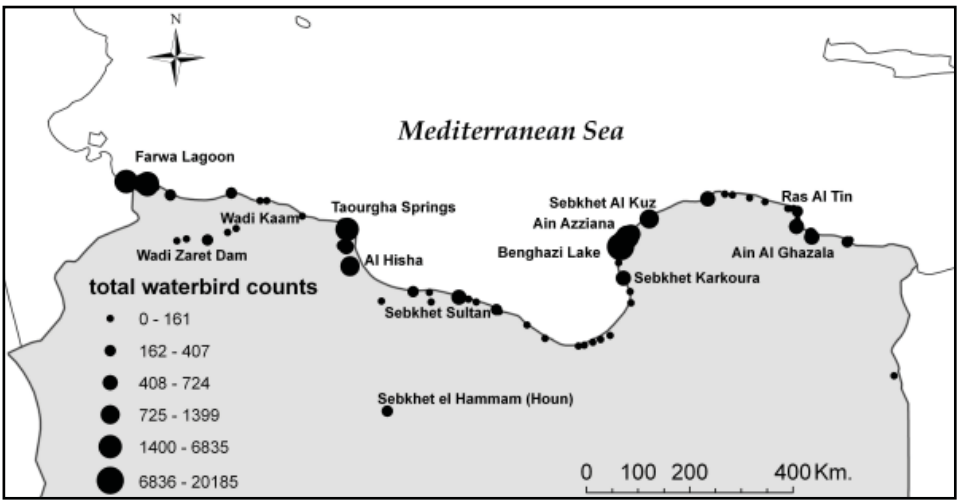

Figure 1. Location of wetlands surveyed in Libya in 2005 and 2006.

Results

Wetlands of major importance in Libya

The Mediterranean is largely a sea without tides; in only two areas, the northern Adriatic around Venice and the Gulf of Gabes in southern Tunisia, is there any appreciable tidal movement. In southern Tunisia the 2-m tidal range provides extensive mudflats used by large numbers of waders and fish-eating birds (Isenmann *et al.* 2005), and these extend a short way into western Libya, notably at Farwa Lagoon, the most important tidal wetland in Libya. Farwa Lagoon (called 'Pisida' by Bundy (1976); Fig. 2a), is a shallow bay sheltered from the open sea by a sandspit nearly 13 km long, but with a 3-km wide opening to the sea. The whole bay holds rich beds of the seagrasses *Posidonia oceanica* and *Cymodocea nodosa* and other marine plants; the lagoon is a major fishing area, largely devoid of buildings. In summer it is a nesting site for Redshank *Tringa totanus*, Little Tern *Sterna albifrons* and Caspian Tern *S. caspia*, the latter rarely recorded as a breeding species in the Mediterranean (Etayeb 2002). A total of nearly 2,500 waterbirds, comprising 31 species, was observed at the site in January 2005. In January 2006 the total was just over 2,500 birds of 27 species. Species observed included Black-necked Grebe *Podiceps nigricollis*, Great Cormorant *Phalacrocorax carbo*, Spoonbill *Platalea leucorodia*, a variety of waders (including over 100 Eurasian Curlews *Numenius arquata*) and many gulls and terns.

Inland from Tripoli, in the foothills of the Jebel Nafusa, are a number of recently constructed, generally small, freshwater dams, which held small numbers of surface-feeding ducks (c. 200 in both years). The largest numbers and range of species occurred at Wadi Zaret Dam.

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In the Tripoli coastal belt, the principal wetlands are the wadi mouths between Tripoli and Misratah. Three of these wetlands, Wadi Ramal, Wadi Maseed (or Mashid) and Wadi Turghat, are included in the Garabulli National Park, established in 1992, but the largest, Wadi Kaam, further to the east, is not included. Most of these wetlands are spring-fed, and break though sand dunes stabilised with exotic plant species such as *Eucalyptus* and *Acacia* before reaching the sea. Near the sea, the water is often shallow and fresh, with reeds along the edges. About 100 waterbirds were recorded at each of these sites; species present included several Ferruginous Ducks *Aythya nyroca*, in 2005 and 2006, and Audouin's Gull *Larus audouinii*, both classed as Near Threatened at global level (IUCN 2006), while Audouin's Gull is one of the 15 species in the RAC/SPA Bird Action Plan.

From Misratah to Sirt, and on past Ajdabiyah, the Gulf of Sirt forms a deep inlet in the North African coast, with low coastal dunes and, behind them, vast salt lakes, where water levels vary enormously according to annual rainfall. Just south of Misratah is an enormous complex of such lakes, about 100 km long and extending up to 20 km inland. The area covers some 250,000 ha, making the 'Taourgha complex' one of the largest wetlands in the Mediterranean. The Taourgha complex is divided into several different sectors: Sebkhet Qasr Ahmed, Sebkhet Taourgha, Sebkhet Om al Adham and Sebkhet Al Hisha, and counts were recorded for each of these sectors. At Taourgha and Al Hisha which both have long histories of human habitation, there are ancient springs and the fresh water collects in small marshes (Hamza 2004). At Taourgha Spring, 284 waterbirds of 29 species were noted in 2005 and some 407 waterbirds of 33 species in 2006. At Al Hisha springs (part of the Al Hisha Nature Reserve, established in 1992), 856 individuals of 28 species were seen in 2005 and 1,009 birds of 24 species in 2006. Both sites had unexpectedly large groups of wintering Eurasian Crane *Grus grus* (over 100 at each site in 2005, and roosts at both sites in 2006 when 308 were seen at Al Hisha), nesting White Stork *Ciconia ciconia*, wintering Squacco Heron *Ardeola ralloides* and Purple Heron *Ardea purpurea* in both years, and a variety of ducks and waders. The figures for Taourgha and Al Hisha include birds on the salt lakes themselves, but they are a considerable underestimate because of the huge size of the wetlands and the difficulty in accessing them. Conditions on and around the salt lakes looked suitable for Slender-billed Curlew *Numenius tenuirostris*, but none was found in either year. In 2006 many gulls were found sheltering from a storm at sea on Sebkhet Qasr Ahmed, including 500 Audouin's Gulls and 5,000 Slender-billed Gulls *L. genei*, much the largest concentrations recorded for both species in 2006.

The Taourgha complex is not the only area of salt lakes in the Gulf of Sirt; such lakes are found all along the coast (notably Sebkhet Sultan), with untouched beaches to the seaward side. The marine area is reported to have extensive beds of seagrass. Just south of Benghazi is Sebkhet Karkoura, a salt pan still used for salt extraction, where 675 waterbirds were noted in 2005. These included 18 Eurasian Cranes, just over 300 waders and 270 Audouin's Gulls, the largest

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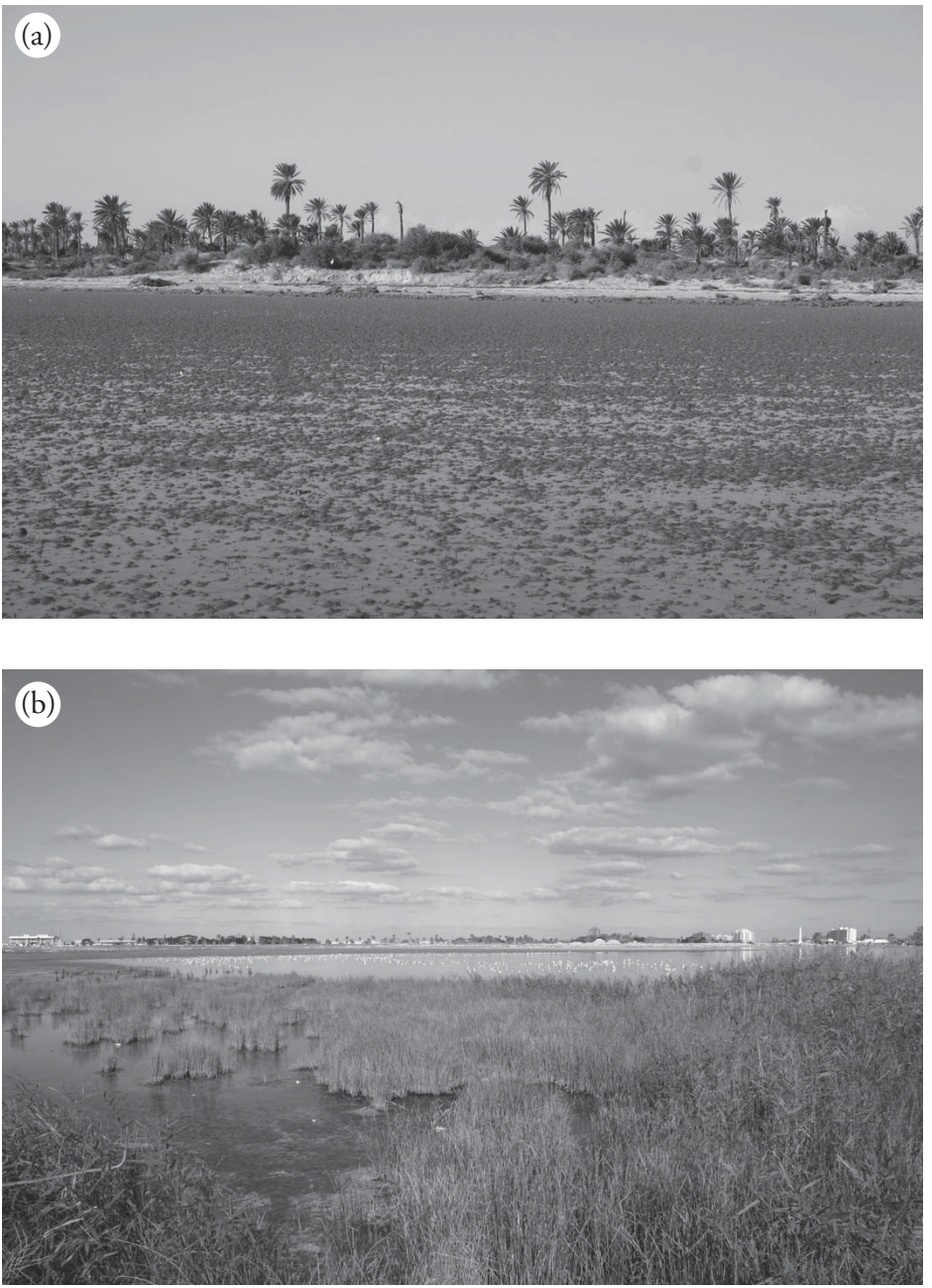

Figure 2. Wetland habitat at: (a) Farwa Lagoon and (b) Benghazi Lake.

group seen in Libya in 2005. Numbers of all species were lower here in 2006. North of Karkoura, coastal areas are composed mainly of agricultural areas and stony, partially and temporarily flooded pastures interspersed with occasional small lagoons and dunes. This vast area seemed highly favourable for Slender-billed Curlew, but none was found. Further north is Sebkhet Ganfouda, once a salt lake and now used as the main waste disposal area for Benghazi, which held over 12,000 gulls in 2005 and 20,000 gulls in 2006.

The original site of the city of Benghazi was chosen for its commercial and strategic position: a coastal harbour, with a ring of salt lakes linked to the sea surrounding and protecting it on the landward side (Fig. 2b). Today this ring of *sebkhets* (Sebkhet Al Thama, Sebkhet Esselawi and Benghazi Lake and Harbours) is under heavy pressure from urbanisation. It also appears to receive some waste water and is hence highly eutrophic, with extensive reedbeds. However, the complex as a whole holds some of the highest concentrations and variety of waterbirds recorded anywhere in Libya to date. A total of nearly 5,000 waterbirds of 41 species (including 500 gulls) was seen in 2005, and nearly 7,000 waterbirds of 47 species (including nearly 4,000 gulls) in 2006, including grebes, herons, spoonbills, ducks, waders, gulls and terns.

Just north of Benghazi are two more major *sebkhets*, Ain Azziana (which also includes a lagoon fed by a freshwater spring) and Al Kuz, both of which attract Greater Flamingo *Phoenicopterus roseus* and waders. A total of 450 waterbirds was recorded at the former in 2005 and 960 in 2006, with 1,155 at the latter in 2005 and 1,399 in 2006.

Further northeast of Benghazi, the two current Libyan Ramsar sites of Sebkhet Ain Azzarga and Sebkhet Ain Ashagiga are situated in the Kouf National Park. Both are coastal salt lakes in the limestone country of the Jebel Akhdar. Much of the coastline between Benghazi and Derna is rocky, but between Derna and Tobruk there is another inlet, the Gulf of Bumba, where the coastal salt lakes of Sebkhet Temimi and Ain al Ghazala are close to one another and support intensive fisheries. A total of over 500 birds, including cormorants, waders and gulls, was observed at Temimi in both years, while numbers at Ghazala were over 300 in 2005 and 600 in 2006, mainly grebes and cormorants, plus some waders, gulls and terns.

The only oasis visited in 2005 was Jaghbub and its nearby salt lakes, where the waterbirds recorded were 13 Great Cormorants, one Grey Heron, one Redshank and two Moorhens *Gallinula chloropus*. In 2006, a visit was also made to the Houn area, 300 km south of Sirt, where a series of agricultural projects, fed by artesian water, create streams and depressions providing suitable conditions for waterbirds. A total of 352 waterbirds was observed, with 10 herons (including two more Purple Herons), over 200 ducks (mainly Teal and Shoveler with five more Ferruginous Ducks), and, surprisingly in the desert, a further 113 Eurasian Cranes.

Numbers of wintering waterbirds

Details of the waterbirds counted in Libya in January 2005 and 2006 are provided

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in Appendix 1, with emphasis on new information obtained since the surveys by Bundy (1976) and Gaskell (2005). Overall, a total of 29,996 waterbirds was recorded at all sites in 2005, nearly 20,000 of them gulls, including 14,000 Black-headed Gulls. In 2006, the waterbird total was 52,012 including nearly 35,000 gulls, over 21,500 of which were Black-headed Gulls. The comments below summarise observations of particular interest within taxonomic groups.

Ardeidae – Herons

Small numbers of Ardeidae that normally winter south of the Sahara were found: Little Bittern *Ixobrychus minutus* (probably overlooked in 2005) at three sites in 2006; Squacco Heron at Taourgha Spring in both 2005 and 2006; and Purple Heron at Taourgha in 2005 and 2006 and at four other sites in 2006. Cattle Egret *Bubulcus ibis*, previously regarded as a scarce and irregular passage visitor, is clearly now wintering in larger numbers (Appendix 1). Numbers of Great Egret *Egretta alba* have also increased in recent years; one bird seen in Benghazi in 2006, which had been colour-ringed as a nestling at Lac de Grand-Lieu, northwest France, in May 2005, was the first African recovery from this ringing site.

Ciconiidae and Threskiornithidae – Storks, Spoonbills and Ibises

For White Stork, Bundy (1976) notes the species only as a possible casual breeder, but Gaskell (2005) records 20 nesting pairs at Al Marj in February 2005. In the Jeffara plain west of Tripoli, White Stork nests were seen in 2005, probably built the previous year, while at Taourgha birds were already occupying nests in palm trees on 6 January 2005. Birds were again present at Taourgha, although no occupied nests were seen, in January 2006. Four colour-ringed Spoonbills were recorded, one ringed in 2003 and three ringed in 2004, from the Danube Basin (one from Hungary and two from Serbia) and Italian breeding sites. A flock of 70 Glossy Ibis *Plegadis falcinellus* was recorded at Taourgha Spring in 2006.

Phoenicopteridae – Flamingos

The main concentrations of Greater Flamingo were at coastal salt lakes in the Gulf of Sirt and Kuz, with the largest numbers (about 500 each year) at Kuz, although in 2006 there were 1,800 (well above the Ramsar 1% figure of 700) near the Tunisian border at Sebkhet Boukamesh, which had been completely dry in 2005. Two colour rings were read in 2005 and 11 in 2006, mainly in the Gulf of Sirt. All birds had been ringed as pulli and most were still immature: three from Andalucia, Spain, seven from the Camargue, France, two from Sardinia and one from Turkey. There have been very few previous recoveries of colour-ringed flamingos in Libya – only one of a live bird and nine of birds found dead, probably killed by hunters. Of the latter, two were from the Gulf of Sirt, six from Benghazi and one from Tobruk.

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Anatidae – Ducks

Numbers of Common Shelduck *Tadorna tadorna* were higher than might have been expected from the literature. Bundy (1976) considered Ruddy Shelduck *T. ferruginea* as an accidental; the survey recorded only one at Sebkhet Boubesla near the Tunisian border in 2006 (which was likely to have been dry in 2005). The literature indicates that, among surface-feeding ducks, only Northern Pintail *Anas acuta*, Northern Shoveler *A. clypeata* and Teal *A. crecca* are regularly seen in Libya, in small numbers; there are few records of Gadwall *A. strepera*. Low numbers of all four species were recorded during the survey, mostly on the few freshwater sites, including the irrigated agricultural area round Houn, 300 km into the desert. In neither year did the surveys locate Marbled Duck *Anas angustirostris*, which winters in significant numbers in the oases of southern Tunisia (Azafzaf & Hamrouni 2002). Future winter surveys of Libyan oases would be of particular interest for this species. Only low numbers of diving ducks were seen, probably reflecting the lack of deeper waters: 233 Pochard, all at the Benghazi complex in 2006, were the most numerous. The Near Threatened Ferruginous Duck is regarded mainly as a passage visitor to Libya, but 10 were found in January 2005 and 12 in 2006. The White-headed Duck *Oxyura leucocephala*, a species classified as Endangered by IUCN (2006) and which occurs regularly in Tunisia, was not seen; again, at least partly due to the lack of deeper water.

Gruidae - Cranes

Perhaps one of the most unusual findings of the surveys was that several hundred Eurasian Cranes winter at sites in the Gulf of Sirt, although Wetlands International (2002a) notes that the wintering area of the Northeast European breeding population covers Algeria, Tunisia and Libya. A total of 246 Eurasian Cranes was found in 2005 and 592 in 2006, the major concentrations in both years being at Taourgha and Al Hisha, where the birds seemed to be feeding on dry grassland around the springs, then flying to coastal salt lakes at dusk to roost. A group of 18 was also noted at Karkoura near Benghazi in 2005 and 13 further south at Brega in 2006. At Houn, some 300 km inland from Sirt, a group of over 100 Cranes was found, and local people confirmed that they were well known in this desert area.

Recurvirostridae, Burhinidae, Charadriidae, Scolopacidae – Waders:

In general, wader numbers were not exceptional, although these surveys found more Black-winged Stilts *Himantopus himantopus* and Avocets *Recurvirostra avosetta* than did previous observers. A single Little Ringed Plover *Charadrius dubius* was seen in 2005, which suggests that they winter in small numbers, as in southern Tunisia, though none was seen in 2006. Small numbers of Ringed Plover were found, 72 in 2005 and 38 in 2006. Over 1,100 Kentish Plover *Charadrius alexandrinus* were recorded in 2005 and 1,036 in 2006; it is likely that many more were overlooked on the large salt lakes where the species is numerous

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but ranges over large areas. The 1% of the total population size that would classify a site as being of international importance for Kentish Plover is 660 for the western Mediterranean population and 410 for the eastern Mediterranean population (Wetlands International 2002b). Thus, irrespective of whether the Libyan birds are considered to be eastern or western, this threshold is likely to be reached or exceeded at several lagoons in Libya, which emphasises the importance of the country for the species.

Four Greater Sand Plovers *Charadrius leschenaultii* and a single possible Lesser Sand Plover *Ch. mongolus* were seen in 2005, and a single Greater Sand Plover was seen in 2006, all east of Misrata; Libya is probably at the extreme west of their winter range. According to local hunters, Golden Plover *Pluvialis apricaria* (just over 400 birds recorded in 2005 and nearly 650 in 2006, mainly north of Benghazi) is a favourite quarry species. The survey found only two flocks of Dotterel *Eudromias morinellus*, which might have been expected to be common on the extensive dry plains of Libya. Observations of Temminck's Stint *Calidris temminckii* at three different sites confirm its status as a winter visitor (not surprising given its wide presence in Tunisia in winter). Knot *C. canutus* is more unusual, since there are few previous records, but there is an established wintering population in the tidal area of southern Tunisia. In 2006 the survey found a single Bar-tailed Godwit *Limosa lapponica*, also known to winter in tidal parts of Tunisia.

One of the objectives of the surveys was to search for Slender-billed Curlew. It is thought that the species – one of the rarest birds in the Western Palearctic with a world population put at fewer than 50 birds (Wetlands International 2002b) and classified in the highest category of Critically Endangered (IUCN 2006) – nests in Western Siberia and migrates through the Black Sea to winter in the Mediterranean. The preferred wintering habitat is believed to be shallow brackish coastal pools/marshes/ponds, with surrounding vegetation of glassworts *Salicornia* spp. and *Arthrocnemum* spp. (Ledant & Lafontaine 1994). Although no Slender-billed Curlews were found, large areas of this type of habitat occur in Libya, and it would be easy to overlook even appreciable numbers. Eurasian Curlews were found in the same habitat: 534 in 2005 and 397 in 2006. A single Whimbrel *Numenius phaeopus* (not previously recorded in Libya in winter) was seen in 2006. Numbers of the six *Tringa* species recorded were in line with previous observations.

Laridae – Gulls

The 10 species of gull recorded accounted for two thirds of the waterbirds observed, and provide some of the most interesting observations.

Four Great Black-headed Gulls *Larus ichthyaetus* were recorded in 2005 and six in 2006, all at coastal sites. Mediterranean Gulls *L. melanocephalus* numbered 228 in 2005 and 239 in 2006. Mediterranean Gulls tend to feed offshore, so some birds may have been overlooked; very large roosts (several thousand) occur in the tidal areas

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of Tunisia (Isenmann *et al.* 2005). Large numbers of Black-headed Gull *L. ridibundus* were observed: 14,000 in 2005 and 21,500 in 2006. All but a couple of hundred were in the Benghazi area, particularly around waste disposal areas. Numbers of Little Gull *L. minutus* were small.

Slender-billed Gull *Larus genei* has increased greatly as a breeding species in Tunisia and other Mediterranean countries in recent years (Wetlands International 2002b; Isenmann *et al.* 2005); nearly 900 were recorded in Libya in 2005, mostly near the Tunisian border. Numbers were much higher in 2006, with a total of over 7,500, including over 1,000 in the general area of Farwa in the west, 5,000 at Sebkhet Qasr Ahmed in the Taourgha complex (apparently sheltering from a storm at sea with Audouin's Gulls), 500 or more in the Benghazi complex and others all along the coast to the east. Given the latest estimate of 123,000–237,000 for the Black Sea and Mediterranean population of this species (Wetlands International 2002b), the total count represents at least 3% of the individuals in this population. One Slender-billed Gull colour ring was read at Farwa in 2005. This bird had been ringed in the Camargue, France in 1999, and was seen breeding there every summer from 2001 to 2004 inclusive.

A total of 344 Audouin's Gulls was recorded in 2005 and 670 in 2006; in 2005 the majority were around Benghazi (270 at Karkoura, 34 at Sebkhet Sultan, with a couple as far east as Derna), but in 2006 there were concentrations of 500 by day, sheltering from a storm at Qasr Ahmed, and 110 at El Ghbeba (at an evening roost).

A total of 1,425 Lesser Black-backed Gulls *Larus fuscus* was recorded in 2005 and 1,438 in 2006; close attention was not paid to the race(s) concerned. Most of the birds seen did not have a very dark mantle and would appear to have been *L. f. intermedius*. Bundy (1976) notes several recoveries in Libya of Lesser Black-backed Gull, presumably *L. f. intermedius*, ringed as pulli in Bornholm (Baltic Denmark) and one from Finland. Colour rings of three marked birds were read at Benghazi waste disposal area in 2006: one had been ringed north of the Arctic Circle in Norway (near Tromsø) as *L. f. graellsii*, the other two had been ringed on the west coast of Finland as *L. f. fuscus*, which winters in the eastern Mediterranean and East Africa. Recoveries of *L. f. graelsii* are most unusual in the Mediterranean, since most winter on the Atlantic coasts of Spain and Morocco. It is possible that all three subspecies winter in Libya, together with Armenian Gull *L. armenicus*, recorded by Gaskell (2005), and Heuglin's Gull *L. (fuscus) heuglini*.

Just over 500 Yellow-legged Gulls *L. michahellis* were noted in both years, with just over 1,500 Caspian (Pontic) Gulls *L. cachinnans* in 2005 and just over 2,600 in 2006. The former were noted throughout the country, with groups of over 100 at Benghazi waste disposal area and Essabre beach near Benghazi, but relatively few around Tripoli; at several coastal sites they were already taking up territories on nesting islands in January 2006. Caspian Gulls were found exclusively in the east, with the vast majority each year on Benghazi waste disposal area; the data appear to represent a major extension in knowledge of the wintering range of Caspian Gull. It should be noted that, in many cases, it was not

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possible to identify large gulls at the species level, and it was necessary to extrapolate the identity of large flocks from scans of sample groups.

Sternidae – Terns

A single Gull-billed Tern *Gelochelidon nilotica* in 2005 was a surprise. For Caspian Tern, most previous records are from the passage period, but the species clearly winters in Libya. A total of 101 Sandwich Terns *S. sandvicensis* was counted in 2005 and 122 in 2006, dotted along the coast from the Tunisian border to beyond Benghazi, but with occasional resting groups of 10–40 birds; these numbers are probably a considerable underestimate, as many of the birds seemed to be feeding at sea in the morning and not landing on the shore until around midday. There were no records of Lesser Crested Tern *S. bengalensis*, which is a summer visitor to Libya and is believed to winter in west Africa. The known Libyan Lesser Crested Tern colonies represent practically the whole of the Mediterranean breeding population. For the same reasons no Little Terns were observed, but they must breed very widely, given the large amount of suitable habitat and the numbers that breed in Tunisia. The observations confirm that Whiskered Tern *Chlidonias hybrida* winters in modest numbers, mainly at the Benghazi complex, with some in the Gulf of Bumba, already in summer plumage.

Discussion

Census of wintering waterbirds

The total number of waterbirds recorded in the surveys, of 29,996 in 2005 and 52,012 in 2006, was relatively low when compared to total numbers in neighbouring North African countries (e.g. over 220,000 waterbirds were counted at 116 sites in Tunisia in January 2003 (Azafzaf & Feltrup-Azafzaf 2003). It should be emphasised, however, that, particularly at the very large coastal salt lakes, coverage was far from complete. Because of the limited time available, the large size of many lagoons and difficulty of access, the number of waterbirds recorded is undoubtedly lower than the number of birds actually present.

The observation that significant numbers of Audouin's Gulls winter on either side of the Gulf of Sirt is a significant new discovery for the species. The species breeds almost entirely within the Mediterranean, and was previously believed to winter mainly in the western Mediterranean and West Africa with only limited numbers in Libya (Cramp & Simmons 1983; Wetlands International 2002b). Moreover, since the Audouin's Gull is of global conservation concern, classified as Near-Threatened (IUCN 2006), monitoring its use of Libyan wintering sites should continue to be a priority in future surveys.

Several species rarely recorded in winter in the Mediterranean were observed during the surveys (among them Little Bittern, Squacco Heron and Purple Heron), together with several species not previously noted or

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only rarely noted in Libya in winter (Slavonian Grebe *Podiceps auritus*, Great Egret, Glossy Ibis *Plegadis falcinellus,* Shelduck, Eurasian Crane, Black-winged Stilt, Avocet, Little Ringed Plover, Greater Sand Plover, Black-tailed Godwit *L. limosa*, Bar-tailed Godwit, Whimbrel, Wood Sandpiper *Tringa glareola*, Marsh Sandpiper *T. stagnatilis*, Caspian Gull, Great Black-headed Gull, Whiskered Tern and Pied Kingfisher *Ceryle rudis*). Furthermore, evidence was obtained of nesting by White Stork, for which there is only one definite previous record in Libya.

Importance of Libyan wetlands

Although few sites met the numerical criteria, in terms of bird numbers, for designation as a wetland of international importance under the Ramsar Convention, many met the qualitative criterion. Four sites had already been identified as Important Bird Areas by BirdLife International (Robertson & Essghaier 2001): three visited during the survey (Garabulli, Ain Azziana, Ain al Ghazala) plus Gara'a Island, not visited during the survey, the site of the largest Lesser Crested Tern colony. The authors suggest that the following sites are worthy of designation as wetlands of international importance under the Ramsar Convention and as Special Protected Areas of Mediterranean Importance (SPAMIs) under the Barcelona Convention:

1. Farwa Lagoon is an excellent example of a tidal bay (a rare wetland type in the Mediterranean), and as such is a high priority for protection measures. Designation would be welcomed by local people, who wish to maintain the current character of the site.

2. Libya's large salt lakes, notably the Taourgha complex, Sebkhet Sultan, Sebkhet Karkoura, Sebkhet Al Kuz and Sebkhet Temimi/Ain Al Ghazala, which are all good representative examples of coastal salt lakes (a characteristic Mediterranean habitat), are of special value because of their pristine and largely natural state. These sites have special importance for several waterbird species: Audouin's Gull at Taourgha and Karkoura, and Greater Flamingo and Kentish Plover at Kuz and Ain al Ghazala.

3. The Benghazi complex of salt-lakes, which carries significant numbers of several bird species and has huge potential as an urban site for raising public awareness of wetlands and their fauna and flora. Its proximity to Benghazi, however, puts it at risk of urban development.

Overall, this study indicates that, while total numbers of waterbirds using Libyan coastal wetlands are modest, species of Mediterranean lagoon systems such as Greater Flamingo, Kentish Plover and Slender-billed Gull, as well as Audouin's Gull, occur in significant numbers. Furthermore, the size and condition of the wetlands make them an important component of this habitat type at regional (Mediterranean) level. The results of the surveys have shown that a number of Libyan wetlands are worthy of international recognition and of increased monitoring and national conservation measures.

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Appendix 1. Numbers of waterbirds counted in Libya in January 2005 and 2006. [a] = Bundy (1976), [b] = Gaskell (2005)

Species	Sites	Numbers Counted		Existing information
		2005	2006	
Little Grebe	Tripoli dams, Taourgha, Houn, Benghazi area, Tobruk	36	23	Resident breeder and winter visitor[a]
Great Crested Grebe	Mainly at Farwa; tens at Temimi, Ghazala, Tobruk	248	259	Regular east to Misratah, max. 20[a]
Black-necked Grebe	Mainly at Farwa, Benghazi complex, Ghazala	305	627	Up to 50 Tripoli harbour, probably regular Benghazi[a]
Slavonian Grebe	Farwa 2006	0	1	No previous records
Great Cormorant	Mainly at Farwa, Benghazi, Temimi, Ghazala. 13 at oasis of Jaghbub 2005	1,150	994	Regular winter visitor to Tripoli[a]
Eurasian Shag	Sea islet of Jebel Akhdar, Mediterranean subspecies	0	5	Resident breeder (?)[a]
Little Bittern	Taourgha and four sites in Benghazi complex.	Probably overlooked	11	Passage visitor only[a]
Squacco Heron	Taourgha Spring	2	2	No previous winter records
Cattle Egret	Wadi Attot dam, Taourgha, Benghazi complex esp. waste disposal area	169	326	Previously scarce and irregular, recent expansion[b]
Little Egret	Widespread, flocks not exceeding 20	80	122	Passage migrant and winter visitor[a]
Great Egret	Widespread: Farwa (35 in 2006), Garabulli, Taourgha, Benghazi	16	54	Mainly singles[a]; small number Benghazi[b]
Purple Heron	Taourgha (both years), Al Hisha, Houn, Ain Ghezala	2	8	Passage migrant only[a]
Night Heron	Taougha and Temimi	0	2	Mainly passage, individuals may winter[a]
Grey Heron	Widespread, largest groups Benghazi	133	92	Mainly passage, not scarce in winter[a]
White Stork	Nesting Jeffara and Taourgha	6	6	Nests recently found for first time east of Benghazi[b]
Glossy Ibis	Only Taourgha	1	70	Passage migrant only [a]
Spoonbill	Mainly Farwa and Benghazi	86	99	Scarce passage and winter visitor[a]; up to 24 Benghazi[b]
Greater Flamingo	Nearly 2000 Boukamesh in 2006; Gulf of Sirt and Kuz	775	2,920	Regular winter visitor Kuz[a]
Greylag Goose	Wadi Attot dam near Tripoli	0	8	Accidental[a]

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Common Shelduck	Boukamesh, Taourgha, Al Hisha (120), Benghazi	107	303	Accidental[a]
Ruddy Shelduck	Boubesla (near frontier with Tunisia)	0	1	Accidental[a]
Wigeon	Dams near Tripoli, Taourgha, Benghazi, Kuz	27	53	Scarce but regular[a]
Gadwall	W. Turghat, Al Hisha, Benghazi, Temimi	14	13	Winter visitor[a]; rare[b]
Teal	Dams near Tripoli, Taourgha, Al Hisha, Houn (120), Benghazi (300 in 2006)	231	606	Common in winter[a,b]
Mallard	Tripoli dams, Taourgha, Gulf of Sirt, Benghazi	40	41	Scarce winter visitor in west[a]
Northern Pintail	Tripoli dams, Taourgha (300 in 2006), Benghazi	154	452	Locally common[a], common[b]
Northern Shoveler	Tripoli dams, Taourgha, Al Hisha, Houn (90 in 2006), Benghazi (700 in 2006), Kuz	501	1,138	Regular in Tripoli area[a], common round Benghazi[b]
Pochard	Tripoli dams, Benghazi (200 in 2006)	42	233	Scarce[a]; up to 100 Benghazi[b]
Ferruginous Duck	Tripoli dams, W. Kaam, Al Hisha, Houn, Benghazi	10	12	Common Tripoli in autumn[a], up to 6 Benghazi[b]
Tufted Duck	Tripoli dams, Benghazi	20	24	Scarce Tripoli[a], peak 35 in Jan[b]
Red-breasted Merganser	Ain Azziana near Benghazi	0	1	Scarce but regular Tripoli[a], once at Benghazi[b]
Moorhen	Tripoli wadi mouths, Taourgha, Benghazi and east of Benghazi	38	44	Resident, scarce in winter Tripoli and Benghazi[a]
Water Rail	Taourgha, Benghazi Lake, east of Benghazi	4	12	Present in winter in low numbers Benghazi[b]
Coot	Tripoli dams, W. Turghat, Taourgha, Al Hisha, Benghazi (300), Ain Ghazala	391	417	Common winter visitor in flocks up to 500 near Tripoli[a], common Benghazi[b]
Eurasian Crane	Taourgha (100), Al Hisha (300), Houn (100), Karkoura	246	595	Scarce and irregular[a]
Oystercatcher	Only Farwa area near Tunisian border	20	6	Scarce[a]
Black-winged Stilt	Taourgha (150), Al Hisha, Benghazi (90)	245	205	Passage visitor commonest in west[a], modest numbers wintering Benghazi[b]
Avocet	Boukamesh (120 in 2006), Farwa, Bishr, Benghazi	35	193	Accidental[a]

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Stone Curlew	Gulf of Sirt, Temimi	1	6	Resident breeder[a]
Little Ringed Plover	Taourgha, near Benghazi	2	0	Passage migrant[a]
Ringed Plover	Farwa, Taourgha, Al Hisha, Benghazi, Temimi, Ain Ghazala	72	72 39	Passage and winter visitor[a]; very small numbers[b]
Kentish Plover	Widespread, e.g. Farwa (470), Qasr Ahmed, Al Hisha (95), Sultan (150), Benghazi (450)	1,110	1,058	Resident breeder, less numerous in winter[a]. Over 700 late summer, Ain Azziana (Meininger 1994) (meets Ramsar 1% criterion)
Greater Sand Plover	Al Hisha, Karkoura, Temimi	4	1	Perhaps passage migrant[a]
Lesser Sand Plover	Ain Al Ghazala	1	0	One previous record
Golden Plover	Boukamesh, Qasr Ahmed, but mainly Benghazi: Kuz (320), Gfanta (110)	433	645	In Tripoli, locally common in winter, flocks up to 150[a]
Grey Plover	Widespread in small numbers: Farwa (130 in 2006)	67	195	Winter visitor, locally common[a,b]
Dotterel	Karkoura, Temimi	52	3	Locally common winter visitor[a]
Northern Lapwing	Tripoli dams, Taourgha, Ghemines, Shahat, Bumba	2	5	Scarce winter visitor[a]
Sanderling	Boukamesh, Farwa, W. Masaad, Ras Lanouf, Ganfouda, Benghazi	140	57	Local and seldom, commoner on passage[a,b]
Knot	Sultan	1	0	Accidental[a]
Little Stint	Widespread: Farwa (130), Boukamesh (200), Qasr Ahmed (230), Benghazi (350).	924	773	Winter visitor, commoner on passage[a,b]
Temminck's Stint	Tripoli dams, Taourgha, Ain Azziana	7	2	Mainly passage, some winter[a,b]
Dunlin	Farwa (200), Qasr Ahmed (150), Al Hisha (150), Benghazi (500), Kuz (400), Temimi (180)	1,399	1,947	Common Farwa, scarce elsewhere[a]
Ruff	Qasr Ahmed, Al Hisha (25), Karkoura (32)	60	27	Mainly on passage, also winters[a]
Jack Snipe	Tripoli dams, Taourgha, Temimi	9	3	Scarce winter visitor[a], 1, Benghazi[b]
Snipe	Taourgha, Benghazi, Ashagiga, Temimi	58	22	Common in winter[a]
Black-tailed Godwit	Farwa, Benghazi	10	10	Passage migrant[a]; 7, Benghazi[b]
Bar-tailed Godwit	Temimi	0	1	Accidental on passage[a]

Eurasian Curlew	Farwa (200), Sultan (100), Karkoura (60), Kuz (140)	534	419	Regular near Tunisian border, scarce elsewhere[a]
Slender-billed Curlew	None found, despite extensive search in good habitat	0	0	Accidental, one old record
Whimbrel	Tripoli harbour	0	1	Scarce passage migrant[a]
Spotted Redshank	Benghazi, Kuz	3	1	Passage migrant scarce in winter[a]
Redshank	Largest numbers east of Benghazi: Farwa (120), Benghazi (50), Kuz (130) Ashagiga (60), Temimi (50)	343	765	Locally common Tripoli[a], present in winter Benghazi[b]
Greenshank	Farwa (20), otherwise in small numbers	8	31	Scarce in winter[a]
Green Sandpiper	Tripoli dams, Benghazi	7	2	Passage migrant, but scarce in winter[a,b]
Wood Sandpiper	Tripoli dams, Taourgha, Benghazi	5	9	Passage migrant, scarce in winter, but 20 at Benghazi[a,b]
Common Sandpiper	Farwa, W. Kaam, Taourgha. Only one near Benghazi	6	8	Not scarce along coast in winter in Tripoli area[a]
Marsh Sandpiper	Tripoli dams, Taourgha, Al Hisha, Benghazi, Ain Azziana	9	4	Scarce on passage[a,b]
Turnstone	Farwa (35), Ras Lanouf, Karkoura (38), Benghazi, Kuz (17).	102	47	Scarce along coasts[a,b]
Mediterranean Gull	Majority round Farwa (190) in 2005, Tripoli harbour (50) Benghazi (175) in 2006	228	289	Common but local along coasts in winter[a]; about 500 winter Benghazi[b]
Little Gull	Only around Benghazi	55	2	Regular in winter in rough weather[a]
Black-headed Gull	All but 200 from Benghazi eastward, mainly at rubbish tips	14,137	21,491	Common Tripoli, scarce elsewhere[a], several thousand round Benghazi[b]
Slender-billed Gull	Mainly Farwa (700) in 2005; Farwa, sheltering from storm at Qasr Ahmed (5000) and round Benghazi in 2006	893	7616	Regular round Benghazi, scarce Tripoli[a], sparingly round Benghazi in winter[b]
Audouin's Gull	Majority 2005 in Benghazi area (Karkoura 270, Sultan 34); in 2006, 500 sheltering from storm at Qasr Ahmed	344	670	Winter visitor Tripoli, max. 72[a], all the year round in west[b]
Lesser Black-backed Gull	50% near Farwa, Qasr Ahmed (380), 600 Benghazi waste disposal area	1,425	1,438	Winter visitor, up to 800 Tripoli[a]

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Caspian Gull	Found exclusively in east, vast majority at Benghazi waste disposal area	1,582	2,629	Small numbers Benghazi Jan-Mar[b]
Yellow-legged Gull	Thinly spread west to east, 100 Benghazi waste disposal area	535	506	Winter visitor
Great Black-headed Gull	Farwa, Sultan, El Ghebaba	4	6	First Libyan record two near Benghazi[b]
Gull-billed Tern	Farwa	1	0	Only on passage[a], Benghazi Oct/Nov[b]
Caspian Tern	Farwa (30), some east of Benghazi	38	42	Mainly on passage, some winter[a], at Benghazi to 19 Oct[b]
Sandwich Tern	Thinly spread along coast west to east	101	122	Winter visitor Tripoli[a], and Benghazi[b]
Whiskered Tern	Mainly Benghazi both years, a few in Gulf of Bumba	77	53	Passage migrant[a], passage and also winter visitor to Benghazi[b]